University of Puerto Rico
Río Piedras Campus
Dean of Graduate Studies and Research

1st Cycle - Evaluation Plan
College of Natural Sciences

Environmental Sciences Graduate Programs (MSc and PhD)

Self-Study Document

Evaluation period: 2009-2015

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Approved by the CIAM Faculty: January 27, 2016
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Executive Summary

The MSc and PhD Graduate Programs in Environmental Sciences began in 2009. Since then, nine graduate students have graduated and three new faculty members have been recruited.

Program strengths- We identified important strengths in areas related to: a) faculty research productivity, b) capacity for student recruitment, c) internationalization, d) student satisfaction with overall graduate experience, e) interdisciplinarity, f) some student skills and competencies, and g) facilities. Below is a list of strengths with summary explanations for each.

a. **Research and creation**– A highlight of this program is its publication rate in five years with 173 peer-reviewed publications and 38 non-peer-reviewed ones by 12 tenured track faculty and one full-time contract over a five-year period particularly in areas related to earth sciences, ecosystems, and natural resources. During the five years, the program was able to complete its recruitment plan to include faculty in the areas of Marine Sciences, Energy, and Ecological Modelling. Both students and faculty pointed out that off-campus research facilities were an asset to the program.
b. **Student recruitment** – Since its implementation, the Graduate Program as a whole has been able to maintain an adequate recruitment rate (average 12/yr) attracting students from diverse professional backgrounds and from different countries, yielding a diverse student body with diverse interests within Environmental Sciences.
c. **Program internationalization** - The Graduate Program hosts faculty and students from PR, US, Asia and Latin America allowing for the establishment of research work and collaborations with other countries. Internationalization of programs is a goal defined within our campus and UPR system's strategic plans.
d. **High student satisfaction in terms of their overall graduate experience** – In a student survey, over 80% of our students gave the overall graduate experience a satisfactory/very satisfactory rating. They were particularly satisfied with the research productivity and facilities and with some of the skills that they were developing within the program.
e. **Interdisciplinary work** – The majority of our graduate students are pursuing the interdisciplinary track which has, as a result, translated into more interdisciplinary research addressed by CIAM's faculty. An increase in interdisciplinary research was a goal of this program and aligns with strategic plans of the campus and the UPR system.
f. **Students' capacity for oral communication, team work, social responsibility** – Ina faculty survey, faculty rated highly the capacity of students for oral communication (related to the high number of presentations at conferences), as well as their capacity for team work and their degree of social responsibility. A contributing factor has been the IGERT Student Training program which developed a series of interdisciplinary courses that involved teamwork and joint activities with off-campus organizations (Agents of Change program). Both student and faculty have participated in a variety of outreach activities that targeted the general public, K-12 schools and the academic community (on and off campus).
g. **Facilities -** Off-campus research facilities (El Verde Field Station, Atmospheric Observatories, Toa baja) managed by the Department of Environmental Sciences received good marks as outlets for research.

Program weaknesses- The self-study report also revealed some weakness that must be addressed. The major weakness of this program is the low student graduation rate combined with problems with student retention and unintended partial students. Below we list and describe these problems.
a. **Student graduation rate** – Only nine students (7 MSc, 1 PhD) have graduated since the program was implemented.

b. **Low recruitment rate into two of three tracks of the program namely 'Environmental Modeling and Spatial Analysis' and 'Sustainable Management of Islands and Tropical Regions'** - Most students choose the interdisciplinary tract (over 90%) with little recruitment into the other two program tracks.
c. **Faculty and student dissatisfaction with several aspects of the program** – Faculty felt that many students felt short on important skills necessary to succeed in Environmental Sciences particularly in their level of statistical/mathematical skills and capacity for written communication. Students were also dissatisfied with their level of statistical skills, mathematical reasoning and research design. Both faculty and students expressed dissatisfaction with the current amount of course requirements with faculty expressing that the program was too 'course-heavy' and requirement-heavy. Program administration and management was also of great concern to faculty and students.

Main Obstacles to the Programs' Mission and Goals and Why – Student underperformance may stem from a variety of reasons and ultimately may limit student success and program development and improvement in all of its areas. Following discussions, we have identified that factors that may potentially limit Program development and productivity fell into four main areas: a) Level of skills among newly recruited students, b) Curricular voids, c) Program management (evaluation/ assessment) and, d) Student funding opportunities.

a. One possibility for the low student ranking for certain skills is that *newly admitted students may have lower than acceptable mathematical and writing skills to be able to succeed in graduate education*. The program has admission requirements that are standard among graduate programs in science and does not have a stated profile for newly admitted students. It should be noted that because this is an interdisciplinary program some of our students may not have science degrees. If so they are provided conditional acceptances pending their completion of undergraduate courses to complete admission pre-requisites. At the time of this report we were unable to quantify how many students came from non-science backgrounds.
b. *Curricular voids* (lack of courses to develop needed skills) may be another factor that may hamper the development of skills and competencies needed to succeed in our graduate program. Courses that improve statistical skills and research design seem to be a general consensus among faculty as well as the need to increase the program's areas of expertise.
c. *Program management*
- <u>Lack of defined, streamlined and consistent strategies for academic evaluation/assessment within the institution at all levels</u> (Department, College, and Campus) which has prevented the systematic and timely collection of data necessary to fully evaluate student progress and different aspects of the MS and PhD programs. It should be noted that the majority of the data used in this report was compiled or collected after September 28, 2015 and while many offices and people provided help, the quantity and quality of the data was not always the best. It is clear that there should be different degrees of responsibilities for data collection and a better way to collect the data. Learning assessment while steered by the College of Natural Sciences has not been as useful to the Program as program assessment results clash with the perception of student skills especially by faculty. CIAM faculty is not fully integrated into this process and instead are not as aware as to what the campus/department-wise learning objectives should be and in some cases there is a clear detachment from the faculty from this process. CIAM learning objectives seem to be loosely defined.
-<u>Heavy course loads and too many exam requirements –</u> Both the MS and PhD programs have too many required courses forcing students to take two years of courses or more of courses delaying their proposal preparations and associated research activities. Faculty expressed the need to re-evaluate the requirements for candidacy advancement (currently one exam in year 1, one in year 2 and a proposal) as well as the content for these exams. Streaming this process to eliminate redundancy focusing the

examinations on skills and the content on the student's research interest may help reduced the students' completion times.

d. *Lack of funding* - The program was very successful at recruiting students in its first five years due to IGERT, PRCEN, CREST, Title V and availability of student TAs. IGERT was considered competitive funding relative to what the institution offers which allowed for the recruitment of competitive students. Following IGERT's completion and after the reduction of TA positions, the ability to recruit by the program has been severely hampered as of 2015 (after the evaluation period).

Next Steps – In this report we provide a summative evaluation of the key areas of the program and provide an outline of potential strategies designed to fill program gaps while building upon the strengths of the program. Some of the strategies being evaluated include but are not limited to a) a re-evaluation of the student recruitment process that build from results from this process and more input with CIAM faculty including the development of a 'Profile for newly admitted students', b) changes in the data collection process for program evaluations and learning assessment in such a way that CIAM can have alternatives when the institutional data sources (CIAM Program Coordination, College of Natural Sciences, DEGI, OPEP, Human Resources) and to ensure temporal consistency and evaluation of learning objectives, c) develop a Department-wide assessment scheme that includes a clear assignment of responsibilities and the educate faculty on their responsibilities to this processes (evaluation and assessment), d) design and develop curricular and academic requirement changes and to reduce gaps in student skills and reduce graduation time with more input from CIAM faculty and students, e) revise and encourage the implementation of an aggressive faculty recruitment plan that helps reduce curricular limitations while helping expand and develop our program.

What follows is a *Self Evaluation Narrative* (21 pages) complemented with a *Self-Evaluation Template (hereafter "Template"),* which *a* repository of data and analyses about the program (83 pages) with *Appendixes* that complement both of the above sections (808 pages). Except for a Recommendations section which is exclusive to the Self Evaluation Narrative, the main sections of the *Self Evaluation Narrative* and *Template* have the same names to maintain parallelism between these sections. Each section has independent numbering (i.e. starts with page #1).

1. SELF-EVALUATION NARRATIVE

I. PROGRAM FOUNDATIONS

A. Accreditation - Neither the MSc nor the PhD Program in Environmental Sciences requires accreditation by professional associations so that their graduates can exercise the functions of their corresponding degree once these are conferred.

B. Background – The Graduate Program in Environmental Sciences has a very strong research component that has attracted national and international students since its beginning in 2009. The research areas were developed based primarily on the interests of the researchers that became members of the Graduate Program and of those that were hired soon after. Most of the researchers were members of the Institute for Tropical Ecosystem Studies (ITES) of UPR-RP which was merged into the new Department of Environmental Sciences in 2012. ITES research had a strong tropical ecosystems ecology approach which served to establish the Luquillo Long-Term Research Program, an NSF-funded program initiated in 1989 which still continues today and has generated over 500 peer-review publications. The core faculty of the Graduate Programs in Environmental Sciences is made up of 13 professors (12 with permanent or tenure-track contracts) covering a variety of areas within environmental sciences (**Template: Tables 1.1.B, P3 ; 3.1.A, P.51**). Since its creation the Graduate Program was designed with a highly interdisciplinary vision that would have a strong social component in its education and research training. Implementation of this vision was possible with funding from an Integrative Graduate Education and Research Traineeship (IGERT) grant to the Graduate Program in Environmental Sciences from the NSF (Award Number 0801577; $2.96 M; 2008-2015) that provided a platform where faculty from different academic departments collaborated in highly interdisciplinary projects and courses and began a culture of true interdisciplinary collaboration in science graduate training focused on environmental problems in topical urban areas with very few parallels on campus given the nature of research, education, and research outcomes from students and faculty (**Template: Appendix 2 – IGERT Final Report**). The implementation of this program catalyzed the creation of the Department of Environmental Sciences, a merger between the undergraduate and graduate academic programs in Environmental Sciences with the Institute for Tropical Ecosystem Studies (ITES) a prolific research institute with a long-history of high impact research. This merger added nine faculty members to the program increasing its capacity for student training. Some of the most significant achievements by The Graduate Program in Environmental Sciences to date are:

1) The completion of 7 MSc Thesis and 1 PhD dissertation (8 students total);
2) The recruitment of 80 students (76 during the evaluation period) with a considerable number of international students (20 countries represented);
3) The pre-institutionalization of the IGERT course curriculum which includes interdisciplinary courses that integrate social and natural sciences;
4) A long list of student and faculty publications (211 total, 50 co-authored with students)
5) Recruitment of three faculty members to expand target research/education areas;
6) The development of an outreach culture that promotes the vision of this program with research or education activities linked to government (state and federal) and non-government organizations as well as the private sector; and
7) For five years, the program was able to offer competitive fellowships (i.e. IGERT, GK-12) which helped to support graduate students interest in urban systems and pre-college education (**Template: Table 4.7.B.; P62 ; Appendix 2)**

Below we summarize the Self Evaluation Committee findings in all of the target areas narrating the status of each area, its strengths and weaknesses. At the end, a section with recommendations is presented that we hope can help strengthen the program even further and aid its future development.

B. Vision, Goals, and Program Objectives

a. Status. The program did not have an initial vision statement but that changed with the creation of the Department of Environmental Sciences (hereafter CIAM for its acronym in Spanish) which resulted from the integration of the graduate and undergraduate academic programs and the former Institute for Tropical Ecosystem Studies, a successful research unit within the College of Natural Sciences which managed several federal grants and programs including the NSF-funded Luquillo LTER Program and various off-campus research facilities. Upon the creation of the department, the Environmental Sciences Graduate Program adopted CIAMs vision statement (**Template: Table 1.1.C.1 Vision, Mission, Goals, Objectives P. 8**). The program has always had a mission statement but what it is written today is somewhat different from what was written in the proposal to create the Graduate Program was approved in 2009 which was vaguer in terms of the function on the program. The committee does not know when changes to the mission statement were made but the mission statement has remained consistent in all of the revisions of the Graduate Program's guidelines for some time (**Template: Appendix 3-Graduate Program Guidelines 2015**). There are six program goals and eight program objectives which remain intact since the program was developed (**Template: Table 1.1.C.1 Vision, Mission, Program Goals, Objectives; P.8).** To our knowledge the self-evaluation exercise is the first attempt ever made to evaluate the alignment of program goals and objectives (**Template: Appendix 4 Proposal to Create a Graduate Program in Environmental Sciences**).

b. Strengths: 1) This vision statement defines the direction of the program and how it views itself within a local and global context (i.e. a community that performs cutting edge research and community participation that solves complex environmental problems and lead to a sustainable biosphere, a community committed to productive relationships outside academic and outside Puerto Rico).
2) Our vision statement does align with the UPR Río Piedras Strategic Plan (Vision 2016) UPR strategic plan and especially to Goal 1 of that plan (**Template: P.7-10**). **3)** CIAM's mission statement is both an affirmation of the program's function and defines a variety of research areas that help guide knowledge production **(Template: Table 1.1.C. Vision, Mission, Goals, Objectives; P.8-10). 4)** CIAM's mission statement is tightly related to at least three elements of the UPR RP Mission statements (P.14) related to a) the provision of an integrated education that promotes a variety of skills including intellectual curiosity (research being the driver of intellectual curiosity skills for our program), b) researchers with social responsibility in CIAM relates to the provision of an interdisciplinary education that studies the environment as a social-natural coupled system and c) the provision of unified visions of knowledge in education. In CIAM, this relates to the creation of new knowledge directed towards achieving a sustainable society, 5**)** The committee found that the mission statement was still very much relevant in today's social context in several aspects). In terms of the development of the profession, our mission calls for highly interdisciplinary training which aligns with professions that fall within the realm of environmental scientists and technicians (**Template; P. 11-12; P16-19).** In terms of the labor market, jobs for environmental scientists and specialist jobs have an expected growth that is faster than average (15%) nationwide (**Template; P. 16-19**) and there are also good prospects for green jobs (closely related to what environmental scientists and specialists do). The *empleosverdes* website (translated as Green Jobs in English; www.empleosverdespr.com/) also reports increases for jobs related to environmental sciences and in particular those related to the waste management and community service industries (see projections by state by industry in http://www.empleosverdespr.com/). In Puerto Rico, green jobs related to professional services, scientists and technicians represent 12.4% (out of 3,717) of green jobs in Puerto Rico or the fourth most common type of green job (http://www.empleosverdespr.com/Media/Documents/Presentaci%C3%B3n%20Resultados%20Encuesta%20Estudios%20T%C3%A9cnicos%20Sheraron.pdf). In terms of the requirements to practice the environmental science profession, professional accreditations are not needed, some positions do not require a graduate degree but others (i.e. academics) do. For many of the positions, a graduate degree brings a higher salary (See

data from Bureau of Labor Statistics; http://www.bls.gov/ooh/life-physical-and-social-science/environmental-scientists-and-specialists.htm#tab-4). In terms of the social context in which the Program has been developed, the program has a high relevancy in two respects. First, there is a large interest among undergraduate students in pursuing a graduate education in Environmental Sciences. A survey of student interest conducted among undergraduates in the Environmental Science Undergraduate Program indicated that 71.5% of students surveyed would like to continue graduate studies and 42.7 % of those indicated that they would like to pursue graduate studies in Puerto Rico. Approximately 86% of those indicated that they would prefer to work with a federal agency **(Template: Appendix 5; Undergraduate Student Satisfaction)**, where a graduate education helps increase the chances of a higher level entry (**Template P. 16-19;**). A second point of relevance in terms of the social context of the program in relation to the program's' mission is that its sustainability focus is very much aligned with the current needs of society to solve major environmental problems in the face of global changes that threaten human well-being. Climate change is an example of these problems that has been deemed to have local and global sustainability implications by local and international scientific authorities (See Analysis P. as indicated by the IPCC 2014 and The Puerto Rico Climate Change Council (PRCC 2014: http://pr-ccc.org/wp-content/uploads/2014/08/PRCCC_ExecutiveSummary.pdf). **6)** The committee felt that Program Goals as stated do best at describing the responsibilities of the program in terms of student capacity-building and learning, research production and knowledge and the relationships of program participants with the outside community (even when this last one is not explicit in the Mission statement). 7) The Vision, Mission and Program Goals and Objectives reflect the situation, interests and complexity of the Environmental Science Department.

c. Weaknesses: 1) The committee felt that the mission statement while very relevant in terms of meeting todays education needs could do more in terms of defining its research tracks more explicitly (interdisciplinary track is defined but not 'sustainable management of island and tropical regions' and 'environmental modeling and spatial analysis') and in expressing the ways it implements community service which are currently undefined in the statement. 2) Stated Program Goals while best at describing the responsibilities of the program in terms of student capacity-building and learning, research and knowledge production, service and relationships with the community are vague in terms of describing its responsibilities in terms of the recruitment and development of faculty as well as its program management and infrastructure (**Template: Table 1.1.C1 Vision, Mission, Goals, Objectives – P.7-10, Table 1.1.C.2 Alignment of Program Goals w. Program Objectives, P.12-14)**. There are no written statements on these in our official program documents although some could be inferred from the responsibilities ascribed to the Department of Environmental Sciences. Clear goals would provide clear directions to the program and will help prevent the development of perceived programmatic conflicts between the program and department/individual faculty goals if there were ever any. 3) Program objectives vary in their enunciation of operation actions (some are operationally stated; others are not). None of the objectives enunciate activities that facilitate the evaluation of the graduate programs although some of these activities can be inferred from the objective statement. 4) The committee did not find a list of indicators by which to measure program objectives and developed a potential list (**Template: Table 1.1.C2 Alignment of Program Goals with Program Objectives, P.12-15**) aligned with objectives and program goals. In developing these indicators, the program also attempted to identify the mechanisms to gather data for these indicators. It should be stated that some objectives were vague in their statement of indicator. 5) The Vision, Mission and Program Goals and Objectives while reflecting the situation, interests and complexity of the Environmental Science Graduate Program fail to highlight the tracks and outreach activities which were unique or else supported by the Graduate Program infrastructure such as IGERT's Agents of Change, LTER Schoolyard, SJULTRA, PRCN, CRESS, REU Program (**Template Program Background, P.24-29)**. 6) It is difficult to align program objectives, in their present form, with program goals even when the committee provided its best educated estimate as to how these would align. Perhaps some program objectives should be seen as program goals that need the development of objectives.

C. Student Profiles and Learning Objectives

a. Strengths: 1) Both Alumni Student Profile (for Masters and PhDs) are written as a list of about 10 statements that start with a verb in the infinitive **(Template: Appendix 1** - **Table 1.2. D.1. and 1.2.D.2.**). **2)** The committee found a lot of correspondence between the Alumni Student Profile and opportunities with the job market. Environmental/sustainability issues have exacerbated on and off the island, creating a need for adequately trained professionals to tackle these problems and thus providing job prospects for graduates. In examining **Tables 1.1.D.1 and 1.1.D.2. (Template: Appendix 1**), we find that many of the characteristics listed in the original Alumni Student Profile are still very much relevant to the needs and opportunities under the current job market. The job market for Environmental Scientists is projected to increase by 15% in 2022. Job market trends while positive are not high for science professors in Environmental Sciences although these figures do not take into consideration job openings associated to retirements in academia (**Template: P. 11-12; P 16-19)**. **3**) Current learning objectives relate to the campus wide-accepted competencies that students must demonstrate during their tenure within the program (but see weaknesses). **4)** Current objectives are measurable and have been measured during assessment **(Template: Appendix 8- Graduate Program Learning Assessment Plan**). **5)** Alumnus profile traits that seem to be aligned with the current achievement of learning objectives within the program (as measured by faculty rankings) are the ability of students to work in teams (70 % satisfactory/very satisfactory), social responsibility (65% satisfactory/very satisfactory) and oral communication (54% satisfactory/very satisfactory – faculty surveys; over 70% student surveys). The ability to work as part of teams in field studies and research projects in Environmental Sciences, and contribute significantly to these is an alumnus profile that does not have an explicit learning objective, yet courses seem to be incorporating that skill effectively as suggested by the level of satisfaction by both faculty and students in their respective surveys **(Template: Faculty and Student Surveys; Appendixes 6 and 7**).

b. Weaknesses: 1) The committee was unable to find learning objectives that were unique to the program. The Program is, however, relying on learning objectives that have been standardized across campus and applied to the evaluation of graduate programs. These prevents the evaluation of program-wide goals and objectives that may be more content oriented. Students expressed the need to make more courses outside the College available for enrollment and especially those in Social Sciences **(Template: Student Surveys Appendix 7).** They also expressed the need for more courses in other areas within Environmental Sciences. **2)** While, current learning objectives do relate to the competencies that students must demonstrate, not all expected competencies have matching learning objectives. The committee evaluated a table that matches each of the learning objectives to the campus-wide competencies that need to be demonstrated by the graduate students in all graduate programs and found that for our program, some competencies (Capacity for independent study, Intellectual Curiosity, Continuous Learning, Leadership, Teamwork) lack learning objectives **(Template: Table 1.2.E Learning Objectives vs. Competencies of the Program, P 20-21). 3)** Not all targeted learning objectives according to the Assessment Plan were evaluated and not all targeted courses were in this evaluation. This reduces the number of students that are included in the process and limits the number of objectives that can be evaluated. By the same token it appears that Teamwork might have been evaluated but the committee could not locate a written learning objective for it **(Template: Appendix 8- Graduate Program Learning Assessment**). **4)** The program currently lacks a profile for newly admitted students. Committee discussions based on the data evaluated argue in favor of one as one of several mechanisms to reduce the variation in certain competencies among students. **5)** There needs to be an evaluation of how entry requirement relate to student performance. Such an evaluation would allow for better recommendation for program development. **6)** Most faculty agree that a change in curricular requirements is in order. Both programs (MSc and PhD) are deemed by faculty and students as too course heavy, currently more focused on content and less on skills. Most faculty agree that there should be a change in focus towards skills related to analysis and knowledge acquisition and lesser focus on providing a fixed general course load to students (**see Template: Appendix 6 - Faculty Survey).**

II CURRICULUM AND CURRICULAR EXPERIENCES

a. Status: Our examination of the curriculum was guided by the template questions. Our answers to the questions are the basis for the following comments on the curriculum. The Masters curriculum has 11 required courses and the PhD has 13. The portfolio of elective courses totals 49 courses with 18 taught by our Graduate Programs (MSc and PhD) and the rest by graduate programs in Biology, Chemistry, Economy, Planning, and the Law School. The curriculum has never been revised since the inception of the Graduate Program but this is a program in its early stages. We have not made an Island-wide assessment of needs relevant to the Graduate Program (**Template: P26-32)**

b. Strengths - The curriculum meets the Bloom Objectives, and the sequence of courses generally follows a logical development of skills meeting the Objectives. But, in general, all Bloom objectives are addressed in many courses throughout the sequence. The curriculum provides skills needed for research. This happens in two ways: **1)** courses promote critical thinking, the ability to get information and synthesize it, the ability to ask pertinent questions, and the ability to communicate via writing and speaking, and **2)** some courses, such as statistics, are expressly designed to provide research skills. In terms of content, the courses cover many areas of knowledge and skills. The idea and practice of an interdisciplinary approach are strongly represented in the curriculum of the Environmental Sciences Department and via opportunities to take courses in other departments. The curriculum is certainly conducive to the development of ethics, standards, and a social conscience, although these are not concepts that are directly taught.

c. Weaknesses: Many of the courses are elementary, introductory courses, which in itself may be appropriate. But see critique below regarding course requirements for students. Professional experience is not expressly provided in the curriculum and no internship is required. According to a student survey, courses were too theoretical and needed more hands-on experience. These experiences are available for IGERT courses but not all students were able to enroll in these courses and therefore these experiences were not widely available to all students. Some faculty expressed concern about the state of the current curriculum which seems to be based on the idea that we are training students for professional management positions. Indeed, we should be doing that, but we should also be offering a strong program for students who wish to become researchers rather than managers. While a goal of a PhD program is to provide students with research training and be adept at carrying out research, not all students are interested in pursuing research careers or careers in academia. A solution is to offer two tracks, one being for a professional master's degree and one being for master's and PhD level research. A consequence of the apparent emphasis on management in the current curriculum is that there are too many required courses in too many elementary subjects, and there is not enough emphasis on research. There is too much emphasis on students acquiring a certain body of knowledge, rather than on acquiring skills for asking and answering research questions. For example, there is no reason why all students need to one course in all the areas represented within the Department (coastal, terrestrial, and urban environments etc.). If their research develops along one of those lines they can then take the relevant introductory course followed by specialized courses. Alternatively, students can be provided by one general courses that exposes them to all areas deemed as core areas within the department. With all the required courses in the current curriculum there is not enough time for research in either the Master's or PhD programs. In the current curriculum Master's students are required to take a full load of courses for two years. This delays starting on research and prevents student from taking more of the more specialized courses needed to develop their science niche. The same applies to the PhD program.

We believe that entering students should already have taken elementary courses in math, biology, chemistry, physics, statistics, and ecology. If not, they should take these as "special students" before entering the Graduate Program. Once in the program, graduate students in the proposed research track should take

advanced courses that underpin research, such as GIS, advanced statistics and experimental design, and a course on writing papers and proposals and in public speaking (as in the Doctoral Seminar in Biology). Also, as a credit course, new graduate students could enter some kind of lab rotation, where they experience the research in different professors' labs. Students could take a course in which they tackle an environmental issue with research. After that they should take the courses on subjects that best suit their line of research.

As mentioned we propose revising the curriculum to contain tracks for **1)** professional management and for **2)** research. We question the rationale for the present curriculum tracks. The present curriculum tracks seem to reflect the idea that we are training students for certain jobs, rather than as researchers. Also, the tracks do not reflect student interests. Apparently the great majority of students are in the *Interdisicplinary* track with very few enrolled in the *Spatial Analysis and Environmental Modelling* track and none at the *Sustainable Management of island and Tropical Regions*. Students preparing for research careers can work out their own "track" with their advisors, deciding what courses best suit their interests and their research goals. The capable environmental scientist emerging form our Graduate Program will know how to ask questions and get the information they need for the problem they need to address in areas in which they do not have detailed knowledge.

The department should discuss the recruitment problem in two of its three tracks. Data from the Bureau of Labor Statistics on occupations for Geoscientists would argue very much in favor of keeping, developing and strengthening the *Spatial Analysis and Environmental Modelling* track **(Template: Appendix 10 – Geospatial Jobs).**

Finally, some faculty debate whether or not graduate students should not get research credit for attending the Departmental Seminar. As future researchers in environmental science they should understand that attending seminars is part of their education in the variety of subjects that comprise environmental science. Also, giving credit for attending the seminar to some students suggests that the other students do not need to go the seminar. Instead, all professors in the department should tell their graduate students that they should attend the Departmental Seminar, and no course credit given. Another possibility, of course, is to make seminars mandatory for all students.

III. PROFESSORS AND RESEARCH

a. Status: The Graduate Program has a diverse and highly productive faculty group dedicating to the cutting-edge and interdisciplinary research in Environmental Science. From 2009 to 2015, the research efforts led to 173 peer-reviewed publications and 38 non-peer-reviewed ones, 193 scientific presentations at venues off the island and 205 within Puerto Rico, and $41,569,382 of external funds with CIAM faculty as PI or Co-PIs to support research and education at UPR. The number of non-peer-reviewed publications seems to have decreased in 2015 but we have no current data to understand the reasons why. It is unclear if peer reviewed publications have decreased as data for 2015 is based on partial data for that year.

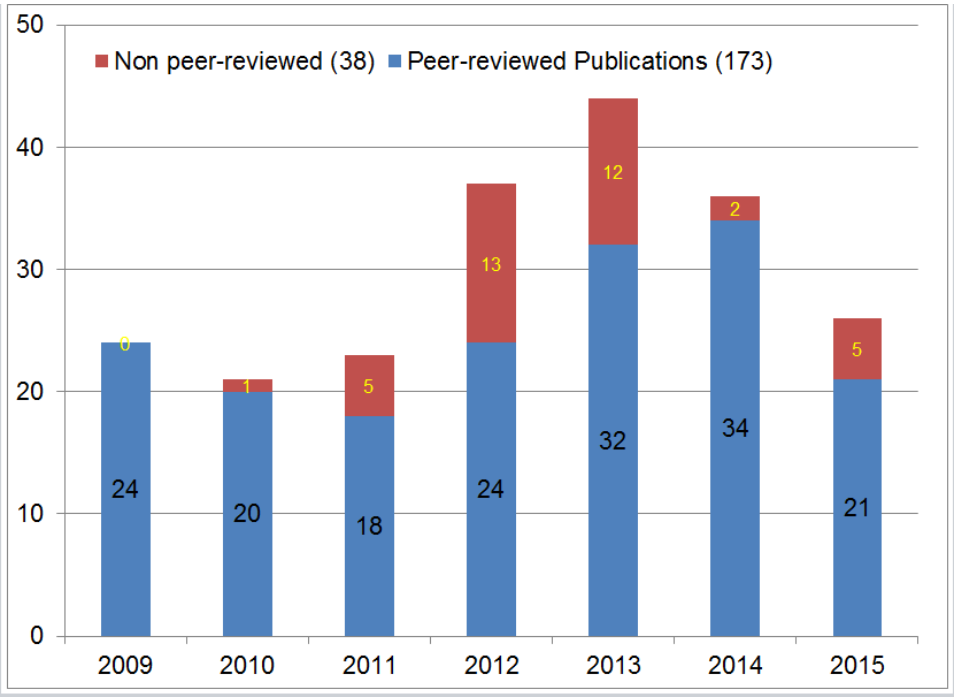

Figure 1. Publications from faculty and student members of the Environmental Sciences Graduate Program from 2009 to 2015.

a.1 Interdisciplinary and internationalized research group

The profile of professors in general meet the need of the program to promote cutting-edge research in solving complex environmental problems and to encourage sustainability. The program highlights interdisciplinary research and the faculty specialty covers atmospheric science, hydrology, ecology, biodiversity, geoscience, biogeochemistry, energy, engineering, and environmental management. In the past 5 years, the program succeeded in recruiting three faculty members to fill in the fields of Marine Sciences, Energy, and Modelling. The faculty comes from PR, US, Asia, and Latin America and conducts projects with broad international collaborations. This in turn attracts more international students to apply to the Graduate Program, which can be seen from the students' recruitment profile.

Eleven out of thirteen faculty members have nine credits of release time for research each. The nine-credit release time is essential for the faculty to keep productive, conduct cutting-edge interdisciplinary research, succeed in acquiring external competitive funds, and to meet societal needs in solving complex environmental problems, which assures a successful and competitive graduate program. Interdisciplinary research and internationalization of the program both align with strategic plans of UPR.

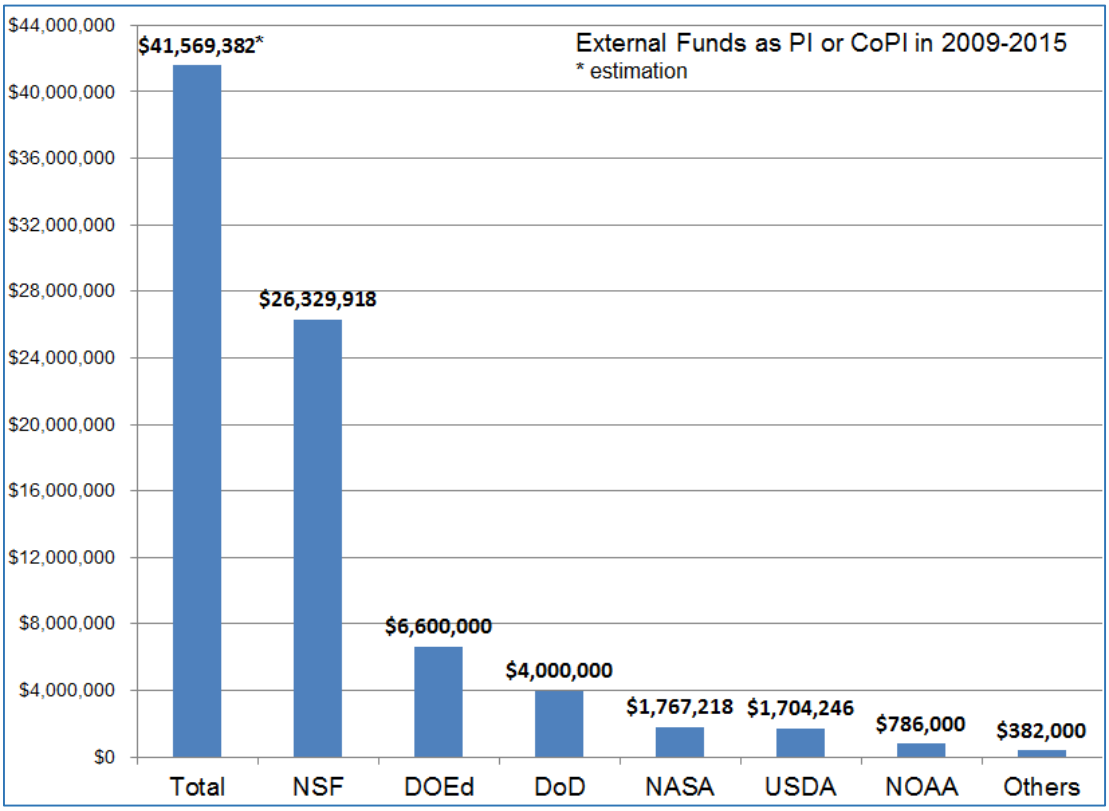

Figure 2 External funds obtained in 2009-2015 with CIAM faculty as PI or Co-PI, includes grants ran by other units within UPR

a.2 External funds for research and education

Research conducted in the Graduate Program during the past five years aims to improve the understanding of the structures and functions of ecosystems and to promote the environmental and natural resources sustainability, which reflects the specialties of the faculty. Recently, research projects coupling the natural and human systems emerge in the program to address interdisciplinary and community participation. The program encourages faculty to obtain external funds to support their research. Such efforts are quite successful in the past 5 years **(Figure 2; Template: Appendix 1 Table TABLE 3.3.C1 Program Projects by Year by Faculty).** There are $41,569,382 in total of external funds with CIAM faculty as PI or Co-PI. However, data on the funds remaining in the programs are not available. The biggest portion comes from NSF with over $26M, mainly supporting the LUQ LTER related projects and the IGERT program. The LUQ LTER is a long-term competitive research project funding tropical ecosystem studies. It started in 1989 and collaborates with many US and international universities, such as University of Georgia, University of California – Berkeley, University of Connecticut, Columbia University, and University of New Mexico. The project has a budget of about $6,000,000 for every six years and it has just been renewed to 2018. The IGERT (Integrative Graduate Education and Research Traineeship) project was funded since the beginning of this graduate program and supported 25 IGERT fellows 2009-2015. It highlights the human-environment interactions in an urbanizing tropical environment. The IGERT, the San Juan Ultra, and the LTER projects all promote community participation and have many outreach activities with stakeholders, government agencies, and K12 schools, such as the Agent of Change programs promoted by IGERT and the Schoolyard program implemented by the LUQ LTER. In addition, PRCEN (NSF-funded) graduate fellows are required to conduct 2 outreach activities each year which include either school visits, lab open house, or field trips for K-12. All DoD-funded students participated in both the FEW symposiums each year supporting local schools and also gave a lab open house each year. All students presented each year at local meetings and many presented at international meetings. GK-12 students were required to spend weekly

contact hours in K-12 activities working with a science teacher in the development of hands-on science activities and modules that were integrated into their science curriculum. They also spent time teaching these activities in the classroom.

These external funds greatly impact the student research. IGERT fellows developed 15 research projects that used a coupled natural-human systems approach through the agents of change project. 11 graduate students were supported by PRCEN (7) and G-12 (4) by providing stipends and paid tuitions. The LTER related projects, San Juan Ultra, NASA Earth Science, NSF CREST, DOD, DoED, and others all fund the graduate students to work on the corresponding theses and dissertations. Meanwhile, these external funds greatly improved the research and teaching facilities of the program (Table 5.4.D in Template P73). The external funds also promoted collaborations with peers from other faculties `of UPR and institutions in US and international. The IGERT program provides a platform for the collaborations between social and natural scientists from different faculties on campus. GK-12 promoted collaborations with the college of natural sciences and the college of education resulting in a special issue on the integration of Environmental Sciences and the Nanosciences in K-12 science curriculum. Such collaborations are interdisciplinary courses offered at CIAM and participations in CIAM graduate students' committees. The LUQ LTER has long-term research collaborations with institutions in the US and beyond. The PRCEN funded summer internships to six graduate students to both the marine Biological Laboratory in Woodshole, MA and to the Institute of Marine Sciences and Limnology in Puerto Morelos, Mexico. The IGERT and GK-12 projects funded student travel to international workshops and conferences. For this program, external funding had always been the main source of student funding (now at 48%). That being said the number of self-funded students has increased (currently 28%) **(See Template: P 63**).

a.3 Research Products

The research efforts made by faculty and students yielded 173 peer-reviewed publications and 38 non-peer-reviewed ones in 2009-2015 (**Figure 3; Template: Appendix 1 TABLE 3.7.F.1 Program Publications).** Of those, 82% publications are peer-reviewed. The publications reflect the interdisciplinary and internationalized research of the program. The geographic areas cover Puerto Rico, Caribbean, America, and Asia. The interdisciplinary papers are published at top journals, such as *Geophysical Research Letters, Ecology, Oecologia, Ecology and Society, Microbial Ecology, Atmospheric Environment, Bioscience, Nature – Climate Change, Nature, Journal of the North American Benthological Society, Journal of Geophysical Research, Ecology Letters, and Journal of Ecology*. The faculty and students of the program also make efforts for dissemination by giving 193 scientific presentations off the island and 205 within Puerto Rico in 2009-2015. Almost all of the off-island trips are funded by the external funds.

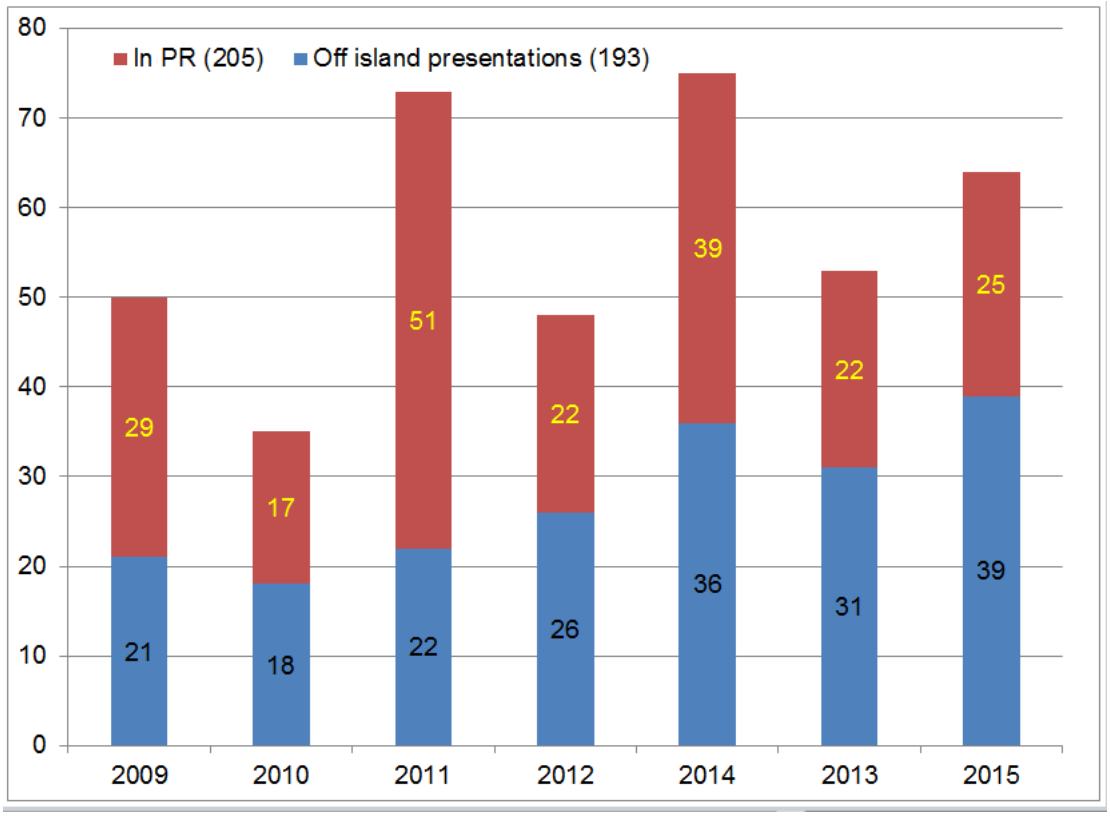

Figure 3 Scientific presentations made by CIAM faculty and students in 2009-2015

b. Strengths

The program is very strong in interdisciplinary and internationalized research. The publication rate is high and the faculty and students make great efforts in disseminating research results by giving scientific presentations in PR and off the island. The efforts to acquire external funds are quite successful and in turn greatly improve the research for faculty and students. Both faculty and students are very satisfied with the intensity and quality of research of the program.

c. Weaknesses

No significant weakness has been identified but the committee recognizes that there is always room for improvement an encourages the faculty to continue diversifying its pool for external funds and continue with efforts to obtain student training grants. Evaluating variance in faculty efforts was not a priority of this committee as that role is exercised by the CIAM's personnel committee. . Data collection on faculty success metrics is not systematic preventing us from determining causal-effect relationships in some areas (i.e. a drop in non-peer review publications after 2013).

IV. STUDENTS AND ALUMNI

a. Status: The program has recruited a total of 76 graduate students during the evaluation period of 2009-2015 but currently has 80 graduate students (23 MSc level, 47 PhD level). Recruitment has proceeded as expected with an average student recruitment of 12 students per year (range 7 – 16) and has similar average selectivity rates for male and female applicants (Males 80%, Females 90%) The program has become attractive to a broader audience with applicants coming from diverse professional backgrounds and different countries resulting in a diverse student body with diverse interests within Environmental Sciences. Eight students (1 PhD

and 7 MS level) have dropped from the program. It is not always clear why they dropped but when it is known, the reasons for dropping the program vary (health reasons, poor GPA, failed graduate exams). When we subtract the number of students that graduated (8) and the number of students that dropped the program (8), we estimate that there are 64 active students in the program. For this evaluation process approximately 90% of active students answered our student survey which suggests an adequate level of engagement in this process and in some Program matters.

Nine students have graduated from the program including eight master students and one PhD. An alumni survey answered by five alumni indicated that that three former MS students have applied or are enrolled in PhD programs (two of those are in ours) and two alumni are working for the government and an NGO (San Juan Bay Estuary). Four students of the five surveyed students were able to work full time and one had a part-time position right after graduation.

b. Strengths

1. Our pool of international applications and international students admitted has increased;
2. All of our graduates are working either in an environmental field related position with government or NGOs or else have gone to pursue a graduate education.
3. Many students apply for the interdisciplinary tract of the program and are doing interdisciplinary work. This is the most flexible option of the program.
4. Many students have a really good productivity in all forms of activities. During the past six years, our students published 37 peer-review papers (50 total) and gave 94 oral presentations in a variety of research forums. (**Figure 4; Template: Appendix 1 Table 5.6.C Student Productivity Metrics)**. These data were generated from a partial collection of student CVs and therefore represents an incomplete assessment of student productivity in our program. We evaluated only 25 CVs (37.9 %) out of 66 active graduate students. The distribution of student productivity out of that sample suggests that 19 students (76%) already have research projects, 14 (56%) students have published peer review papers and 13 students (52%) did at least one oral presentation in a conference. From **Figure 4 and 5**, we can see increasing trend in both the number of presentations and publications by students in our program. A reduction in the last year is likely an artifact from the fact that data for 2015 was incomplete as the year was not finished when figures were generated.

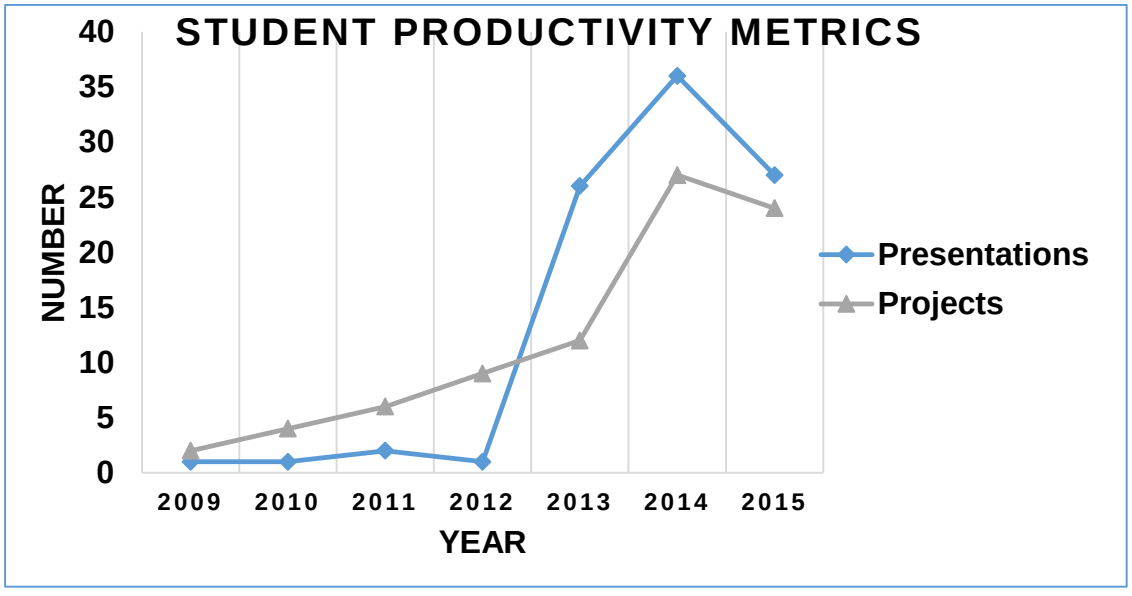

Figure 4. Students' presentations productivity trend by years

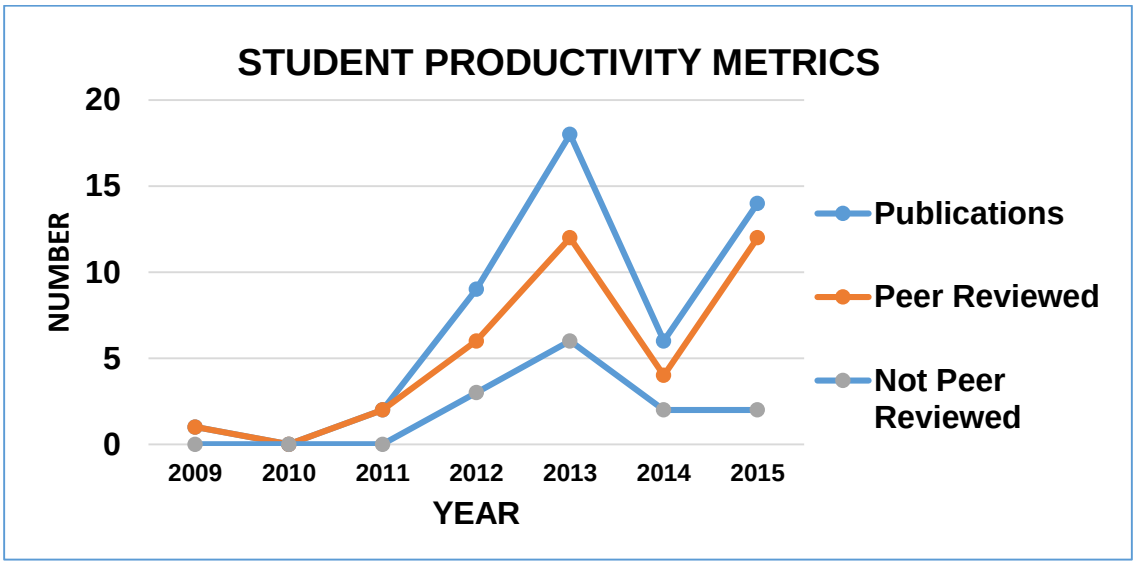

Figure 5. Students' publications productivity trend by years

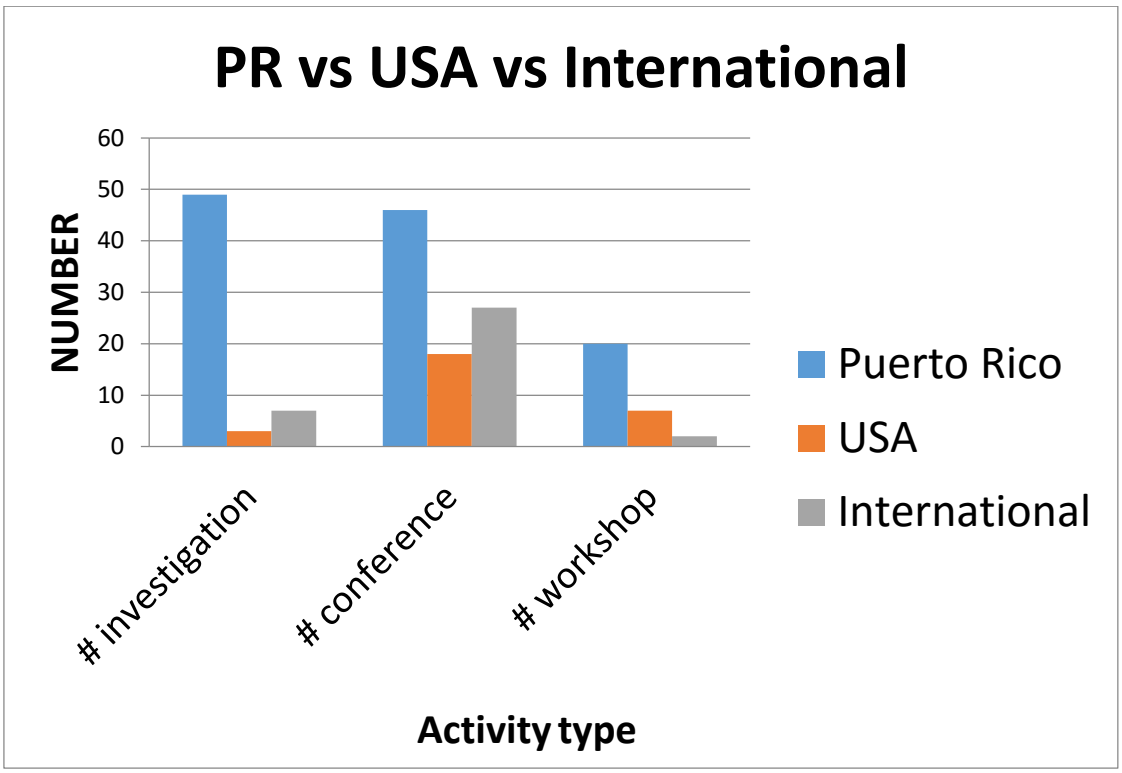

Figure 6. Students' activities world-wide distribution

5. There is a large proportion of international students in our program (**22%, Template: Table 4.2 A International Students, P.62-63**). Internationalization of student academic activities was best achieved through attendance of conferences and workshops (in more than 20 countries) although some student research does take place outside the United States and include six countries or regions (**Figure 6**).
6. Student funding for stipends has allowed student recruitment during this first cycle of the Program (but see concerns below).

c. Weaknesses

1. Lack of a specific recruitment plan for admission. There seem to be more students in some areas that in others (most students are within the interdisciplinary track and very few students are represented in the other two tracts: **Sustainable management in islands and tropical regions; Environmental Modelling and Spatial Analysis**).
2. Students take longer to graduate than the Program. From **Tables 4.8C and 4.8D (Template: Graduation Rates, P.65),** we can see that our students are taking more time to complete their graduate study compared to a completion period which are three years for finishing a master degree and five years for a PhD degree commonly seen in many universities. Our Masters students take at least 4 years to graduate and only one PhD student has graduated in 4 years. The rest have yet to graduate. Close to 20% of students indicated that they are in their 5th or 6th years from the student's survey. But the PhD candidates are more than 75% in student's survey. In addition, we can draw a trend that local students have spent more time than international students and students from continental US based on our graduate student survey.
3. Shortage of student TA positions began last year and that resulted in more rejections than otherwise we would have had. Funding is expected to become a crucial factor for the admissions which affect the implementation of our recruitment strategies even though we don't have a thorough recruitment plan.
4. Data collection on student success metrics is ineffective and inconsistent preventing us from determining causal-effect relationships in some areas (i.e. a drop in student publications in 2014) and most-likely resulting in underreporting of successes (i.e. publication data is based on only student 25 CV's).

V. ESSESNTIAL RESOURCES FOR TEACHING AND RESEARCH

a. Status

Bibliographic Resources- A September 2015 inventory performed by the library system, yielded that the library of natural science acquired 228 books, 15 databases, 4,124 magazines, and 1,542 electronic journals. Currently, we have 5 databases covering environmental science, 75 journals in environmental science field, and 85 interdisciplinary journals related to environmental science In addition, we have 25 licenses of ArcGIS, 25 licenses of ENVI remote sensing software, unlimited licenses of SPSS, Microsoft Office including Access, and Mathematica. The amount of purchasing library resources of the Faculty of Natural Science has been stable in 2009-2015 with $2,311,145 in average annually. The library collection allows literature research in environmental science, ecology, chemistry, and interdisciplinary studies, such as those related to social science. The library resources on campus provide high quality and relevant journals in these fields and we have access to these journals via campus intranet.

Technology Resources- We have at least nine graduate courses heavily relying on the technologies of statistics, simulation, data management, or distance learning. Discussions revealed that four graduate courses were adapted for distance learning but data about the nature of these courses and where they stand was not available at the time of this proposal. Several research and education projects require technology exclusively dedicated to them, such as the GIS and remote sensing technology for the USDA project on "Strengthening educational capacities in Geospatial Science and technology in Agricultural and Natural Resources Management" and the NASA project on "Vulnerability and Adaptive Management of Tropical Coastal Wetlands in the context of Land Use and Climate Changes", and the online data management and service for the information management of LUQ LTER.

Technology plan- We do not have a technology plan for the program. We depend on assignments from the student technology fee and on external funds to improve our technology. However, none of our proposals to use the technology fee have been approved by UPR. All of our current technology resources are funded by external funds, especially those from NSF and USDA. We have three technology labs, C233 at CIAM, CN114 at CITEC (*Centro de Informacion y Tecnologías*), and a computer lab at the El Verde Field Station. Essential software for both research and teaching are installed in these facilities **(Table 1).**

Table 1 Public software resources of CIAM

Software	C233	CN114	El Verde	Course
ArcGIS	25 licenses	25 licenses		CIAM8225 CIAM4995 CIAM8205
ENVI	25 licenses			CIAM5231
STELLA	5 licenses			CIAM8118 CIAM8257
SPSS	free on campus	free on campus		CIAM6256
R	free	free		CIAM6256
MS Access DB	free on campus	free on campus		CIAM 8118
PC-ORD	6 licenses			
SigmaPlot	5 licenses			
Paradox			4 licenses	

Relevant external-funded projects have plans of acquisition, renovation, and distribution of technological hardware and software but, they are only valid during the implementation of the projects and they cannot cover maintenance or replacement.

b. Strengths- Both faculty and students are satisfied with the library and technology resources, as well as the off-campus research facilities. The program maintains high-level research resources due to its strength in acquiring external funds continuously.

c. Weaknesses-1) We need a technology plan for the program or the department for sustainable development. The network service at the CN side and AFB needs to be upgraded through the plan.
2) A server is needed to support off-campus access to these library resources through our campus account.
3) Routine faculty survey is needed to adjust electronical journals subscriptions. The last survey by CITEC was done more than 2 years ago.
4) A computer lab located at CN114 was turned into a computer lab with GIS capabilities with the goal to improve access to GIS students in our department for teaching and research purposes. Funds were procured from USDA by Environmental Sciences professors. Agreements were made with CITEC to be the custodian of this equipment. In practice the access to CN114 has been limited since the lab is not within the main building of CITEC and the department does not have direct access privilege. A consequence of that is that the laboratory fails to meet its intended purpose and instead meet the needs of other departments more than ours.

VI. PROGRAM MANAGEMENT

a. Status

Historical context – The Graduate Program in Environmental Sciences was approved by UPR Río Piedras's Senate in 2003, however its implementation started in 2009 first with the Masters Program and then with the PhD Program in 2010. In the years between 2003 and 2009, there were many changes in the administrative and academic context surrounding the Programs (**Figure 7 – Program Development Timeline**) that limited the timely implementation of some administrative goals and program components. The majority of faculty affiliated to the department and directly affiliated to the program feel that a late implementation meant that some of the curricular requirements might have been at odds with evolving career/curricular needs in the years intervening the submission of the original proposal and its subsequent implementation. A lawsuit against UPR (and former CIAMs director) contesting the implementation of the program, consumed a considerable amount of administrative time. Since 2009, the Graduate Program has had four Program Coordinators. The Department of

Environmental Sciences has had two directors since its creation in 2012. An argument is that all of these events coupled with frequent changes in key administrative positions have posed challenges to the management of the Graduate Program in terms of the standardization of procedures, streamlining and continuity of tasks such as curricular development as well as data collection for the Graduate Programs and for the Department of Environmental Sciences.

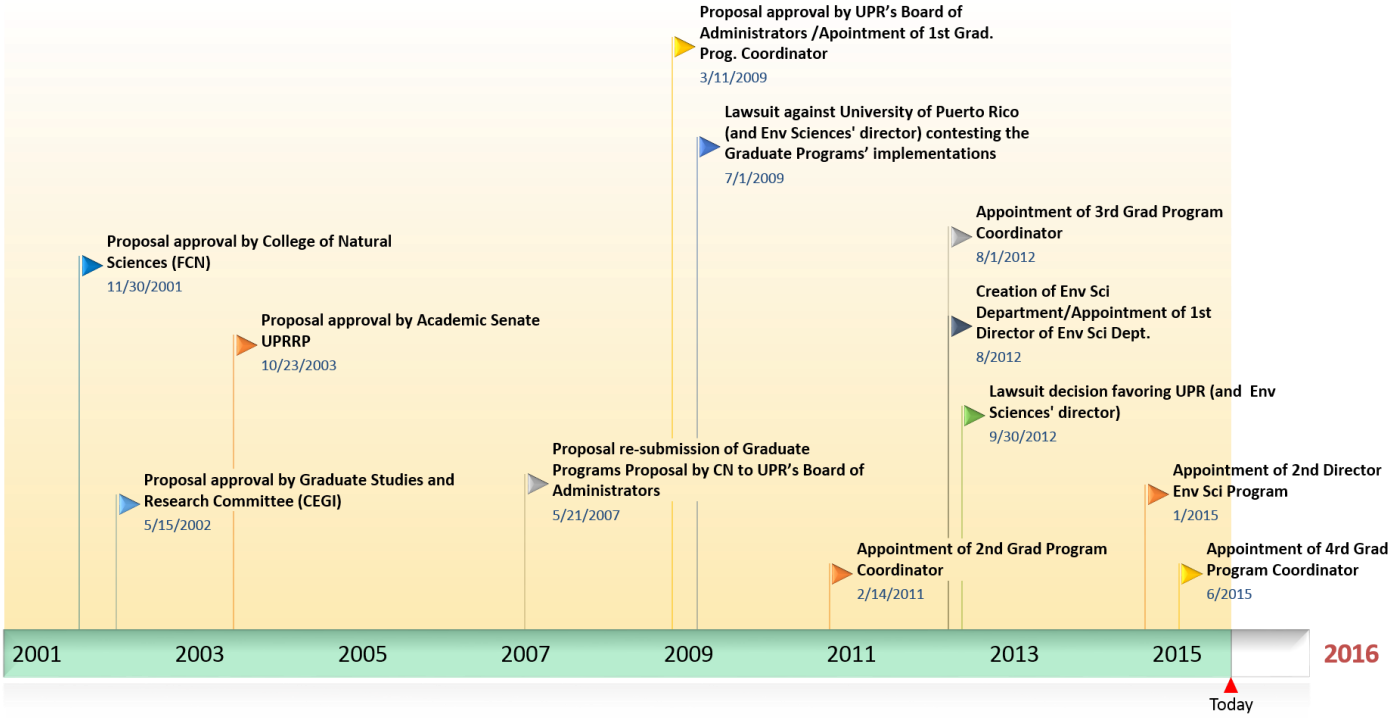

Figure 7. General timeline showing significant administrative events and administrative dynamics prior and following the implementation of the Graduate Programs in Environmental Sciences.

Department administration. Management of the Graduate Program in Environmental Sciences during this first evaluation period (2009-2015) was critical to its foundation. Several large external grants provided important funding to attract new students, quickly developing a critical mass of over 60 graduate students by the end of the fifth year. The Graduate Program initiated in 2009. At the time, it was initially coordinated by the Program Director, Rafael Rios. From 2010-2012, it was coordinated by Jess Zimmerman. In 2012, the Department of Environmental Sciences was created with the merger of the Institute for Tropical Ecosystem Studies. The Graduate Program was coordinated from 2012 to May 2015 by Rosana Grafals. Since August 2015, Gary Gervais has been the coordinator. In 2013, the Dean of Natural Sciences created the Deanship of Graduate Studies and Research. This office provides an important role in the administration of all graduate programs in the Faculty of Natural Sciences, including the CIAM Graduate Program.

Professor Rios continued as Department Chair through March 2015. The Department organigram structure maintained the existing LTER project management group (former Institute for Tropical Ecosystem Studies) at their historical location in Anexo Facundo Bueso Building. In addition to managing LTER grant funds, this group led by an executive official (Wanda Rivera) maintained control of department budget spending.

The new Department also became the administrator of El Verde Field Station. This station operates under a Station Administrator (Mr. Francisco Pérez) and a Science Director (Professor Alonso Ramirez). The organigram did not contain graphically connected, although were clearly recognized, other sponsored projects such the Natural Resources Career Tracks (NRCT), Puerto Rico Center for Environmental Neurobiology (PRCEN), Center

for Renewable Energy (CRES) and Integrative Graduate Education and Research Traineeship (IGERT). Each of these projects established their own administrative staff. This allowed dedicated administrative efforts in support of each of the project goals. However, this structure is redundant on some administrative tasks and possibly non-cost effective.

In April 2015, Jorge R. Ortiz-Zayas was appointed Interim Department Chair. The department administrative structure was revised soon after. **Figure 7** shows the new organigram of CIAM. This structure recognizes the academic and project administration strengths of the department and highlights student services as central in the administration of CIAM.

The Department of Environmental Sciences has three permanent committees that meet regularly: a Personnel Committee, an Academic Affairs Committee and a Graduate Program Committee. The committees are appointed by the department chair and provide recommendations to the department chair related to personnel, academic, and graduate program issues.

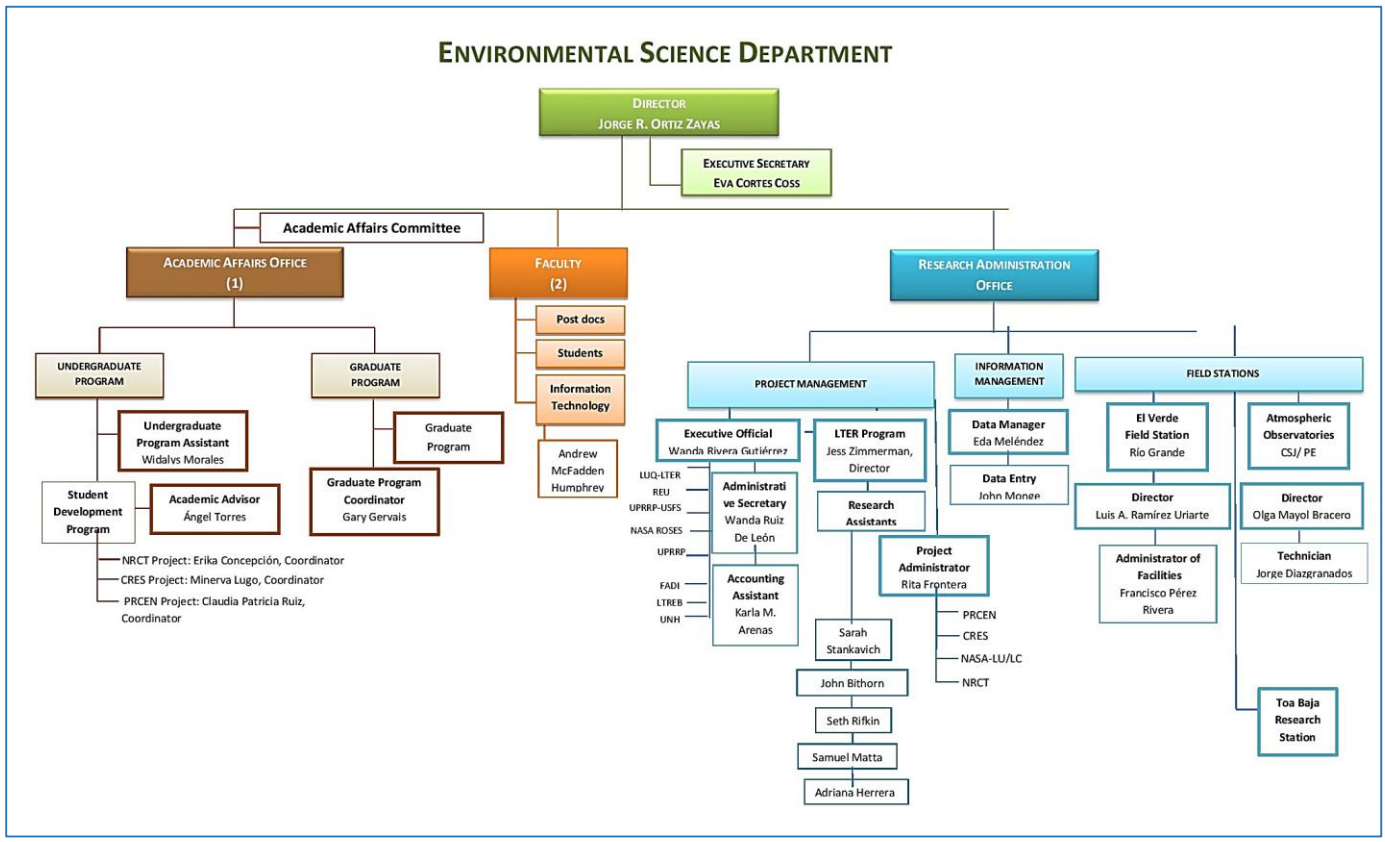

Figure 8. Organigram illustrating the placement of the Graduate Program within the Department of Environmental Sciences

Space situation. The rapid growth of the new Department required new office and laboratory spaces to accommodate the new faculty and staff. Given the lack of space available in the New Natural Sciences Bldg. (Phase 2), a former teaching laboratory space that was seldom used at one time was converted into a conference room and offices for professors and administrative staff. While new office space was created, however, teaching laboratory space that is of value today (i.e. to teach new graduate and undergraduate laboratory courses) was lost. The administrative staff of the LTER Project remained located in Annex Facundo Bueso during this period. Faculty is physically spread over New Natural Sciences, Facundo Bueso, and Annex

Facundo Bueso buildings. There is a generalized sense that while efficient at maximizing the available space, the existing distribution of personnel limits their day- to-day interactions. Since 2009 the Department GIS classroom (C233) was renovated with new computers and software with fund from (DOE-No. 59089-RT-REP: UPR-UGA Partnership for a Research Center for Excellence in Renewable Energy, Loretta Robertson co-PI). With external funding granted to Professor Mei Yu, one of the CITEC computers labs (CN 114) was equipped with new computers and software. This lab services the entire Natural Sciences Faculty. Other important space acquisitions in the New Natural Sciences Bldg. were the IGERT Student Office (NCN 250) and a new Environmental Modeling Laboratory (Professor Qiong Gao). During this reporting period, however, perhaps the most important infrastructure developments for the program were 1) the remodeling of laboratory facilities in the baseman of Facundo Bueso Building with NSF-ARRA funds (Melendez-Ackerman, Brokaw, Zimmerman co-PI's with an NSF investment of $1,998,475) and matching funds from UPR, 2) the construction of a new laboratory building at the El Verde Field Station with funding from NSF-FSML (Ramirez PI) and expected to be inaugurated in the Spring 2016, and 3) the remodeling of the El Verde Facilities (with institutional funds from the College of Natural Sciences). The remodeled infrastructure in Facundo Bueso provides laboratory facilities in the following areas (Forest Ecosystems, Soil Biogeochemistry, Tropical Ecology and Evolution, Tropical Aquatic Systems and Atmospheric Chemistry supporting six faculty (Olga Mayol, Alonso Ramírez, Jess Zimmerman, Nick Brokaw, Xiaoming Zou, Elvia Meléndez-Ackerman). The facilities at El Verde host LUQ-LTER activities and receive faculty and students from all over the World (**See Template: Appendix 11 –Luquillo Experimental Forest: Research History and Opportunities: Facilities**). More recently, additional space in Anexo Facundo Bueso (formerly the Academic Excellence Center) was loaned to CIAM to organize the historic collection of scientific reports of the Puerto Rico Nuclear Center and the Puerto Rico Center for Energy and Environmental Research.

The remodeled infrastructure in Facundo Bueso provides laboratory facilities in the following areas (Forest Ecosystems, Soil Biogeochemistry, Tropical Ecology and Evolution, Tropical Aquatic Systems and Atmospheric Chemistry supporting six faculty (Olga Mayol, Alonso Ramírez, Jess Zimmerman, Nick Brokaw, Xiaoming Zou, Elvia Meléndez-Ackerman). The facilities at El Verde host LUQ-LTER activities and receive faculty and students from all over the World (**See Template: Appendix 11 –Luquillo Experimental Forest: Research History and Opportunities: Facilities**). More recently, additional space in Anexo Facundo Bueso (formerly the Academic Excellence Center) was loaned to CIAM to organize the historic collection of scientific reports of the Puerto Rico Nuclear Center and the Puerto Rico Center for Energy and Environmental Research. Additional investments to research and teaching infrastructure were made to the space in C118 (lab) and tree offices for professors in phase I and I buildings of the college of Natural Sciences. **Table 2** summarizes the data that we have on invested funds for CIAM facilities.

Table 2. Investments to facilities that support CIAM teaching and research.

Facility*	Year	Users	Cost
El Verde Field Station	2015	**CN students and faculty, UPR system students, off island researchers**	~$20,000
Indoor aquaculture laboratory (CN 117)	2011-15	CN students and faculty	$125,000
Outdoor aquaculture laboratory (CN)	2015	ES students	$50,000
Water quality analysis laboratory (CN 115)	2009-15	CN students and faculty	$500,000
GIS laboratory (C-233) computers and software	2011	ES students	$54,000
ES conference room (C-229) table, chairs, projection	2010	ES faculty and students	$10,000

ES faculty and student offices (C-229)	2010	ES faculty and students	$35,000
CN videoconferencing facilities (A-211, A-142, JGD123, Deanship Conference Room)	2010	CN faculty	$125,000
Facility*	**Year**	**Users**	**Cost**
Tutoring and mentoring laboratory (A-207)	2011	CN students	$15,000
Outdoor media and learning commons	2015	CN students and faculty	$750,000
ES Endowment for student recruitment	2009-10	ES students	$100,000
Geospatial Science Lab (CN114) Faculty Labs at Facundo Bueso	2008 - 2010 -	CN ES	$50,000 $2,000,000

Program dissemination. The rapid growth of the Graduate Program in Environmental Sciences revealed that there was a high demand for this academic program. Promotion of the program has been limited to dissemination of faculty and research projects through both a department web page (http://envsci.uprrp.edu) and project web pages (http://www.lternet.edu; http://prcen.upr.edu/, http://renewable.uprrp.edu/cres_cms/). Brochures have also been distributed during open houses and exhibition booths. The IGERT program attended national conferences like SACNAS for recruitment and dissemination of the Graduate Program and IGERT. Most prospective students are attracted by word of mouth from other students and professors. Outreach efforts by faculty and students in the Graduate Program are extensive **(Template – Program Background P.1-6; Appendix 2 –IGERT Final Report, Appendix 11-Luquillo Experimental Forest: Research History and Opportunities: Outreach, Appendix 12 San Juan ULTTRA Final Report)**

Faculty recruitment. In the proposal for the creation of the Graduate Program, there was a development plan which included a faculty recruitment strategy. This plan allowed the recruitment of three new faculty members (professors Gao, Louime, Robertson). There is a draft of a development plan dated March 2015 which briefly delineates areas of potential development for the Department of Environmental Sciences and the Graduate Program. There is general agreement that the Department needs a new strategic development plan. In a recent faculty meeting it was decided that the Department will initiate a process to develop a new plan starting in the Spring Semester 2016. A recruitment plan was drafted in November 2015 at the request of the Campus Academic Affairs Committee. The plan identifies as a priority, the recruitment of an earth scientist. Other important areas of recruitment of the faculty are: environmental sociologist, toxicologist or environmental neuroscientist, Bayesian statistician, and an environmental economist and an environmental engineer. These potential development areas most be re-evaluated during the strategic planning process planned to initiate in the spring of 2016.

b. Strengths: Major milestones in terms of research infrastructure development and faculty recruitment were achieved in a very short period of time. There is an approved faculty recruitment plan (**Template: Appendix 13**). The program's faculty has brought 40 times more funds than what it receives from the institution to operate **(Figure 2; Template: Table 6.1.A-CIAM Budget, P 79)**

c. Weaknesses: a. Faculty and student surveys gave low satisfaction scores to Program Management and Administration. Facilities management responsibilities, changes in leadership positions, lack of a program strategic plan and effective data collection may be factors contributing to that. b. Some research/academic areas need increase expertise (**See Template: Appendix 6 and 7 – Faculty and Student Surveys).** An effort should be made to evaluate survey results to develop an action plan and revise faculty recruitment plan as needed. c. Outreach while extensive is not guided by development plan and seems underreported (i.e we only have an idea of the scope through this process). D. An approved development plan with clear goals for the

program is lacking (but see **Template: Appendix 14 for Development Plan Draft). The future lack of institutional support for TA's jeopardizes the stability of the program (student recruitment and retention, research).**

VII. CIAM ASSESSMENT (AVALÚO) PROCESS

a. Status:

Process and timeline of formal assessment activities*:* The CIAM Graduate Program Coordinator and the Assistant Dean of the Office of Graduate Studies of the College of Natural Sciences have the joint responsibility of developing and implementing the CIAM learning assessment plan which has three objectives: 1) evaluating which courses follow within the campus-wide learning assessment domains, 2) Evaluating of how well course goals were met, 3) Evaluating student achievement based on the Department's learning goals. In this process the Program Coordinator develops and implements and 5-year plan which states the learning domains to be evaluated each year and the target courses to conduct formal evaluations. This plan is evaluated and approved Office of Graduate Studies and the Dean of the College of Natural Sciences. Each year, the Graduate Program Coordinator sends a detailed plan of assessment activities to Office of Graduate Studies of the College of Natural Sciences. The Office of Graduate Studies of the College of Natural Sciences develops the rubrics for each domain which are then applied to the target courses. This is to standardize the process among graduate programs and align it to the campus wide assessment goals. To date four different rubrics **(Template: Appendix 8. - CIAM Assessment Plan)** have been developed to target six courses and the proposal defense and targeting three Department-wide learning goals (Research and Creation, Effective Communication, and Critical Thinking and five different campus-wide learning domains (Research and Creation, Teamwork, Effective Communication, Information Competence and Critical Thinking) (See Assessment Plans). This process started in 2013 with the development of a five-year learning assessment plan, semester plans and four rubrics which began implementation in the form of a pilot program in the 2013-2014 academic year and started more formally in 2014 with the approval of a five-year assessment plan. Since the program was created the program has had four Graduate Coordinators and three Assistant Deans of the Office of Graduate Studies of the College of Natural Sciences with changes occurring in 2015. Data and metrics for the Program have been generated primarily by the Program Coordinator and by the Office of Graduate Studies and Research of the College of Natural Sciences. Databases for both offices are rudimentary (added from paper to digital) and in different formats (excel matrices and word files). Up until May 2014, our Graduate Program maintained an Excel database with student results. These were tabulated to show the relative proportion of MS and PhD students that participated, the courses evaluated, the relative distributions of courses per domain evaluated, the evaluation results for course goals and the evaluation results for student learning achievement. In 2015, the program obtained summary data in a pdf file from the Office of Graduate Studies and Research of the College of Natural Sciences after sending the rubrics filled out by faculty.

Results – Summary tables for the 2013-2014 academic year **(Template: Appendix 9 – Learning Assessment Results**) showed that the program evaluated three courses (CIAM 6999 - Thesis Research, CIAM 8999 – Dissertation Research, CIAM 6910 - Research Rotation – see 2013-2014 results). For this period 12 students were represented in the assessment process (75% PhD). The evaluation process was biased in terms of courses evaluated (half of the evaluations came from the research rotation course), and in term of the objectives evaluated (research and communication skills). CIAM expectations were met for all goals as most evaluations (92%) were good or excellent (with these metrics CIAM goals were for 75% or more of the students to meet expectations (good or excellent). It should be noted that effective communication was a skill were less students obtained an 'excellent' score. The self-study committee obtained a summary percentage data for the different criteria in for the 2013-2014 academic year see 2014-2015 results). For this year, the program only evaluated three courses out of the six targeted and two learning domains out of the five targeted (Research and Creation and Effective Communication), For both domains students exceeded expectations. It should be noted that for this academic period, 100% of the students exceeded expectations in effective communication.

Process and timeline of informal assessment activities - CIAM conducted faculty and student surveys in the fall of 2015, to evaluate their degree of satisfaction related to the level of student skills in all campus learning domains (**see Template: Appendix 6 and 7 -Faculty and Student Surveys).** There were 42 responses from faculty and 57 responses from students. In general students expressed a higher degree of satisfaction with most of their skills than faculty did but both groups express a low degree of satisfaction (less than 40%) in research design and mathematical reasoning skills. There was a big disparity in the satisfaction ratings for written communication which had a lower degree of satisfaction among faculty (25% satisfied) than among students (63% satisfied or very satisfied). Both groups expressed a need to increase program opportunities to develop statistical/research design/data management/bioinformatics skills (but see others in **Template: Faculty and Student Surveys in Appendix 6 and 7).** Social responsibility of students and their ability to do team work were skills that showed a high degree of satisfaction among faculty with over 60% of the faculty expressed that they were satisfied or very satisfied).
Reflection on this process: Generation of results were different in different years. In is unclear to the Self-Study committee how results feed back into the program. Once Results are collected are these discussed with the graduate committee and in faculty meetings? What are the mechanisms to ensure that these results result in an adaptive graduate program management?

a. Strengths – The Program has faculty willing to cooperate with the assessment process and the Program is diligent at complying with assessment guidelines and procedures as requested.
b. Weaknesses - There is a disconnection between results from this process and the reality of student outcomes and program goals. Reevaluating learning objectives, assessment procedures and faculty involvement in this procedures, is highly recommended to make sure that indicators used are useful to assessment.

VIII. RECOMMENDATIONS

This section is a summary of recommendations in the whole document. Refer to specific sections for more detail.

Program foundations-Objectives given in the program description are vague. These need to be made more concrete. Also, the objectives and goals should be better aligned. Our Department recognizes that we do not have a strong development plan. We intend to start work on a development plan early in 2016.

Student recruitment and retention-The program's admission requirements are standard among graduate programs in science, but we do not have a stated profile for newly admitted students. It should be noted that because this is an interdisciplinary program some students do not have science degrees and are provided conditional acceptances pending their completion of undergraduate courses to complete entrance pre-requisites. Regardless many students may not have the desired level of mathematical/research design skills.

We need ensure that incoming students meet a minimum levels of skills going beyond the entrance requirements (GPA, GRE, and letters of recommendation and transcript). We need to develop a profile for newly admitted students, to modify recruitment procedures, and consider ways to rectify deficiencies among admitted students.

We need, however, to improve graduation rates retention. It takes a certain type of student to be successful and active in graduate school. Developing a student profile for newly admitted student and evaluating our entire recruitment approach may be key. A face to face interview or Skype interview could be applied. An improved system for student tracking and learning assessment is also recommended. We also need to develop a clear policy for part-time students to account for longer graduation rates for those that are clearly no working as full-time students. We have identified that at least nine students do not receive support from UPR and hold jobs off campus.

Curriculum and curricular experiences

Learning objectives-We need to develop leaning objectives for the following profile element of the MSc: "To occupy technical and managerial positions in state and federal government agencies as well as private companies that required the services of a specialist with a solid knowledge in the environmental sciences."

We need to develop leaning objectives for the following profile elements of the PhD: 1) "To work as part of teams in field studies and research projects in Environmental Sciences and contribute significantly to these", and 2) "Carry out teaching and research work in higher education institutions, or occupy leadership positions in research or administration in the government."

Competencies-There is a need to improve graduate student competencies (for newly admitted and admitted students) and a need to reduce the variance among graduate students in their level of certain skills (analytical/statistical/mathematical, written communication, and time management skills. In general, entering students should already have taken courses in math, biology, chemistry, physics, statistics, and ecology. If not, they should take these as "special students" before entering the Graduate Program.

Course requirements-Most faculty agree that a change in curricular requirements is in order. Both MS and PhD programs are deemed too course heavy, and more focused on content than on skills. Most faculty agree that there should be a change in focus towards skills related to analysis and knowledge acquisition and lesser focus on providing a fixed general course load to students.

The current curriculum seems to be biased on the training of students for professional management positions. Indeed, we should be doing that, but at the same time is obliged to offer a strong program for students who wish to become researchers rather than managers. Certainly, a goal of a PhD program is to train student with strong research backgrounds. One solution is to consider offering two tracks, one being for a professional master's degree and one being for master's and PhD level research. Another solution (although not mutually exclusive is to strengthen the curriculum in such a way that the development of much needed research skills are amplified.

A consequence of the apparent emphasis on management in the current curriculum is that there are too many required courses in too many elementary subjects, and there is not enough emphasis on research. There is too much emphasis on students acquiring a certain body of knowledge, rather than on acquiring skills for asking and answering research questions. For example, there is no reason why all students need to take courses in coastal, terrestrial, and urban environments. If their research develops along one of those lines they can then take the relevant course. With all the required courses in the current curriculum there is not enough time for research in either the Master's or PhD programs. In the current curriculum, Master's students are required to take required courses for two years and the PhD students for three years. The heavy course load coupled with the required examinations (Exam A, Exam B and proposal defense, thesis defense) delays starting on research.

Once in the program, graduate students in the proposed research track (see below) should take advanced courses that underpin research, such as GIS, advanced statistics and experimental design, and a course on writing papers and proposals and in public speaking (as in the Doctoral Seminar in Biology). Also, as a credit course, new graduate students could enter some kind of lab rotation, where they experience the research in different professors' labs. Students could take a course in which they tackle an environmental issue with research. After that they should take the courses on subjects that best suit their line of research.

Some faculty feel that graduate students should not get research credit for attending the Departmental Seminar. As incipient researchers in environmental science they should understand that attending seminars is part of their education in the variety of subjects that comprise environmental science. Also, giving credit for attending the seminar to some students suggests that the other students do not need to attend. Other faculty feel that this is the only way to make students attend the seminar and have well-attended seminars. One issue that

needs to be address is that a fraction of our students are not traditional students (i.e. do not function as full-time students, have families and in some cases other jobs) who are not necessarily on campus daily therefore influencing their decisions to attend seminars.

-Curriculum tracks-The current curriculum load seems to be based on the idea that we are training all students for professional management positions. Indeed, we should be doing that, but we should also be offering a strong program for students who wish to become researchers rather than managers. Certainly, the goal of a PhD program is to train student as researchers. The curriculum should be restructure such that it serves both demands (research, management). Another solution is to offer two tracks, one being for a professional master's degree and one being for Master's and PhD level research.

Some faculty have questioned the rationale for having specific subject curriculum tracks. Curriculum tracks reflect the idea that we are training students for certain jobs, rather than as researchers. Students can work out their own "track" with their advisors, deciding what courses best suit their interests and their research goals. The capable environmental scientist emerging form our Graduate Program will know how to ask questions and get the information they need for the problem they need to address. This view contrast with the current idea that our program offering should tract job market demands which are certainly focused and which support having our subject tracts. The Program faculty needs to have more debates on which are the best strategies to reconcile curricular offerings, availability of jobs, research training needs and the need to increase graduation rate.

-Curriculum content and course development-Our questionnaires elicited suggestions from students and faculty for curriculum content and re-design or creation of new courses. Most course suggestions concerned courses covering particular skills.

Collaboration, an interdisciplinary approach, and social responsibility should all be promoted. These were all components of the Integrative Graduate Education and Research Traineeship (IGERT) program that supported many PhD students in the Department. IGERT successfully created a culture of these elements, and we should work to keep that culture intact. IGERT also involved work with resource managers in various agencies, and this aligns with the suggestion that we achieve a greater integration of the academic work with the current and future needs of the Puerto Rican society in everything that relates to the environment and sustainable development.

The most frequent recommendation regarding courses was to increase teaching of critical thinking, mathematical reasoning, experimental design, statistics, and other analytical skills. Another suggestion is for a course on writing, including proposals and manuscripts for publication. More emphasis in courses on interdisciplinary studies was suggested. Some students are concerned that certain courses are not offered often enough.

-Examinations-It was suggested that we reduce the number of exams that graduate students have to take before they are told whether or not they fit in the program (at present there are three). Several faculty suggested using a two-exam model (first year exam + proposal defense) although there is no agreement yet on the content of the first year exam. Streamlining this process to eliminate redundancy, and focusing the examinations on skills and the content on the student's research interest, may help reduce the students' completion times. For the Master's program there should be one exam and preferably it would be a proposal defense. This needs more discussions with the whole faculty.

Essential resources for research -We need to increase resources in three areas: 1) Financial support for students, including more assistantships, 2) office space for students and administration, and 3) access to academic journals, including a server for off-campus access to these resources through our campus account. Maintenance of facilities may become an issue under financial constraints.

Faculty recruitment-We need to increase breadth of faculty expertise by adding faculty. First priority is an earth scientist. Second priority are: environmental sociologist, toxicologist, environmental neuroscientist, Bayesian statistician, environmental economist and, environmental engineering. Faculty discussions also revealed that the Council of Higher Education, in its evaluation of the program prior to its approval recommended the recruitment of faculty in areas of Earth Sciences. We should revise the faculty recruitment plan and work to get it implemented. This will help reduce curricular limitations while helping expand and develop our program. Exploring formalization of faculty contributions from outside the College of Natural Sciences is a necessary step to provide more stability in the availability of highly specialized courses.

Program administration and management- Two areas stand out as needing improvement. First, efficiency and clarity in reporting student progress is poor. Second, there should be changes in the data collection process for program evaluations, to ensure temporal consistency in evaluation of learning objectives. This will help the Department work to improve outcomes. Most of the data used in this report was compiled or collected after September 28, 2015, and while many offices and people helped, the quality of the data was not always the best. It is clear that there should be different degrees of responsibilities for data collection and a better way to collect the data. Learning assessment instruments and the assessment structure has not been useful to get at the development of competences and skills.

ONE GENERAL RECOMMENDATION OF THIS COMMITTEE IS TO HOLD A FACULTY MEETING TO DISCUSS AN ACTION PLAN THAT ALLOWS FOR FURTHER DISCUSSIONS WITH FACULTY (CIAM, OUTSIDE), STUDENTS AND STAFF WITHOUT THE RUSH OF DEADLINES AND TO DEVELOP A STRATEGIC PLAN FOR THE GRADUATE PROGRAM THAT ADDRESSES ITS NEEDS (FINANCIAL AND CURRICULAR). A FACULTY RETREAT IS SUGGESTED.

SELF STUDY TEMPLATE DOCUMENT
GRADUATE PROGRAM IN ENVIRONMENTAL SCIENCES

January 29, 2016
Rev February 18, 2016

I- Program Foundations

A. Accreditation

According to the provisions of University of Puerto Rico Regulations, the programs proposed must have the approval of the academic authorities of the Río Piedras campus and the Central Administration of the University of Puerto Rico before they can begin and both programs were approved accordingly. None of the programs requires accreditation by professional associations so that their graduates can exercise the functions of their corresponding degree once these are conferred.

If your program is susceptible to receiving a professional accreditation answer the following questions on this section: If not go to the next section (Background 1.B.).

1. **¿What is the complete name of the accrediting agency? If there is more than one, then name all.** _N/A_____

Start of process[2]	Last Visit	Accreditation
Month/Year	*Month/Year*	We obtained it *Month/Year to Month/Year* Not needed

[2]For those that are in the process of accreditation for the first time.

2. **List the concerns (if** any)
   NA

3. **If the program can be accredited but the process has not started describe the attempts made to request it and explain the limitations to this process.**

   NA

B. Background

1. **Provide a present description of the Program that includes:**

   a. **How is research conducted (i.e., following researcher interests, through research centers or through established research tracks)?**

The Graduate Program in Environmental Sciences has a very strong research component that has attracted national and international students since its beginning in 2009. The research areas were developed based primarily on the interests of the researchers that became members of the Graduate Program and of those that were hired soon after. Most of the researchers (nine) were members of the Institute for Tropical Ecosystem Studies (ITES) of UPR-RP which was merged into the new Department of Environmental Sciences in 2012. ITES research had a strong tropical ecosystems ecology approach which served to establish the Luquillo Long-Term Research Program, an NSF-funded program initiated in 1989 which still continues today and has generated over 500 peer-review publications.

Table 1 lists the core graduate faculty of the Graduate Program and their areas of expertise. At present, the graduate core faculty consists of 13 professors, 12 with permanent or tenure track contracts. The strength of this group relies on their capacity to conduct high-quality environmental research. These researchers have contracts with nine credits of release time and three credits dedicated to teaching.

Table 1.1. B Graduate core faculty of the Department of Environmental Sciences.

Professor	Research area
1. Rafael Ríos	Environmental engineering wastewater and rural potable water treatment systems
2. Nick Brokaw	Dynamics of tropical plants and forests
3. Xiaoming Zou	Soil biogeochemistry
4. Jess Zimmerman	Natural and urban forest dynamics
5. Elvia Meléndez	Biodiversity conservation, urban ecology
6. Olga Mayol	Atmospheric chemistry
7. Alonso Ramírez	Aquatic ecology
8. Jorge R Ortiz-Zayas	Limnology, water resources management
9. Clifford Louime	Renewable energy, biofuels
10. Loretta Roberson	Physiological ecology of marine algae, renewable energy
11. Mei Yu	Landscape ecology
12. Qiong Gao	Ecosystems and environmental modeling
13. Gary Gervais	Renewable energy, biofuels; Science and technology policy for economic development

b. Guiding principles and main schools of thought.

Our Department mission outlines very well our guiding principles and focus. On the one hand, a lot of the research conducted in the Graduate Program in Environmental Sciences strives at understanding the structure and function of ecosystems to promote environmental and natural resources sustainability. It is influenced by the legacy of Howard.T. Odum who, applying a systems approach, conducted pioneer ecosystem research at El Verde Field Station in the 1960's. Today, however, a lot of the Program's research is also highly applied and interdisciplinary merging principles of both natural and social sciences and promoting community participation. Earth sciences principles are also applied to assess human impacts throughout different elements of the Biosphere (oceans, watersheds, atmosphere, etc.). The

recruitment of new faculty has expanded its research capacity into other areas such as renewable energy and environmental neurobiology,

c. Its context, compromise with social needs, relationships with organizations, service centers, within or outside of Puerto Rico.

Since its creation, the Graduate Program was designed with a strong social component. This focus allowed an Integrative Graduate Education and Research Traineeship (**Appendix 2 – IGERT Final Report**) grant to the Graduate Program in Environmental Sciences from the NSF (Award Number 0801577). This grant ($2.96 M; 2008-2015) provided a platform where faculty from different academic departments collaborated in highly interdisciplinary projects involving graduate students from the newly created Environmental Sciences Department. The goal of this program was to train Ph.D. students to apply an interdisciplinary and collaborative approach to environmental problems in urbanizing, tropical landscapes. The IGERT program was based on an iterative model of human-environment interactions, addressing the question of how human activity alters ecosystems, and, in turn, how do altered ecosystem services change human activity in an urbanizing tropical environment.

Collaborations with other departments and external organizations in Puerto Rico and in the US have been essential. For instance, each graduate student participated in an Agents of Change Project, which required the identification of an environmental problem in a nearby community and an investigation to propose solutions involving members of the community. Through an interdisciplinary curriculum, IGERT students received training on the human dimensions of environmental change, politics and environmental ethics, environmental communication, among others. These courses prepared them to conduct their Agents of Change projects which required their dissemination. One of the success stories of the IGERT Program took place in the Corredor del Yaguazo, Inc., a local NGO located on a poor coastal community located in Cataño. Decades ago, this community settled inside a marsh and has been historically affected by flooding and by poor management of solid wastes and sewage. Through the IGERT Program, students have applied an environmental justice approach to assess environmental risks and propose participatory processes where through education community members are empowered to seek solutions to their socio-environmental problems. A total of 15 IGERT fellows and 23 IGERT associates participated in our program over its duration from 2008-2015.

Other important collaborators of the Graduate Program have been the San Juan Ultra Project, a novel US Forest Service initiative focused on urban socio-ecology. The University of Puerto Rico at Rio Piedras, Center for Applied Tropical Ecology and Conservation, the San Juan Bay Estuary Program, the Rio Piedras Urban Action Center (CAUCE), the US Geological Survey, the US Environmental Protection Agency, the Puerto Rico Department of Natural and Environmental Resources, among other institutions.

2. Develop a history of the program considering the following:

a. ***Date and context in which the program was created***

Certification 49 of 2008-2009 from UPR's Junta de Síndicos officially established the Graduate Program in Environmental Sciences on 11 March 2009. Soon after, on 10 June 2009, the Puerto Rico Council of Higher Education approved the Master of Science degree (Certificación 2009-093), effective retroactively to 22 Abril 2009.

On 24 January 2012, UPR's Junta de Síndicos authorized the creation of the Department of Environmental Sciences within the College of Natural Sciences (Certificación 51; 2011-12). This certification merged the existing undergraduate program in Environmental Sciences with the new MS and Ph.D. programs and the Institute for Tropical Ecosystem Studies.

Later, on 19 December 2012, but effective retroactively since 4 June 2010, the Ph.D. in Environmental Sciences was approved by the Puerto Rico Education Council (Certificación 2012-297). This certification required submission of a compliance report from UPR which was submitted by UPR Vice President for Academic and Student Affairs to the Puerto Rico Education Council on 28 February 2013 completing the evaluation process.

Before the creation of the Graduate Program in Environmental Sciences, UPR-RP offered a B.S. in Environmental Sciences. The undergraduate program initiated in 1976 responding to the need for environmental professionals that could assist the government in the administration of the Puerto Rico Environmental Policy Act of 1970 and the subsequent environmental laws and regulations. This program has been very successful in generating environmental scientists, many which are currently employed by government agencies (state and federal) and non-government organizations.

b. Its most significant achievements.

The creation of the Department of Environmental Sciences and its merger with the Institute for Tropical Ecosystem Studies added nine faculty members with established research tracks that increased its capacity to conduct high-level environmental research. Since its creation in 2010 and through November 2015, nine students have completed their master degrees (James Hogan, Annette Negroni, Norberto Quiñones, Harold Manriquez, Natalia Rodriguez, Dieunel Derilus, Xochitl Pérez Medina)) and one a Ph.D. (Claudia Ruiz). In addition, during this academic year, one additional Ph.D. student is expected to graduate (Nora Alvarez). Recruited graduate students in the department have generated or co-authored 37 publications on peer-review journals, with some like, Nora Alvarez and Mervin Pérez with international relevance and other like Chris Nycht in high impact journals.

c. Student recruitment and internationalization

Another important achievement of the Graduate Program has been the institutionalization of the IGERT course curriculum. Currently, even after the grant has ended, the Department continues to offer courses in environmental ethics and politics, environmental communication, and human dimensions of environmental change. Many students are currently engaged in research that address environmental problems of urban systems.

Lastly, new faculty has been recruited to further strengthen our capacities in areas such as environmental modelling (Quiong Gao) marine algae physiology (Dr. Loretta Roberson), and renewable energy (Dr. Clifford Louime). New research areas have also emerged in the fields of socio-ecology, environmental neurobiology, biofuel prospecting with marine algae, urban ecology. These areas have attracted over $25 M in external funding over the last five years.

d. Outreach

Even when there is no formal strategy for outreach for our graduate program (nor our department), faculty and graduate students have been actively participated in outreach activities associated with major funded projects or through their own research projects. Some of the major achievements are summarized below:

15 outreach activities that include newspaper articles, TV/radio interviews, podcasts artshow, videos by the Agents of Change Project (Appendix 1 – IGERT Final Report P. 25-27). The Video 'Basura Problema o Tesoro' (Garbage: Problem or Treasure) has received over **5,100 views** (https://www.youtube.com/watch?v=IZEgwyHsgpY)

38 non-peer reviewed publicatios (13 of those with students) with varied aims ranging from the dissemination of the program's research to the improvement of interdisciplinary education in environmental sciences and targeting various levels of education.

Participants from various projects (San Juan ULTRA, IGERT, PRCEN, LTER, GK-12, CREST-CATEC) have developed and implemented hands-on exhibits at many public fairs and activities supported by local NGOS or the UPR system to disseminate Environmental Science Research and Education opportunities. These exhibits are usually manned by graduate student's and faculty of our program. Two examples include the participation of many of these projects in the activity called Nanodays (developed by GK-12) which took place in Plaza Las Americas, the largest mall in the Caribbean and in the activity called the Para La Naturaleza Fair both of which impacted throusands of people because of their locations in high-traffic public areas and wide dissemination.

Many web sites and internet sites showcase our graduate programs's research and education activities:
-Department of Environmental Sciences – (http://envsci.uprrp.edu/index.php?page=Home&hl=en_US) It is the administrative unit of the Graduate Program. This page presents our program and program activities.
-Luquillo LTER – (http://luq.lternet.edu/) – Showcases research and and education activities for the Luquillo Long-Term Ecological Research Programs including the **LTER School Yard Program –** (A K-12 program that has engaged teachers and students from four municipalities of Puerto Rico in research activities at their schools.
-Journey to El Yunque - (http://www.elyunque.net/) – Middle school online tool that enhances environmental science curriculum by providing students with interactive activities to evaluate ecosystem/poulation dynamics within the context of the El unque National Forest site of the Luquillo LTER. In collaboration with The Learning Partnership.
-**REU in Tropical Ecology and Evolution** - (http://reu.ites.upr.edu/) – Showcases summer research internships opportunities for undergraduates.
-**Center for Renewable Energy and** Sustainability (http://renewable.uprrp.edu/) – showcases highly collaborative and interdisciplinary research in the area of algae-based biofuels and is used as a tool for teaching students in the College of Natural Sciences about core concepts and principles in the field of renewable energy and sustainability.

-PRCEN Education https://www.facebook.com/Prcen Puerto Rico Center for Environmental Neuroscience promotes integrative approachs that combine ecology, biology and chemistry on four interconnected Puerto Rican ecosystems (marine, estuary, terrestrial and freshwater) with state of the art research.
-PRCEN HOME http://prcen.upr.edu/ We have developed and website which has several useful links to resources for research and education in the fields of neuroscience and Environmental Science.
-San Juan ULTRA (SanJuanULTRA.org). Showcases research and education actitivites of the San Juan ULTRA (**Urban Long-Term Research Areas**) Collaborative Research Network. The network was established in the city of San Juan in 2009 by the USDA Forest Service and the National Science Foundation (NSF) to produce knowledge on urban areas and to support policy, education, and local initiatives in order to improve the quality-of-life and environmental conditions in San Juan. The network engages academic and non-academic organizations and individuals, many of our faculty and program collaborators are active participants of this Network.
-Center for Applied Tropical Ecology and Conservation (CATEC) (http://crest-catec.upr.edu/)**.** This center has been critical in the development and maintenance of research and activities that relate to

applied ecology an onservation and has supported the research of many of our graduate faculty.

e. The most significant changes suffered since its creation and to what cause these changes responded to. (For example, curricular revision, creation or elimination of areas of specialization, offering of Ph.D., etc.).

Perhaps one of the most significant findings in the Graduate Program has been the preference of students by the interdisciplinary option. This option allows students to design, in agreement with their mentors, an academic program tailored to their needs and research interests. So far, nearly 65 graduate students are enrolled in the interdisciplinary option. The other two additional options have generated minor interest. The option of Sustainable Management of Islands and Tropical Regions has currently no students enrolled while the Modeling and Spatial Environmental Analysis option has two students enrolled. One possible explanation for this trend is the lack of course offerings in these two options, which will require additional faculty to teach them.

f. How has the program addressed societal, professional and the institutional needs to whom the program responds to?

The interdisciplinary nature of the Graduate Program in Environmental Sciences Program address important social needs and both local and international levels. While most of our students are from Puerto Rico, there is a relatively large proportion of international students from South America, Haiti, and China. Our students will be trained with skills that will allow them to solve some of the most pressing environmental problems in their countries. Locally, our IGERT fellows have been actively engaged in community outreach projects and their research have provided valuable insight to managers to solve complex environmental problems.

C. Vision, Goals, and Program Objectives –

Populate table with the philosophical (**Vision**[3] y **Mission**[4]) y programmatic (**Goals**[5] y **Objetives**[6]) and Programmatic Foundations that the Program has. Full out the spaces provided in the table that suggest the sequence of the required information. The Mission follows the Vision and Goals and Objectives follow the Vision. Adjust the table to adapt it to the number of goals and objectives. Do not attempt to fix or develop fundamentals during the evaluation process. If these require adjustments that should be part of the Development Plan.

Table 1.1.C.1 Vision, Mission, Goals y Objectives of the Program

Vision[3]**:** The program's vision is the same as the Department's vision: *The Department of Environmental Sciences of the University of Puerto Rico, Río Piedras is a scientific community of professors and students dedicated to cutting –edge research and community participation that would move forward the science that helps solve complex environmental problems but at the same time would encourage a balance between human needs and a sustainable biosphere. The program is also committed with productive interrelations with the government, private sector, non-government organizations, and the general public at the local, regional and international level.*	
Mission[4]**:** *The Graduate Program in Environmental Science at UPR – Río Piedras (UPRRP) is directed towards preparing scientists and researchers with a profound and integrated knowledge of the environment via a rigorous and comprehensive education with a strong emphasis in research. The Graduate Program strives to include diverse scientific disciplines combined in innovative ways to understand and manage the environment, encompassing various interactions among the physical, chemical, and biological components of the biosphere as well as social, economic, and biomedical sciences and planning and legal studies related to environmental science. Environmental science in the Graduate Program at UPRRP is designed to provide an integrated, quantitative, and interdisciplinary focus to the study of coupled human-natural systems, as opposed to studies of environmental issues per se. The Program will provide the student with a solid scientific basis related to natural and anthropogenic processes which affect the environment and will also prepare them to define and analyze environmental problems, apply advanced methods and techniques in environmental analyses, create new knowledge and make decisions directed towards achieving a sustainable society.* ***(Appendix 3 – Graduate program Guidelines).***	
Goals[5] **(From Appendix 4)**	**Objectives**[6] ***(Appendix 4 – Proposal to Create Program)***
A greater integration of the academic work with the current and future needs of the Puerto Rican society in everything that relates to the environment and sustainable development.	● To form scientists with a highly critical and analytical sense, and a solid knowledge in the field of environmental sciences, which are able to meet the needs of society with regard to the use, management and improvement of the environment within the context of islands and tropical regions. ● To facilitate interdisciplinary and collaborative research efforts with other graduate programs of the University of Puerto Rico, and with universities and public and private institutions in other islands and tropical regions.

The search, by students and faculty members, of alternatives that promote harmony between the social, environmental and economic processes for the achievement of the common good.	● To promote, in Puerto Rico and other islands and tropical regions, research in the area of environmental sciences, particularly with regard to problems and environmental issues characteristic of tropical regions and Islands.
Integration and the proper use of the most advanced technology to the analysis of environmental problems.	● To encourage the application of knowledge acquired through study and research towards the achievement of the sustainable development of Islands and tropical regions in our students.
The active and responsible participation of the University community in the decision-making processes that affect the environment and the quality of life of Puerto Ricans.	● To develop in students the rigor in the pursuit of knowledge, and a high sense of ethics and social responsibility.
The development of a scientific community that not only promotes the creation and transmission of knowledge, but also generates, develops and supports environmental transformation in the country, and provides real solutions that help solve the problems faced by society.	● To encourage the participation of students in the pursuit of solutions and alternatives for issues and problems related to the environment.
	● To develop in students the rigor in the pursuit of knowledge, and a high sense of ethics and social responsibility.
Goals[5](From Appendix 4)	**Objectives[6] *(Appendix 4 – Proposal to Create Program)***
The establishment of an effective collaboration among the academic community attached to the program and the federal and state agencies, in such a way that they benefit from the breadth of expertise of the Program with regards to the management and interpretation of environmental databases, and to the search for solutions to the problems that the country faces.	● Establish effective communication with the government and communities, to direct research efforts towards the search of possible solutions to the problems facing the Islands and tropical regions, emphasizing the aspects concerning Puerto Rico.

[3]The vision is a clear image or written statement of what one would expect the program to look like in the suture. This image provides the Program a sense of direction and points towards where is heading in terms of strategic planning. .

[4] The mission is an affirmation that presents the function of the Program, its reason for existing, its academic focus, (research/professional), its areas of specialization and those aspects that make the Program unique. This affirmation sets the basis for curricular development, establishing the research tracks and service areas. It defines the relationship between student training and with knowledge production and community service. It also suggests the structure and guides the functioning of the program.

[5] The goals of the program are statements that expose in broad terms the responsibilities that the program has to achieve the implementation of its primary mission: to train students. The goals set the purposes from which the programmatic and management elements result. This contain either implicitly or explicitly an indicator of success. Each goals is operationalized with a series of objectives.

[6] The objectives of the program are operational statements that detail the responsibilities listed in the goals of the program. They provide criteria and measurable information (qualitative or quantitative) that can be used to plan, determine progress and facilitate the program's' progress. The program's success indicators stem from these objectives and consist of parameters that are usually quantitative and are used are criteria used to measure the performance of different elements of the program.

[7] The relevance of the mission is related to the development of the profession, the requirements to execute it, the obsolescence index of the field, the labor market and the social context in which the Program is placed.

a. Analysis

Respond to the following questions taking as reference the information provided in table 1.1. C.

i. Vision

1. **¿Does the program have a <u>Vision</u>?** **X Yes** (Go to next question) No (Go to questions about the Mission.). This was not in the original description of the proposal but was adopted from the Department of Environmental Sciences' vision.

2. **¿Does the <u>Vision</u> define where the program is headed to in terms of its strategic planning? Does it respond to the Strategic Plan of UPR Rio Piedras, *Visión Universidad 2016*?**

The Department of environmental sciences at the University of Puerto Rico at Río Piedras is a community of faculty and students dedicated to cutting edge-research research and community participation which will serve to advance science that helps to solve complex environmental problems, but at the same time enacts a balance between human needs and a sustainable biosphere. The Department is also committed to productive relationships with governments, businesses, non-governmental organizations and the public, both locally as well as regionally and internationally.

Our vision aligns with UPR Rio Piedras Strategic Plan (Vision 2016) in several aspects and particularly those related to Goal 1 of the Vision 2016 Plan which states the following:

The research, creation, erudition and the fundamentals of academic work on campus, will result in the dissemination and production of knowledge, will contribute to the growth of disciplines, interdisciplinary work and will contribute to the sustainable growth of Puerto Rican and international societies.

3. **¿Is the format of this Vision appropriate? ¿Is it written as an affirmation or a statement in a precise and concise manner? ¿Is it conjugated in the present tense and third singular?**

Yes to all questions

4. **¿To what extent does the <u>Mission</u> mentions the function of the program, its reason for being, its academic focus (research y/o professional), specialization areas and/or those features that make the program unique? (See footnote 4, page 8).**

This program is very specific about its function and its reason for being: *to prepare scientists in environmental sciences*. Unique features of this Graduate Program that are mentioned in the mission include the integration of diverse areas in environmental science training and the interdisciplinary focus interdisciplinary focus to the study of coupled human-natural systems. All of these are aligned to the interdisciplinary tract of the graduate programs (both MS and PhD). A curricular sequence within the interdisciplinary option of the program relates to the urbanizing tropics and was developed as a result of the NSF-IGERT program (**Appendix 2 - IGERT Final Report**). The mission statement is not explicit, however, about other areas of specialization or research tracks (sustainable management of insular systems, environmental modeling and spatial analysis). The mission is not explicit about the relationship between students training with knowledge production and community service although, the program's goals are (**Table 1.1.C.1: Vision, Mission, Goals y Objectives of the Program**).

5. ¿Is the format appropriate? ¿Is it written as a paragraph is a precise, concise and accessible manner?

Yes, the mission is appropriate. Yes, the mission is expressed as a paragraph and is written in a precise, concise and accessible manner.

6. ¿How does the Program's Mission responds to the present Mission of the Rio Piedras campus?

Our mission aligns with the mission statement for the University of Puerto Rico Rio Piedras campus (Mission and Vision 2016) in particular to items 1 to 3 of UPRRP's mission statement. Below we have identified elements of the campus mission that align to those of our program

-*UPRRP's mission:* Foster the integrated education of its students through programs of study which promote intellectual curiosity, the capacity for critical thinking, constant and ongoing learning, effective communication skills, an appreciation for and cultivation of ethical and aesthetic values, involvement in campus governance, and a sense of social awareness and responsibility. *Our mission:* preparing scientists and researchers with a profound and integrated knowledge of the environment via a rigorous and comprehensive education with a strong emphasis in research

-*UPRRP's mission:* Provide graduate education of the highest quality, with research and creative activity as key elements that strengthen undergraduate education; offer post-baccalaureate programs for the education and training of professionals of the highest caliber, persons who will be committed to the ideals and values of Puerto Rican society. *Our mission:* to provide an integrated, quantitative, and interdisciplinary focus to the study of coupled human-natural systems.

- *UPRRP's mission:* Provide an undergraduate education of excellence which offers students a unified vision of knowledge that brings general education and specialization into harmony; foster in students a capacity for independent study and research. *Our mission:* to create new knowledge and make decisions directed towards achieving a sustainable society.

7. ¿Is the current Program's Mission still relevant? **X Yes** No

Explain why. If your answer is NO, then explain what the Program will do to update it.

In terms of the development of the profession, our mission calls for highly interdisciplinary training which aligns with professions that fall within the realm of environmental scientists and technicians (See data from Bureau of Labor Statistic; http://www.bls.gov/ooh/life-physical-and-

social-science/environmental-scientists-and-specialists.htm#tab-1).

In terms of the requirements to practice the environmental science profession, professional accreditations are not needed, some positions do not require a graduate degree but others (i.e academics) do. For many of the positions a graduate degree brings a higher salary (See data from Bureau of Labor Statistics -http://www.bls.gov/ooh/life-physical-and-social-science/environmental-scientists-and-specialists.htm#tab-4).

In terms of the labor market, jobs for environmental scientists and specialist jobs have an expected growth that is faster than average (15%) nationwide (See data from Bureau of Labor Statistics Appendix 4). Also, the prospects for green jobs (closely related to what environmental scientists and specialists do). The *empleosverdes* (translated as Green Jobs in English; http://www.empleosverdespr.com/) also reports increases for jobs related to environmental sciences and in particular those related to the waste management and community service industries (see projections by state by industry in http://www.empleosverdespr.com/). In Puerto Rico, green jobs related to professional services, scientists and technicians represent 12.4% (out of 3,717) of green jobs in Puerto Rico or the fourth most common type of green job (http://www.empleosverdespr.com/Media/Documents/Presentaci%C3%B3n%20Resultados%20Encuesta%20Estudios%20T%C3%A9cnicos%20Sheraron.pdf).
In terms of the social context in which the Program has been developed, the program has a high relevancy in two respects. First, there is a large interest among undergraduate students in pursuing a graduate education in Environmental Sciences. A survey of student interest conducted among undergraduates in the Environmental Science Graduate Program indicated that 71.5% of students surveyed would like to continue graduate studies and 42.7 % of those indicated that they would like to pursue graduate studies in Puerto Rico (**Appendix 5 – Undergraduate Student Interest Survey**). Approximately 86% of those indicated that they would prefer to work with a federal agency (e.g. EPA, NOAA, US Forest Service). In those agencies, a graduate education helps increase the chances of a higher level entry (and thus higher salaries). A second point of relevance in terms of the social context of the program in relation to the program's' mission is that its sustainability focus is very much aligned with the current needs of society to solve major environmental problems in the face of global changes that threaten human well-being. Climate change is an example of these problems that has local and global sustainability implications as indicated by the IPCC 2014 (add link) and The Puerto Rico Climate Change Council (PRCC 2014: http://pr-ccc.org/wp-content/uploads/2014/08/PRCCC_ExecutiveSummary.pdf)

ii. Program Goals

1. ¿In what sense do Program Goals express in broad terms the main responsibilities of the Program, the capacity-building/learning of students, recruitment and development of faculty, research and production of new knowledge, infrastructure, management, service and relationships with the community.

Program Goals do best at describing the responsibilities of the program in terms of student capacity-building and learning, research production and knowledge and service and relationships with the community but they are vague in terms of recruitment and development of faculty as well as program management and infrastructure.

2. ¿Does each goal have an achievement indicator against which it is possible to provide evidence of the extent by which the goal has been met?

Table 1.1. C2 Alignment of Program Goals w. Program Objectives		
	Goal	**Objective/Indicator**
	A greater integration of the academic work with the current and future needs of the Puerto Rican society in everything that relates to the environment and sustainable development.	To form scientists with a highly critical and analytical sense, and a solid knowledge in the field of environmental sciences, which are able to meet the needs of society with regard to the use, management and improvement of the environment within the context of islands and tropical regions. ● # students that graduated (MS, PhD) ● Number of research projects in themes related to the environment and sustainable development with emphasis on those related to current and future needs. (# vs time?) From CVs, logros, ● List of research projects (titles) ● Jobs held by alumni To facilitate interdisciplinary and collaborative research efforts with other graduate programs of the University of Puerto Rico, and with universities and public and private institutions in other islands and tropical regions ● # Faculty from other departments/colleges particapating in the program
	The search, by students and faculty members, of alternatives that promote harmony between the social, environmental and economic processes for the achievement of the common good.	To promote, in Puerto Rico and other islands and tropical regions, research in the area of environmental sciences, particularly with regard to problems and environmental issues characteristic of tropical regions and Islands. ● List of research projects by themes – identify which ones related to sustainability (Faculty and students' CVs) ● List of presentations/publications (Faculty and Students' CV) ● List of Applied Research Highlights (Faculty vs Students surveys
	Integration and the proper use of the most advanced technology to the analysis of environmental problems.	To encourage the application of knowledge acquired through study and research towards the achievement of the sustainable development of Islands and tropical regions in our students. ● Original Equipment List vs Current Equipment List

	The active and responsible participation of the University community in the decision–making processes that affect the environment and the quality of life of Puerto Ricans.	To develop in students, the rigor in the pursuit of knowledge, and **a high sense of ethics and social responsibility.** # Number of Outreach Activities – that may influence decision making. From Project reports, CV List of activities that show participation of students/faculty in boards/coalitions – see CVs and data on agents of change, Links between program and government (as they relate to decision making). see CVs and data on agents of change, Project reports
	The development of a scientific community that not only promotes the creation and transmission of knowledge, but also generates, develops and supports environmental transformation in the country, and provides real solutions that help solve the problems faced by society.	● To encourage the participation of students in the pursuit of solutions and alternatives for issues and problems related to the environment. ● To develop in students, the rigor in the pursuit of knowledge, and a high sense of ethics and social responsibility. # publications (Faculty and Students) # presentations (Faculty and students) List of agents of change projects List of ways in which these projects generate/develop and support environmental transformation # outreach activities – highlights (from project reports, CVs
	The establishment of an effective collaboration among the academic community attached to the program and the federal and state agencies, in such a way that they benefit from the breadth of expertise of the Program with regards to the management and interpretation of environmental databases, and to the search for solutions to the problems that the country faces.	● To establish effective communication with the government and communities, to direct research efforts towards the search of possible solutions to the problems facing the Islands and tropical regions, emphasizing the aspects concerning Puerto Rico. # research projects with collaborations with Federal and State Government # Projects funded by Federal vs State agencies. List and nature of data bases generated

Other indicators of success related to expected but non-explicit goals

Capacity Building/learning of students – metrics for learning objectives in research course, workshops provided, courses provided, new courses

Internationalization – in alignment with Diez para la Decada, #International Faculty, #International students, # international projects, presentations, activities

Faculty recruitment – not explicit but explained in faculty recrnt plan – described how we met this goal

with our three new hires and contracts.
I
Infrastructure – indicators of success – remodeled laboratories – from final project report, professors with offices, professors with labs, remodeling of El verde (two infrastructure grants for CIAM), Number of Infrastructure Projects (Mei)

Program Management – Creation of the Department as a way to support program. Faculty Evaluations, Year to Completion by students, Graduate Program Coordination - achievements, satisfaction surveys faculty and students.

Recruitment/Retention - #applications, # acceptances, # degrees, # outreach activities

iii. Program Objectives

1. **To what extent do the Program Objectives enunciate operational actions and specific activities to be carried out to fulfil the responsibilities mentioned in the goals of the program?**
   Objectives vary in their enunciation of operation actions (some are not operational as stated, eg. Objective 1) and none of them enunciate activities that facilitate the programs evaluation although in some cases in can be deducted from the objective statement.

2. **Can it be deduced for each goal what is the indicator of achievement, i.e., they provide the objectives measurable information (qualitative and/or quantitative) though which future assessment of the operational aspects of the program is facilitated?**

Not necessarily, several objectives are vague in their statement of indicators of achievement.

iv General Questions

1. ¿Do Program fundamentals (Vision, Mission, Program Goals and Objectives) reflect the situation, interests and complexity of the Program?

The Vision, Mission and program Goals and objectives reflect the situation, interests and complexity of the Environmental Science Program but perhaps fail to highlight the tracks and outreach activities which are unique to the program. The program objectives

2. ¿Do fundamentals provide a clear sense of direction and adequate to its circumstances that facilitate the implementation and evaluation of results?

In their present form it is hard to align program objectives with, program goals. Perhaps some objectives should be seen as goals that need the development of objectives.

D. Student Profiles and learning Objectives

Please examine to the following Tables in **Appendix 1 (Appended Tables Section)**

Table 1.2.D.1 – Alignment of Student Profiles and Learning Objectives (*Alineamiento de Perfiles Estudiantiles y Objetivos del Aprendizaje*)

Table 1.2.D.2 – Alignment of Student Profiles and Learning Objectives (*Alineamiento de Perfiles Estudiantiles y Objetivos del Aprendizaje*)

a. Analysis

Answer the following questions taking into the information provided in Appendix 1: Table 1.1.D.1 and Table 1.1.D.2. as a reference.

i. New Student Profile

***1.* ¿Does the Program have a *Desired Profile for New Students* that details the baseline competencies that the student should have as a startup point in the Program? Or does it only have a list of admission pre-requisites? If the latter, then when does the Program hopes to have a final profile?**

No, it does not have a profile for new students. It does have a set of requirements **(Table 2.3.D. Admission Requirements - P. 54**). We are currently developing a profile based on our experience during the first year cycle.

ii. Alumni Profile

2. *Is there a correspondence between the* Alumni Profile *and the needs and opportunities of the job and academic market? Justify your answer*.

A lot of the job market context that gave rise to the current program still remains true after 5 years. Environmental/sustainability issues have exacerbated on and off the island, creating a need for adequately trained professionals to tackle these problems and thus providing job prospects for graduates. In examining **Tables 1.1. D1 and 1.1. D2 (Appendix 1)** we find that many of the characteristics listed in the original Alumni profile **are still very much relevant to the needs and opportunities under the current job market.** Here we describe the job market for PR and the US context providing updates when appropriate.

At the local level, practically all industries interested in establishing in Puerto Rico or carrying out construction activities must obtain the environmental permits which can be as simple as an emission permit for an emergency generator or as complex as an Environmental Impact Statement (EIS). These permits are the responsibility of the engineering consulting firms in charge of the project. Simple permits can be prepared by a person with a bachelor's degree but an EIS for a large project requires research of the flora and fauna, environmental analysis and modeling, and environmental and natural resource use and management. Many consulting firms are currently carrying out these tasks employing professionals with a master's degree in environmental health where a professional with a master's degree in environmental sciences would be more appropriate.

There are many federal agencies in Puerto Rico with jurisdiction on environmental issues; these include

the United States Geological Survey, Engineer Corps, Fish and Wildlife Service and the Environmental Protection Agency (EPA), US Forest Service, Natural Resource and Conservation Service among others. At the EPA, the initial professional placement is at the GS-9 level.

The local agencies at the state-level providing employment opportunities are the Department of Natural Resources and the Environment, the Waste Management Authority, the Water Authority and the Environmental Quality Board. At the Board, the three technical (non-managerial) environmental positions: Permissions Officers, I and II Environmental Specialists and the "I" and "II" Environmental Quality Inspectors.

Description for the Permissions Officer I position is: "Professional and specialized position consisting in analyzing and evaluating permit applications and carry out research to determine compliance with the environmental laws and regulations". The academic requirements for this position are a Master's degree in Environmental Sciences or Environmental Manager specializing in Environmental Evaluation and Risk Management or Environmental Planning, a Master's in Management Engineering specialized as an Environmental Manager or a Master in Science specializing in Environmental Health from an accredited university.

Description for the Environmental Quality Inspector I position is: "Professional and specialized position in the environmental sciences field consisting in the analysis, study and scientific research related to conservation, protection and quality control of natural resources and ecosystems." The academic requirements for this position are a Master's degree in Environmental Sciences or as an Environmental Manager specializing in Environmental Evaluation and Risk Management or a Master in Science specializing in Chemistry, Physics or Biology from an accredited university. The Environmental Quality Inspector I position only requires a bachelor's degree.

Para la Naturaleza and The San Juan Bay Estuary Program, the largest environmental NGOs in PR has hired staff with masters and PhDs in recent times as a strategy to integrate scientific activities into their overall mission and in particular through their citizen science programs.

At the national (US) level analyses of data from both the Bureau of Labor Statistics at the Department of Federal Employment and empleosverdespr.com (translates as green jobs in English) suggest a state of good job prospects for environmental scientists and specialists (i.e growth in projected employment opportunities) and that there is a need for an advanced degree in order to achieve professional success in the discipline. The following quotes were obtained from the Bureau of Labor Statistics at the Department of Federal Employment in regard to job prospects and education needs (BLS; http://www.bls.gov/ooh/life-physical-and-social-science/environmental-scientists-and-specialists.htm#tab-4, obtained on October 26, 2015):

"Employment of environmental scientists and specialists is projected to grow 15 percent from 2012 to 2022, faster than the average for all occupations. Heightened public interest in the hazards facing the environment, as well as the increasing demands placed on the environment by population growth, is expected to spur demand for environmental scientists and specialists".

"For most entry-level jobs, environmental scientists and specialists must have a bachelor's degree in environmental science or a science-related field, such as biology, chemistry, physics, geosciences, or engineering. However, a master's degree may be needed for advancement. Environmental scientists and specialists who have a doctoral degree make up a small percentage of the occupation, and this level of

training is typically needed only for the relatively few postsecondary teaching and basic research positions" However….."in addition to growth, many job openings will be created by scientists who retire, advance to management positions, or change careers."

The following table, obtained from the National Employment Matrix, also from the Bureau of Labor Statistics, shows employment projections for the next seven years, indicating a growth of approximately 15% for jobs in Environmental Sciences. As a researcher, a Ph.D. in environmental sciences can in academia or for government supported research laboratories but also in the private sector in environmental consulting firms, helping them to monitor and manage environmental concerns, minimize their environmental impacts, comply with environmental regulations among other things. *Empleosverdespr.com* has posted a study commissioned by government of Puerto Rico about the state of "green jobs" in Puerto Rico which list jobs in the Professional Scientifics and Technical Services category as the fourth most common green job on the island (study title: *Perfil de las Industrias y Ocupaciones Verdes (PIOV) en Puerto Rico*)

Employment projections [a]

Occupational title	Employment, 2012	Projected employment, 2022	Change, 2006-16	
			Number	Percent
Environmental scientists and specialists, including health	**90,000**	**103,2,000**	**13,200**	**14.6**
Environmental Science Professor	**6,300**	**7,100**	**800**	**0.8**
Hydrologists	**7,400**	**8,100**	**800**	**0.8**

[a] Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2014-15 Edition, Environmental Scientists and Specialists,on the Internet at http://www.bls.gov/ooh/life-physical-and-social-science/environmental-scientists-and-specialists.htm (visited October 26, 2015).

An evaluation of several job search engines confirms that, for Puerto Rico, most environmental jobs found a master's degree to be preferable to a bachelor's degree in hiring and that most jobs do not require a PhD (see examples of positions below). However, it should be noted that a recent job posting for the US Forest Service that was listed at entry level GS-12, did require a PhD and was better paid than all the others found in the search engine.

3. In what way does the Alumni Profile gather the skills and tasks that the alumnus must show during the *initial stages of his/her career?*

We found that many of the characteristics addressed in our Alumni profile (team player, effective communicator, able to occupy technical and managerial positions, able to critically analyze data) were listed at these job postings. Knowledge of environmental regulations seems to be a common job requirement for technical positions. While not an explicit skill of our Alumni profile for the master's program, it is most definitely implied in the Alumni profile statement "be able to conduct environmental impact assessments " Prior experience seems to be a common requirement of higher paid jobs which indicates the need to ensure that students participate in internships and practical experiences.

Additional data on the job market relevant to our profile:
-70% of green jobs in PR did not require an accreditation (empleosverdespr.com) which aligns with National trends (BSL).

Skills Needed for the Job according to BLS (cited directly from BSL site):
Analytical skills. Environmental scientists and specialists base their conclusions on careful analysis of scientific data. They must consider all possible methods and solutions in their analyses.
Communication skills. Environmental scientists and specialists may need to present and explain their findings and write technical reports.
Interpersonal skills. Environmental scientists and specialists typically work on teams with scientists, engineers, and technicians. Team members must be able to work together effectively to achieve their goals.
Problem-solving skills. Environmental scientists and specialists try to find the best possible solution to problems that affect the environment and people's health.
Self-discipline. Environmental scientists and specialists may spend a lot of time working alone. They need to be able to stay motivated and get their work done without supervision

Additional facts from BLS that may be relevant to the Alumni profile
"Students should look for opportunities, such as classes and internships that allow for work with computer modeling, data analysis, and geographic information systems. Students with experience in these programs will be the best prepared to enter the job market"

Students who want to reach the Ph.D. level and have a career in academia or as an environmental scientist doing basic research may find it advantageous to major in a more specific natural science such as chemistry, biology, physics, or geology, rather than the broader environmental science degrees.

"Some environmental scientists and specialists begin their careers as scientists in related occupations, such as hydrology or engineering, and then move into the more interdisciplinary field of environmental science"

4. **¿Is the level of requirements for the Alumni Profile in tune with the expected degree (i.e. Masters or PhD**)?

Most faculty agree that a change in curricular requirements is in order. Both programs are deemed too course heavy, currently more focused on content and less on skills. Most faculty agree that there should be a change in focus towards skills related to analysis and knowledge acquisition and lesser focus on providing a fixed general course load to students (see faculty survey Appendix).

5. **¿Is the Alumnus Profile written as a list of about 10 statements that start with a verb in the infinitive (not necessarily an action verb)? If that is not the case, when will the program expects to have that profile in such format?**
Yes the Alumnus Profile for Masters and PhDs are written as a list of about 10 statements that start with a verb in the infinitive **(See Table 1.2. D1 and 1.2.D2 - Appendix 1).**

iii. Learning Objectives

6. To what extent do <u>Learning Objectives</u> indicate the competencies that students must demonstrate <u>during their tenure within the program</u>?

Current learning objectives relate to the competencies that students must demonstrate during their tenure within the program. However, not all expected competencies have matching learning objectives. Here we present a table that **matches each of the learning objectives to the competencies that need to be demonstrated by the graduate** student:

Table 1.2.E Learning Objectives vs Competencies of the Program

<u>Learning Objective PhD</u>	**<u>Competencies PhD</u>**
Present research results in written form and expose them in open discussion with clarity and precision.	Effective Communication
Formulate, design and evaluate a research problem in a particular area within environmental sciences.	Critical Thinking
To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Social Responsibility
Formulate, design and evaluate a research problem in a particular area within environmental sciences.	Research and Creation
Without learning objectives	Capacity for independent study
Without learning objectives	Intellectual Curiosity
Without learning objectives	Continuous Learning
To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Ethic sensibility and aesthetics
To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Appreciation, cultivation and commitment with values and ideals of Puerto Rican society within a Caribbean and international context.
Analyze the research results. To analyze the natural and induced geologic processes inherent to islands and tropical regions. To analyze patterns of environmental change and their effects on the variety of components of a watershed as well as the changes in energy fluxes as an effect of the impact of human activities.	Knowledge Integration
Analyze the research results.	logic-mathematical thinking
To analyze the natural and induced geologic processes inherent to islands and tropical regions. To analyze the natural and induced geologic processes inherent to islands and tropical regions. To analyze patterns of environmental change and their effects on the variety of components of a	Knowledge, skill, attitude that are relevant to the program

watershed as well as the changes in energy fluxes as an effect of the impact of human activities.	
To analyze the natural and induced geologic processes inherent to islands and tropical regions.	Information competencies
Without learning objectives	Leadership
Without learning objectives	Teamwork

8. Are these measurable? Are they operationally defined, in behavioral terms?
Yes learning objectives are measurable and operationally defined through behavioral terms

9. Is their format appropriate? Do they begin with an action verb in the infinitive? Are they written according to what the student (not the professor) should be capable of doing? Are they ordered from the simplest competencies to the most complex ones? Their format is appropriate but they were organized to align with the order of the Alumnus Profile items.

10. Are learning objectives aligned, that is to say, do they harmonize with the Alumnus Profile? Can the program infer then, that through those objectives the students should be prepared to the exercise of their careers? Current objectives do harmonize with the alumni profiles as show by the following tables:

TABLE 1.2.F.1 Learning Objectives of the Program vs MSc Graduate Profile

Learning Objectives MSc	**MSc Profile**
To formulate, design and evaluate a research problem in a particular area within environmental sciences.	To apply the methods and the most modern techniques related to the analysis of environmental parameters, the sustainable management of natural resources, environmental systems modelling, or spatial analysis of the environment, according to their area of specialty. To design and implement environmental evaluation and management plans, especially in regard to issues and problems characteristic of tropical regions and Islands. To contribute to the solution of environmental problems using the knowledge acquired through study and research, and the most recently published scientific knowledge in the area.
To analyze the research results.	To conduct environmental assessments, prepare and critically analyze environmental assessment documents, draft environmental impact statements, and effectively communicate the results of such assessments, either in writing or through presentations and public hearings To plan and conduct field studies, and analyze studies performed by others to check the adequacy of procedures and compliance with

	current regulations. To critically analyze data and environmental information, and propose theoretical and practical solutions to the environmental problems identified.
To present research results in written form and expose them in open discussion with clarity and precision.	To be an effective communicator of environment issues in public and private forums, in scientific and professional conferences, and for audiences of all levels of knowledge, both in oral and written To conduct environmental assessments, prepare and critically analyze environmental assessment documents, draft environmental impact statements, and effectively communicate the results of such assessments, either in writing or through presentations and public hearings
To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	To be an agent of change in his/her community and in society in regard to the preservation of the environment and the optimal use of natural resources.
Without learning objectives	To work as part of teams in field studies and research projects in Environmental Sciences, and contribute significantly to these. To occupy technical and managerial positions in State and federal government agencies as well as private companies that required the services of a specialist with a solid knowledge in the environmental sciences.

TABLE 1.2.F.1 Learning Objectives of the Program vs PhD Graduate Profile

Learning Objective PhD	PhD Profile
To formulate, design and evaluate a research problem in a particular area within environmental sciences.	To initiate, direct and supervise research projects in environmental sciences, write proposals to fund these and establish professional collaborations with other researchers To advance the theoretical and technical knowledge in the area of environmental sciences through the development, implementation and evaluation of protocols and techniques for sampling and analysis of environmental parameters, the design of comprehensive plans for sustainable management of sites and environmental resources, or the development of mathematical models and techniques of spatial analysis to solve complex environmental problems according to their area of specialty.
To analyze the research results.	To integrate knowledge acquired through in-depth study and research, or through the application of the most recently published scientific knowledge, to analyze the problems and environmental situations characteristic of Islands and tropical regions, and to provide viable alternatives that are directed towards the achievement of their sustainable development To serve as expert in court cases related to his area of expertise, or in other situations that require advice from a consultant with deep knowledge in environmental sciences
To present research results in written form and expose them in open discussion with clarity and precision.	To be an effective communicator of environment issues in public and private forums, in scientific and professional conferences, and for audiences of all levels of knowledge, both in oral and written form. To contribute significantly to their area of expertise in environmental sciences through the publication of research findings in professional journals of recognized excellence, evaluation and critical analysis of the work carried out by others, and the active and effective participation in local and international scientific meetings

To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Contribute to the sustainable development of society, providing an integrative vision in the analysis of the problems of modern society in light of the anticipated social and environmental changes, promoting changes and attainment of a better quality of life through the optimal sustainable use of natural and environmental resources, and assuming positions of leadership in the defense of the environment
To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	To be an agent of change in his/her community and in the society in regard to the preservation of the environment and the optimal use of natural resources
Without learning objectives	Carry out teaching and research work in higher education institutions, or occupy leadership positions in research or administration in the Government and private industry. To work as part of teams in field studies and research projects in Environmental Sciences, and contribute significantly to these.

11. If there have been significant changes or you foresee significant changes to the program, Are those changes reflected in the *Newly Admitted Student Profile, Learning Objectives* and the *Alumni Profile*?

Results from a faculty survey performed in November 2015, suggest a need to improve graduate student competencies (for newly admitted and admitted students) and a need to reduce the variance among graduate students in their level of certain skills (analytical/statistical/mathematical, written communication, time management skills **(See Appendix 6 – Faculty Survey P. 20-24**). Survey answers as well as internal discussions have indicated the need to develop a profile for Newly Admitted Students, modifications to recruitment procedures and modifications to the graduate exam format to ensure that students meet a minimum levels of skills going beyond the entrance requirements (GPA, GRE, and Letters of recommendation transcript). Many faculty expressed the need to diversify the curriculum. However, there is a general feeling among faculty that the programs (MSc and PhD) are too course heavy and that the teaching focus should be on teaching skills (learning how to learn and analyze, seek knowledge) within the context of Environmental Sciences. A general suggestion from faculty is to reduce the course requirements and allow students with their graduate committees design their course tracks. Also, to reduce the number of graduate exams that students have to take before they are told whether or not they fit in the program (right now there are three). Several faculty suggested using a two exam model (first year exam + proposal defense) although discussions are still ongoing as to what the structure of the first year exam should be.

IV. General Questions

12. ¿Up to what point is there evidence of the relationship between the New Student and Alumni Profiles and the Learning Objectives? Are there gaps between some and the others that could be having a negative effect on learning?

Alumnus profile traits that seem to be aligned with the current achievement of learning objectives within the program (as measured by faculty rankings) are the ability of students to work in teams (70 % satisfactory/very satisfactory), social responsibility (65% satisfactory/very satisfactory) and oral communication (54% satisfactory/very satisfactory). The ability to work as part of teams in field studies and research projects in Environmental Sciences, and contribute significantly to these is an alumnus profile that does not have an explicit learning objective, yet courses seem to be incorporating that skill effectively. On the other hand, students did not rank as high in other skills contemplated by learning objectives and essential to produce alumni with the expected profile. Specifically, results from the faculty survey suggest the need to improve the level of skills related to science activity (critical thinking, analytical/statistical skills, written communication, time management all of which had less than a 30% combined satisfactory/very satisfactory rating, (see **Appendix 6 -Faculty Survey P. 20-24**). A student survey has indicators of how students feel in regard to certain skills. Results indicate that they feel less satisfied with their research design and statistical skills (**Appendix 7 -Student Survey P 17-20**). These results contrast dramatically with formal evaluations of learning objectives through the campus-wide assessment plan which evaluated the following learning objectives for the year 2014-2015: Critical Thinking, Communication Skills, Research and Creation (**Appendix 8 – Environmental Sciences Assessment Plan and Rubrics)**. **Results indicated that most students (75% – 100%) meets and exceed expectations in these areas (see Appendix 9 – Environmental Sciences Learning Assessment Results). The mechanisms leading to these dramatic differences between evaluation processes needs further exploration and discussion.**

-Some profile elements of the MSc do not have explicit learning objectives:

a. To occupy technical and managerial positions in State and federal government agencies as well as private companies that required the services of a specialist with a solid knowledge in the environmental sciences.

-**Some profile elements of the PhD do not have learning objectives:**

a. To work as part of teams in field studies and research projects in Environmental Sciences and contribute significantly to these.
b. Carry out teaching and research work in higher education institutions, or occupy leadership positions in research or administration in the Government.

13. What strategies and instruments has the Program used to measure student learning and what have been the results?

The program has followed the Campus-Wide Student Assessment Plan under the guidance of the College of Natura Sciences (**Appendix 8 – Environmental Sciences Assessment Plan and Rubrics)**. Under these guidelines, the performance of students is evaluated during the comprehensive exams and proposal defenses using rubrics developed by the College to evaluate Campus-Wide learning objectives. Instruments used to evaluate learning objectives are provided in **Appendix 8 – Environmental Sciences Assessment Plan and Rubrics)**. The assessment evaluation plan defines 12 learning objectives (domains) with six being measured at different times during the last five years. In 2014-2015, the learning objectives evaluated were: Critical Thinking, Communication Skills, Research and Creation have been the most consistent ones. Indirect assessment of student learning is also

done through faculty and student surveys by asking respondents to rate students on a variety of skills (which relate to campus-wide and program learning objectives; **Appendixes 6 (P.20-25) and7 (P. 17-20).**

II. Curriculum and Curricular Experience

Study Program

Provide the study program and curricular sequence as they were approved. Adapt the item following the structure of your curriculum. The study program list the sequence of steps needed to acquire knowledge and skills that will lead the student to obtain its degree; demonstrate expectations in terms of requirements, sequence and estimated time to completions. The analysis of the study program compared to the time that it really takes to complete its requirements will allow you to make a realistic evaluation of the original design and the actual functioning of the program.

Table 2.1.A.a Curricular Sequence - Masters Degree in Environmental Sciences

Program Name		**Masters Degree in Environmental Sciences**			
Track		**Sustainable management in islands and tropical regions**			
1st year					
First Semester			**Second Semester**		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	CIAM 6115		3	CIAM 6118	
3	CIAM 6117		3	CIAM 6256	
3	CIAM 6235		3	CIAM 6116	
1	CIAM 6901		1	CIAM 6901	
10	Total credits		10	Total credits	

SEGUNDO AÑO					
First Semester			**Second Semester**		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	CIAM 8425	CIAM 6115, 6117, 6118	3	Elective	
3	CIAM 8435	CIAM 6115, 6117, 6118	3	Elective	
3	CIAM 6999 - Thesis		3	CIAM 6999 -Thesis	
9	Total credits		9	Total credits	

Table 2.1.A.b Curricular Sequence – Master of Science Degree in Environmental Sciences

Program Name		Masters Degree in Environmental Sciences			
Track		Environmental Modelling and Spatial Analysis			
First year					
First Semester			Second Semester		
Crs	Required courses*	Pre-requisites	Crs	Required courses *	Pre-requisites
3	CIAM 6115		3	CIAM 6118	
3	CIAM 6117		3	CIAM 6256	
3	CIAM 6235		3	CIAM 6116	
1	CIAM 6901		1	CIAM 6901	
10	Total credits		10	Total credits	

Second Year					
First Semester			Second Semester		
Crs	Required courses*	Pre-requisites	Crs	Required courses *	Pre-requisites
3	CIAM 8225	CIAM 6235	3	Elective	
3	CIAM 8267	CIAM 6236	3	Elective	
3	CIAM 6999		3	CIAM 6999	
9	Total credits		9	Total credits	

Table 2.1.A.c Curricular Sequence – Master of Science Degree in Environmental Sciences

Program Name		Masters Degree in Environmental Sciences			
Track		Interdisciplinary Studies			
First year					
First Semester			Second Semester		
Crs	Required courses*	Pre-requisites	Crs	Required courses *	Pre-requisites
3	CIAM 6115		3	CIAM 6118	
3	CIAM 6117		3	CIAM 6256	
3	Elective		3	Elective	
1	CIAM 6901		1	CIAM 6901	
10	Total credits		10	Total credits	

Second Year					
First Semester			Second Semester		
Crs	Required courses*	Pre-requisites	Crs	Required courses *	Pre-requisites
3	Elective (Specialty Course)		3	Elective	
3	Elective (Specialty Course)		3	Elective	
3	CIAM 6999		3	CIAM 6999	
9	Total credits		9	Total credits	

Table 2.1.A.d Curricular Sequence – PhD Degree in Environmental Sciences

Program Name		PhD Degree in Environmental Sciences			
Track		Sustainable management in islands and tropical regions			
First year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	CIAM 6115		3	CIAM 6118	
3	CIAM 6117		3	CIAM 6256	
3	CIAM 6235		3	CIAM 6116	
1	CIAM 6901		1	CIAM 6901	
10	Total credits		10	Total credits	

Second Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	CIAM 8425	CIAM 6115, 6117, 6118	3	CIAM 8445	CIAM 6115, 6117 and 6118.
3	CIAM 8435	CIAM 6115, 6117, 6118	3	Elective	
2	CIAM 8405		2	CIAM 8405	
3	CIAM 8999		3	CIAM 8999	
11	Total credits		11	Total credits	

Third Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	Elective		3	Elective	
6	CIAM 8999		6	CIAM 8999	
9	Total credits		9	Total credits	

Fourth Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
0	CIAM 8996		0	CIAM 8996	
0	Total credits		0	Total credits	

Table 2.1.A.e Curricular Sequence – PhD Degree in Environmental Sciences

Program Name		PhD Degree in Environmental Sciences			
Track		Environmental Modelling and Spatial Analysis			
First year					
First Semester			Second Semester		
Crs	**Cursos Requeridos***	**Prerrequisitos**	**Crs**	**Cursos Requeridos***	**Prerrequisitos**
3	CIAM 6115		3	CIAM 6118	
3	CIAM 6117		3	CIAM 6256	
3	CIAM 6235		3	CIAM 6116	
1	CIAM 6901		1	CIAM 6901	
10	Total credits		10	Total credits	

Second Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	CIAM 8225	CIAM 6256, CIAM 6235	3	CIAM 8236	CIAM 6235
3	CIAM 8257	CIAM 6256	3	Elective	
2	CIAM 8205		2	CIAM 8205	
3	CIAM 8999		3	CIAM 8999	
11	Total credits		11	Total credits	

Third Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	Elective		3	Elective	
6	CIAM 8999		6	CIAM 8999	
9	Total credits		9	Total credits	

Fourth Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
0	CIAM 8996		0	CIAM 8996	
0	Total credits		0	Total credits	

Table 2.1.A.e Curricular Sequence – PhD Degree in Environmental Sciences

Program Name		PhD Degree in Environmental Sciences			
Track		Interdisicplinary Studies			
1st Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	CIAM 6115		3	CIAM 6118	
3	CIAM 6117		3	CIAM 6256	
3	Elective		3	Elective	
1	CIAM 6901		1	CIAM 6901	
10	Total credits		10	Total credits	

Second year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	Elective (Specialty Course)		3	Elective (Specialty Course)	
3	Elective (Specialty Course)		3	Elective	
3	CIAM 8999		3	CIAM 8999	
9	Total credits		9	Total credits	

Third Year					
First Semester			Second Semester		
Crs	**Required courses***	**Pre-requisites**	**Crs**	**Required courses ***	**Pre-requisites**
3	Elective		3	Elective	
6	CIAM 8999		6	CIAM 8999	
9	Total credits		9	Total credits	

Fourth Year					
First Semester			Second Semester		
Crs	**Cursos Requeridos***	**Prerrequisitos**	**Crs**	**Cursos Requeridos***	**Prerrequisitos**
0	CIAM 8996		0	CIAM 8996	
0	Total credits		0	Total credits	

TABLE 2.B ELECTIVES Graduate Program in Environmental Sciences

Option menu of directed electives			
Crs	**Course Code**	**Course name**	**Pre-requisites**
3	CIAM 6235	Remote sensing I.	Acceptance into the Graduate Program
3	CIAM 6635	Modern methods in environmental science	Acceptance into the Graduate Program
1-3	CIAM 6990	Special topics in environmental science	Acceptance into the Graduate Program or Permission of the Instructor
2	CIAM 8115	Human dimensions of climate change	Permission of the Program Coordinator
2	CIAM 8116	Environmental policy and ethics	Permission of the Program Coordinator
2	CIAM 8117	Urban environment, design, and expansion	Permission of the Program Coordinator
2	CIAM 8118	Socioecological models and informatics	Permission of the Program Coordinator
2	CIAM 8119	Ecosystem services and ecological economics	Permission of the Program Coordinator
2	CIAM 8120	Environmental communications	Permission of the Program Coordinator
2	CIAM 8205	Seminar in modeling and environmental spatial analysis I.	Permission of the Program Coordinator
3	CIAM 8225.	Methods in spatial analysis.	CIAM 5231
3	CIAM 8257	Techniques in environmental model construction	CIAM 6256
2	CIAM 8405	Seminar in island and tropical region management	Permission of the Program Coordinator
3	CIAM 8425	Environmental geology	CIAM 6115, 6117, and 6118
3	CIAM 8435	Environmental hydrology	CIAM 6115, 6117, and 6118
3	CIAM 8775	Solid Waste management	CIAM 6115, 6117, and 6118
3	CIAM 8785	Energy generation	CIAM 6115, 6117, and 6118
1-3	CIAM 8990	Special topics in environmental science	Permission of the Program Coordinator or Permission of the Instructor
	BIOL 5440	Limnology	Acceptance into the Graduate Program
3	BIOL 6115	Communities and ecosystems	Permission of the Instructor
3	BIOL 6125	Microbial ecology	Permission of the Instructor
3	BIOL 6126	Population ecology	Permission of the Instructor
3	BIOL 6145	Bioconservation	Permission of the Instructor
3	BIOL 6190	Advanced ecology	Permission of the Instructor
3	BIOL 6367	Ecological genetics	Permission of the Instructor
3	BIOL 6999	Special topics in modern biology	Permission of the Instructor
3	BIOL 8368	Seminar on population biology	Permission of the Instructor
3	FISI 6441	Nuclear physics	FISI 6452 or Permission of Instructor
3	MATE 6601	Probability and statistics I	MATE 5001, 5002 or equivalent
3	MATE 6602	Probability and statistics II	MATE 6601
3	MATE 6686	Experimental design and advanced	CIAM 6256 or equivalent

		data analysis	
3	**MATE 6700**	**Projects in applied mathematics**	**Permission of the Instructor**
3	**MATE 8990**	**Topics in applied mathematics**	**Permission of the Instructor**
3	**MATE 8995**	**Topics in computational mathematics**	**Permission of the Instructor**
3	**QUIM 6215**	**Theory of analytical chemistry**	**QUIM 3255, 4042 or the equivalent**
3	**QUIM 6225**	**Theory of instrumental analysis**	**QUIM 3255, 4041 or the equivalent**
2	**QUIM 8205**	**Seminar: analytical chemistry I**	**Permission of the Instructor**
2	**QUIM 8206**	**Seminar: analytical chemistry II**	**QUIM 8205**
3	**QUIM 8992**	**Special topics in analytical chemistry**	**Permission of the Instructor**
3	**QUIM 8996**	**Special Topics in Physical Chemistry**	**Permission of the Instructor**
3	**DERE 7539**	**Natural resources legislation**	**Permission of the Instructor**
3	**DERE 7540**	**Environmental law**	**Permission of the Instructor**
3	**DERE 7676**	**Seminar: Topics on environmental law**	**Permission of the Instructor**
3	**ECON 6090**	**Graduate seminar in environmental economics**	**Permission of the Instructor**
3	**ECON 6095**	**Natural resources economics**	**Permission of the Instructor**
3	**PLAN 6020**	**Geographical information systems for planners**	**Permission of the Instructor**
3	**PLAN 6098**	**Environmental economics for planners**	**Permission of the Instructor**
3	**PLAN 6551**	**Analytical methods for Planners I**	**Permission of the Instructor**
3	**PLAN 6552**	**Analytical methods for planners II**	**Permission of the Instructor**

B. Courses and Learning Experiences (Curricular Design Matrices)

1. Explanation of the elements of Curricular Design Matrices **Tables 2.2.B.1-6**

As required, we assessed courses in the Graduate Program of the Environmental Sciences Department according to whether they embody the Bloom Teaching Objectives. *The Bloom Objectives revised for Environmental Science*. The Bloom Objectives are generic. We rewrote the generic descriptions for application to an environmental science curriculum and for use in the assessment table *Cursos y Experiencias de Aprendizaje*, in which each course in the graduate environmental science curriculum is assessed. We also added detail to the Bloom Objectives by incorporating into the Objectives some *Objetivos del aprendizaje estudiantil* from other assessments.

Bloom Objectives: generic descriptions

Bloom's Taxonomy is a classification model of thinking according to six levels of complexity. Over the years, these levels have been presented as a ladder, leading many teachers to make their students to move to higher levels of thinking. The initial levels are: knowledge, understanding, and application. The advanced levels are: analysis, synthesis, and evaluation. The original Bloom Taxonomy was changed to now include:

● Memory: Evoke, recognize and remember relevant knowledge of the "long term memory" (long-term memory).
● Understanding: Constructing meaning from oral, written messages and drawings by means of interpretation, modeling, classifying, summarizing, inferring, comparing, and explaining.
● Apply: Carry out or use a procedure through performance or implantation.
● Analyze: Break down the material into its components, determining the relationship between the parties how the parts relate to the whole unit or for the purpose, through differentiation, organization and attribution.
● Evaluate: Spending judgment based criteria and standards through the collation and critical.
● Create: Connect elements to form a coherent or functional whole; reorganizing elements into a new pattern or structure by the invention or production planning.

Detail added to the Bloom Objectives
We added detail to each Bloom Objective, using two sets of skills, or attitudes to be developed, applied in other assessments of courses in Environmental Science.

The first set of specific skills and attitudes we took from an assessment of some course by Wilma Santiago (Office of Graduate Studies, College of Natural Sciences). This set includes:
1. Effective Communication
2. Critical Thinking
3. Social Responsibility
4. Research and Creativity
5. Capacity for independent study
6. Intellectual Curiosity
7. Lifelong Learning
8. Ethical and aesthetic sensitivity
9. Appreciation and commitment to the values and ideals of Puerto Rican society in the Caribbean and international context
10. Integration of Knowledge
11. Logical-Mathematical Reasoning
12. Knowledge, skill or attitude own program
13. Information skills
14. Leadership
15. Group work

Skills 14 and 15, Leadership and work in groups are not specific objectives in our courses. These are not included in any of our modified Bloom Objectives.

The second set of specific skills and attitudes we took from a previous assessment of selected courses in Envronmental Science. This set of specific skills and attitudes was taken from the *Dominios de la Misión del Recinto* as described in the list of *Objetivos del aprendizaje estudiantil*. This list includes the following:
<u>Effective communication</u>
Present research results in written form and expose them to open discussion with clarity and precision.
<u>Research and development</u>

Formulate, design and evaluate a research problem in a particular area of environmental science.
Critical thinking
Analyze the results of the investigation
Information Literacy
Develop in students the rigor in the pursuit of knowledge, and a high ethical sense and social responsibility.

2. Bloom Objectives Revised and Expanded

Below we give the Bloom learning objectives revised and expanded as described above for particular application to the Department of Environmental Sciences graduate curriculum. Here we include the short explanation of each objective and we list the skills and attitudes involved in each objective.

Acquire: Gain a profound knowledge of the environment

This objective involves entails the following attitudes and skills:

- Critical thinking
- Capacity for independent study
- Continuous learning
- Knowledge integration
- Knowledge, skills and attitude own program
- Information literacy

Understand: Have a comprehensive vision of environmental systems

This objective involves entails the following attitudes and skills:

- Critical thinking
- Capacity for independent study
- Intellectual curiosity
- Continuous learning
- Knowledge Integration
- Logical-mathematical reasoning
- Knowledge, skills and attitude own program

Apply: Be able to apply knowledge of environmental systems to environmental problems

This objective involves entails the following atitudes and skills:

- Effective communication
- Critical thinking
- Research and creation
- Capacity for independent study
- Continuous learning
- Ethical and aesthetic sensitivity
- Appreciation and commitment to the values and ideals of Puerto Rican society in the Caribbean and international context
- Knowledge Integration
- Logical-mathematical reasoning
- Knowledge, skills and attitude own program
- Information competency
- Information literacy

Analyze: Be able to analyze environmental problems toward formulating solutions

This objective involves entails the following attitudes and skills:

Social responsability
Critical thinking
Research and creation
Capacity for independent study
Intellectual curiosity
Continuous learning
Ethical and aesthetic sensitivity
Appreciation and commitment to the values and ideals of Puerto Rican society in the Caribbean and international context
Knowledge Integration
Logical-mathematical reasoning
Knowledge, skills and attitude own program
Information competency
Information literacy

Evaluate: Be able to weigh different approaches to solving environmental problems

This objective involves entails the following attitudes and skills:

Social responsability
Critical thinking
Research and creation
Capacity for independent study
Intellectual curiosity
Continuous learning
Ethical and aesthetic sensitivity
Appreciation and commitment to the values and ideals of Puerto Rican society in the Caribbean and international context
Knowledge Integration
Logical-mathematical reasoning
Knowledge, skills and positive attitude to the program
Information competency
Information literacy

Create: Be able to develop and understand implementation of policies for solving environmental problems

This objective involves entails the following attitudes and skills: Social responsability
Critical thinking
Research and creation
Capacity for independent study
Intellectual curiosity
Continuous learning
Ethical and aesthetic sensitivity
Appreciation, culture and commitment to the values and ideals of Puerto Rican society in the Caribbean and international context

Knowledge Integration
Knowledge, skills and positive attitude to the program
Information competency

3. Use of expanded Bloom Objectives in the Curricular Design Tables (*Matriz de Diseño Curricular*) - We assessed all graduate courses with regard to the Bloom Objectives as shown in the **Tables 2.2.B.1-6 (see below).** There are three tracks in each of the Master's and PhD programs. There is a table for each track in each program; thus there are six tables altogether.

Courses and Learning Experiences (Curricular Design Matrices)

Program learning objectives (general objectives) are divided into course objectives and other curricular experiences (specific objectives) Fill Out the column "Learning Objectives' with the general learning objectives ordered from the simplest to the most complex following Blooms Taxonomy of Objectives[11]. Mark those objectives that imply that research or critical thinking skills in the left hand columns. In the columns of Specific Objectives mark down the courses and or experiences from left to right following the curricular sequence order. Last, mark those courses and experiences that according to the syllabi do respond to the general learning objectives. This will allow you to make a visual alignment of the curricular alignment, perceive the order in which the objectives where laid out in the curriculum and detect design gaps.

Courses and Learning Experiences (Curricular Design Matrices)

Program learning objectives (general objectives) are divided into course objectives and other curricular experiences (specific objectives) Fill Out the column "Learning Objectives' with the general learning objectives ordered from the simplest to the most complex following Blooms Taxonomy of Objectives[11]. Mark those objectives that imply that research or critical thinking skills in the left hand columns. In the columns of Specific Objectives mark down the courses and or experiences from left to right following the curricular sequence order. Last, mark those courses and experiences that according to the syllabi do respond to the general learning objectives. This will allow you to make a visual alignment of the curricular alignment, perceive the order in which the objectives where laid out in the curriculum and detect design gaps.

Table 2.2.B.1 .MASTER'S IN ENVIRONMENTAL SCIENCES IN THE AREA OF SUSTAINABLE MANAGEMENT OF ISLAND AND TROPICAL REGIONS

Research	Crit Think	Learning Objectives- *Objetivos del Aprendizaje* (General Objectives - *Objetivos Generales*)	Specific Objectives (Objetivos Específicos)												
			CIAM 6115	CIAM 6117	CIAM 6235	CIAM 8901	CIAM 6116	CIAM 6118	CIAM 6256	CIAM 8902	CIAM 8425	CIAM 8435	CIAM 6999 Graduate Research	Curso Electivo XXXX	Curso Electivo XXXX	CIAM 6999 Graduate Research
x	x	**To Remember (Recordar)**: gain a profound knowledge of the environment	x	x		x	x	x		x	x	x				
x	x	**To Comprehend (Comprender)**: have a comprehensive vision of environmental systems			x	x	x			x	x	x				
x	x	**To Apply (Aplicar)**: be able to apply knowledge of environmental systems to environmental problems	x	x		x		x		x						
x	x	**To (Analizar)**: be able to analyse environmental problems toward formulating solutions	x	x	x	x		x	X	x						
x	x	**To Evaluate (Evaluar)**: be able to weigh different approaches to solving environmental problems				x				x						
x	x	**To Create (Crear)**: be able to develop and understand implmentation of policies for solving environmental problems				x				x						

Other requirements: 1. Approve a qualifying exam (Part A) during the summer of the first year; 2. Present thesis research proposal before beginning research work, and 3. Present and defend the Master's thesis after completing the second year.

Table 2.2.B.2.MASTER'S IN ENVIRONMENTAL SCIENCES IN THE AREA OF Environmental; Modeling and Spatial Analysis

Research	Crit Think	Learning Objectives- *Objetivos del Aprendizaje* (General Objectives - *Objetivos Generales*)	Specific Objectives – (*Objetivos Específicos*)												
			CIAM 6115	CIAM 6117	CIAM 6235	CIAM 8901	CIAM 6116	CIAM 6118	CIAM 6256	CIAM 8902	CIAM 8225	CIAM 8257	CIAM 6999 Graduate Research	Curso Electivo XXXX	Curso Electivo XXXX	CIAM 6999 Graduate Research
X	X	**To Remember (Recordar)**: gain a profound knowledge of the environment	X	X		X	X	X		X						
X	X	**To Comprehend (Comprender)**: have a comprehensive vision of environmental systems			X	X	X			X	X	X				
X	X	**To Apply (Aplicar)**: be able to apply knowledge of environmental systems to environmental problems	X	X		X		X		X						
X	X	**To (Analizar)**: be able to analyze environmental problems toward formulating solutions	X	X	X	X		X	X	X	X					
X	X	**To Evaluate (Evaluar)**: be able to weigh different approaches to solving environmental problems				X				X		X				
X	X	**To Create (Crear)**: be able to develop and understand implementation of policies for solving environmental problems				X				X						

Other requirements: 1. Approve a qualifying exam (Part A) during their first year summer session, 2. Present a thesis research proposal before beginning research work, and 3. Present and defend the Master's thesis after completing the second year.

Table 2.2.B.3.MASTER'S IN ENVIRONMENTAL SCIENCES IN THE INTERDISCIPLINARY OPTION

Research	Crit Think	Learning Objectives- *Objetivos del Aprendizaje* (General Objectives - *Objetivos Generales*)	(Specific Objectives - *Objetivos Específicos*)												
			CIAM 6115	CIAM 6117	XXXX CORE COURSE	CIAM 8901 Graduate Seminar 1	CIAM 6118	CIAM 6256	XXXX CORE COURSE	CIAM 8902 Seminario Graduado II	XXXX ____ Specialty course	Curso Electivo XXXX	CIAM 6999 Investigación Graduada	Curso Electivo XXXX	Curso Electivo XXXX	CIAM 6999 Graduate Research
X	X	**To Remember (Recordar)**: gain a profound knowledge of the environment	X	X		X	X			X						
X	X	**To Comprehend (Comprender)**: have a comprehensive vision of environmental systems				X				X						
X	X	**To Apply (Aplicar)**: be able to apply knowledge of environmental systems to environmental problems	X	X		X	X			X						
X	X	**To (Analizar)**: be able to analyze environmental problems toward formulating solutions	X	X		X	X	X		X						
X	X	**To Evaluate (Evaluar)**: be able to weigh different approaches to solving environmental problems				X				X						
X	X	**To Create (Crear)**: be able to develop and understand implementation of policies for solving environmental problems				X				X						

Other requirements: 1. Approve a qualifying exam (Part A) during the summer of the first year, 2. Present thesis research proposal before beginning research work, and 3. Present and defend the Master's thesis after completing the second year. If thesis research, presentation, and defense are not completed during the second year, the student must register in CIAM 6896 (Master's thesis continuation), until the degree requirements are completed, in order to be considered a full time student

Table 2.2.B.4 DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL SCIENCES IN THE AREA OF SUSTAINABLE MANAGEMENT OF ISLAND AND TROPICAL REGIONS

Research	Crit Think	Learning Objectives- *Objetivos del Aprendizaje* (General Objectives - *Objetivos Generales*)	(Specific Objectives - *Objetivos Específicos*)																			
			CIAM 6115	CIAM 6117	CIAM 6235	CIAM 8901	CIAM 6116	CIAM 6118	CIAM 6256	CIAM 8902	CIAM 8425	CIAM 8435	CIAM 8405	CIAM 8999 Graduate Research	CIAM 8445	XXXX ELECTIVE	CIAM 8406	CIAM 8999 Graduate Research	XXXX ELECTIVE	CIAM 8999 Graduate Research	XXXX ELECTIVE	CIAM 8999 Graduate Research	CIAM 8896 thesis continuation	CIAM 8896 thesis continuation
X	x	**To Remember (Recordar)**: gain a profound knowledge of the environment	X	x		x	x	x		x	x	x	x		x		x							
X	x	**To Comprehend (Comprender)**: have a comprehensive vision of environmental systems			x	x	x			x	x		x		x		x							
X	x	**To Apply (Aplicar)**: be able to apply knowledge of environmental systems to environmental problems	X	x		x		x		x		x	x				x							
X	x	**To (Analizar)**: be able to analyse environmental problems toward formulating solutions	X	x	x	x		x	x	x			x				x							
X	x	**To Evaluate (Evaluar)**: be able to weigh different approaches to solving environmental problems				x				x			x				x							
X	x	**To Create (Crear)**: be able to develop and understand implmentation of policies for solving environmental problems				x				x			x				x							

Other requirements: 1. Give a presentation in the graduate seminar course during the second year, 2. Approve a qualifying exam (Part A) during the summer of the first year, 3. Approve a qualifying exam (Part B) during the summer of the second year, 4. Present dissertation research proposal before beginning research work, 5. Present and defend a Doctoral dissertation after completing the fourth year.

Table 2.2.B.5 DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL SCIENCES IN THE AREA OF ENVIRONMENTAL MODELING AND SPATIAL ANALYSIS

Research	Crit Think	Learning Objectives- *Objetivos del Aprendizaje* (General Objectives - *Objetivos Generales*)	(Specific Objectives - *Objetivos Específicos*)																				
			CIAM 6115	CIAM 6117	CIAM 6235	CIAM 8901	CIAM 6116	CIAM 6118	CIAM 6256	CIAM 8902	CIAM 8225	CIAM 8257	CIAM 8205	CIAM 8999 Graduate Research	CIAM 8236	XXXX CURSO ELECTIVO	CIAM 8206	CIAM 8999 Graduate Research	XXXX CURSO ELECTIVO	CIAM 8999 Graduate Research	XXXX CURSO ELECTIVO	CIAM 8999 Graduate Research	CIAM 8896 thesis continuation	CIAM 8896 thesis continuation
x	X	**To Remember (Recordar)**: gain a profound knowledge of the environment	x	x		x	x	x		x			x				x							
x	X	**To Comprehend (Comprender)**: have a comprehensive vision of environmental systems			x	x	x			x	x	x	x		x		x							
x	X	**To Apply (Aplicar)**: be able to apply knowledge of environmental systems to environmental problems	x	x		x		x		x														
x	X	**To (Analizar)**: be able to analyse environmental problems toward formulating solutions	x	x	x	x		x	x	x	x				x									
x	X	**To Evaluate (Evaluar)**: be able to weigh different approaches to solving environmental problems				x				x		x												
x	X	**To Create (Crear)**: be able to develop and understand implmentation of policies for solving environmental problems				x				x														

Other requirements: 1. Give a presentation in the graduate seminar course during the second year, 2. Approve a qualifying exam (Part A) during the summer of the first year, 3. Approve a qualifying exam (Part B) during the summer of the second year, 4. Present dissertation research proposal before beginning research work, 5. Present an original research proposal during the third year, and 6. Present and defend a Doctoral dissertation after completing the fourth year.

Table 2.2.B.6 DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL SCIENCES IN THE INTERDISCIPLINARY OPTION

Research	Crit Think	Learning Objectives- *Objetivos del Aprendizaje* (General Objectives - *Objetivos Generales*)	(Specific Objectives - *Objetivos Específicos*)																				
			CIAM 6115	CIAM 6117	XXXX CORE COURSE	CIAM 8901	CIAM 6118	CIAM 6256	XXXX CORE COURSE	CIAM 8902	XXXX _____ Specialty course	XXXX _____ Specialty course	XXXX _____ Subject Seminar	CIAM 8999 Graduate Research	XXXX _____ Specialty course	XXXX _____ Curso Electivo	XXXX _____ Subject Seminar	CIAM 8999 Graduate Research	XXXX CURSO ELECTIVO	CIAM 8999 Graduate Research	XXXX CURSO ELECTIVO	CIAM 8999 Graduate Research	CIAM 8896 thesis continuation	CIAM 8896 thesis continuation
x	X	**To Remember (Recordar)**: gain a profound knowledge of the environment	x	x		x	x			x														
x	X	**To Comprehend (Comprender)**: have a comprehensive vision of environmental systems				x				x														
x	X	**To Apply (Aplicar)**: be able to apply knowledge of environmental systems to environmental problems	x	x		x	x			x														
x	X	**To (Analizar)**: be able to analyse environmental problems toward formulating solutions	x	x		x	x	x		x														
x	X	**To Evaluate (Evaluar)**: be able to weigh different approaches to solving environmental problems				x				x														
x	X	**To Create (Crear)**: be able to develop and understand implmentation of policies for solving environmental problems				x				x														

Other requirements: 1. Give a presentation in the graduate seminar course during the second year, 2. Approve a qualifying exam (Part A) during the summer of the first year, 3. Approve a qualifying exam (Part B) during the summer of the second year, 4. Present a dissertation research proposal before beginning research work, 5. Present an original research proposal during the third year, and 6. Present and defend a Doctoral dissertation after completing the fourth year.

C. Content and Curricular Revision

1. Does curricular content[12] have a solid current credibility, as evidenced by the practice, teaching, study, and application of research results and / or theoretical concepts such content driven by the scientific communities of the discipline? [12] The content refers to knowledge contained within the curriculum.

The current curriculum seems to be based on the idea that we are training students for professional management positions based on the amount of courses that they have to take. A professional degree is a good thing, but it is not the only thing that we are offering here. We are offering a Master's and PhD, which are about research ability. Thus, a goal of a graduate program is to provide students with solid research training. In the present, apparently management-oriented program, there is too much emphasis on students acquiring a certain body of knowledge, rather than on acquiring skills for asking and answering research questions.

The current curriculum has too many required courses in too many elementary subjects, and there is not enough emphasis on research. For example, there is no reason why all students need to take individual courses in coastal, terrestrial, and urban environments. If their research develops along one of those lines they can then take the relevant course. With all the required courses in the current curriculum there is not enough time for research in either the Master's or PhD programs. In the current curriculum Master's students are required to take a full load of courses for two years. This delays starting on research. The same applies to the PhD program. Faculty and student surveys argued for major changes in the curriculum but more discussions are needed before decisions (idelcan be made. In the end they need to be guided by program/goals and objectives and these need addressing as well.

We believe that entering students should already have taken courses in math, biology, chemistry, physics, statistics, and ecology. If not, they should take these as "special students" before entering the graduate program. Once in the program (having taken all basis courses), graduate students should take advanced courses that underpin research, such as GIS, advanced statistics and experimental design, and a course on writing papers and proposals and speaking (as in the Doctoral Seminar in Biology). Also, as a credit course, new graduate students could enter some kind of lab rotation, where they experience the research in different professors' labs. Students could take a course in which they tackle an environmental issue with research. After that they should take the courses on subjects that best suit their line of research.

Related to this, we might question the rationale for curriculum tracks given that more students are enrolled in the interdisciplinary option. Students can work out their own "track" with their advisors, deciding what courses best suit their interests and their research goals. The capable environmental scientist emerging form our graduate program will know how to ask questions and get the information they need for the problem they need to address. On the other hand, these specializations are either relevant to societal needs (Sustainability – related to Track I) or in high demand in the job market (i.e. Geoscientists – related to Track II).

Some faculty are of the opinion that Graduate students should not get research credit for attending the Departmental Seminar. As incipient researchers in environmental science they should understand that attending seminars is part of their education in the variety of subjects that comprise

environmental science. Also, giving credit for attending the seminar to some students suggests that the other students do not need to go the seminar. Instead, all professors in the department should tell their graduate students that they should attend the Departmental Seminar, and no course credit given. The department should discuss the possibility of offering professional master's degrees, with a management orientation.

2. Was this peer-reviewed and / or published in places that are not dedicated to the promotion of the program or of individual promoting their teachers or researchers' curricular content
Yes, during the proposal development phase.

3. Does it reflect the content guidelines and ethical, legal and regulatory standards that impact the field of studies in question, including the criteria for accreditation agencies?

No course is dedicated in the present curriculum is dedicated to ethics and standards. The program conforms to the standards and regulations of the university, and we intend that it will produce students with an ethical approach to environmental science.

4. When was the last curriculum review of the Program?
Never, since initial approval.

5. How did the latest curriculum revision (if any) help change the curricular offerings? Not applicable, since the program has not been revised.

6. Were there changes or significant innovations in the study areas of the program expected from last curriculum review? If there were, do you reflect these changes in the curriculum (Table 2.1.A.) or academic programs (Section II.F) Program?

There is more interest and expertise in energy issues than when the program was approved. There have been no curricular changes to reflect this interest. However, a professor specializing in certain aspects of the energy issue has been hired and he is developing a new course.

7. Are there important areas of study that meet the program from? Can these study areas be addressed through minor changes to the curriculum, or do they warrant a complete curriculum review? If so, what steps should you take the program to renew its curriculum?

We believe the curriculum needs changes, as suggested in the answer to question 1 above.

D. Admission Requirements:

Mark with an "X" the requirement of your Program:

Table 2.3.D.

Admission Requirements	Env. Sciences MSc/PhD
Academic Index (Minimum 3.0 GPA)	X
Entrance exam	
PAEG	
GRE (or PAEG but this is most common)	X
Research Interests Essay	X
Interview	*Only in special cases
Recommendations	X
Professional Experience	X
Research Experience	X
Other: Two years of Chemistry, One year of Biology, Pre-calculus and Calculus, Statistics, One Year of Physics	X

1. **Are the appropriate admission requirements to identify suitable candidates for the program? Do you know what is the predictive value of these requirements to forecast optimal retention, and performance of students in the program?**

-NO, faculty has expressed that the level of certain skills (mathematical, statistical, written communication) are still below what is needed to succeed as an Environmental Scientist.

-NO, we do not know the predictive value of the different requirements.

2. How are lax or stringent admission requirements of the program?

-They are strict for GPA and Letters of recommendations they are flexible for everything else. When Students are missing courses but they have promise (based on their GPAs and letters of recommendation) they are asked to take undergraduate courses to make up for the gaps.

3. Is it preparing students to meet these requirements adequately to meet the admission standards of the program?

The variance in skills among students is high. Many come with Master degrees but even then statistical skills and writing skills may be low.

4. Do you require the program have a degree in the same discipline's curriculum to pursue graduate studies?

NO, A Bachelors degree in the same discipline is not a requirement.

5. Do initial courses start from the premise that you need to possess a bachelor's degree to take them or, conversely, result in knowledge that should already have acquired?

Both premises apply

6. Is the overload of curriculum courses and / or graduation requirements designed to compensate for the lack of background in the discipline?

YES the curriculum has too many courses.

7. Is there a course (or specialized course in statistics) the student must possess as a prerequisite to pursue graduate studies in this program?
Two years of Chemistry, One year of Biology, Precalculus, Calculus, Statistics. One Year of Physics

8. Are these <u>prerequisites</u> needed?
Yes they are needed.

E. Graduation Requirements

Mark with an X all the Program Requirements.
Tabla 2.4.E.

Graduation Requirements	Yes
Minimum Academic Index	X
Total Credit Requirement	X
Examn A and B	X
Proposal Defense	X
Research Project	
Thesis/Dissertation	X
Practicum	
Residency[14]	
Internship	
Other	

1. Are graduation requirements in line with the general objectives of the program learning? Do they meet graduation requirements with its purpose, that is, facilitate the achievement of learning goals or hinder? (See Table 2.2.B, courses and learning experiences)

Yes, graduation requirements are aligned with general objectives. Some of the requirements limit the graduation time for students (Exam A + Exam B). The first two exams need to be reevaluated so that the focus is on skills and so that the content is more related to the student's research. For the Master's program there're should be one exam and preferably it would be a proposal defense.

2. Is the selection and organization of the requirements of the appropriate graduation to facilitate the learning objectives or could meet the same purposes by other more efficient means? (See Table 2.2.B, courses and learning experiences)

Faculty/Students/Alumni have expressed the need for structural changes in the graduation requirements and for curricular changes in both the PhD and Masters Programs

3. Do you provide the program flexibility to meet the degree requirements? That is, does the student choose to study aspects of alternative (eg research or professional) or replaced by equivalent work requirements can? Explain.

The program has three tracks: **SUSTAINABLE MANAGEMENT OF ISLAND AND TROPICAL REGIONS, ENVIRONMENTAL MODELING AND SPATIAL ANALYSIS and AN INTERDISICPLINARY OPTION.** The student is accepted into one of them upon acceptance to the program based on his/her interests. The curriculum has two years of course requirements half of which are elective courses, the interdisciplinary track offers the most flexibility in terms of what the student can chose.

4. Are choices offered to complete the doctoral degree requirements in less time, to the Master? Explain
Students can co-validate up to 8 and 10 credits (for MSc and PhD respectively provided that these courses have equivalencies on campus and that they meet the program requirements.

5. Do all degree requirements with guidelines, handbooks or manuals explain the procedures, expectations and evaluation criteria thereof? Do they have these manuals for the approval of the members of the program?

Yes, all courses have approved syllabi by the Academics Affairs committee

6. Is there defined in a protocol somewhere or itinerary for the development of the different phases of thesis / dissertation and the roles of mentor and student? Do they have these protocols approved by program members and students?

Yes, the program guidelines are posted on the Programs Website.

F. Analysis of Curricular Design

1. Does the program have full-time and part-time curricular sequences?

Sí X No, solo cuenta con una a tiempo completo___.

2. Does this reflect student needs?

A fraction of students behaves part-time (less than 9 credits) in practice, 28% are currently self-supported and of those many have regular Jobs, and some students do not take more credits following monetary considerations. We have not made a structured assessment of need for a part-time curriculum.

3. How does the the curriculum design affect the time it takes students to complete their degree requirements?

Too many required courses and too many exams (one exam in year 1 and one exam in year two) before they are required to defend a proposal (most do in year three)

4. What can be seen in the table of courses and learning experiences about the distribution and sequence of courses and requirements? Can you identify any patterns? Are the learning objectives followed in a relatively orderly manner? Are gaps perceived?

There is a slight trend in the curriculum sequence from the first to last of the Bloom objectives. This means that the curriculum does follow a logical development of skills. But, in general, all Bloom objectives are being met throughout the sequence

5. ¿ Is the distribution of course appropriate for curriculum content? That is, do they include the core courses all the knowledge and skills that are essential? is desirable knowledge in directed electives are included, specialty courses or equivalent requirement? Do they contain free electives only tangential for knowledge?

Perhaps the curriculum focuses too much on content and less on skillss (see faculty and student survey results on mathematical skills, written communication skills). Alumni have expressed that they would like more practical experiences (field experiences, hands on). Alumni and faculty have exppresse the need to expand interdisciplinary experiences or course availability outside the natural sciences. That being said students have expressed he need for more courses in certain areas and more interdisciplinary courses.

6. Are there core courses at an appropriate level of complexity for the degree offered (Masters or PhD)?

No. There are too many elementary, required courses in both programs

7. Is the relationship between the conditions for admission and degree requirements appropriate to promote a successful and efficient performance of students in the program? In what way does this relationship facilitate or hinder requirements obtaining degree.

Students from toher areas may not have had basic courses. Perhaps this is inevitable in an interciscisplinary program that ecourages students with different kinds of preparation to apply. Some faculty have expressed the need to require an entrace profile and ways to ensure better mathematical

and writting competencies before entering the program. Remedial courses have also been sugested. Some faculty have expressed that these may be to general or basic for students that already have a degree in Ecology or Environmental Sciences but that they may be ok for students that come from other areas (Geography, Planning, Architecture). Some faculty have expressed the need to require an entrance profile and ways to ensure better mathematical and writing competencies before entering the program. Remedial courses have also been suggested.

8. What is the relationship (if any) between the research generated in the program and curriculum design? Does the curriculum direct the research, or vice versa?

There is some relationship (i.e. spatial modeling, GIS, remote sensing, Water, Terrestrial course, Urban System, social-ecological systems, statistics) but the curriculum does not cover all (Bio-conservation, Soil Science). For example, statistics is required early in the curricular sequence. Students are exposed to interdisciplinary approaches in some of the departmental courses. For example, a course on waste disposal would include natural and social sciences. Also, many of electives available in other departments add interdisciplinarity, for example, courses in the law school.

9. Do the curriculum and / or co-curricular experiences skills and knowledge of information technology (searching, information management, selection, synthesis) that allow students to broaden their vision of the field

Yes. These skills are required for success in courses that require writing or term papers or projects of any kind.

10. How does the curriculum prepare students to develop social and civic conscience? There are no objectives for social responsibility and team work; objectives are perhaps to vague in terms of measureable action items. On the other hand, a main theme in many courses is the impact of humans on the environment and the consequences for society. This should arouse one's social conscience. Faculty were very satisfied of the social responsibility skills displayed by students.

11. How does the curriculum provide for a student to develop professional skills in scenarios work accessible to future graduate program? Do you provide a curriculum for internship experience or professional practice?
Professional experience is not expressly provided in the curriculum. Students get it through research and teaching, submitting manuscripts and presenting papers in conferences. Some labs hold weekly lab meetings were they adquire these skills as well. The agents of change IGERT requirement did provide for professional experiences but it was not a course but a program. No internship is required.

11. How does the curriculum provide the means for students to acquire the skills and attitudes that enable them to be productive and creative contribution to the professional development of their discipline of study?
Skills and atitudes for success as a researcher in environmental science are promoted in all courses. The heavy distribution requirements ensure knowledge over large areas of environmental science, appropriate for a professional or management degree. However, we think that the balance between creating researchers and managers needs discussion.

11. In what way do the curriculum and co-curricular experiences promote knowledge and interdisciplinary learning?

Students are exposed to interdisciplinary approaches in some of the departmental courses. For example, a course on waste disposal would include natural and social sciences. Also, mamy of electives available in other departments add interdisciplinarity, for example, courses in the law school.

12. Does the program adequately prepare students to pass the certification exams? (If applicable).
Not applicable.

G. Academic Offerings

All of our courses are diurnal. Courses experienced very few student withdrawals; This is a young program were all courses are new but new courses been created in addition to those in the original proposals (see table below)

See Appendix 1. Table 2.5.F Frequency of course offerings and new courses developed

i. How regularly are all the curricular courses offered?
Medular courses are offered every year, some specialized courses are offered more often than others, a lot of specialized courses are offered under 'open topic' courses and therefore not offered as regularly.

ii. Are the required and elective courses,run according to curriculum sequence offered, the needs and the number of students?

See answer above

iii. Indicate the number of courses created, modified, deleted and defaulted per academic year in the following table:

Table 2.6.F.- THERE IS NO DATA TO FILL THE TEMPORAL SEQUENCE OF NEW CURSES BUT SEE TABLE 2.5.F (Appendix 1) FOR THE NUMER OF NEW COURSES DESCRIBED.

Año Académico	Creados	Modificados	Eliminados	Moratoria
2009-10				
2010-11				
2011-12				
2012-13				
2013-14				
2014-15				

vi. What is the demand for courses of this program by students from other programs?
We do not have this data on hand

vii. How regularly does the program evaluate the courses offered?
Learning objectives are evaluated in curricular revisions in selected courses; Faculty performance in

every course gets evaluated by students every semester but there have been reporting problems in the past.

viii. What do students think about the content and quality of courses, teaching and learning processes and the execution of teachers in the classroom? [16]

[16] Use information from course evaluations.

For this question we relied on student surveys. Data on course evaluations had not been summarized by the Department. Even when 64% of the students expressed satisfaction with the overall curricular experience only 48% of the students expressed satisfaction with the existing curriculum according to our student survey. Students were most concerned with the diversity and scope of existing curriculum (41% satisfaction) and the degree by which courses offered the skills to succeed in their careers (56% satisfaction) and the frequency of offerings of elective courses (56% satisfaction). The committee did not have the data available from course evaluations during this process.

III. Professors and Researchers:

A. Profile of Program Professors*

In the following table list the names of professors and their academic background (including the institution and year of graduation for the highest degree obtained). Indicate with an (X) in the corresponding column, if the teacher is a collaborator or ascribed to the program. Also provide the teachers field of specialty, years of service, the courses offered regularly and the number of master's and doctorate's theses supervised in the last (5) years. In the last column mark (X) those teachers from abroad.

Table 3.1.A. Professors in the Program

Professor[1]	Research area	Highest Degree	Service years	Courses offered[2]	# supervised students[3]	International
1. Rafael Ríos[4]	Environmental engineering, wastewater and rural and urban drinking water treatment systems	PhD, 1975, Univ Texas	>30	CINA 3005,	ES 3 (PhD)	0
2. Nick Brokaw	Dynamics of tropical plants and forests	PhD 1980; Colorado State Univ	14	CIAM 6116, CINA 3005, CINA 4157	BIO (2MSc, 1 PhD)	2
3. Xiaoming Zou	Soil biogeochemistry	PhD, 1992, Colorado State Univ.	23	CIAM 6990, CINA 3005	ES 2 (PhD)	2
4.Jess Zimmerman	Natural and urban forest dynamics	PhD, 1989, University of Utah	24	BIO 3113, BIO 6116, CIAM 6116, CIAM 8405,	ES 3 (1PhD, 2MSc) Bio 4 (2PhD, 2MSc)	2
5. Elvia Meléndez	Biodiversity conservation, urban ecology	PhD, 1995, Univ. of California, Irvine	19	CIAM 8990, CIAM 8991, CINA 3005	ES 7 (6PhD, 1MSc); BIO 5 (1PhD, 4MSc)	2
6. Olga Mayol	Atmospheric chemistry	PhD, 1998, UPR Rio Piedras	14	CIAM 8990 CIAM 6990 CINA 5990	ES 3 (2 PhD, 1 MSc), CHEM (5 PhD), PHYS (1 PhD)	0

				CINA 4177 CINA 4127 QUIM 8992 QUIM 8205 QUIM 8206 QUIM 3001 QUIM 3002 FISI 8996		
7.Alonso Ramírez	Aquatic ecology	PhD, 2001 Univ Georgia - Athens, GA	14	CIAM 5005, CIAM 6118, , BIOL5538, BIOL5540	ES 5(4MSc, 1PhD) BIO 7(3MSc, 4PhD)	1
8. Jorge R Ortiz-Zayas[5]	Limnology, water resources management	PhD, 1998, Univ. of Colorado	12	CIAM 6115, BIOL 3010	ES 4(2MSc, 2PhD)	1
9. Clifford Louime	Renewable energy, biofuels	PhD, 2005 Univ. of Florida A&M	1	CIAM 8990, CINA4127, CIAM4995	3(2MSc, 1PhD)	3
10.Loretta Roberson	Physiological ecology of marine algae, renewable energy	PhD 2000, Stanford University, CA	7	CIAM 6117, CIAM 6910, CIAM 6999, CIAM 4990, CIAM 4071, CIAM 4127	5(4 MSc, 1PhD)	1
11. Mei Yu	Landscape ecology	PhD, 1998, Chinese Academy Sci.	8	CIAM 8225, CIAM 8205, CIAM 8118, BIOL3111, CINA5990	ES 3 (PhD)	0
12. Qiong Gao	Ecosystems and environmental modeling	PhD, 1987, Cornell Univ.	3	CIAM 6256, CIAM 8118, CIAM 5235, CIAM 8257	3 (2 PhD, 1 MSc)	2
13. Gary Gervais[6]	Renewable energy, biofuels; Science and technology policy for economic development	PhD, 2000, UPR-Rio Piedras	4	CIAM 4127 CIAM8990, CIAM 8775	3(2MSc, 1PhD)	3
14.Rosanna Grafals[7]	Geography, Coastal Systems	PhD 2010, Rutgers, new Brunswick	4	CIAM 6901, CIAM 5231, CINA 4071, CINA 4072, CINA 4995,	ES 1(MSc)	0

[1]This table only considers professors assigned to the Environmental Science Program. In addition to these faculty, nine external faculty contributed to the provision of graduates for the program, six external faculty served as graduate advisors and 61 external faculty served in graduate committees for a total of 89 faculty engaged in the program (see full list in Appendix X).

[2]All faculty members has undergraduate teaching duties.

[3]Various faculty also advise in other Graduate Programs on campus (ES = Env. Sciences), BIO (Biology), CHEM (Chemistry), PHYS (Physics)

[4] Former Department Chair (2010-2014)

[5]Current Department Chair (2015-Present)

[6]Also serves a current Graduate Program Coordinator

[7]Former Graduate Program Coordinator, no longer at UPR Rio Piedras but still a member of the Program.

B. Academic Load

Complete the following table using the form Breakdown of Academic Work of the past academic year:

Table 3.2.B. Breakdown of Academic Work[18] (SEE APPENDED TABLES SECTION – Appendix 1 on FTEs).

1. How does the Profile of Professors respond to the needs and aspirations of the Program, in terms of specialization, internationalization and development of investigative work?

The profile of professors in general meets the need of the program to promote cutting-edge research in solving complex environmental problems and to encourage sustainability. The program highlights interdisciplinary research and the faculty specialty covers atmospheric science, hydrology, ecology, biodiversity, geoscience, biogeochemistry, energy, and environmental management. The faculty comes from PR, US, Asia, and Latin America and conducts projects with broad international collaborations. This in turn attracts more and more international students to apply for the Graduate Program.

2. According to the categories in Table 3.2.B., describe the distribution of the regular academic work, What is the average weekly hours spent on each task?
The faculty (11 out of 13) of the Graduate Program has 9 credits release time dedicated to research and 3 credits for teaching in each semester.

3. ¿Is it appropriate the distribution of academic work of the professors in the Program to promote their productivity and performance in teaching and research?

The 9 credits release time for research is essential for the faculty to keep productive, conduct cutting-edge interdisciplinary research, succeed in acquiring external competitive funds, and meet the society needs in solving complex environmental problems, which assures a successful and competitive graduate program.

C. Research Projects and Creative Work

List the research and creative work done in the Program over the past six years (add rows as needed). If the Program has a Research Center, mark with an asterisk in the column "Project Title", the projects that belong to the Research Center. Place a (P) at the end of the title of the project for the ones that are planned. (SEE APPENDED TABLES – Appendix 1: Table 3.3.C. (Research Projects by year); TABLE 3.7.F1. (Program Publications) and TABLE 3.7.F2 (Program Presentations).

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1. Discuss the degree of correspondence of the research made the past five years and the research presented in Table 3.1A
Research conducted in the Graduate Program in Environmental Sciences in the past five years aims to improve the understanding of the structures and functions of ecosystems and to promote the environmental and natural resources sustainability, which reflects the specialties of the faculty. The long-term ecological studies of the LTER project correspond to the background of the faculty from ITES.

If there have been changes in the research themes, are they the result of significant innovations in the

study areas of the Program, changes in the discipline, desirable practices or foreseeable developments?

Recently, research programs coupling the natural and human systems emerge in the program, to address interdiscipline and community participation. The Integrative Graduate Education and Research Traineeship program highlights the human-environment interactions in an urbanizing tropical environment. Another example is the San Juan Ultra program of "Social-Ecological System Change, Vulnerability, and the Future of a Tropical City".

2. To what extent the Program research have an impact in the student research (thesis and dissertation direction, supervision and training)?
The program research greatly impacts the student research. 34 IGERT fellows choose their dissertations following the direction of coupled natural and human systems. The LTER related projects, San Juan Ultra, NASA Earth Science, and others all fund the graduate students to work on their corresponding theses and dissertations.

3. To what extent the research made in the Research Center (if it applies) have an impact in student research (thesis and dissertation direction, supervision and training)?
Most student theses and dissertations are deried from projects developed within the Graduate Program

4. What activities the Program performs that have a direct impact in careers or community? (Eg participating in editorial boards, commissioned studies)
The IGERT, the San Juan Ultra, and the LTER projects all promote community participation and have many outreach activities with stakeholders, government agencies, and K12 schools. The examples include the Agent of Change programs provided by IGERT and the Schoolyard program by the LUQ LTER.

5. What activities does the Center of Research performs (if applicable) that have a direct impact in careers or community? (Eg participating in editorial boards, commissioned studies)
Some faculty and faculty collaborators participants are memebers of NGO boards (e.g. Fundacion Amigos del Yunque-E. Meléndez-Ackerman) and joint commissions with government agencies (e.g. E. Meléndez-Ackerman Joint Comminssion on Green Ifrastructue with San Juan Municipality and San Juan ULTRA)

6. Does the faculty currently collaborates on projects with peers from other faculties on Campus, at other institutions in or outside Puerto Rico?

X Yes (Mention which ones) No
Yes. The faculty has broad collaborations with peers from other faculties, from US, and international. The IGERT program provides a platform for the collaborations between social and natural scientists from different faculties on campus. Such collaborations cover interdisciplinary courses offered at CIAM and participations in CIAM graduate students' committees. The LUQ LTER has long-term research collaborations with institutions in US and international.

D. Funds

Indicate the number of research and academic assistants assigned to the Program, funds for travel and the number of trips made for research disclosure.
We don't have the information on the first two columns, and the summary is based on the off-island presentations.

Table 3.4.D. Student Funding and Travel

Year	Amount of Research Assistants	Mount of Teachinig Assistants	Travel Funds	Amount of trip for Research Disemmination
2009	2	2	unkown	21
2010	0	0	unkown	18
2011	3	3	unkown	22
2012	7	7	unkown	26
2013	17	17	unkown	36
2014	12	12	unkown	31
2015	2	2	unkown	39
***Probably external and institutional funds**				

1. What incentives were provided by the program, the Faculty or Campus to the professors and students of the Program for research?
Release time and Flexible teaching schedules for faculty, competitive RA funding for qualified students (IGERT, GK-12) and TAs,

2. Do you consider that the amount and type of incentive the Program offers the Professors is enough to encourage research in your Program? Yes No (Please explain)

Some faculty have complained about poor salaries and not enough release time. The sabbatical freeze is also a problem, the state of laboratory facilities (lack of equipment/maintenance) is a concern for some faculty **(see Appendix 6 Faculty Survey)**

3. Do you consider that the amount of teaching or research assistantships is enough to satisfy the needs of the Program? Yes No (Please explain)

No, already the IGERT funding is gone and the number of TAs has diminished leading to a larger number of students requesting TA funds than positions available. This will limit the number of students that the program will be able to accept.

4. Is it appropriate the institutional support provided by assistantships, travel funds, etc. for the development of research and creative work in the Program?
No see answer above. We generally do not have funds to support travel from the university. Almost all the trips are supported by external funds.
5. What efforts are made by the Program to obtain additional external funds for their research?

The program makes great efforts to obtain external funds to support research. Most funds are from NSF and other major funding agencies are NASA, USDA, NOAA, and Department of Educations.

6. Does the professors and academic management of the Program achieve sufficient external funds for research?
Yes. The program is quite successful in acquiring sufficient external funds for research. There are

$27,119,316 of external funds as PI or Co-PIs to support the research and education in 2009-2015.

E. Student Research

List the amount of research done and disseminated including Thesis and Dissertations, whether in Conferences, Congresses, Seminars or in publications (You can also include this as an Appendix)

See Appended Table 5.6.E. STUDENT PRODUCTIVITY METRICS

1. What is reflected in that table in terms of the research done by students throughout the years?

The data demonstrate that our program has an excellent track record in student presentation/publication (50 publications in total, 37 in peer reviewed journals)

2. What initiative is used by the Program take to increase the dissemination of research by students? The program already requires PhD students to have at least one first-author paper submitted before graduating. For Master's students it is highly recommended that they author a paper. Our students frequently present in national and international conferences. We do not need to take new initiatives in this areas – our priorities for improving the program should be focused on more critical issues.

3. What percentage of undergraduate students work in research developed by the Graduate Program?

Most of our undergraduate students carry out at least a research rotation in one of the many labs on campus. In addition, our undergraduates have many opportunities to participate in research internships in PR and the States and all are required to participate in an internship or else write and undergraduate thesis (tesina). Our program is very strong in undergraduate research.

F. Publications

See Appended TABLE 3.7.F1 (Program Publications) and TABLE 3.7.F2 (Program Presentation)

1. What is the expectation of the program in terms of the number of publications expected annually from each professor? We expect our professors to keep productive and publish at peer-reviewed journals as senior authors and coauthors.

2. What percentage of faculty publications are in peer-reviewed journals?

146/170 = 86%

3. Does the program have its own publication?
Yes (Answer the questions 3 to 3.e) No (Skip to question 6)

No

4. What strategies for disseminating their research does the program use on and off campus?

- Publications (magazines, books) Forums

- Conferences
- University Community Seminars
- Outside of the university
- Others (Fairs, School Visits, Open Houses) _____

5. According to data collected in this section, is the number of publications of the past six years in line with the program's objectives (according to the annual expectation for each professor)?
According to data collected for the past six years, the number of publications is in line with the program's objectives.

6. What has been the impact of publications on competitiveness and projection of the program?

The publications are broad and interdisciplinary. The geographic areas are Puerto Rico, Caribbean, and globe. The program has interdisciplinary papers published at top journals, such as Geophysical Research Letters, Ecology, Oecologia, Ecology and Society, Microbial Ecology, Atmospheric Environment, Bioscience, Nature – Climate Change, Nature, Journal of the North American Benthological Society, Journal of Geophysical Research, and Journal of the North American Benthological Society

IV. Students/Alumni (Estudiantes/Egresados)

A. Admission

a. Cap - Indicate the Program's Cap – The Program has no cap but it has been discussing the possibility of setting one based on availability of mentors but mostly funding.

b. Marque cuáles de los siguientes criterios se consideran para determinar el cupo del programa:

Instalaciones

Cantidad de estudiantes activos

Presupuesto

Cantidad de profesores disponibles para enseñar cursos

X Cantidad de investigadores activos que podrán supervisar tesis

Cantidad de cursos a enseñarse

Cantidad de estudiantes en prórroga

X Ayudantías disponibles

Diversidad de la población estudiantil

Otros: ☐

C. Recruitment

1. Is there a recruitment plan for students?
NO, the program does not have a recruitment plan. It relies on different strategies (see below) but these are not driven by specific program-wide goals.

Yes. How effective has it been? Indicate the quantity of students recruited through that plan in the last 5 years.

Does not apply

No. Whic are the recruitment strategies used by the program?

X Fairs for graduate studies.
___Publicity campain
___University visits
X Others: Informal - Brochures at Fairs; UPRRP Open House, Word of mouth, Faculty contacts, Website
___None

2. Distribution of student population. Write in the following table the amounts for the last five years.

Table 4.1.A.

Year	Cap	Applicants*		Admitted		%Selectivity		Admitted from UPR System		Enrolled		Status Enrolled	
		Male	Female	Male	Female	Male	Female	UPR-RP	Other UPR Unites	Male	Female	Part-time	Full -Time
2009-10	na	6	10	6	10	100	100	11	2	6	10	2	13
2010-11	na	2	5	2	5	100	100	2	5	2	5	1	6
2011-12	na	6	6	6	5	100	100	7	4	6	6	1	10
2012-13	na	6	9	6	9	100	100	10	5	6	7	0	15
2013-14	na	22	12	10	7	45.4	58.3	4	10	10	6	0	14
2014-15	na	11	13	4	11	36.4	84.6	10	3	4	8	0	13

[19] By selectivity one means the amount of adminted students to applicats.
[20] The attractivity refers to the quantity of accepted students to those that finally register.

a. Consider the data in the table above and evaluate. ¿How selective [19] and attractive [20] is the Program?

We area admitting about 50% of the applicants, lack of funding, incomplete applications and lack of an identified mentor are some of the main rejection factors. It would seem like the program was highly attractive during the first three years (100% attractivity) but that attractiveness was declined by 20% in the other years. (Lack of competitive funding?)

b. How variable has the number of admitted students been in the last six years?
The program admits between 7-17 students / year (average 12/yr) and that has been consistent through time except in year 2015-2016 (data not shown) were only a few students were admitted because of lack of funding.

c. How have admissions adjusted in relation to the Cap? We choose the best applicants provided that there are funds available.

d. Describe the distribution of enrollment in relation to gender.
There are more females tan males in most years but differences

e. Describe the distribution of full-time to partial students.
It was our understanding that all of our students were officially fulltime students but some hold full-time or part-time jobs not related to their research or teaching areas. It would seem as if some students were admitted on a part-time status but the committee nor the graduate coordinator were aware of that prior to this study. A total of 3 part-time students were admitted in the early days and they are all employees of UPRRP. Today that number has risen to 14 (28% of students). **There is no formal policy in our program to deal with part-time students.**

f. Describe the proportion of admitted students that are from UPR-Rio Piedras with those admitted from other campuses within the system.
It is variable but in four out six years a larger portion of the students were from UPR Rio Piedras with the percentage of admitted student from this campus s ranging from 40% to 85%.

Table 4.1. B. Distribution of admitted students according to campus of origin.

UPR Campus	Numbers of students admitted
UPR - Rio Piedras	38
UPR - RUM	9
UPR – MSC	4
UPR – humacao	1
UPR – Cayey	1
UPR – Ponce	1

g. Describe and compare the quantity of students by campus that come from other countries.
Three of our international students obtained a degree from UPR-RUM.

h. Estudiantes Internacionales

Indique en la siguiente tabla la cantidad de estudiantes internacionales que han solicitado admisión al Programa, los que han sido admitidos y matriculados.

Table 4.2.A. International Students

Year	International Students		Admitted	Enrolled
	Qty	Country		
2009-10	1	Colombia	1	1
2010-11	1	Méjico	1	1
2011-12	5	Perú, Haití, India	5	5
2012-13	6	China, Hawaii, Costa Rica, Uruguay, India, Guatemala	6	6
2013-14	11	China, Colombia, Haití, Venezuela, India, España, Guatemala,	9	8
2014-15	8	España, Colombia, Haiti, India, Vietnam	4	1

i. How diverse, in terms of country of origin, is the student body of the Program?
It is pretty diverse, students come from the Caribbean region, south and Central America, continental US, Europe and Hawaii.

j. Describe how diversity contributes to the competitiveness and enrichment of the program and the goal of internationalization of the Campus and the UPR system.
In addition to our 22 international students, we have recruited 4 students from the US mainland. The presence of an international student body is very important for our environmental sciences program as they bring us environmental perspectives from their home countries, including a variety of temperate, dry, humid, mountain and marine environments that our local students cannot directly experience. IN addition, the presence of a large number of both native English speakers, native Spanish speakers, and speakers of English as second (or third) language provides our students with the opportunity to improve their language skills and cross-cultural relations.
The program recognizes the importance of international experiences not only because they meet the UPR RP campus and UPR system's goals and missions but because this has been recognized as an

important component that is strongly associated with the generation of diversity of ideas and innovation within companies and countries[a] . Moreover, the internationalization of curricular programs is quickly becoming common policy and a frequent strategic item of higher education institutions world-wide[a]. Many countries now recognize the immediate need for an educated, cosmopolitan workforce capable of workforce capable of performing in international settings[b,c]. At the same time, international faculty and students bring opportunies to expand international collaborations which not only expand the outreach of our institution but are a requirement if one is to address particular issues (i.e environmental problems that deal with regional or global scale issues. Several of our faculty and students have developed and implemented successful projects abroad where UPR Rio Piedras gets credit (**Appendix 1. Tables 5.6.E, Table 3.3.C, Table 3.7.F).**

[a] - letto-Gillies G., A. Filippetti and M. Frenz. (2011) Are innovation and internationalization related? A comparative analysis of European countries', Industry and Innovation, vol 18. http://bus.lsbu.ac.uk/cibs/sites/bus.lsbu.ac.uk.bus.cibs/files/2011aAAJ%20Filip%20Frenz%20I-G%20Industry%20Innov.pdf

[b] - NAFSA (2003) Securing America's future: global education for a global age. Report of the Strategic Task Force on Education Abroad of the American Association for International Educators. www.nafsa.org/securingamericasfuture

[c] - National Science Board (2000) Toward a more effective NSF role in international science and engineering (Interim Report; Publication NSB-00-217). http://www.nsf.gov/nsb/documents/ 2000/nsb00217/nsb00217.htm

H. Student Retention

1. Indicate the quantity of students by cohort for each academic year. Calculate the retention rate for the second and third year y the program is for a Masters and for the sencond and fourth year if the program is for a PhD. Then calculate retention rate [21] for those years.

Table 4.3.B.

Admission Year	Quantity of Admitted students	Quantity of enrolled students in 2nd year		Quantity of enrolled students in 3rd year		Quantity of enrolled students in 4th year	
		#	%	#	%	#	%
2009-10	16	15	100%	15	100%	12[a]	100%
2010-11	7	7	100%	7	100%	6[b]	100%
2011-12	12	11[c]	100%	10[d]	100%	8[e]	90%
2012-13	13	13	100%	13	100%	12[f]	100%
2013-14	16	15[g]	94%	15	88%	N/A	
2014-15	12	12	100%	N/A		N/A	

[21]Quantity of students that register each year divided by the quantity of students that registered in the first year of study. Some students continue after their fifth year. [a] A student dropped after the first year, four dropped after the fourth year (one did not pass the degree exam), three graduated; [b] Two students graduated, [c]A students did not continue, [d]A student did not continue, [e]Three students graduated; [f]One studente graduated; gOne student did not finish

2. Marque con una (X) las razones principales que por las que los estudiantes no completaron su Programa. Utilice información que haya sido recopilada por el propio Programa a través de

cuestionarios u otros medios.

X Physical disability	__ Armed Forces
X Prologended absence	X Academic suspension (GPA)
X Voluntary drop	X Falta de recursos económicos
X Dificultades de salud	__Limited Student Services
Lack of Resources in the Program	X Interpersonal relationships with Faculty

Limited Academic Offerings

____Low diversity of courses

___ Inconvenient Schedule

Other reasons: Some for unknown reasons

3. ¿What information falls from the analyses of data included in tables 4.3B a 4.7.B and the criteria listed in question #2?

Our students are taking too long to graduate. The drop rate is not too high but our students are progressing too slowly towards their degrees. Of the students who left the program, three had academic problems (probation) one got a job in the States and one had serious health problems.

4. What actions have been taken by the Program to assist students when they need to drop? Which ones are needed?

The program has taken these steps to assist students when they want to drop:

Individual Counseling
Reasonable accommodation
A Masters option for PhD students

5. Enconomic Incentives:

In the following table, register the quantity of students that have solicited loans, Tas or scholarships in the past sisx years?[22]. In each column, register the corresponding data on the quantity of incentives and those that were awarded.

Table 4.7.B. Distribution of TA's and Scholarships

Year	Loans[1]		TA's		Scholarships	
	Application	Granted	Application	Otorgados	Application	Granted
2009-10	N/A	N/A	2	2	9	9
2010-11	N/A	N/A	0	0	6	6
2011-12	N/A	N/A	3	3	7	7
2012-13	N/A	N/A	7	7	5	5
2013-14	N/A	N/A	17	17	30	30
2014-15	N/A	N/A	12	12	27	27

[1]Data not available, Data does not account for partial students.

Compare the demand of economic student support by the program with the provision of different incentives.

During the first five years of operation of the program we were fortunate in being able to support our entire graduate student body. The situation in the future is much more difficult because of the reduction in research grants and the University budget cuts. Here is the table on the sources of student frunding for the current academic year (outside the evaauation period).

Table 4.7.C. Student funding distribution by source fr 2015-2016.

Source of Funding[1]	N TOTAL = 61[2]	Percentage
PEAF-TA(CIAM/DEGI)	14	23%
GRANTS	29	48%
SELF-FUNDED	17	28%
DEGI	1	<2

[1] For this year one student is on probation, 14 are partial students and 2 students are taking clases prior to admissions (Applicants for August).

[2]Some student data missing.

I. Graduation

Time to complete the Degree.

a. **Does the Program show clearly the time it takes to complete the degree, the order that courses should be taken and the time to complete curricular experiences (if applicable)?**
X Sí No ☐ ☐

b. **¿Does the Program offers orientation about the impoetance of following the curricular sequence and the implications not to follow it?**

Yes, during the pre-registration and registration periods and follow up letters (College of Natural Sciences)

c. **What is the averae time to complete the Degrees?**

3 to 4 year MSC, 6 years or more PhD años

d. **¿Do students confront problems in completing the degree in the appointed time by the Program?**

Yes, none of the MS students have graduated in two years and only one PhD student has graduate in four. 18% of the students that answer the student survey indicated that they are in ther 5th or 6th year. In that survey, students commented frequently about the lack of enough courses to complete their course requirements, and a lack of diversity of courses to meet their needs. They asked for inclusion of more graduate courses from other departments in order to expand the courses available. Students also asked for more laboratory techniques courses and even training in social science methods. Course in other colleges are technically available to all students on campus. The Graduate School of Planning and the Department of Psychology have been generous in allowing our students to enroll in their courses but the committee recognizes that without formal agreements and integrated academic planning, taking courses from other colleges and departments may be a problem under situations of over-enrollement especially in courses that are degree requirements. CIAM has been holding frequent meetings with the Department of Psychology to address this issue and hopes to use that experience to work with other units on campus

On the other hand, faculty also expressed concern about critical skills in science which ultimately related to mathematical and writing skills and proficiency in reseach design which was also a concern of students according to informal surveys (see faculty and student surveys in Appendix 5 and 6). These may also limit dramatically the ability of a student to finish in a timely manner.

Graduation Rate:

Using the quantity of students enrolled as a reference (See Table 4.3 B), indicate in the following tables the number of students that graduate by year in the MA and PhD Programs. Write the data in the corresponding Program columns.

Table 4.8.C MASTERS Graduation Rate

Año de admisión	#Estudiantes admitidos	# estudiantes graduados en 2 años	# estudiantes graduados en 3 años	# estudiantes graduados en 4 años o más
2009-2010	6*	0	0	1*
2010-2011	3	0	1	2
2011-2012	6	0	1	3
2012-2013	4	0	0	0
2013-2014	3	0	N/A	N/A
2014-2015	4	N/A	N/A	N/A

* Note. Most of the 2009 cohort were admitted as PhD students, but one of them did not passs the qualifying exam part B so completed a Master's degree instead. Two MS students from this cohort failed to complete the program.

Table 4.8.D DOCTORATE Graduation Rate

Año de admisión	#Estudiantes admitidos	# de estudiantes graduados en 4 años	# de estudiantes graduados en 5 años	# de estudiantes graduados en 6 años	# de estudiantes graduados en 7 años o más
2009-2010	10*	1	0	0	N/A
2010-2011	4	0	0	0	N/A
2011-2012	6	0	N/A	N/A	N/A
2012-2013	9	N/A	N/A	N/A	N/A
2013-2014	13	N/A	N/A	N/A	N/A
2014-2015	8	N/A	N/A	N/A	N/A

* One of the 2009 PHD cohort took a Master's degree instead. Three of the 2009 cohort have dropped out of the program or taken leave of absence.

J. Alumni (Egresados)

1. **Does the Program have a system to track Alumni?**
   Sí. (Go to question 2).) No (Go to question 5)

2. **How has the Program maintained contact with its Alumni?**

   It is informal via email and by individual faculty

3. **¿Where are the Alumni employed and how long does it take to obtan employment after graduation**

   75%of the graduates (5) who responded are working in academia and 25% in government. We did not ask about how long their job hunts lasted.

4. **What percentage of Alumni are actually studying more advanced degrees?** 37.7%
   Two of our MS graduates entered our own PhD program. One of our MS holders is applying for a PHD in the States.

Table 4.9. A. of Alumni from the Environmental Science Program

Last Name	1st Name	Degree	Track	Graduation Year
Derilus	Dieunel	MS	Interdisicplinary Program	May-14
Forestil	Antonin	MS	Interdisicplinary Program	Jan-16
Hogan	James	MS	Interdisicplinary Program	Jan-15
Manrique-Hernandez	Harold	MS	Interdisicplinary Program	May-13
Negroni-Miranda	Annette	MS	Interdisicplinary Program	Jun-14
Pérez Medina	Xochitl	PhD	Interdisicplinary Program	Jun-16*
Quinones	Norberto	MS	Interdisicplinary Program	Jan-15
Rodríguez Ortiz	Natalia M.	MS	Interdisicplinary Program	Jun-14
Ruiz	Claudia-Patricia	PhD	Interdisicplinary Program	Jun-14
Wagner-Vega	Karleen	MS	Interdisicplinary Program	Jun-15

*** Defended but making corrections**

5. Support Services

Counseling

How does the Program implement Academic counseling? How does the Program inform its students about requirements, regulation, intitutional and Program services? (Please include examples of these in Appendixes)

The graduate coordinator, the graduate administrative assistant in the Dean's office and the Department Chair are all heavily involved in academic advising. Furthermore, the Assistant Dean of Students is available for intervention in the event of serious problems in academic performance, health issues or other isues which may impede the progress of a student toward completing the degree.

All Natural Sciences students, when first admitted receive a one-week orientation/traning workshop where requierements, regulations and services are explained.

Onbusdman

What ahs the Program done to attend situations and complaints by students? Which ave been the most common causes for complaints?

One student – appealed exam B after failing and recommended to complete a MSC instead of a PHD; after appealing to the Graduate Dean's office and Chancellor the student subsequently sued the University (ongoing).

V. Essential Resources for Teaching, Research and Creation

A. Bibliographic Resources

1. What bibliographic resources are currently available to the program? (You should ask this information your librarian.)
- Books (Number of Titles:__228___) # Note: This include Libros, Libros (Cuenta Especial), and Continuaciones purchased by the library of Natural Science during the evaluation period
- Databases (Mention:___15 __)
- Magazines (Quantity of Titles:___ 4124__) # Note: sum of Revistas for all years during the evaluation period.

- Electronic journals (Mention:__1542___) # Note: available in 2015.
Currently, there are 5 databases covering environmental science, 75 journals in environmental science field, and 85 interdisciplinary journals related to environmental science.

-Software: ArcGIS 25 seats, ENVI 25 seats, SPSS, Microsoft Office including Access, Mathematica

2. Indicate the amount spent on the purchase of library resources, the resource type and number of recommendations for the purchase of bibliographic resources issued by the faculty.

Table 5.2.B. Investments on library resources

Year	Quantity invested in buying bibliographical resources	Types of resources purchased (Books, data-bases, film material, peer-reviewed journals, etc.)	Quantity of recommendations for purchase of library resources given by faculty
Año	**Cantidad invertida en compra de recursos bibliográficos**	**Tipo de recurso adquirido (libros, base de datos, material fílmico, revistas arbitradas, etc.)**	**Cantidad de recomendaciones para compra de recursos bibliográficos emitidas por la facultad**
2009-10	$2,225,037.49	1247	NA
2010-11	$2,317,192.88	1200	NA
2011-12	$2,423,409,34	920	NA
2012-13	$2,245,076.09	912	NA
2013-14	$2,270,571.16	1287	NA
2014-15	$2,385,585,03	1542	NA

3. What is the relationship between the research generated by the Program (and its Research Center) with the bibliographic resources available through Campus? Do you have access to journals and adequate and sufficient resources to develop and sustain research program? The program research involves environmental science, ecology, chemistry, and interdisciplinary research, such as those related to social science. The library resources on campus provide most of the popular journals in these fields. We have access to

these journals via campus intranet.

4. Are the bibliographical resources available to the program needs for optimal functioning? What, if anything, would you suggest changing? We need a server to support off-campus access to these resources through our campus account.

5. What is the availability of existing resources? Are electronic resources available when students need them? Are they easy to get in their full version? They are ordered print resources and in good condition? The existing resources are available and students can access electronic resources while on campus. Full versions are available with subscription. Students seem to be moderately satisfied with library resources **(Appendix 6 – Student Survey)**

B. Technological Resources

1. Courses - Make a list of the courses offered by the Program where the technology for more than just word processing, for example uses: handling statistics, simulation, data management, translation or languages, distance learning, technology for learning, online courses, design websites, Blackboard, among others.

Table 5.4.C. RESOURCES FOR RESEARCH / TEACHING

Course Code	Course Title	Type of technological resource
CINA 5990	Temas en Ciencias, Matemáticas y Tecnología	
	Tópicos Especiales en Ciencias Amb.	
	Biomonitoreo Acuático	
	Clouds and Precipitation	
	Suelos y Ambiente	
	Fase Hielo Nubes	
	Física Partículas Atmosfer	
	Suelos y Ambiente	
	Producción de Energía	
	Biomonitoreo de Sistemas Acuáticos	
CIAM 5005	Biomonitoreo de Sistemas Acuáticos	Distance learning
CIAM5235	Percepción Remota	Remote sensing
CIAM6115	El Ambiente Terrestre	Distance learning
CIAM 6116	Ecosistemas Tropicales	
CIAM6117	El Ambiente Costero	Distance learning
CIAM6118	Ambientes Urbanos	
CIAM 6256	Métodos de Análisis Estadístico	Data Management, Statistics
CIAM6990	Water Treatment	
	Tópicos Especiales en Ciencias Amb.	
	Biomonitoreo de Sistemas Acuáticos	
	Percepción Remota	
	Suelos y Ambiente	
CIAM 8115	Dimensiones Humanas en el Cambio Ambiental	
CIAM8116	Política y Etica Ambiental	
CIAM8117	Ambiente Urbano, Diseño y Expansión	
CIAM8118	Informática Ecológica	Data Management, Statistics, Simulation, GIS
CIAM8119	Economía Ecológica	
CIAM8120	Comunicación Ambiental	
CIAM 8205	Seminario sobre Análisis Espacial	GIS, Remote sensing, Data Management, Statistics
CIAM8405	Seminario sobre Manejo Sostenible de Islas y Regiones Tropicales	
CIAM8225	Métodos de Análisis Espacial	GIS, Remote sensing, Data Management, Statistics
CIAM8257	Modelaje Ambiental y Ecológico	Modeling, statistics, simulation, data management
CIAM8425	Geología Ambiental	

CIAM8435	Environmental Hydrology	
	Seminario Socio Ecológico	
CIAM8990	Modelando el Transporte y Dispersión de Gases y Aerosoles en la Atmósfera	
	Escritura Científica y Redacción de Propuesta	

2. Research - Does the Program have teaching or research projects that require technology exclusively dedicated to the same program? X Yes, which one is it?

(Please explain).) USDA project on "Strengthening educational capacities in Geospatial Science and technology in Agricultural and Natural Resources Management", $290,000, 2008-2011
NASA project on "Vulnerability and Adaptive Management of Tropical Coastal Wetlands in the context of Land Use and Climate Changes", $407,218, 2012-2016
NSF LTER project, supporting LTER information management, El Verde Computer Facility
NSF CREST project on "Puerto Rico Center for Environmental Neuroscience", $5,000,000, 2011-2016
DoD project on "Partnership for a Research Center for Excellence in Renewable Energy", $4,000,000, 2011-2015

[25] The ratio of students per computer refers to the number of students enrolled divided by the number of computers that the program owns.

Table 5.4.D. Part of the Environmental Science facilities developed and supported by external funds in 2009-2015 (* not complete)

Facility*	**Year**	**Users**	**Cost**
El Verde Field Station Rehabilitation	2015	CN/UPR System Students and faculty; Off island researchers,	$20,000
Indoor aquaculture laboratory (CN 117)	2011-15	CN students and faculty	$125,000
Outdoor aquaculture laboratory (CN)	2015	ES students	$50,000
Water quality analysis laboratory (CN 115)	2009-15	CN students and faculty	$500,000
GIS laboratory (C-233) computers and software	2011	ES students	$54,000
ES conference room (C-229) table, chairs, projection	2010	ES faculty and students	$10,000
ES faculty and student offices (C-229)	2010	ES faculty and students	$35,000
CN videoconferencing facilities (A-211, A-142, JGD123, Deanship Conference Room)	2010	CN faculty	$125,000
Tutoring and mentoring laboratory (A-207)	2011	CN students	$15,000
Outdoor media and learning commons	2015	CN students and faculty	$750,000
ES Endowment for student recruitment	2009-10	ES students	$100,000
Geospatial Science Lab (CN114)	2008 -	CN	$50,000
Faculty Labs at Facundo Bueso	2010 -	ES	$2,000,000

C. Technology Plan

1. **Does the program have a proper Technology Plan?**
   We do not have a technology plan for the program. We depend on the technology fee of the faculty and the external funds to improve our technology, such as those from NSF and USDA.
2. **Does the plan include the acquisition, renovation, distribution, maintenance and replacement of technology?**
   The relevant external-funded projects have the plan of acquisition, renovation, and distribution. However, usually they cannot cover maintenance or replacement. The computers and software available at C233 and CN114 are provided through such external funds.
3. **Does it include the training of professors and other staff?**
   Some projects include the training of professors, such as the USDA one.
4. **Does it include the training of students?**
   Some projects include the training of students, such as the USDA one.
5. **Does the program have a budget for the implementation, development and maintenance of the Technology Plan? No. We depend on the technology fee of the faculty, however, we have not received any.**
6. **Does the plan consider a quantity within your budget for maintenance and upgrades (upgrades) for technological resources, eg operating systems, computer programs, memory, among others?** No. We depend on the technology fee of the faculty, however, we have not received any.
7. **Does the plan consider the expansion of resources, services and schedules?** No.

D. Analysis

Evaluate how adequate are the Program technology resources in order to promote productivity and excellence in the professors teaching endeavors.

1. Is the ratio of students per computer right? XYes No

2. Are the available programs sufficient and adequate for the user demand?
X Yes No

Table 5.5. E Public software resources				
Software	C233	CN114	El Verde	Course
ArcGIS	25 licenses	25 licenses		CIAM8225 CIAM4995 CIAM8205
ENVI	25 licenses			CIAM5231
STELLA	5 licenses			CIAM 8118 CIAM 8257
SPSS	free on campus	free on campus		CIAM 6256
R	free	free		CIAM 6256
MS Access DB	free on campus	free on campus		CIAM 8118
PC-ORD	6 licenses			
SigmaPlot	5 licenses			
Paradox			4 licenses	
Matlab				

3. Are the functions of these staff facilities, of the services offered, consonant with the needs of the users and the expectations of the development of the program? YES

4. How adequate are facilities, library resources and technological equipment for the users' needs and the development expectations of the program?

Lack of some important journals and restricted access to CN114.

5. What does the Program need to do to update its library resources, improve physical infrastructure, acquire and maintain adequate technological resources?

Specific journals needed *journals and* and access to CN114 through the program.

VI. Management, Planning, and Development

A. Organization, Rules and Procedures

1. Prontuaries, graduate catalog, and promotion of Program

a. ¿How does the Program promotes its mission, goals and objectives?

☒Brochures ☐Web page

☒Buletin Boards ☐Other: _____

b. Does the Program brochures comply with the institutional norms of the Puerto Rico Council of Education and The Middle States Association?

☐Yes ☐No **WE DO NOT KNOW**

c. ¿**What was the result of the most recent update of the Graduate Course Catalog? Mark all that apply**.

☐Courses were eliminated from the Catalog and from the Central Administration Archive.

☐Courses were added. How many? ___

☐Courses were updated, but there were no additional changes from those officially registered.

☐Course updates were requested and we are in the process of making the changes official.

☒It was not updated. (Our Program is new and therefore this was not required).

d. How is the Program promoted?

☒Brochoures

☐Fliers

☒Web page

☐Massive communication media. Specify _____

☒Other recommendations from students/word of mouth

e. Does the Program brochures comply with the institutional norms of the Puerto Rico Council of Education and The Middle States Association? WE DO NOT KNOW

f. **Is the promotional material in compliance with the institutional norms of the Puerto Rico Council of Education and The Middle States Association?** WE DO NOT KNOW

☐Sí ☐No

Please, specify. Is there is no compliance, indicate what measures will be taken to achieve compliance.

2. **How the Program academic management does communicate the institutional norms? How does it achieve with their compliance?**

   Through periodic faculty meetings and written communications sent via email.

B. Training

1. **How frequent administrative personnel participate in professional development conferences, workshops, and seminars?**

   ☒Monthly

   ☒Every semester

   ☐Every year

   ☐Other _____

2. **Indicate workshops and conferences attended during the last academic year.**

   In general, our personnel have attended workshops and seminars required by the "Ley de Ética Gubernamental" and technical courses on clerical skills.

3. **Are these professional development activities adequate and sufficient to promote the efficient operation of the Program and improve its services?**

   No. We should promote even more professional development activities to our personnel.

4. **How frequent is the performance of all administrative personnel evaluated?**

   ☐Monthly

   ☐Every semester

   ☒Every year

   ☐Other _____

   ☐Not evaluated.

5. **What effect does personnel evaluations have on their performance?**
   In general, evaluations reinforce employee strengths and assist in their areas of identified improvement. In some cases, tasks have been revised according to their performance evaluation.

C. Recruitment

Faculty:

1. **Does the Program have development and recruitment plan?**

☒Yes. Answer: How useful has it been? Does this plan consider retirement of professors and changes in emphasis in the different fields of the discipline? (Include a copy of the plan as an appendix)

In the proposal for the creation of the Graduate Program, there was a development plan which included a recruitment strategy. This plan allowed the recruitment of two new faculty members (professors Gao and Louime). There is a draft of a development plan dated March 2015 which briefly delineates areas of potential development for the Department of Environmental Sciences and the Graduate Program. There is general agreement that the Department needs a new development plan. In a recent faculty meeting it was decided that the Department will initiate a process to revise our plan starting in the Spring Semester 2016.

☐No. Answer: How are professors hired?

2. **Are the common practice and procedures aligned with the intent of recruitment of the most ideal faculty according to the goals, objectives and development expectations of the Program and the Rio Piedras Campus?**

Yes. Hiring has followed the identified program needs.

3. **What problems does the Program faces in hiring professors?**

Lack of institutional funding has always been a problem.

4. **List faculty recruitment priorities over the next five years.**

First priority: Earth scientist

Second priority: Environmental sociologist, toxicologist or environmental neuroscientist, Bayesian statistician, environmental economist

D. Permanent committees

1. **What are the permanent committees of the Program?**

1. Personnel
2. Academic Affairs
3. Graduate Program

2. **Do they comply with their proposed tasks? Do they function effectively?**

In general, all committees are very active and responsive to our needs.

3. **Does the Program have an External Board?** ☐Yes ☒No

E. Community relations

1. Is there evidence of linkages between the Program, the private sector and the government? How are these relationships maintained?

IGERT established strong collaborations with government, private and non-government organizations. Other strong links have been established through the Puerto Rico Center for Environmental Neuroscience with US EPA and San Juan ULTRA. In general, these Program remains well-linked with the Puerto Rico Department of Natural and Environmental Resources, US Geological Survey, Department of Health, the San Juan Bay Estuary Program, Para La Naturaleza, IITF-Forest Service. These agencies and organizations are constantly inviting professors and students to workshops and meetings on collaborative projects (**Appendix 1 – IGERT Final Report; Appendix – 11 San Juan ULTRA Final Report P. 3-5, 13-26).**

2. With what other Campus units do the Program maintain direct collaborations?

The Department of Psychology through their graduate program in community psychology, the Graduate School of Planning, The UPR Law School and the departments of Biology, and Chemistry, are probably our strongest collaborators.

3. What is the relationship between the Program and the other academic units within the College of Natural Sciences including the Dean's Office?

We collaborate well with most academic units and have maintained productive working relationships with the Dean's Office.

4. Through which initiatives or concrete projects does the Program maintain its relationship with the external community? How do Program members provide service to the external community?

Our interdisciplinary focus requires that we maintain strong links with other external units. The most concrete examples are the collaborative research projects conducted between the Graduate School of Planning and our Program (NASA HICE-PR), and with the US Forest Service (San Juan Ultra). The IGERT Project also established strong collaborative relationships with the external community. The El Verde Field Station, site of the LTER maintains strong ties with other institutions and is key for outreach activities for this project and the Department of Environmental Sciences.

5. Has the Program had any projects under the Intramural Practice scheme? If so, please describe them.

No. Our Program hasn't had any projects under that scheme.

F. Development Plan

1. **Does the Program have a Development Plan?** ☒Sí ☐No

   (If yes, please add **SEE APPENDIXES 13 and 14 Env. Science Faculty Recruitment and Department Development Plans**) ☒Sí ☐No

2. **Does the Program have its development expectations clearly defined?** ☐Sí

   ☒No

3. **Have these expectations been discussed and approved by the faculty?** ☐Sí

   ☒No

4. **What mechanisms have been used to discuss and disseminate the Development Plan of the Program?**

   We have discussed in a recent faculty meeting the need to initiate the revision of our development plan early next semester. The current plan is outdated. It is also tied to the development pan of the Department of Environmental Sciences. The committee found a draft of a plan but never an officially approved plan.

5. **Our Program Development Plan is**: (mark all that apply)

   ☐Reasonable and feasible

   ☐Updated

   ☐Establish goals

   ☐Define objectives and activities, Assign responsabilities.

   ☐Considers the ultimate goal that the faculty wishes to develop the Program

   ☐Establish tasks with deadlines.

Our Department recognizes that we do not really have a development plan and have initiated plans to develop one early next semester.

G. Budget

1. **Does the Program have its own operational budget?**
   xYes. (**SEE APPENDIX 15-Program Budget**)
   ☐No

TABLE 6.1.A. CIAM annual budget for fiscal year 2015-16.

I. Institutionally-funded (51%)	Amount
• Administration (department chair differential and secretarial support)	$60,643
• Tenure track and permanent faculty	$1,097,348
Assistant professors (2)	
Associate professor (1)	
Full professors (11)	
• Technicians	$21,120
• Graduate students assistantships (14)	$153,145
• Operational funds	
Materials and supplies	$10,000
Travel	$3,000
Undergraduate student stipends	$4,089
Subtotal	$1,349,345
II. Externally-funded (49%)	
• Administration	$380,024
• Faculty and post docs	$262,357
• Technicians	$324,909
• Graduate student assistantships (29)	$308,198
Subtotal	$1,275,488
TOTAL	$2,624,833

2. **Is the budget based on priorities established in the Development Plan?** XYes

   □No

3. **How does the faculty and students participate in the design of the operational budget of the Program, its use and evaluation of results?**

   The annual budget is designed by the Department Chair. There is little or none participation of the faculty and students in the design, use of evaluation of results.

4. **How diverse is the fiscal income portfolio of the Program? What Program initiatives are planned to attract additional funding? Is there a plan to identify and apply for external funds?**

   This has been the strength in our Program. Before the Graduate Program was created, the Institute for Tropical Ecosystem Studies administered the Luquillo LTER Program. This Program has financed many Department activities and provides funding to pay the salaries of most of the administrative staff. This program has created a project administration unit that currently manages over $12.5M in external funds and brought 27M since 2009 (not counting projects that were submitted through other units. In addition, other researchers not directly related to the LTER, have also been very effective in attracting external funds (PUENTES Project (US Dept of Educ, IGERT Program, the Center for Renewable Energy and Sustainability (US Dept of Energy, $2M, period; 2011-2016), the Puerto Rico Center for Environmental Neurobiology (PRCEN, NSF-CREST, the Center for Applied Tropical Ecology and Conservation (NSF, $5M 2010-2014),

among others, have provided critical funding for faculty and students to establish the Graduate Program in Environmental Sciences. As some of these projects have ended, our faculty is actively pursuing other opportunities of external funds to maintain the level of productivity and attract new students to the Graduate Program. CIAM Reserachers associated to Grasuate Programs help bring UPR and its programs $41M, with a recurrent investment by UPR of $2M.

H. Analysis

1. **Is the management perceived as an agent of change?**

The current program director has initiated a formal process of reorganization that builds on our strengths and maximizes the use of the existing human resources and infrastructure. He is also promoting the development of a new strategic development plan and has submitted a new recruitment plan for the Department.

2. **What are the major administrative challenges that the Program faces today? What measures are being taken to face them?**

Lack of institutional funding to support graduate students that were previously funded by external grants. We are writing new project proposals. In the meantime, however, some students will not be funded causing potential problems in their academic progress and to attract new students.

2. **Does the Program services students, alumni, and professors with excellence in all areas? Is there a particular service area that requires special attention? What adjustments or additional investments are needed to improve the quality of the Program?**

Students and Faculty have give low ratings to the Program's management and the availability of funding (See Appendix 5 and 6 - Faculty and Student Surveys). Faculty recommend an extensive revision of recommendation by program participants that extends beyond this autostudy period and that results effective action items within the context of a solid development plan for the program.

3. **Has the support offered by the upper management been adequate to assist the Program in satisfying its needs and aspirations?**

The Graduate Program in Environmental Sciences is one of the most effective graduate programs in the UPR system attracting external funding. This capacity benefits not only our Department, but the whole faculty and university system. Therefore, additional support is needed to maintain this Program to assure that it can continue attracting external funds. For example, providing more graduate student assistantships will allow research projects to continue while we continue to seek for additional external funding. In addition, support to maintain the existing research infrastructure is needed to continue offering high-quality research opportunities to students and faculty.

4. **What policies and procedures (if any) at the upper administration should be modified to facilitate the functioning and future development of the Program? Provide recommendations.**

- An integrated data collection management system that allows cross referencing data from DEGI's

application system, the registrars system and the college of natural sciences data collection efforts.

- Any data collection system should take into account the not only needs of the end users of the data but the potential needs of those entering the data. This is a factor that FACTUM failed to recognize. There is clearly a disconnection among administrative offices that impeded data collection and integration.

VI. Student Learning Assessment (Avalúo del Aprendizaje Estudiantil)

A. Implementation

Answer what are the differences in the metrics used from those proposed in the Guidelines to implement Learning Assessment:

1. How many students participated in assessment activities?

12 in 2013-2014

12 in 2013-2014 and 12 in 2014-2015

2. What competencies were measured?

Critical Thinking, Research and Creation, Effective Communication

3. Which Instruments were used??

Four rubrics **(see Appendix 7 Learning Assesment Plan and Rubrics)** and Faculty and Student Satisfaction Surveys on Student Skills **(Appendix 5 and 6)**

4. Was there a change from the original plan? Explain

Yes, only research courses were evaluated; CIM 8425 as not evaluated

5. Were there unexpected situations during the implementation? Explain.

Changes in Graduate Program Coordinator and Department Director. For some reason there is no immediate tracking of students that do not turn in their evaluations

6. Does the Program have a 5-year Assessment Plan?

Yes, see Appendix 8 and Narrative P.15-16

B. Analysis

1.. Can one detect a relationship between student performance in research and student critical thinking skills before they start their theses?

- With the rubrics all students evaluated met expectations. The weakest skill during the first evaluation was effective communication but this was not the case during the second evaluation where the number of students ranked excellent increased dramatically **(Appendix 9 -Learning Assessment Results)**
- Faculty surveys do not show a high level of satisfaction in writing skills nor mathematical reasoning (not measure with rubrics) **Appendix 6 -Faculty Surveys**
-Student surveys suggest that students are not comfortable with their level of research design (somewhat contained in research and creation) and mathematic reasoning (not measured with rubrics). **Appendix 7 -Student Surveys**

It would appear as if there is a disparity between the actual level of skills attained by students and what the rubrics reflect. An evaluation of this process and the instruments used is needed. The committee recommends evaluating other instruments.

2. **Can one detect a relationship between student performance in research and factors related to the design and implementation of the curriculum and the Program?**

- Both faculty and students have expressed that both graduate programs are too course heavy focused more on content than on skills. Graduate exams A required for both Masters and PhD's focus on knowledge acquisition rather than skills. Masters students need to pass one exam, a proposal defense and a thesis defense. For PhDs they need to pass two exams (Year 1, Year 2), the proposal defense and the dissertation defense.

-In evaluating the graduation rates, the committee is concerned about the length of time that it takes for students to graduate (partly imposed by the program structure, through examination requirements and the amount of courses that students need to take.

-All recruited students have engaged in research experiences while in the program and many are actively publishing their work but not all. Limited skills on research design, statistics and writing skills may be a problem **(Faculty and Student Surveys - Appendix 6 and 7).**

3. What other factors not contained in this section may have contributed or limited achivements of students from what was expected?

The program accepts students that come from non-science program upon completion of undergraduate requirements. Studying the performance of these students vs. those with a more complete science background may be necessary

The program does not have a profile for new students, having such profile may help ensure that students coming into the program come with competency levels for math and writing that at a higher standard.

Even with successes in gathering competitive funding for students. Overall, this is not a program that has competitive funding relative to competitive programs in the US and Europe. Competitive funding attracts competitive students.

4. What assessment activities can take place in the future to get a better understanding of the problems identified or to detect with a greater certainty other potential factors that may have contributed or limited student achievement?

We need to study results from Faculty and Student Surveys more carefully and hold meetings with students and participating faculty to develop sound strategies that are feasible and effective. Some suggestions have been proposed in the Project Narrative and Executive Summary of this Self Evaluation Document.

Appendix 1 – Self Study Tables

Table 1.2.D.1 – Alignment of Student Profiles and Learning Objectives
(Alineamiento de Perfiles Estudiantiles y Objetivos del Aprendizaje)

Standard from Acreditation (if Applicable)	**Profile of New Students (Nuevo Ingreso)**[8] (Year of Approval)	**Learning Objectives (Objetivos del Aprendizaje)**[9] (Year of Approval)	**Alumni Profile (Egresado)**[10,11] (Year of Approval)
		The graduate student in the Masters Program in Environmental Sciences must:	The alumni of the Masters in Environmental Sciences must be able to:
	Not aplicable	Formulate, design and evaluate a research problem in a particular area within environmental sciences. To analyze patterns of environmental change and their effects on the variety of components of a watershed as well as the changes in energy fluxes as an effect of the impact of human activities.	Apply the methods and the most modern techniques related to the analysis of environmental parameters, the sustainable management of natural resources, environmental systems modelling, or spatial analysis of the environment, according to their area of specialty.
	Not aplicable	Formulate, design and evaluate a research problem in a particular area within environmental sciences. To analyze the natural and induced geologic processes inherent to islands and tropical regions.	Design and implement environmental evaluation and management plans, especially in regard to issues and problems characteristic of tropical regions and Islands.
	Not aplicable	Analyze the research results.	Conduct environmental assessments, prepare and critically analyze environmental assessment documents, draft environmental impact statements, and effectively communicate the results of such assessments, either in writing or through presentations and public hearings.

Standard from Acreditation (if Applicable)	Profile of New Students (Nuevo Ingreso)[8] (Year of Approval)	Learning Objectives (Objetivos del Aprendizaje)[9] (Año de aprobación)	Alumni Profile (Egresado)[10] (Year of Approval)
	Not aplicable	Formulate, design and evaluate a research problem in a particular area within environmental sciences. Analyze the research results.	Plan and conduct field studies, and analyze studies performed by others to check the adequacy of procedures and compliance with current regulations.
	Not aplicable		Work as part of teams in field studies and research projects in Environmental Sciences, and contribute significantly to these.
	Not aplicable	Formulate, design and evaluate a research problem in a particular area within environmental sciences.	Contribute to the solution of environmental problems using the knowledge acquired through study and research, and the most recently published scientific knowledge in the area.
	Not aplicable	Analyze the research results. To analyze patterns of environmental change and their effects on the variety of components of a watershed as well as the changes in energy fluxes as an effect of the impact of human activities.	Critically analyze data and environmental information, and propose theoretical and practical solutions to the environmental problems identified.
	Not aplicable	To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Be an agent of change in his/her community and in society in regard to the preservation of the environment and the optimal use of natural resources.

Standard from Acreditation (if Applicable)	Profile of New Students (Nuevo Ingreso)[8] (Year of Approval)	Learning Objectives (Objetivos del Aprendizaje)[9] (Año de aprobación)	Alumni Profile (Egresado)[10] (Year of Approval)
	Not aplicable	Present research results in written form and expose them in open discussion with clarity and precision.	Be an effective communicator of environment issues in public and private forums, in scientific and professional conferences, and for audiences of all levels of knowledge, both in oral and written form.
	Not aplicable		Occupy technical and managerial positions in State and federal government agencies as well as private companies that required the services of a specialist with a solid knowledge in the environmental sciences.

[8] The profile for new students is a description of the competencies that students should have to enter the program. These competencies define the students' learning baseline. Usually the programs only have a list of entrance requirements and not a profile. If the Program does not have a profile, leave this column empty.

[9] The learning objectives define the operational expectations of learning for the students. They include those competencies that students should demonstrate during the course of the program, and those by which the program can infer if they are prepared or not to practice their career. They are statements or general operational descriptions that grossly the expectations that the program establishes in regard to student learning. The learning objectives serve as concrete guidelines to evaluate the effectiveness and efficiency of the program. They are written using terms of observable behaviors, starting sentences with action verbs in the infinitive. They need to align with the alumni's profile.

[10] The alumnus profile is a description of the alumni of the program in agreement with the competencies that the student will exhibit when practicing, with a reasonable degree of efficiency, during the exercise of his/her career. This is sort of an archetype of the basic professional.

[11] Learning Objectives and Alumni profile are as they appear in the proposal to create the Graduate programs approved in 2009.

Table 1.2.D.2 – Alignment of Student Profiles and Learning Objectives (See Appendix 1 for Example)
(Alineamiento de Perfiles Estudiantiles y Objetivos del Aprendizaje. Ver Apéndice 1 para ejemplo)

Standard from Accreditation (if Applicable)	Profile of New Students (Nuevo Ingreso)[8] (Year of Approval)	Learning Objectives (Objetivos del Aprendizaje)[9]	Alumni Profile (Perfil del Egresado)[10] (Year of Approval)
		The graduate student in the PhD Program in Environmental Sciences must:	The alumni of the PhD Program in Environmental Sciences must be able to:
	Not aplicable	To formulate, design and evaluate a research problem in a particular area within environmental sciences	Initiate, direct and supervise research projects in environmental sciences, write proposals to fund these and establish professional collaborations with other researchers.
	Not aplicable	To analyze the research results. To analyze the natural and induced geologic processes inherent to islands and tropical regions. To analyze patterns of environmental change and their effects on the variety of components of a watershed as well as the changes in energy fluxes as an effect of the impact of human activities.	Advance the theoretical and technical knowledge in the area of environmental sciences through the development, implementation and evaluation of protocols and techniques for sampling and analysis of environmental parameters, the design of comprehensive plans for sustainable management of sites and environmental resources, or the development of mathematical models and techniques of spatial analysis to solve complex environmental problems according to their area of specialty.

Standard from Accreditation (if Applicable)	Profile of New Students (Nuevo Ingreso)[8] (Year of Approval)	Learning Objectives (Objetivos del Aprendizaje)[9] (Año de aprobación)	Alumni Profile (Perfil del Egresado)[10] (Year of Approval)
	Not aplicable	Formulate, design and evaluate a research problem in a particular area within environmental sciences To analyze the natural and induced geologic processes inherent to islands and tropical regions.	Integrate knowledge acquired through in-depth study and research, or through the application of the most recently published scientific knowledge, to analyze the problems and environmental situations characteristic of Islands and tropical regions, and to provide viable alternatives that are directed towards the achievement of their sustainable development.
	Not aplicable	Analyze the research results. To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Serve as expert in court cases related to his area of expertise, or in other situations that require advice from a consultant with deep knowledge in environmental sciences.
	Not aplicable	To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Be an agent of change in his/her community and in the society in regard to the preservation of the environment and the optimal use of natural resources
	Not aplicable	Present research results in written form and expose them in open discussion with clarity and precision.	Be an effective communicator of environment issues in public and private forums, in scientific and professional conferences, and for audiences of all levels of knowledge, both in oral and written form.

tandard from Accreditation (if Applicable)	Profile of New Students (Nuevo Ingreso)[8] (Year of Approval)	Learning Objectives (Objetivos del Aprendizaje)[9] (Año de aprobación)	Alumni Profile (Perfil del Egresado)[10] (Year of Approval)
	Not aplicable	Present research results in written form and expose them in open discussion with clarity and precision.	Contribute significantly to their area of expertise in environmental sciences through the publication of research findings in professional journals of recognized excellence, evaluation and critical analysis of the work carried out by others, and the active and effective participation in local and international scientific meetings.
	Not aplicable	To analyze patterns of environmental change and their effects on the variety of components of a watershed as well as the changes in energy fluxes as an effect of the impact of human activities. To develop in students the rigor in the search for knowledge as well as a high sense of ethical and social responsibility.	Contribute to the sustainable development of society, providing an integrative vision in the analysis of the problems of modern society in light of the anticipated social and environmental changes, promoting changes and attainment of a better quality of life through the optimal sustainable use of natural and environmental resources, and assuming positions of leadership in the defense of the environment and natural resources.
	Not aplicable		Carry out teaching and research work in higher education institutions, or occupy leadership positions in research or administration in the Government and private industry.

8 The profile for new students is a description of the competencies that students should have to enter the program. These competencies define the students' learning baseline. Usually the programs only have a list of entrance requirements and not a profile. If the Program does not have a profile, leave this column empty.

9 The learning objectives define the operational expectations of learning for the students. They include those competencies that students should demonstrate during the course of the program, and those by which the program can infer if they are prepared or not to practice their career. They are statements or general operational descriptions that grossly the expectations that the program establishes in regard to student learning. The learning objectives serve as concrete guidelines to evaluate the effectiveness and efficiency of the program. They are written using terms of observable behaviors, starting sentences with action verbs in the infinitive. They need to align with the alumni's profile.

10 The alumnus profile is a description of the alumni of the program in agreement with the competencies that the student will exhibit when practicing, with a reasonable degree of efficiency, during the exercise of his/her career. This is sort of an archetype of the basic professional.

Table 2.5.F Frequency of course offerings and new courses developed

CODE	TITLE	Section	Required	CRS	2015-2016	2014-2015	2014-2015	2013-2014	2013-2014	2012-2013	2012-2013	2011-2012	2011-2012
					SEM1	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2
5990**	*Special Topics in Env. Science	O13		1									
		O13		1		X							
	Aquatic Systems Biomonitoring	O11		1						X			
	Clouds and Precipitation	O13		1			X						
	Soils and the Environment	O13		3	X								
	Ice phase in clouds	O41		1							X		
	Physical particles in atmosphere	O31		1							X		
	Soils and the Environment	O23		3					X		X		
	Energy Production	113		3		X							
	* Aquatic Systems Biomonitoring	203		3		X							
CIAM 5005	* Aquatic Systems Biomonitoring	0U1		3	X								
CIAM5231	Remote Sensing	0U1		3	X	X		X	X	X	X		X
CIAM5235	Remote Sensing			3									

CODE	TITLE	Section	Required	CRS	2015-2016	2014-2015	2014-2015	2013-2014	2013-2014	2012-2013	2012-2013	2011-2012	2011-2012
					SEM1	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2
CIAM6115	Terrestrial Environment	0U1	X	3		X		X		X			
CIAM 6116	Tropical Ecosystems	0U1	X	3			X		X				
CIAM6117	Coastal Enviroments	0U1	X	3	X	X		X		X			
CIAM6118	Urban Environment	0U1	X	3			X		X				
CIAM 6256	Statistical Analyses Methods	0u1	X	3	X		X		X				X
CIAM6669	Research/Thesis	O11	X	1				X		X			
		O12	X	2				X		X			
		O13	X	3				X		X			
CIAM6901	Graduate Seminar	OU1	X	1						X			
		0U1		1	X	X	X	X	X				
CIAM 6910	Supervised Graduate Research (Rotation)	O11		1	X	X	X						
		O12		2	X	X	X						
		O13		3	X	X	X						
CIAM6896	Thesis Research continuation	0U1		0					X				
CIAM6990**	Water Treatment	0U1		3			X						
	Special Topics in Env. Science	O11		1					X				
	Aquatic Systems Biomonitoring	O13		3	X								
	Remote Sensing	O23		3	X								
	Soils and the Environment	O33		3	X								

CODE	TITLE	Section	Required	CRS	2015-2016	2014-2015	2014-2015	2013-2014	2013-2014	2012-2013	2012-2013	2011-2012	2011-2012
					SEM1	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2
CIAM6999	Grdauate Research	O11	X	3	X	X	X	X	X				
		O12	X		X	X	X		X				
		O13	X		X	X	X		X				
CIAM 8115	*Human Dimensions of Environmental Change	0U1		2						X			
		OU1		2				X					
		0U1		2		X							
CIAM8116	*Policy and Environmental Ethics	0U1		2						X			
		OU1		2									
		OU1		2		X							
CIAM8117	*Urban Environment, Design and Expansion	0U1		2						X			
		0U1		2		X							
CIAM8118	*Ecological Informatics	0U1		3			X						
CIAM8119	*Ecologica Economics	0U1		3			X						
CIAM8120	*Environmental Communications	0U1		3			X						
CIAM 8205	Spatial Analysis Seminar	0U1	X	2	X								
CIAM8405	Sustainable Management of Island and Tropical Regions Seminar	O12		2	X								
CIAM8225	Spatial Analysis Methods	0U1	X	3			X		X	X			

CODE	TITLE	Section	Required	CRS	2015-2016	2014-2015	2014-2015	2013-2014	2013-2014	2012-2013	2012-2013	2011-2012	2011-2012
					SEM1	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2	SEM1	SEM2
CIAM8425	Environmetnal Geology	0U1		3						X			
CIAM8435	Environmental Hydrology	?		3									
CIAM8901	Graduate Seminar	0U1		1			X						
CIAM8901	Graduate Seminar	0U1		1		X							
CIAM8990**	Social-Ecology Seminar	0U1		1	X			X					
	Modeling Transport and Disersion of Atmosphere Gases and Aereosols	O11		1			X						
	*Scientific Writing and Proposal Writting	O13		?			X						
CIAM8999	Dissertation Research	O11	X	1		X	X	X		X			
		O12		2		X	X	X		X			
		O13		3		X	X	X		X			
		O14		1-3		X	X		X				
		O16		1-3		X	X		X				

* NEW COURSES (N= 10)

** Specialty course with variable topic

UNIVERSIDAD DE PUERTO RICO
Recinto de Río Piedras
Oficina de Presupuesto

Table 3.2.B.
Breakdown of Academic Work[18]

LEYENDA

I- Instructor	**CA- Catedrático Asociado**
CX- Catedrático Auxiliar	**C- Catedrático**
HS- Horas Semanales	**ETC- Equivalente de Tarea Completa**
HC- Horas Crédito	

INFORME DE EQUIVALENCIA DE TAREA ACADÉMICA
AÑO ACADEMICO 2012-2013 - PRIMER SEMESTRE

FACULTAD DE CIENCIAS NATURALES
PROGRAMA CIENCIAS AMBIENTALES

DESGLOSE DE LA TAREA ACADEMICA

ETC - Equivalente de Tarea Completa (base: programas subgraduados 12 creds. / programas de maestría y doctorado 9 creds.)			**TAREA ACADÉMICA**																			
			ENSEÑANZA E INVESTIGACIÓN EN ESTE DEPARTAMENTO																**Total**		**Compensación a otorgar**	
			Tarea Académica		Tarea Académica Ad Honorem		Total Tarea Académica		Investigación		Tarea Ad Hororem Investigación		Total Investigación		Administración		Total Destaques, licencias y Administración					
Número de Plaza	Rango	Nombre del Incumbente	HS	ETC	HS	ETC	HS	ETC	HS	ETC	HS	ETC	HS	ETC	HS	ETC	HS	ETC	HS	ETC	HS	ETC
031001	DIR DEPARTAMENTO ACADEMICO			**0.00**		**0.00**	**0**	**0.00**		**0.00**		**0.00**	**0**	**0.00**		**0.00**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**
031004	CATEDRATICO	MOLINELLI FREYTES, JOSE A.	**9**	**0.75**		**0.00**	**9**	**0.75**	**3**	**0.25**		**0.00**	**3**	**0.25**		**0.00**	**0**	**0.00**	**12**	**1.00**	**0**	**0.00**
031005	CATEDRATICO AUXILIAR	ROBERSON MURILLO, LORETTA M.	**6**	**0.50**		**0.00**	**6**	**0.50**	**9**	**0.75**		**0.00**	**9**	**0.75**		**0.00**	**0**	**0.00**	**15**	**1.25**	**3**	**0.25**
031006	CATEDRATICO	RIOS DAVILA, RAFAEL A.		**0.00**	**3**	**0.25**	**3**	**0.25**	**3**	**0.25**		**0.00**	**3**	**0.25**	**12**	**1.00**	**12**	**1.00**	**18**	**1.50**	**3**	**0.25**
031007	CATEDRATICO ASOCIADO	GAO, QIONG		**0.00**		**0.00**	**0**	**0.00**	**12**	**1.00**		**0.00**	**12**	**1.00**		**0.00**	**0**	**0.00**	**12**	**1.00**	**0**	**0.00**
033001	DIR DEPARTAMENTO ACADEMICO			**0.00**		**0.00**	**0**	**0.00**		**0.00**		**0.00**	**0**	**0.00**		**0.00**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**

			TAREA ACADÉMICA																			
			ENSEÑANZA E INVESTIGACIÓN EN ESTE DEPARTAMENTO																Total		Compensación a otorgar	
			Tarea Académica		Tarea Académica Ad Honorem		Total Tarea Académica		Investigación		Tarea Ad Hororem Investigación		Total Investigación		Administración		Total Destaques, licencias y Administración					
033002	CATEDRATICO ASOCIADO	MAYOL BRACERO, OLGA L.	2	0.17		0.00	2	0.17	10	0.83		0.00	10	0.83		0.00	0	0.00	12	1.00	0	0.00
033003	CATEDRATICO ASOCIADO	ORTIZ ZAYAS, JORGE R.	3	0.25		0.00	3	0.25	9	0.75		0.00	9	0.75		0.00	0	0.00	12	1.00	0	0.00
033004	CATEDRATICO	MELENDEZ ACKERMAN, ELVIA J.	3	0.25		0.00	3	0.25	9	0.75		0.00	9	0.75		0.00	0	0.00	12	1.00	0	0.00
033005	CATEDRATICO	BROKAW, NICHOLAS V.L.	3	0.25		0.00	3	0.25	9	0.75		0.00	9	0.75		0.00	0	0.00	12	1.00		
033006	CATEDRATICO	ZIMMERMAN EARP, JESS K.		0.00		0.00	0	0.00	9	0.75		0.00	9	0.75	3	0.25	3	0.25	12	1.00	0	0.00
033007	CATEDRATICO	ZOU, XIAOMING		0.00		0.00	0	0.00	12	1.00		0.00	12	1.00		0.00	0	0.00	12	1.00	0	0.00
033011	CATEDRATICO ASOCIADO	YU, MEI	3	0.25		0.00	3	0.25	9	0.75		0.00	9	0.75		0.00	0	0.00	12	1.00	0	0.00
033012	CATEDRATICO ASOCIADO	RAMIREZ ULATE, LUIS A.	3	0.25		0.00	3	0.25	9	0.75		0.00	9	0.75		0.00	0	0.00	12	1.00	0	0.00
				0.00		0.00	0	0.00		0.00		0.00	0	0.00		0.00	0	0.00	0	0.00	0	0.00
Contrato		Gervais, Gary		0.00		0.00	0	0.00	6	0.50		0.00	6	0.50	6	0.50	6	0.50	12	1.00	0	0.00
Contrato		Angulo, Pilar		0.00		0.00	0	0.00		0.00		0.00	0	0.00	12	1.00	12	1.00	12	1.00	0	0.00
Contrato		Grafals, Rosana	14	1.17		0.00	14	1.17		0.00		0.00	0	0.00		0.00	0	0.00	14	1.17	2	0.17
Contrato		Martinez, Jose	3	0.25		0.00	3	0.25		0.00		0.00	0	0.00		0.00	0	0.00	3	0.25	0	0.00
Contrato		Roman, Glenda	3	0.25		0.00	3	0.25		0.00		0.00	0	0.00		0.00	0	0.00	3	0.25	0	0.00
Compensacion adicional		Ramos, Jorge	3	0.25		0.00	3	0.25		0.00		0.00	0	0.00		0.00	0	0.00	3	0.25	0	0.00
Compensacion adicional		Rodriguez, Luis	2	0.17		0.00	2	0.17		0.00		0.00	0	0.00		0.00	0	0.00	2	0.17	0	0.00
Contrato		Cardona, Pedro	2	0.17		0.00	2	0.17		0.00		0.00	0	0.00		0.00	0	0.00	2	0.17	0	0.00
Contrato		Arce, Javier		0.00	2	0.17	2	0.17		0.00		0.00	0	0.00		0.00	0	0.00	2	0.17	0	0.00
				0.00		0.00	0	0.00		0.00		0.00	0	0.00		0.00	0	0.00	0	0.00	0	0.00
		GRAN TOTAL	59.00	4.92	5.00	0.42	64.00	5.33	109.00	9.08	0.00	0.00	109.00	9.08	33.00	2.75	33.00	2.75	206.00	17.17	8.00	0.67

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2009-10	Developing a Sustainable Education and Research Agenda at El Verde Field Station, Puerto Rico Period: 2009	A. Ramírez, PI O. Mayol Bracero, PI E. Melendez-Ackerman, PI	National Science Foundation $17,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	UMEB: Undergraduate research on tropical ecosystems: from rainforest to cities Period: 2006-2012.	A. Ramírez, J. Thomlison	National Science Foundation $600,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	LTREB: Emergent landscape patterns in stream ecosystem processes resulting from groundwater/surface water interactions Period: 2005-2011.	C.M. Pringle , PI **A. Ramírez, PI** F. Triska, PI	National Science Foundation $447,319		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	REU Site: Tropical Ecology and Evolution at El Verde Field Station. Period: 2006-2010	A. Ramírez, PI	National Science Foundation $355,940		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	Strenghthening Educational Capacities in Science and Technology for Agricultural and Natural Resources Period:2008-2011	Yu, Mei, PI Meléndez-Ackerman, Elvia, Co PI X. Ben Wu, Co-PI Perotto-Baldivieso, H., Co-PI Other Participants: Dr. Maria Aguirre-Ortiz, Andrew McFadden, Dr. William Gould, Dr. Denny Fernandez del Viso, Charito Orengo Rodriguez; Denny Fernandez del Viso, Debby	U.S. Department of Agriculture-CSREES $85,811.00	$36,433.00	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Parrilla, Maria Vega, Sol Taina Cintron Berdecia, Luis Villanueva, Daniel Davila, Hector Rivera, Linda Ivette Ortiz, Wilfredo Falcon Linero, Clarisse Betancourt, Colibri Sanfiorenzo, Victor Rivera, Edwin A. Hernandez, Ramon Lopez-Rosado, Flor I Diaz Rivera, Wilnelia Recart Gonzalez, Angelica Erazo-Oliveras, Ruben Alayon Gonzalez, Nilda I. Luhring Gonzalez, Betzaida Ortiz-carrion, Cielo E. Figuerola-Hernandez, Maria Elena Ocasio-Torres, Suhey Ortiz Rosa, Luis Villanueva-Cubero, Sol Taina Cintron Berdecia, Ricardo J. Colon, UPR-Humacao, Suhey Ortiz Rosa, Luis Villanueva-Cubero, Angelica Erazo-Oliveras, Maricelys Figueroa, S meeting: Sol Taina Cintron Berdecia, Colibri Sanfiorenzo, Christopher Cheleuitte				
2009-10	LTER 4: Long-Term Ecological Research, Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI	National Science Foundation		**TABLE 3.7.F.2 PROGRAM**	**TABLE 3.7.F.1 PROGRAM**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Jill Thompson, Co PI	$4,920,000.00		**PRESENTATIONS**	**PUBLICATIONS**
2009-10	LTER4 Supplement: Long-Term Ecological Research Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $615,663.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Pareo/LTER4 Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $2,460,000.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	"Teaching Ecosystem Complexity through Field Science Inquiry"; Program: NSF-Teacher Professional Continuum; Period: June 2006-Dec. 2010	Ortiz Zayas, Jorge, Co PI	National Science Foundation $134,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	"EcoHydrology of Critical Coastal habitats in a tropical Dry forest"; Program: Period: 1 September 2007-31 August 2014	Ortiz Zayas, Jorge, Co PI	NSF-Center for Applied Tropical Conservation $181,605		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	"Caribbean Coastal Scenarios" Grant: $52,000; Period: May 2008-Dec. 2011.	Ortiz Zayas, Jorge, Co PI	Program: Interamerican Institute for Global Change Research $52,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	"Integrating theory with practice through internships in the geosciences: a University of Puerto Rico-Rio Piedras Track 1 Initiative"; Period: Octuber 2009-Sept 2012.	Ortiz Zayas, Jorge, PI	Program: NSG-Opportunities to Enhance Diversity in the Geosciences $197,341		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Integrating landscape attributes,	Ortiz Zayas, Jorge, PI	Department of	$21,148.00	**TABLE 3.7.F.2**	**TABLE 3.7.F.1**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	ecosystem services, and stakeholder perceptions and incentives for determining land use suitability for conservation.		Agriculture $66,770.00		**PROGRAM PRESENTATIONS**	**PROGRAM PUBLICATIONS**
2009-10	"Luquillo Schoolyard LTER"; Period: 2003-2011.	Ortiz Zayas, Jorge, Co PI	National Science Foundation-LTER $22,000/year		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Collapse of the Ancient Maya	Brokaw, Nicholas, PI Ward, Sheila, CoPI	National Science Foundation $249,768.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	"Spatial-temporal variations in land cover and human population and their effects on wetlands in Puerto Rico", **2009-2011**	Mei YU (PI); Dingfang Chen, Caralina Mommany		*UPR-DEGI, FIPI* $30,900	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	NSF Integrative Graduate Education and Research Traineeship Program (IGERT): Natural-Human Systems in the Urbanizing Tropics. 2008-2015	Rafael Rios, PI Nicholas Brokaw, CoPI Jess Zimmerman, CoPI Maritza Barreto, CoPI Alonso Ramírez, CoPI	National Science Foundation $566,605.00	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Circuit Rider Program for Non PRASA Systems, Puerto Rico Health Department, Medical Sciences Campus of the University of P. R.	Rafael Rios Project Director Adail Alicea	Puerto Rico Health Department $200,000	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	An integrated internship, entoring, and skill-building program promoting the geosciences at the University of Puerto Rico -Rio Piedras: a track 1 initiative.	Rafael Rios, CoPI	National Science Foundation $197,341	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	NSF Opportunities for Enhancing Diversity in the Geosciences Program (OEDG).					
2009-10	Partnership for Undergraduate Education in the Natural Sciences for Transformational Engagement of STEM Students: PUENTES, Department of Education.	Rafael Rios, Investigator	Department of Education $2,246,030	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Vulnerability Analysis and Emergency Response Plans for Non PRASA Systems, Puerto Rico Health Department, Medical Sciences Campus of the University of P. R.	Rafael Rios Project Director Adail Alicea	Puerto Rico Health Department $200,000	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Impact of African Dust On Clouds and Precipitation in a Caribbean Tropical Montane Cloud Forest	Olga Mayol-Bracero, PI	National Science Foundation $137,916.00	*$24,254.00*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Digitizing a Virtual Flora Of the El Verde Research Area in the Luquillo Mountains, Puerto Rico	James Ackerman (PI), Elvia Melendez-Ackerman (co-PI)		*UPR/FIPI $20,000.00*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Impact of African Dust On Clouds and Precipitation in a Caribbean Tropical Montane Cloud Forest	Olga Mayol-Bracero, PI	National Science Foundation $300,000	*$235,000*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Center for Applied Tropical Ecology Conservation	Elvia Meléndez-Ackerman CoPI	National Science Foundation $5,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2009-10	From Hectares to Nanometers: GK-12 Multidisciplinary Explorations of Functional Nanoscience and Tropical Ecosystem	Gerardo Morell, PI Elvia Meléndez, CoPI Manuel Gómez, CoPI Ana-Rita Mayol, CoPI Lizzette Velázquez, CoPI Liz Díaz, Co Investigator K-12 Teacher: Eliana Bendezu, Angela del Toro, María López, Shirley Martínez, Aileen Morales, Ana Paris, María Sánchez, Frank Torres, Graduate Student (research assistants): José Fumero; Yamaris Pacheco; Iván López; Luis Valentín; Carlos Conde; Rafael Velázquez, Hector Rivera, Stephanie Montalvo Undergraduate Student: Mayra Hernández; Janice Hernández; Arelis Rivera; Fabiola Rodríguez Other Participants: Jorge Ortiz, Joel Alvarez, Aida	National Science Foundation $3,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		LaSanta; Luz González; Lymarie Hernández; Nicolás Ramos; Frankie Ramos; Nancy Vázquez; Ingrid Mercado; Idalia Sánchez; Iris Ramos; Fouad Aliev; Kai Griebenow; Olga Mayol; José Miró; Lorraine Santiago; Verónica Toro Other Collaborators or Contacts: Elisabeth Andrews; John Orgen; Patrick Sheridan; Ariel Lugo; Angel Marti-Arbona; Steve McGee; Shrilashmi Katar; Li Shi				
2009-10	Collaborative Research:LTREB: Long-Term studies of Reproduction and Seedling recruitment in a Network of Latin American Tropical Forests: global change, Climate variability, and Species coexistence	Jess K. Zimmerman, PI	National Science Foundation $210,000.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Luquillo Long-Term Ecological Research 4: Understanding Change in the Ecosystems of Northeastern Puerto Rico Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P. Jess Zimmerman, Senior P. Jorge Ortiz, Senior Personnel	National Science Foundation $79,150.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2009-10	Luquillo Long-Term Ecological Research 4: Understanding Change in the Ecosystems of Northeastern Puerto Rico Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P. Jess Zimmerman, Senior P. Jorge Ortiz, Senior P.	National Science Foundation $4,920,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Tropospheric Remote sensing and air Monitoring	Olga Mayol Bracero, CoPI	NOAA-CREST $786,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2009-10	Temperature Sensitivity of Soil Respiration as Influenced by Rubber Plantations in Southeast Asia	Xiaoming Zou, PI	Asian Pacific Network $70,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	UMEB: Undergraduate research on tropical ecosystems: from rainforest to cities Supplement. Period: 2010-2012.	A. Ramirez, PI	National Science Foundation $271,117		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Improvements to El Verde Field Station, Puerto Rico	Alonso Ramírez, PI	National Science Foundation $135,496 Pending		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	UMEB: Undergraduate research on tropical ecosystems: from rainforest to cities Period: 2006-2012	A. Ramírez, J. Thomlison	National Science Foundation $600,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	LTREB: Emergent landscape patterns in stream ecosystem processes resulting	C.M. Pringle **,** PI **A. Ramírez**, **PI** F. Triska, PI	National Science Foundation $447,319		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	from groundwater/surface water interactions. Period: 2005-2011					
	REU Site: Tropical Ecology and Evolution at El Verde Field Station. Period: 2006-2010	A. Ramírez, PI	National Science Foundation $355,940		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Strenghthening Educational Capacities in Geospatial Science and Technology for Agricultural and Natural Resources	Yu, Mei, PI Meléndez-Ackerman, Elvia, Co PI X. Ben Wu, Co-PI Perotto-Baldivieso, H., Co-PI Other Participants: Dr. Maria Aguirre-Ortiz, Andrew McFadden, Dr. William Gould, Dr. Denny Fernandez del Viso, Charito Orengo Rodriguez; Denny Fernandez del Viso, Debby Parrilla, Maria Vega, Sol Taina Cintron Berdecia, Luis Villanueva, Daniel Davila, Hector Rivera, Linda Ivette Ortiz, Wilfredo Falcon Linero, Clarisse Betancourt, Colibri Sanfiorenzo, Victor Rivera, Edwin A. Hernandez, Ramon Lopez-Rosado, Flor I Diaz Rivera, Wilnelia Recart	U.S. Department of Agriculture-CSREES $290,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Gonzalez, Angelica Erazo-Oliveras, Ruben Alayon Gonzalez, Nilda I. Luhring Gonzalez, Betzaida Ortiz-carrion, Cielo E. Figuerola-Hernandez, Maria Elena Ocasio-Torres, Suhey Ortiz Rosa, Luis Villanueva-Cubero, Sol Taina Cintron Berdecia, Ricardo J. Colon, UPR-Humacao, Suhey Ortiz Rosa, Luis Villanueva-Cubero, Angelica Erazo-Oliveras, Maricelys Figueroa, S meeting: Sol Taina Cintron Berdecia, Colibri Sanfiorenzo, Christopher Cheleuitte				
2010-11	Luquillo LTER Program 4: Understanding Change in The Ecosystems of Northeastern Puerto Rico	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P. Jess Zimmerman, Senior P. Jorge Ortiz, Senior Personnel	National Science Foundation $113,879.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Luquillo LTER Program 4: Understanding Change in The Ecosystems of Northeastern Puerto Rico	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P. Jess Zimmerman, Senior P. Jorge Ortiz, Senior Personnel	National Science Foundation $4,920,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	LTER 4 Supplement: Long-Term Ecological Research, Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI	National Science Foundation $615,663.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2010-11	"EcoHydrology of Critical Coastal habitats in a tropical Dry forest"; Program: Period: 1 September 2007-31 August 2014	Ortiz Zayas, Jorge, Co PI	NSF-Center for Applied Tropical Conservation $181,605		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	"Caribbean Coastal Scenarios" Grant: $52,000; Period: May 2008-Dec. 2011.	Ortiz Zayas, Jorge, Co PI	Program: Interamerican Institute for Global Change Research $52,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	"Integrating theory with practice through internships in the geosciences: a University of Puerto Rico-Rio Piedras Track 1 Initiative"; Period: October 2009-Sept 2012.	Ortiz Zayas, Jorge, PI	Program: NSG-Opportunities to Enhance Diversity in the Geosciences $197,341		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Collapse of the Ancient Maya	Brokaw, Nicholas, PI Ward, Sheila, CoPI	National Science Foundation $249,768.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	"Luquillo Schoolyard LTER"; Period: 2003-2011.	Ortiz Zayas, Jorge, Co PI	National Science Foundation-LTER $22,000/year		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	"*Spatial-temporal variations in land cover and human population and their effects on wetlands in Puerto Rico*", **2009-2011**	Mei YU (PI); Dingfang Chen, Caralina Mommany		*UPR-DEGI, FIPI* $30,900	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	NSF Integrative Graduate Education and	Rafael Rios, PI	National Science	*0*	**TABLE 3.7.F.2**	**TABLE 3.7.F.1**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Research Traineeship Program (IGERT): Natural-Human Systems in the Urbanizing Tropics. 2008-2015	Nicholas Brokaw, CoPI Jess Zimmerman, CoPI Maritza Barreto, CoPI Alonso Ramírez, CoPI	Foundation $0		**PROGRAM PRESENTATIONS**	**PROGRAM PUBLICATIONS**
2010-11	Circuit Rider Program for Non PRASA Systems, Puerto Rico Health Department, Medical Sciences Campus of the University of P. R.	Rafael Rios Project Director	Puerto Rico Health Department $200,000	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	An integrated internship, mentoring, and s building program promoting the geosciences at the University of Puerto R -Rio Piedras: a track 1 initiative. NSF Opportunities for Enhancing Diversit the Geosciences Program (OEDG).	Rafael Rios, CoPI	National Science Foundation $197,341	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Impact of African Dust On Clouds and Precipitation in a Caribbean Tropical Montane Cloud Forest	Olga Mayol-Bracero, PI	National Science Foundation $105,427.00	*$25,734.00*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Impact of African Dust On Clouds and Precipitation in a Caribbean Tropical Montane Cloud Forest	Olga Mayol-Bracero, PI	National Science Foundation $300,000	*$235,000*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Renovating Infraestructure for Tropical Ecology and	Brad Weiner, PI Nicholas Brokaw, CoPI Elvia Meléndez, CoPI	National Science Foundation $1,998,475	*$1,998,475.00*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Environmental Sciences	Jess Zimmerman, Senior P. Alonso Ramírez, Senior P. Jorge Ortiz, Senior Personnel Olga Mayol, Senior Personnel Mei Yu, Senior Personnel Xiaoming Zou, Senior P. Lissette González, Senior P. Raúl Cintrón, Senior P. Juan Gómez, Senior P. Wilfredo Boria, Senior P.				
2010-11	Digitizing a Virtual Flora Of the El Verde Research Area in the Luquillo Mountains, Puerto Rico			*FIPI* *$20,000.00*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Collaborative Research: Interactive effects of Climate variability and Human land use on long-Term tree community Dynamics in a Puerto Rican wet forest	Jess Zimmerman, PI	National Science Foundation $451,485.00 Pending		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Modeling successional Dynamics of species and Functional groups in wet Tropical forests: Integrating neighborhood Effects, functional traits, And phylogeny	Jess Zimmerman, PI	National Science Foundation $267,842.00 Pending		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Center for Applied	Elvia Meléndez-	National Science		**TABLE 3.7.F.2**	**TABLE 3.7.F.1**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Tropical Ecology Conservation	Ackerman CoPI	Foundation $5,000,000		**PROGRAM PRESENTATIONS**	**PROGRAM PUBLICATIONS**
2010-11	From Hectares to Nanometers: GK-12 Multidisciplinary Explorations of Functional Nanoscience And Tropical Ecosystem	Gerardo Morell, PI Elvia Meléndez, CoPI Manuel Gómez, CoPI Ana-Rita Mayol, CoPI Lizzette Velázquez, CoPI William Leffingwell K-12 Teacher: Eliana Bendezu, Angela del Toro, María López, Shirley Martínez, Aileen Morales, Ana Paris, María Sánchez, Frank Torres, Graduate Student (research assistants): José Fumero; Yamaris Pacheco; Iván López; Luis Valentín; Carlos Conde; Rafael Velázquez; Héctor Rivera; Bárbara Casanas; Sofía Burgos; Clarivel Lasalde; Agustín	National Science Foundation $3,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Engman Undergraduate Students: Mayra Hernández; Janice Hernández; Stephanie Montalvo; Arelis Rivera; Fabiola Rodríguez; Lymarie Hernández; Stephanie Montalvo; Bimely Torres; Lourdes Lastra; Wilnelia Recart; Luis Maldonado; Paola Zayas; Natalia Rivera Other Participants: Héctor Joel Alvarez; Jorge Ortiz; Aida LaSanta; Luz González; Lymarie Hernández; Gladys Dávila; Nicolás Ramos; Frankie Torres; Nancy Vázquez; Ingrid Mercado; Idalia Sánchez; Iris Ramos; Fouad Aliev; Kai Griebenow; Luis Fonseca; Olga Mayol; José Miró; Lorraine Santiago; Verónica Toro; Jorge Colón; Carlos González; Alonso Ramírez; Mariam Colón, Raquel Rodríguez; Dorelis Rebollo; Víctor Rodríguez; Isabelita Colón; Maricarmen Medina				
2010-11	ULTRA-Ex: Social-Ecological System	Jess Zimmerman, PI	National Science Foundation		**TABLE 3.7.F.2 PROGRAM**	**TABLE 3.7.F.1 PROGRAM**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Change, Vulnerability, and the Future of a Tropical City		$300,000		**PRESENTATIONS**	**PUBLICATIONS**
2010-11	Collaborative Research:LTREB: Long-Term studies of Reproduction and Seedling recruitment in a Network of Latin American Tropical Forests: global change, Climate variability, and Species coexistence	Jess K. Zimmerman, PI	National Science Foundation $210,000.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2010-11	Tropospheric Remote sensing and air Monitoring	Olga Mayol Bracero, CoPI	NOAA-CREST $786,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	REU Site: Tropical Ecology and Evolution at El Verde Field Station (PI A. Ramírez). Period: 2011-2016	**A. Ramírez, PI**	National Science Foundation $101,148.00	$23,483.00	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	UMEB: Undergraduate research on tropical ecosystems: from rainforest to cities Supplement. Period: 2010-2012.	**A. Ramirez, PI**	National Science Foundation. $271,117		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	UMEB: Undergraduate research on tropical ecosystems: from rainforest to cities Period: 2006-2012	A. Ramírez, J. Thomlinson	National Science Foundation $600,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	LTREB Renewal: Emergent landscape patterns in stream ecosystem processes resulting from groundwater/surface water interactions Period: 2005-2011.	C.M. Pringle , PI **A. Ramírez, PI** J. Duff, PI	National Science Foundation $449,491		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	LTREB: Emergent landscape patterns in stream ecosystem processes resulting from groundwater/surface water interactions (PIs). Period: 2005-2011.	C.M. Pringle, A. Ramírez, F. Triska	National Science Foundation. $447,319		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Puerto Rico Center for Environmental Neuroscience	Steven Treistman PD/PI Bruno Marie-Bordes Co PD/PI Mark W Miller Co PD/PI Joshua Rosenthal Co PD/PI Maria A Sosa Co PD/PI Loretta Roberson Co PD/PI Alberto Sabat Co-Investigator Guillermo Yudowski Co-Investigator Martine Behra Co-Investigator Alonso Rivera Co-Investigator Liz Diaz Co-Investigator Eduardo Rosa-Molinar Co-Investigator	National Science Foundation $1,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	UPR-Río Piedras HSI STEM	Loretta Roberson, PI	Department of Education	0	**TABLE 3.7.F.2 PROGRAM**	**TABLE 3.7.F.1 PROGRAM**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
			$869,970.00		**PRESENTATIONS**	**PUBLICATIONS**
2011-12	Luquillo Long-Term Ecological Research 4: Understanding Change in the Ecosystems of Northeastern Puerto Rico Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P. Jess Zimmerman, Senior P. Xiaoming Zou, Senior P.	National Science Foundation $24,000.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Luquillo Long-Term Ecological Research 4: Understanding Change in the Ecosystems of Northeastern Puerto Rico Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P. Jess Zimmerman, Senior P. Xiaoming Zou, Senior P.	National Science Foundation $79,150.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Luquillo Long-Term Ecological Research 4: Understanding Change in the Ecosystems of Northeastern Puerto Rico Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P. Jess Zimmerman, Senior P. Jorge Ortiz, Senior P. Xiaoming Zou, Senior P.	National Science Foundation $4,920,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	LTER4 Supplement: Long-Term Ecological Research, Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Alonso Ramírez, Senior P.	National Science Foundation $615,663.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	"EcoHydrology of Critical Coastal habitats in a tropical Dry forest"; Program: Period: 1 September 2007-31 August	Ortiz Zayas, Jorge, Co PI	NSF-Center for Applied Tropical Conservation		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	2014		$181,605			
2011-12	"Integrating theory with practice through internships in the geosciences: a University of Puerto Rico-Rio Piedras Track 1 Initiative"; Period: October 2009-Sept 2012.	Ortiz Zayas, Jorge, PI	Program: NSG-Opportunities to Enhance Diversity in the Geosciences $197,341		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	CNH-Ex: The Collapse of the Ancient Maya:Multi-Disciplinary Researchon Society and the Environment	Brokaw, Nicholas, PI Ward, Sheila, CoPI	National Science Foundation $135,600.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	"*Vulnerability of tropical wetlands based on high-resolution satellite images and socioeconomic data*", Agency: Current Status: **Funded**, **2011-2012**	Mei YU (PI); Qiong Gao (Co-PI) Graduate Students: Luis Villanueva, Daniel Dávila, Agnes Parrilla	*NASA-PR IDEAS-ER* $30,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	NSF Integrative Graduate Education and Research Traineeship Program (IGERT): Natural-Human Systems in the Urbanizing Tropics. 2008-2015	Rafael Rios, PI Rafael Rios, PI Nicholas Brokaw, CoPI Jess Zimmerman, CoPI Maritza Barreto, CoPI Alonso Ramírez, CoPI	*National Science Foundation $0*	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Circuit Rider Program for Non_PRASA Syst Puerto Rico Health Department, Medical Sciences Campus of the University of P. F	Rafael Rios Project Director Adail Alicea	Puerto Rico Health Department $200,000	*0*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2011-12	An integrated internship, mentoring, and s building program promoting the geosciences at the University of Puerto Rico -Rio Piedras: a track 1 initiative. NSF Opportunities for Enhancing Diversit the Geosciences Program (OEDG).	Rafael Rios, CoPI Olga Mayol Bracero, CoPI	National Science Foundation $197,341	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Impact of African Dust On Clouds and Precipitation in a Caribbean Tropical Montane Cloud Forest	Olga Mayol-Bracero, PI	National Science Foundation 83,949.00	*$27,294.00*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Impact of African Dust On Clouds and Precipitation in a Caribbean Tropical Montane Cloud Forest	Olga Mayol-Bracero, PI	National Science Foundation $300,000	*$235,000*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Collaborative Research: Interactive effects of Climate variability and Human land use on long-Term tree community Dynamics in a Puerto Rican wet forest	Jess Zimmerman, PI	National Science Foundation $451,485.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Increasing Public Health Workforce Capacity to Implement and Deliver	José Molinelly PI	National Geographic Education	*$39,668.00*	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Laboratory Services and Public Health Interventions in the Dominican Republic Under the President's Emergency Plan for AIDS Relief (PEPFAR) in the Dominican Republic		Foundation $71,668.00			
2011-12	Modeling successional Dynamics of species and Functional groups in wet Tropical forests: Integrating neighborhood Effects, functional traits, And phylogeny	Jess Zimmerman, PI	National Science Foundation $267,842.00 Pending		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Center for Applied Tropical Ecology Conservation	Elvia Meléndez-Ackerman CoPI	National Science Foundation $5,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	From Hectares to Nanometers: GK-12 Multidisciplinary Explorations of Functional Nanoscience And Tropical Ecosystem	Gerardo Morell, PI Elvia Meléndez, CoPI Manuel Gómez, CoPI Ana-Rita Mayol, CoPI Lizzette Velázquez, CoPI Jorge Ortiz, Faculty William Leffingwell K-12 Teacher:	National Science Foundation $3,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Eliana Bendezu, Angela del Toro, María López, Shirley Martínez, Aileen Morales, Ana Paris, María Sánchez, Frank Torres, Graduate Student (research assistants): José Fumero; Flavia Morales; Yamaris Pacheco; Iván López; Luis Valentín; Carlos Conde; Rafael Velázquez; Héctor Rivera; Barbara Casanas; Sofía Burgos; Clarivel Lasalde; Augustin Engman Undergraduate Student: Mayra Hernández; Janice Hernández; Stephanie Montalvo; Arelis Rivera; Fabiola Rodríguez; Lymarie Hernández; Stephanie Montalvo; Bimely Torres; Lourdes Lastra; Wilnelia Recart; Luis Maldonado; Paola Zayas; Natalia Rivera Other Participants: Héctor Joel Alvarez; Jorge Ortiz;				

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Aida LaSanta; Luz González; Gladys Dávila; Lymarie Hernández; Nicolás Ramos; Frankie Torres; Nancy Vázquez; Ingrid Mercado; Idalia Sánchez; Iris Ramos; Fluad Aliev; Kai Griebenow; Luis Fonseca; Olga Mayol; José Miró; Lorraine Santiago; Verónica Toro; Jorge Colón; Carlos González; Alonso Ramírez; Mariam Colon; Raquel Rodríguez Dorelis Rebollo; Victor Rodríguez; Isabelita Colon; Maricarmen Medina; Abimael Rodríguez; Carlos Cabrera; Ana Guadalupe; Elvira Cuevas; Alberto Sabat; Luis Santiago; Alessandra Montano; Yahaira Cruz; José Arrarás Other Collaborators or Contacts: Elisabeth Andrews; John Orgen; Patrick Sheridan; Ariel Lugo; Angel Marti-Arbona; Steve McGee; Shrilashmi Katar; Li Shi; Dachi Yang; Sharon Cantrel; Hector Abruna; Manuel Figueroa; Michael Mackay; Eric Mazur;				

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Vladimir Mitin; Miguel Pereira; Monserrate Roman; Nev Singhota; Julio C. Verdejo; Veronia Acosta-Martinez; Gary Andersen; María Domínguez; Lorreta Roberson; Michael Culberston				
2011-12	Increasing laboratory capacity at El Verde Field Station, University of Puerto Rico. Period: 2012-2013.	A. Ramírez, PI	National Science Foundation $349,960.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	Partnership for a Research Center for Excellence in Renewable Energy. Period: 2011-2015	PI: Kai Griebenow. co-PI Loretta Roberson. Coordinador: Gary Gervais; INvestigadores: Liz Diaz, Gary Toranzos, Luis Rios; Sub-award: University of Georgia in Athens (KC. Das - local PI)	DOD No. 59089-RT-REP: UPR-UGA $4,000,000			
	REU Site: Tropical Ecology and Evolution at El Verde Field Station Period: 2011-2016	A. Ramírez, PI	National Science Foundation 175,577.00	$24,270.00	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	REU Site: Tropical Ecology and Evolution at El Verde Field Station –PARTICIPANTES Period: 2011-2016	A. Ramírez, PI	National Science Foundation 0	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	UMEB: Undergraduate research on tropical ecosystems: from rainforest to cities Supplement. Period: 2010-2012.	A. Ramírez, PI	National Science Foundation $271,117		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	UMEB: Undergraduate research on tropical ecosystems: from rainforest to cities. Period: 2006-2012	A. Ramírez, PI J. Thomlison, PI	National Science Foundation. $600,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	LTREB Renewal: Emergent landscape patterns in stream ecosystem processes resulting from groundwater/surface water interactions. Period: 2011-2016	C.M. Pringle, PI A. Ramírez, PI J. Duff, PI	National Science Foundation $449,491		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
	Puerto Rico Center for Environmental Neuroscience	Steven Treistman PD/PI Bruno Marie-Bordes Co PD/PI Mark W Miller Co PD/PI Joshua Rosenthal Co PD/PI Maria A Sosa Co PD/PI Loretta Roberson Co PD/PI Alberto Sabat Co-Investigator Guillermo Yudowski Co-Investigator Martine Behra Co-Investigator Alonso Rivera Co-Investigator Liz Diaz Co-Investigator Eduardo Rosa-Molinar Co-Investigator	National Science Foundation $1,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2011-12	Renovating Infraestructure for Tropical Ecology and	Brad Weiner, PI Nicholas Brokaw, CoPI Elvia Meléndez, CoPI	National Science Foundation $1,998,475		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Environmental Sciences	Alonso Ramírez, Senior P. Jorge Ortiz, Senior Personnel Olga Mayol, Senior Personnel Mei Yu, Senior Personnel Xiaoming Zou, Senior P. Lissette González, Senior P. Raúl Cintrón, Senior P. Juan Gómez, Senior P. Wilfredo Boria, Senior P.				
2012-13	LTER4: Long-Term Ecological Research Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $820,000.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Request for Supplemental Funding: Luquillo LTER Program 4: Understanding Change in the Ecosystem of Northeastern Puerto Rico Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $99,999.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Pareo/LTER4 Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $2,460,000.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	"An Integrated Approach for the Detection of Estrogenic Activity in a Tropical Urban Watershed" Program: Puerto Rico Water and Environmental Resources Research Institute, US Geological Survey. Water Resources	Ortiz Zayas, Jorge R., Co PI	National Institutes for Water Resources $19,600.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Research Grant State Program; Period 1 March 2012 to 29 February 2015.					
2012-13	"EcoHydrology of Critical Coastal habitats in a tropical Dry forest"; Program: Period: 1 September 2007-31 August 2014	Ortiz Zayas, Jorge, Co PI	NSF-Center for Applied Tropical Conservation $181,605		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	CNH-Ex: The Collapse of the Ancient Maya:Multi-Disciplinary Research and the Environment	Brokaw, Nicholas, PI Ward, Sheila, CoPI	National Science Foundation $114,168.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Partnership for a Research Center for Excellence in Renewable Energy. Period: 2011-2015	PI: Kai Griebenow. co-PI Loretta Roberson. Coordinador: Gary Gervais; INvestigadores: Liz Diaz, Gary Toranzos, Luis Rios; Sub-award: University of Georgia in Athens (KC. Das - local PI)	DOD No. 59089-RT-REP: UPR-UGA $4,000,000			
2012-13	*"Vulnerability and Adaptive Management of Tropical Coastal Wetlands in the context of Land Use and Climate Changes"*, Current Status: Funded, 2012-2016	Yu, Mei; Gao, Qiong , PIs Graduate Students: Villanueva, Luis; Dávila, Daniel; Wang, Chao; Bracero, Loderay; Salazar Mónica'; Martínez, Myrelis; Parrilla, Agnes	National Aeronautics & Space Administration $ 132,800.00	$187,297.00	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2012-13	NSF Integrative Graduate Education and Research Traineeship Program (IGERT): Natural-Human Systems in the Urbanizing Tropics. 2008-2015	Rafael Rios, PI Nicholas Brokaw, CoPI Jess Zimmerman, CoPI Maritza Barreto, CoPI Alonso Ramírez, CoPI	National Science Foundation $597,836.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	NSF Innovation through Institutional Integration Program: Maximizing Yield Through Integration (MYTI): Science and Math Education in the Context of a Disposing Society	Rafael Rios, CoPI	National Science Foundation $1,500,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Microbes of built environments spanning human urbanization, Alfred P. Sloan Foundation,	Rafael Rios Investigator	Sloan Foundation $600,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Vulnerability Analysis of Small Water Treatment Systems, Puerto Rico Health Department, Rio Piedras Campus of the University of P. R, Technical Assistance Program	Rafael Rios Project Director Adail Alicea	Puerto Rico Health Department $200,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Transferencia de Tecnología para el Desarrollo de SMM en las Comunidades Rurales de Puerto Rico-Análisis del Estado Actual	Ana V. Arache-Martínez	Syracuse University $5,000.00	$0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Population status and Reproductive success of the Endengered Ephiphte Gesneria pauciflora-A	Elvia Meléndez-Ackerman, PI	U.S. Fish & Wildlife Service Dept. of Interior		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Conceptual Framework Towards Delisting		$32,663.00			
2012-13	UPR-Río Piedras HIS STEM	Loretta Roberson, PI	Department of Education $457,720.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	UPR-Río Piedras HIS STEM-Remodelación	Loretta Roberson, PI	Department of Education $404,456.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Preparing Students for Careers with the USDA Forest Service by Linking Student Success with Experimental Learning Opportunities in Forest Management and Climate Change Ecology	Martha J. Desmond, PD Jess K. Zimmerman, CoPD Berlinda Baca Sánchez, CoPD Skip Van Bloem, CoPD	Department of Agriculture $354,594.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Collaborative Research: Interactive effects of Climate variability and Human land use on long-Term tree community Dynamics in a Puerto Rican wet forest	Jess Zimmerman, PI	National Science Foundation $451,485.00 Pending Pending		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2012-13	Modeling successional Dynamics of species and Functional groups in wet Tropical forests: Integrating neighborhood	Jess Zimmerman, PI	National Science Foundation $267,842.00 Pending		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Effects, functional traits, And phylogeny					
2012-13	From Hectares to Nanometers: GK-12 Multidisciplinary Explorations of Functional Nanoscience And Tropical Ecosystem	Gerardo Morell, PI Elvia Meléndez, CoPI Manuel Gómez, CoPI Ana-Rita Mayol, CoPI Lizzette Velázquez, CoPI Liz Díaz, Co Investigator K-12 Teacher: Eliana Bendezu, Angela del Toro, María López, Shirley Martínez, Aileen Morales, Ana Paris, María Sánchez, Frank Torres Graduate Student (research assistants): José Fumero; Flavia Morales; Yamaris Pacheco; Iván López; Luis Valentín; Carlos Conde; Rafael Velázquez; Héctor Rivera; Barbara Casanas; Sofía Burgos; Clarivel Lasalde; Augustin Engman; Edward Aviles; Ileana Feliciano; Jorge Viera; María García; Michelle Rivera; Pablo Hernández; Pamela Vallejo; Raisa Hernández; Raúl	National Science Foundation $3,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Santiago; Damaris Suazo; Kennett Rivero; Rita Cáceres; Omar Delannoy; Ramón Rodríguez; Melissa Dávila; Gina Ortiz; Alesander Pérez Undergraduate Student: Mayra Hernández; Janice Hernández; Stephanie Montalvo; Arelis Rivera; Fabiola Rodríguez; Lymarie Hernández; Stephanie Montalvo; Bimely Torres; Lourdes Lastra; Wilnelia Recart; Luis Maldonado; Paola Zayas; Natalia Rivera;Abilenny García; Yarimar de la Torre; Diana Díaz; José Fuentes; Liz Hernández; Luis Rivera; Alexis Guzmán; Carla López; Dafne Reyes; Esteban Grovas; Jhoset Burgos Other Participants: Héctor Joel Alvarez; Jorge Ortiz; Aida LaSanta; Luz González; Gladys Dávila; Nicolás Ramos; Frankie Torres; Nancy Vázquez; Ingrid Mercado; Idalia Sánchez; Iris Ramos; Kai Griebenow; Luis Fonseca; Olga Mayol; José				

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Miró; Lorraine Santiago; Verónica Toro; Jorge Colón; Carlos González; Alonso Ramírez; William Leffingwell; Mariam Colon Other Collaborators or Contacts: Elisabeth Andrews; John Orgen; Patrick Sheridan; Ariel Lugo; Angel Marti-Arbona; Steve McGee; Shrilashmi Katar; Li Shi; Dachi Yang; Sharon Cantrel; Hector Abruna; Manuel Figueroa; Michael Mackay; Eric Mazur; Vladimir Mitin; Miguel Pereira; Monserrate Roman; Nev Singhota; Julio C. Verdejo; Veronia Acosta-Martinez; Gary Andersen; María Domínguez; Lorreta Roberson; Michael Culberston				
2013-14	Puerto Rico Center for Environmental Neuroscience	Steven Treistman PD/PI Bruno Marie-Bordes Co PD/PI Mark W Miller Co PD/PI		National Science	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Joshua Rosenthal Co PD/PI Maria A Sosa Co PD/PI Loretta Roberson Co PD/PI Alberto Sabat Co-Investigator Guillermo Yudowski Co-Investigator Martine Behra Co-Investigator Alonso Rivera Co-Investigator Liz Diaz Co-Investigator Eduardo Rosa-Molinar Co-Investigator		Foundation $1,000,000		
2013-14	Partnership for a Research Center for Excellence in Renewable Energy. Period: 2011-2015	PI: Kai Griebenow. co-PI Loretta Roberson. Coordinador: Gary Gervais; INvestigadores: Liz Diaz, Gary Toranzos, Luis Rios; Sub-award: University of Georgia in Athens (KC. Das - local PI)	DOD No. 59089-RT-REP: UPR-UGA $4,000,000			
2013-14	Increasing laboratory capacity at El Verde Field Station, University of Puerto Rico Period: 2012-2013	A. Ramírez, PI		National Science Foundation $349,960	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	REU Site: Tropical Ecology and Evolution at El Verde Field Station Period: 2011-2016	A. Ramírez, PI		National Science Foundation $396,417	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	LTREB Renewal: Emergent landscape	C.M. Pringle, PI		National	**TABLE 3.7.F.2**	**TABLE 3.7.F.1**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	patterns in stream ecosystem processes resulting from groundwater/surface water interactions. Period: 2011-2016	A. Ramírez, PI J. Duff		Science Foundation $449,491	**PROGRAM PRESENTATIONS**	**PROGRAM PUBLICATIONS**
2013-14	ULTRA-Ex: Social-Ecological System Change,	Ariel E Lugo, PI Melendez-Ackerman, Elvia Co PD/PI Munoz-Erickson, Tischa Co PD/PI Santiago, Luis Co PD/PI Seguinot-Barbosa, Jose Co PD/PI Barreto, Maritza, Co-Investigator Carlo Joglar, Tomás, Co-Investigator Concepcion, Carmen, Co-Investigator Cusack, Daniela Co-Investigator Flores Mangual, Mario Co-Investigator Flores Mangual, David Co-Investigator García-Montiel, Diana, Co-Investigator Hall, Myrna, Co-Investigator Hall, Charlie, Co-Investigator Heartsill, Tamara, Co-Investigator Martinuzzi, Sebastián, Co-			**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Investigator McDowell, William, Co-Investigator Méndez-Lázaro, Pablo Co-Investigator Ortíz-Zayas, Jorge, Co-Investigator Pontius, Robert 'Gil', Co-Investigator Ramos, Olga, Co-Investigator Ramírez, Alonso, Co-Investigator Santos, Jennifer , Co-Investigator Terrasa, José Juan, Co-Investigator Cuadrado-Landrau, Victor **Other Professionals:** González, Gabriela Santiago-Bartolomei, Raúl Vallejo, Julio Rosas, Keysa, Technician Verdejo, Julio, Consultant **Graduate Students-Research Assistants:** Branoff, Benjamin, Cornell, Lori Eraso, Angela, Guzmán, Paula Hernández, Ruben, Manrique, Harold, Nycht, Chris, Olivero,				

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
		Sofia, Quintero, Braulio, Ramos, Luis, Ramsey, Molly Trujillo, Ana; Vila, Cristina Villanueva, Luis **Undergraduates students:** Angely Colon, Sofia;Bonilla, Ali; Correa, Nicholas;Diaz Torres, Elizabeth; Fontanez, José; Garay, Aramis; Henderson, Amanda;Hernandez, Yankiomy; Lopez, Carla; Delgado, Peter Torres, Khrisia				
2013-14	Subaward Agreement awarded by UPR-Medical Sciences Campus project titlted CREST	Loretta Roberson, PI	National Science Foundation $348,993.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	LTER4: Long-Term Ecological Research Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $4,920,000.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	LTER4 Supplement: Long-Term Ecological Research, Period: 2006-2014	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $615,663.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	Luquillo LTER V: Understanding Environmental Change in Northeastern Puerto Rico	Nicholas Brokaw, PI Ariel Lugo, Co PI Jill Thompson, Co PI	National Science Foundation $980,000.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2013-14	"An Integrated Approach for the Detection of Estrogenic Activity in a Tropical Urban Watershed" Program: Puerto Rico Water and Environmental Resources Research Institute, US Geological Survey. Water Resources Research Grant State Program; Grant : $60,000: Period 1 March 2012 to 29 February 2015.	Ortiz Zayas, Jorge R., Co PI	$60,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	"EcoHydrology of Critical Coastal habitats in a tropical Dry forest"; Program: Period: 1 September 2007-31 August 2014	Ortiz Zayas, Jorge, Co PI	NSF-Center for Applied Tropical Conservation $181,605		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	Collapse of the Ancient Maya	Brokaw, Nicholas, PI Ward, Sheila, CoPI	National Science Foundation $249,768.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	"*Vulnerability and Adaptive Management of Tropical Coastal Wetlands in the context of Land Use and Climate Changes*", Agency: *NASA-Land Use/Land Cover Change Program* Current Status: Funded, 2012-2016	Yu, Mei; Gao, Qiong , PIs Graduate Students: Villanueva, Luis; Dávila, Daniel; Wang, Chao; Bracero, Loderay; Salazar Mónica'; Martínez, Myrelis; Parrilla, Agnes	$407,218		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	"Mechanisms of Tropical Ecosystem	Gao, Qiong, PI	$30,000		**TABLE 3.7.F.2**	**TABLE 3.7.F.1**

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TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Functions in Responses to Land use and Climate change", funded by NASA-PR IDEAS-ER, $30,000; 2013 - 2014	Yu, Mei, Co-PI Students: Davila, Daniel; Villanueva, Luis; Salazar, Monica; Martinez, Myrelis			**PROGRAM PRESENTATIONS**	**PROGRAM PUBLICATIONS**
2013-14	NSF Integrative Graduate Education and Research Traineeship Program (IGERT): Natural-Human Systems in the Urbanizing Tropics. 2008-2015	Rafael Rios, PI Nicholas Brokaw, CoPI Jess Zimmerman, CoPI Maritza Barreto, CoPI Alonso Ramírez, CoPI	National Science Foundation $3,000,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	NSF Innovation through Institutional Integration Program: Maximizing Yield Through Integration (MYTI): Science and Math Education in the Context of a Disposing Society-2012-2016	Rafael Rios, CoPI	National Science Foundation $1,500,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	Microbes of built environments spanning human urbanization	Rafael Rios Investigator	Alfred P Sloan Foundation $600,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	Development of Engaging and Readily Transferable Laboratory Experiences for the Introductory Program	José Ortiz Ubarri, PI	National Science Foundation $51,780.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2013-14	From Hectares to Nanometers: GK-12 Multidisciplinary Explorations of Functional Nanoscience	Gerardo Morell, PI Elvia Meléndez, CoPI Manuel Gómez, CoPI Ana-Rita Mayol, CoPI	National Science Foundation $3,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	And Tropical Ecosystem	Lizzette Velázquez, CoPI Liz Díaz, Co-Investigator K-12 Teacher: Eliana Bendezu; Angela del Toro; María López; Shirley Martínez; Aileen Morales; Ana Paris; María Sánchez; Frank Torres Graduate Student (research assistants): Rita Cáceres; Khaled Habiba; José Hernández; Flavia Morales; Adriana Rivera; Kenneth Rivero; Damaris Suazo; Luis Villanueva Other Participants-Faculty Gladys Dávila; Jorge Ortiz				
2014-15	LTER 5: Understanding environmental change in northeastern Puerto Rico. Period: 2012-2014.	Co-PIs: N. Brokaw, G. Gonzalez, C.M. Pringle, A. Ramírez, M. Willig	National Science Foundation $2,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	Pareo/LTER5	Co-PIs: N. Brokaw, G. Gonzalez, C.M. Pringle, A. Ramírez, M. Willig	National Science Foundation $820,000.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	REU Site: Tropical Ecology and Evolution at El Verde Field Station Period: 2011-2016	A. Ramírez, PI	National Science Foundation $78,429.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2014-15	LTREB Renewal: Emergent landscape patterns in stream ecosystem processes resulting from groundwater/surface water interactions. Period: 2011-2016.	C.M. Pringle, PI A Ramírez, PI J. Duff, PI	National Science Foundation $449,491		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	Puerto Rico Center for Environmental Neuroscience	Mark W. Miller, PI Steven Treistman PD/PI Bruno Marie-Bordes Co PD/PI Mark W Miller Co PD/PI Joshua Rosenthal Co PD/PI Maria A Sosa Co PD/PI Loretta Roberson Co PD/PI Alberto Sabat Co-Investigator Guillermo Yudowski Co-Investigator Martine Behra Co-Investigator Alonso Rivera Co-Investigator Liz Diaz Co-Investigator Eduardo Rosa-Molinar Co-Investigator	National Science Foundation $1,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	Partnership for a Research Center for Excellence in Renewable Energy. Period: 2011-2015	PI: Kai Griebenow. co-PI Loretta Roberson. Coordinador: Gary Gervais; INvestigadores: Liz Diaz, Gary Toranzos, Luis Rios; Sub-award: University of Georgia in Athens (KC. Das - local PI)	DOD No. 59089-RT-REP: UPR-UGA $4,000,000			

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
2014-15	UPR-Río Piedras HSI STEM	Loretta Roberson, PI	Department of Education $870,000.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	"Human impacts to coastal ecosystems in Puerto Rico; a remote sensing, hydrological, ecologic and socio-economic assessment with management implications". NASA Interdisciplinary Research in Earth Sciences (IDS) Program; Grant $1.3 M. Period: July 2014-June 2017.	Ortiz Zayas, Jorge R., Co PI	$1.3M		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	"An Integrated Approach for the Detection of Estrogenic Activity in a Tropical Urban Watershed" Program: Puerto Rico Water and Environmental Resources Research Institute, US Geological Survey. Water Resources Research Grant State Program; Grant : $60,000: Period 1 March 2012 to 29 February 2015. Role: PI	Ortiz Zayas, Jorge R., Co PI	$60,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	"*Vulnerability and Adaptive Management of Tropical Coastal Wetlands in the context of Land Use and Climate Changes*",	Yu, Mei; Gao, Qiong , PIs Graduate Students: Villanueva, Luis; Dávila, Daniel; Wang, Chao; Bracero, Loderay; Salazar Mónica'; Martínez, Myrelis; Parrilla, Agnes	NASA $407,218		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	"Mechanisms of Tropical Ecosystem Functions in Responses to Land use and	Gao, Qiong, PI Yu, Mei, Co-PI	NASA-PR IDEAS-ER $30,000		**TABLE 3.7.F.2 PROGRAM**	**TABLE 3.7.F.1 PROGRAM**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Climate change", funded by, 2013 - 2014	Students: Davila, Daniel; Villanueva, Luis; Salazar, Monica; Martinez, Myrelis			**PRESENTATIONS**	**PUBLICATIONS**
2014-15	NSF Integrative Graduate Education and Research Traineeship Program (IGERT): Natural-Human Systems in the Urbanizing Tropics. 2008-2015	Rafael Rios, PI Nicholas Brokaw, CoPI Jess Zimmerman, CoPI Maritza Barreto, CoPI Alonso Ramírez, CoPI	National Science Foundation $3,000,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	NSF Innovation through Institutional Integration Program: Maximizing Yield Through Integration (MYTI): Science and Math Education in the Context of a Disposing Society	Rafael Rios, CoPI	National Science Foundation $1,500,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	Microbes of built environments spanning human urbanization, Alfred P. Sloan Foundation,	Rafael Rios Investigator	Sloan Foundation $600,000	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	Development of Engaging and Readily Transferable Laboratory Experiences for the Introductory Program	José Ortiz Ubarri, PI	National Science Foundation $74,915.00	0	**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**
2014-15	Preparing Students for Careers with the USDA Forest Service by Linking Student Success with Experimental Learning Opportunities in Forest	Martha J. Desmond, PD Jess K. Zimmerman, CoPD Berlinda Baca Sánchez, CoPD Skip Van Bloem, CoPD	Department of Agriculture $355,384.00		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.3.C PROGRAM PROJECTS BY YEAR BY FACULTY – (Projects in blue not available in DEGI data base)

Year	Project Title	Personnel/Project	External Funds (indicate Agency and quantity)	Institutional Funds and quantity	Dissemination (indicate conference, congress name and place of dissemination)	Reserach Publications/Creative Work
	Management and Climate Change Ecology					
2014-15	From Hectares to Nanometers: GK-12 Multidisciplinary Explorations of Functional Nanoscience And Tropical Ecosystem	Gerardo Morell, PI Elvia Meléndez, CoPI Manuel Gómez, CoPI Ana-Rita Mayol, CoPI Lizzette Velázquez, CoPI Liz Díaz, Co Investigator Gladys Dávila, Faculty Jorge Ortiz, Faculty K-12 Teacher: Eliana Bendezu, Angela del Toro, María López, Shirley Martínez, Aileen Morales, Ana Paris, María Sánchez, Frank Torres, Graduate Student (research assistants): Rita Cáceres, Khaled Habiba, José Hernández, Flavia Morales, Adriana Rivera, Kenneth Rivero, Damaris Suazo, Luis Villanueva	National Science Foundation $3,000,000		**TABLE 3.7.F.2 PROGRAM PRESENTATIONS**	**TABLE 3.7.F.1 PROGRAM PUBLICATIONS**

TABLE 3.7.F.1 PROGRAM PUBLICATIONS

A. PEER REVEWED PUBLICATIONS BY YEAR	
	2015
1.	Abelleira, Martinez Oscar J, **Elvia J Melendez-Ackerman**, Diana Garcia Montiel, John A. Parrotta.2015. Seed Dispersal Turns an Experimental Plantation on Degraded Land into a Novel Forest in Urban Northern Puerto Rico. Forest ecology and Management 357:68-75
2.	Acevedo, M. A., Fletcher, R.J., R. L. Tremblay, and **E.J. Melendez-Ackerman**. 2015. Spatial asymmetries in connectivity influence colonization-extinction dynamics. Oecologia DOI 10.1007/s00442-015-3361-z
3.	Boyero, L., R. G. Pearson, M. O. Gessner, D. Dudgeon, **A. Ramírez**, C. M. Yule, M. Callisto, C. M. Pringle, A. C. Encalada, M. Arunachalam, J. Mathooko, J. E. Helson, J. Rincón, A. Bruder, A. Cornejo, A. S. Flecker, C. Mathuriau, C. M'Erimba, J. F. G. Jr, M. Moretti11 and T. Jinggu (2015). Leaf-litter breakdown in tropical streams: is variability the norm? Freshwater Science 34(2): 759-769.
4.	Denjean, C., S. Caquineau, K. Desboeufs, B. Laurent, M. Maille, M. Quiñones Rosado, P. Vallejo, **O. L. Mayol-Bracero** and P. Formenti, Does the long-range transport of African mineral dust across the Atlantic enhance their hygroscopicity? Geophysical Research Letters, in press, 2015
5.	Fitzgerald, E., A. P. Aulta, M. Zauscher, **O. L. Mayol-Bracero**, and K. A. Prather, Comparison of the Mixing State of Long Range Transported Asian and African Mineral Dust, Atmospheric Environment, in press, 2015
6.	Gutiérrez-Fonseca, P. E., A. M. Alonso-Rodríguez, A. Cornejo, A. C. Bailey, J. M. Maes & **A. Ramírez**. 2015. New records of *Anacroneuria* Klapálek, 1909 (Plecoptera: Perlidae) for Central America. Zootaxa 3994(3):445-448.
7.	Huang, W., W. H. McDowell, **X. M. Zou**, H. H. Ruan, J. S. Wang, Z. L. Ma. 2015. Qualitative differences in headwater stream dissolved organic matter and riparian water-extractable soil organic matter under four different vegetation types along an altitudinal gradient in the Wuyi Mountains of China. Applied Geochemistry 52: 67–75.
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10.	Monmany, C., **Yu, M.,** Restrepo, C., **Zimmerman, J**. 2015. How are landscape complexity and vegetation structure related across an agricultural frontier in the subtropical Chaco, NW Argentina? ***Journal of Arid Environments*** (in press)
11.	Rojas-Sandoval, J., **E. J. Meléndez-Ackerman**, J.Fumero-Cabán, M. García-Bermúdez, J. Sustache , S. Aragón, M. Morales-Vargas, G. Olivieri and D. S. Fernández. "10-year assessment of ungulates exclusion in the dry forest of Mona Island: understory vegetation responses" *Caribbean Naturalist* In press .
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B. NON-PEER REVEWED PUBLICATIONS BY YEAR
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40. **Ortiz-Zayas, JR.** January 2010. Luquillo Schoolyard LTER, Internado de Investigación Ecológica 20-22 de noviembre de 2009. Video documentary. Institute for Tropical Ecosystem Studies, University of Puerto Rico, Río Piedras.

TABLE 3.7.F.2 PROGRAM PRESENTIONS

2015
1. Brokaw, N., S. Ward, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, T. Beach, F. Valdez, J. Pagán. "Research Needs in the Maya Forest." Annual Meeting of the Association of American Geographers; Chicago, Illinois; April 2015
2. Ward, S., N. Brokaw, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, T. Beach, F. Valdez, J. Pagán. "Environmental Heterogeneity Underlies the Maya Forest". Annual Meeting of the Association of American Geographers; Chicago, Illinois; April 2015
3. Santiago, V., I. Robles, X. Pérez, L Diaz, L. Roberson, Comparison of QuEChERS and Soxhlet Methods for Extraction of Contaminants (presented by V. Santiago), Emerging Researchers National (ERN) Conference in STEM Washington, D.C.
4. 2-4 Oct 2015, L. Roberson and C.P. Ruiz. PRCEN Education and Outreach, 2015 PRCEN Annual Retreat, San Juan, PR, oral
5. 2-4 Oct 2015, M. Marty, L. Roberson and G. A. Yudowski. A chemical approach to mitigate coral bleaching. 2015 PRCEN Annual Retreat, poster
6. 2-4 Oct 2015, N. Martinez, V. Arana and L. Roberson. Impact of thermal stress in Photosynthesis and Growth on the adult and larvae stages in Porites astreoides. 2015 PRCEN Annual Retreat, October 2015 poster
7. 2-4 Oct 2015, M. Sánchez-García, S. Zottoli, L. Diaz-Vazquez, and L. Roberson. Estuarine fishes as bio-indicator for changes in environmental conditions and emerging contaminants. 2015 PRCEN Annual Retreat, October 2015 poster
8. 2-4 Oct 2015, V.Santiago, Y. Duquesne-Maldonado, A. Rodríguez-Hernández, C. P. Ruiz-Diaz, X. Pérez, L. Díaz and L. Roberson. Annual Variation in Persistent Organic Compounds in the San Juan Bay Estuary. 2015 PRCEN Annual Retreat, October 2015 poster
9. 2-4 Oct 2015, C. González Ramos, C.P. Ruiz-Diaz and R. Rodríguez, L. Roberson. Coral community characterization in La Parguera, Puerto Rico. 2015 PRCEN Annual Retreat, October 2015 poster

10. 2-4 Oct 2015, F. García-Robles, M. Sánchez-García and L. Roberson. Water quality in the San Juan Bay Estuary from 2011 to 2015. 2015 PRCEN Annual Retreat, October 2015 poster
11. 2-4 Oct 2015, A. Rodriguez, L. Diaz-Vazquez, and L. Roberson. Uptake of contaminants of emerging concern in the blue crab, Callinectes sapidus, 2015 PRCEN Annual Retreat, October 2015 oral
12. 5 Aug 2015, V. Santiago, Y. Duquesne-Maldonado, A. Rodríguez-Hernández, C. P. Ruiz-Diaz, X. Pérez, L. Díaz and L. Roberson. Annual Variation in Persistent Organic Compounds in the San Juan Bay Estuary. Simposio de investigación de verano: El Verde REU y PRCEN, UPR Río Piedras, poster
13. 5 Aug 2015, C. González Ramos, C.P. Ruiz-Diaz and R. Rodríguez, L. Roberson. Coral community characterization in La Parguera, Puerto Rico. Simposio de investigación de verano: El Verde REU y PRCEN, UPR Río Piedras, poster
14. 5 Aug 2015, F. García-Robles, M. Sánchez-García and L. Roberson. Water quality in the San Juan Bay Estuary from 2011 to 2015. Simposio de investigación de verano: El Verde REU y PRCEN, UPR Río Piedras, poster
15. 14 Mar 2015, Y. Duquense, A. Rodriguez, C.P. Ruiz, L. Diaz, and L. Roberson, Annual variation in the presence and distribution of phthalates in the San Juan Bay estuary, 2015 JR Tech/PRISM Annual Meeting, UPR Rio Piedras, PR, oral
16. 14 Mar 2015 I. Rivera, A. Rodriguez, C.P. Ruiz, L. Diaz, and L. Roberson, Annual variation in the presence of contaminants of emerging concern in the San Juan Bay estuary, 2015 JR Tech/PRISM Annual Meeting, UPR Rio Piedras, PR, oral
17. 14 Mar 2015 V. Santiago, A. Rodriguez, C.P. Ruiz, L. Diaz, and L. Roberson, Annual variation in persistent organic compounds in the San Juan Bay Estuary, 2015 JR Tech/PRISM Annual Meeting, UPR Rio Piedras, PR, oral
18. Odonata of Puerto Rico: an updated list and historical records. A. Ramírez & P. E. Gutiérrez-Fonseca. International Congress of Odonatology, La Plata, Argentina. Nov. 2015. Oral presentation.
19. Advances on the larval taxonomy of the genus Epigomphus Hagen, 1854 (Anisoptera: Gomphidae). R. Novelo Gutiérrez, A. Ramírez & D. L. Delgado Camilo. International Congress of Odonatology, La Plata, Argentina. Nov. 2015. Oral presentation.
20. Larval Odonata of Mesoamerica and the Caribbean: state of knowledge. D. L. Delgado Camilo & A. Ramírez. International Congress of Odonatology, La Plata, Argentina. Nov. 2015. Poster presentation.
21. Natural history of Telebasis vulnerata (Hagen, 1861) (Zygoptera: Coenagrionidae) in Puerto Rico. P. E. Gutiérrez-Fonseca, J. Sánchez Ruiz & A. Ramírez. International Congress of Odonatology, La Plata, Argentina. Nov. 2015. Poster presentation.
22. Biodiversity of Odonata of Rio Piedras, an urban area of San Juan, Puerto Rico. A. Ramírez & P. E. Gutiérrez-Fonseca. International Congress of Odonatology, La Plata, Argentina. Nov. 2015. Poster presentation.
23. Insights from a 25+ year dataset in lowland Costa Rica: Effects of hydrologic connectivity from the mountains to the sea on stream ecosystems of an inland protected area. A. Ramírez, C.M. Pringle, G.E. Small, B. Bixby, J.H. Duff, M. Ardón, A.P. Jackman, M. Snyder, C. Ganong, P.E. Gutiérrez-Fonseca, F.J. Triska. Annual meeting of the Ecological Society of America, Baltimore, Aug 2015. Oral.
24. The effect of urbanization on the web spinning behaviors of riparian orb-weaving spiders. J. Sanchez, S. Kelly, A. Ramírez. Society for Freshwater Sciences annual meeting, Milwaukee, MN, May 2015. Oral presentation.

25. Subsidies from aquatic to riparian consumers along an urban gradient in a tropical watershed – a stable isotope analysis. S. Kelly, A. Ramírez. Society for Freshwater Sciences annual meeting, Milwaukee, MN, May 2015. Oral presentation.
26. Disturbance as a key factor in understanding macroinvertebrate assemblage dynamics in neotropical streams. A. Ramírez. Society for Freshwater Sciences annual meeting, Milwaukee, MN, May 2015. Oral presentation.
27. Insect morphology reflects environmental variability in tropical lowland streams, Costa Rica. P. E. Gutiérrez-Fonseca, A. Ramírez. Society for Freshwater Sciences annual meeting, Milwaukee, MN, May 2015. Poster presentation.
28. The food web of a tropical island stream. K. Rosas, C. Colon-Gaud, A. Ramírez, T. Anderson. Society for Freshwater Sciences annual meeting, Milwaukee, MN, May 2015. Poster presentation.
29. Factors controlling macroinvertebrate assemblages in two streams with contrasting macroconsumer abundances. B. Vazquez, A. Ramírez. Society for Freshwater Sciences annual meeting, Milwaukee, MN, May 2015. Poster presentation.
30. Importancia de los ecosistemas ribereños en la conservación de la biodiversidad en un paisaje fragmentado. Vázquez, G. et al. 5to Congreso Mexicano de Ecología. San Luis Potosí, México. Abril 2015. Poster.
31. Participative biomonitoring in Latin America: new tools and opportunities. Rodriguez-ortiz, N. M., Walteros-Rodríguez, J. M., Ramos, C., Ramírez, A. Annual meeting of the Association for Science in Limnology and Oceanography. Spain. February 2015. Oral.
32. Urban Green Infrastructure and Relevance to Sustainability Science – School of Architecture UPRRP, Invited Lecturer Klumb House Seminar, March 25, 2015.
33. Urban Green Infrastructure and Relevance to Sustainability Science – Graduate School of Planning, UPRRP -Invited Lecturer, Graduate School of Planning, Environmental Economics Class – April, 2, 2015.
34. Socio-economic drivers of green infrastructure at the household scale and relevance to sustainability science. Invited Speaker, Biology Week Seminar – UPR Mayaguez April 19, 2015.
35. Infraestructura verde en la ciudad y sus servicios ecosistemicos – Invited Panelist Nature doing Work symposium, School of Architecture, Polytechnic University, April 21, 2015.
36. Infraestructura verde en la ciudad y sus servicios ecosistémicos: intereseccion entre las ciencias sociales y naturales, Community Psychology Panel on Interdisciplinary work between the Natural and the Social Sciences. Red Graduada April 22, 2015.
37. Cambio climático y polinización. Escuela Ecológica de Caguas – Abril 28, 2015.
38. Perceived Benefits and Problems of Residential Trees in an urban watershed in Puerto Rico. XI Congreso Cientifico Internacional, San To Domingo Republica Dominicana Jun 10-12, 2015
39. Sofía Olivero and Elvia Meléndez-Ackerman. Presentaciones: Perceived Ecosystem Services and Disservices of Residential Green Infrastructure within the Río Piedras Watershed. The 5th World Sustainability Forum. Basel Switzerland Sept 7-9, 2015.
40. Merced-Hoyos JC, A. Bonilla, Elvia Melendez-Ackerman, Mervin Perez, Nicolas Correa et al. Implication of demographic data of rediscovering Eugenia fajardensis(Myrtaceae), a possibly endangered species. ESA Annual meeting Baltimore August 10-15
41. Ortiz-Zayas, J.R. Interacciones humanas en el ambiente hidrográfico de Puerto Rico. Presentación Oral. XI Congreso de Investigación Científica. Ministerio de Educación

Superior, Ciencia y Tecnología. Santo Domingo, República Dominicana. 10-12 de junio de 2015. Universidad Autónoma de Santo Domingo.
42. O. L. Mayol-Bracero Berkeley – August 2015.
43. Mayol-Bracero, Olga L. Aerosols and Climate, Latin American and Caribbean Aerosol Measurements School: From measurements technologies to applications La Paz, Bolivia, June 22, 2015. Oral
44. Torres-Delgado, E., C. J. Valle-Diaz, D. Baumgardener, W. H. McDowell, G. González, O. L. Mayol-Bracero, Understanding the effect of African dust particles on cloud chemistry and microphysics in a tropical montane cloud forest in the Caribbean. Latin American and Caribbean Aerosol Measurements School: From measurements technologies to applications, La Paz, Bolivia, 24 June 2015. Poster
45. Martínez Cortés, A. M., G. Mocnik, A. D. A. Hansen, O. L. Mayol-Bracero. A study of Black Carbon concentrations over Puerto Rico, presented at the Latin American and Caribbean Aerosol Measurements School: from measurements technologies to applications, La Paz, Bolivia, 24 June 2015. Poster
46. Mayol-Bracero, Olga L. Properties and Impacts of Long-range Transported African Dust on Puerto Rico, Symposium on Airborne Dust, Climate Change, and Human Health, Miami, Florida, May 20, 2015. Oral
47. Mayol-Bracero, Olga L. Atmospheric Chemistry and Aerosols Research Group at UPR-RP, AMP UPRRP, Puerto Rico, May 1, 2015. Oral
48. Formenti, P., C. Denjean, K. Desboeufs, B. Laurent, S. Chevaillier, M. Maillé, M. Cazaunau, P. Vallejo, M. Quiñones, I.E. Gutierrez-Molina, F. Cassola, P. Prati, E. Andrews, J. Ogren, O. L. Mayol-Bracero, Size distribution and optical properties of long-range transported African dust, Abstract EGU2015-7702, presented at 2015 General Assembly, EGU, Vienna, Austria, 12-17 Apr 2015. Oral
49. Denjean, C., S. Caquineau, K. Desboeufs, B. Laurent, M. Quiñones, P. Vallejo, O. L. Mayol-Bracero, P. Formenti, Does the long-range transport of African mineral dust across the Atlantic enhance their hygroscopicity?, Abstract EGU2015-7790, presented at 2015 General Assembly, EGU, Vienna, Austria, 12-17 Apr 2015. Oral
50. Desbeoufs,K., . Formenti; S. Triquet; B. Laurent; C. Denjean; I. E. Gutteriez-Moreno; O. L. Mayol-Bracero, Characterisation of nutrients wet deposition under influence of Saharan dust at Puerto-Rico in Caribbean Sea, presented at 2015 General Assembly, EGU, Vienna, Austria, 12-17 Apr 2015. Poster
51. Laurent, B., P. Formenti, K. Desboeufs, J. Vincent, C. Denjean, G. Siour, and O. L. Mayol-Bracero, Modeling of intercontinental Saharan dust transport: What consequences on atmospheric concentrations and deposition fluxes in the Caribbean? presented at 2015 General Assembly, EGU, Vienna, Austria, 12-17 Apr 2015. Poster
52. Torres-Delgado, E., C. J. Valle-Diaz, D. Baumgardener, W. H. McDowell, G. González, O. L. Mayol-Bracero, Rain chemistry and cloud composition and microphysics in a Caribbean tropical montane cloud forest under the influence of African dust, presented at the European Geosciences Union General Assembly 2015, EGU, Vienna, Austria, 16 April 2015. Poster
53. Vallejo, P., P. Fprmenti, K. Desboeufs, M. Quiñones, S. Chevaillier, S. Santos, E. Andrews, J.A. Ogren, O. L. Mayol-Bracero, Chemical Composition of the Aerosol Fine Fraction during African Dust Events as part of the Dust-ATtACk Experiment in the Caribbean Region, Abstract EGU2015-14063, presented at 2015 General Assembly, EGU, Vienna, Austria, 12-17 Apr 2015. Poster
54. Torres-Delgado, E., C. J. Valle-Diaz, D. Baumgardener, W. H. McDowell, G. González, O. L. Mayol-Bracero, Impact of African dust on cloud and rain chemistry and cloud microphysics in Caribbean cloud forest, presented at the 35rd Puerto Rico

Interdisciplinary Scientific Meeting 50th Junior Technical Meeting, Universidad de Puerto Rico, Río Piedras Campus, San Juan, Puerto Rico, 29 Mar 2015. Poster

55. Martínez Cortés, A. M., O. L. Mayol-Bracero. A study of equivalent black carbon concentrations over Puerto Rico using a light transmission method, presented at the 35th Puerto Rico Intedisciplinary Scientific Meeting (PRISM), 50th Junior Technical Meeting, University of Puerto Rico-RP, Puerto Rico, March 2015. Poster
56. De La Rosa-Acosta, M. Derilus, D., Morales-Medina, M., Fortuné, J., and Gervais, G.W. Comparison of Different Methods to Measure Organic Matter Content in Feedstock and Effluents of a Saline Anaerobic Bioreactor for Biogas Production. Poster presentation at the annual undergraduate research symposium, Universidad del Este, Carolina, Puerto Rico. Oct 23, 2015.
57. Fortuné, J., Forestil, A. & Gervais, G.W. "Nutrient flows and recovery in multistage anaerobic bioreactors fed with Sargassum spp." Poster Presentation at the 50th ACS Junior Technical Meeting & 35th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico, Rio Piedras campus, PR, March 14, 2015.
58. Gao, Q. and Yu, M. Aug. 10 – 14, 2015. Presentation at the 100th Annual Meeting of the Ecological Society of America, Baltimore, MD. Ecohydrological dynamics of tropical watersheds in response to land use and climate changes
59. Davila Casonova, D. and Yu, M. April 20-24, 2015. Poster presentation at the Annual Science Meeting of NASA Land Cover and Land Use Change Program and 2015 NASA Carbon Cycle & Ecosystems Joint Science Workshop, College Park, MD. Understanding the past to predict the future: sea level rise, wetland migration and impacts to the habitat of a critically endangered frog
60. Villanueva Cubero, L. and Yu, M. April 20-24, 2015. Poster presentation at the Annual Science Meeting of NASA Land Cover and Land Use Change Program and 2015 NASA Carbon Cycle & Ecosystems Joint Science Workshop, College Park, MD. Policy shifts and their impacts on coastal wetlands protection
61. Gao,Q. and Yu, M. April 20-24, 2015. Poster presentation at the Annual Science Meeting of NASA Land Cover and Land Use Change Program and 2015 NASA Carbon Cycle & Ecosystems Joint Science Workshop, College Park, MD. Ecohydrological dynamics of tropical watersheds in response to land use and climate changes
62. Gao,Q. and Yu, M. April 20-24, 2015. Poster presentation at the Annual Science Meeting of NASA Land Cover and Land Use Change Program and 2015 NASA Carbon Cycle & Ecosystems Joint Science Workshop, College Park, MD. Discerning the fragmentation dynamics between tropical forest and wetland in the context of reforestation, urban sprawl, and policy change

2014

63. Brokaw, N., S. Ward, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, C. Doyle, T. Beach, F. Valdez, J. Pagán. "The Ancient Maya and the Modern Forest". Internation Union of Forestry Reseach Organizations; Salt Lake City, Utah; October 2014.
64. Roberson, L. and J. Rosenthal, A comparative transcriptomics approach to understanding calcification in corals Association for the Sciences of Limnology and Oceanography (ASLO) Annual Meeting, Honolulu, HI, Feb 22-28, 2014 (Abstract ID: 17730), http://www.eposters.net/poster/a-comparative-transcriptomics-approach-to-understanding-calcification-in-corals
65. Sanchez, M., S. Zottoli, L. Diaz, and L. Roberson, Use of Lutjanus jocu (dog snapper) as a bioindicator of emerging contaminants and changes in environmental condition, ASLO Annual Meeting, Honolulu, HI, Feb 22-28, 2014 (Abstract ID: 16942), http://www.eposters.net/pdfs/lutjanus-jocu-dog-snapper-as-a-bio-indicator-of-emerging-contaminants-and-changes-in-environmental.pdf

66. Marty, M., L. Roberson, and G. Yudowsky, A chemical approach to prevent coral bleaching, ASLO Annual Meeting, Honolulu, HI, Feb 22-28, 2014 (Abstract ID: 17447), http://www.eposters.net/pdfs/a-chemical-approach-to-prevent-coral-bleaching.pdf
67. Perez, X., L. Diaz, and L. Roberson, Spatial and temporal distribution of contaminants in the San Juan Bay Estuary, PR, ASLO Annual Meeting, Honolulu, HI, Feb 22-28, 2014, (Abstract ID: 17695)
68. Perez, M., J. Bas. L. Diaz, and L. Roberson, Studying the potential for bioaccumulation of heavy metals and organic pollutants in oysters and algae from the San Juan Bay Estuary, ASLO Annual Meeting, Honolulu, HI, Feb 22-28, 2014 (Abstract ID: 17821), http://www.eposters.net/pdfs/studying-the-potential-for-bioaccumulation-of-heavy-metals-and-organic-pollutants-in-oysters-and.pdf
69. Roberson, L. and M. Angulo, Targeting first year students to increase use of student services, 6th Annual AHSIE HSI/Title V Best Practices Conference, Los Angeles, CA, March 16-19, 2014
70. Oct 2-4, 2014 M. Sánchez-García, S. Zottoli, L. Diaz-Vazquez, and L. Roberson. Estuarine fishes as bio-indicators of harmful environmental conditions, 2014 PRCEN Annual Retreat, Hotel El Convento, San Juan, PR, poster
71. Oct 2-4, 2014 M. Marty, L. Roberson and G. A. Yudowski. A chemical approach to prevent coral bleaching ..2014 PRCEN Annual Retreat, Hotel El Convento, San Juan, PR, oral
72. Oct 2-4, 2014 N. Martinez, and L. Roberson Effect of temperature and salinity on photosynthesis in the coral Porites astreoides, 2014 PRCEN Annual Retreat, Hotel El Convento, San Juan, PR, poster
73. Oct 2-4, 2014 Perez, M., J. Bas, L. Diaz, and L. Roberson, Studying the potential of heavy metals and organic pollutants in oysters and algae from the San Juan Bay Estuary, 2014 PRCEN Annual Retreat, Hotel El Convento, San Juan, PR, poster
74. Oct 2-4, 2014 L. Roberson and J. Rosenthal, A comparative transcriptomics approach to understanding calcification in corals 2014 PRCEN Annual Retreat, Hotel El Convento, San Juan, PR, oral
75. 26 Sep 2014, M. Sánchez-García, S.J. Zottoli, L. Díaz, and L. Roberson, Estuarine fishes as bio-indicators of harmful environmental conditions, Simposio de Investigación Estudiantil Ambientis, University of Turabo, Gurabo, PR, poster
76. 26 Sep 2014, N. Martinez and L. Roberson Effect of temperature and salinity on photosynthesis in the coral Porites astreoides, Simposio de Investigación Estudiantil Ambientis, University of Turabo, PR, poster
77. 26 Sep 2014, M. Marty, G. Yudowsky and L. Roberson, A chemical approach to prevent coral bleaching, Simposio de Investigación Estudiantil Ambientis, University of Turabo, PR, poster
78. 11 Sep 2014, L. Roberson. Contaminants of Emerging Concern in San Juan Bay Estuary and impacts on associated organisms, 2014 PR Caribbean Science Consortium/Non-PRASA Systems Workgroup Joint Workshop, UPR Río Piedras, PR (invited), oral
79. 11 Sep 2014, L. Roberson. General Science Session Moderator, 2014 PR Caribbean Science Consortium/Non-PRASA Systems Workgroup Joint Workshop, UPR Río Piedras, PR (invited), oral
80. Apr 24, 2014 Perez, M., J. Bas. L. Diaz, and L. Roberson, Carbohydrate, Fat, Protein and Metal Analysis in Cultured Gracilaria, A FEW Ideas for the New Millennium, UPR Río Piedras, San Juan, PR, poster

81. Mar 15, 2014 N. Martinez and L. Roberson, Effect of temperature and salinity on photosynthesis in the coral Porites astreoides (presented by N. Martinez) Junior Technical Meeting and the Puerto Rico Interdisciplinary Scientific Meeting , UPR Cayey, PR, oral
82. Mar 13, 2014 N. Martinez and L. Roberson, Effect of temperature and salinity on photosynthesis in the coral Porites astreoides (presented by N. Martinez), Caribbean Regional Association for Coastal Ocean Observing General Assembly, Club Náutico de San Juan, San Juan, PR, poster
83. Mar 13, 2014 Perez, X., L. Diaz, and L. Roberson, Spatial and temporal distribution of emerging contaminants in the San Juan Bay Estuary, Puerto Rico (presented by X. Perez) Caribbean Regional Association for Coastal Ocean Observing General Assembly, Club Náutico de San Juan, San Juan, PR, poster
84. Mar 13, 2014 M. Sánchez-García, S.J. Zottoli, L. Díaz, and L. Roberson, Estuarine fishes as bio-indicators of harmful environmental conditions, Caribbean Regional Association for Coastal Ocean Observing General Assembly, Club Náutico de San Juan, San Juan, PR, poster
85. 20 Feb 2014 Roberson, L., Impact of environmental conditions on algal productivity, co-products and production of biofuel, US Department of Defense Site Visit, UPR Río Piedras, San Juan, PR, oral
86. Jan 21-24, 2014, Perez, X., L. Diaz, and L. Roberson, Spatial and temporal distribution of emerging contaminants in the San Juan Bay Estuary, Puerto Rico, Coastal Oceans and Shelf Seas Task Team International Coordination Workshop, Rincon, PR (invited), oral
87. Dinámica metabólica del perifiton de ríos de la cuenca alta del río La Antigua, Veracruz, México. Ramírez-Babativa, D., Vázquez, G., Ramírez, A., García-Franco, J., Caballero, M. VI Congreso Nacional de Limnología. Universidad Nacional de México, México DF. Noviembre 2014. Poster
88. A case for developing long-term macroinvertebrate assemblage datasets in headwater streams at the LUQ-LTER, Puerto Rico. Rosas, K.G., Colón-Gaud, J.C., Ramírez, A. Join Aquatic Sciences Meeting, Portland, OR. May 2014. Oral
89. Global differences in urbanization and stream ecology: a synthesis. Roy, A. H., Capps, K.A., Jones, K. L., Parr, T.B., Ramírez, A., Smith, R.F., Walsh, C.J., Wenger, S. J. Join Aquatic Sciences Meeting, Portland, OR. May 2014. Oral
90. Quantifying carbon losses from tropical watersheds: the effects of urbanization on organic and inorganic carbon flux. Koenig, L.E., Ramírez, A., McDowell, W.H. Join Aquatic Sciences Meeting, Portland, OR. May 2014. Oral
91. Consequences of climate-driven changes in precipitation: shifts in seasonal pH regime and nutrient concentrations in neotropical rainforest streams. Ganong, C.N., Small, G.E., Duff, J.H., Ardón, M., Ramírez, A., Triska, F.J., Pringle, C.M. Join Aquatic Sciences Meeting, Portland, OR. May 2014. Oral
92. Assessing macroinvertebrate growth rates in the Rio Piedras, a tropical urban stream, Puerto Rico. Sánchez-Ruiz, J.A., Gutiérrez-Fonseca, P., Rosas, K.G., Ramírez, A. Join Aquatic Sciences Meeting, Portland, OR. May 2014. Poster
93. Food webs topology and biomass flow in a tropical urban stream. Gutiérrez-Fonseca, P. Ramírez, A. Join Aquatic Sciences Meeting, Portland, OR. May 2014. Poster
94. Adaptación del Protocolo de Evaluación Visual de Quebradas para la Isla Tropical de Puerto Rico: El caso de la Región Noreste. N.M. Rodríguez Ortiz y A. Ramírez. 2ndo Congreso Latino Americano de Macroinvertebrados de Agua Dulce. Queretaro, Mexico. Abril 2014. Oral

95. Estudios sobre macroinvertebrados acuáticos en América Latina: avances recientes y direcciones futuras. A. Ramírez, P.E. Gutiérrez-Fonseca. 2ndo Congreso Latino Americano de Macroinvertebrados de Agua Dulce. Queretaro, Mexico. Abril 2014. Oral

96. Dinámica a largo plazo de las variables fisicoquímicas y sus efectos sobre la estructura y composición del ensamblaje de macroinvertebrados en ríos de zonas bajas en Costa Rica. P.E. Gutiérrez-Fonseca, C.M. Pringle, A. Ramírez. 2ndo Congreso Latino Americano de Macroinvertebrados de Agua Dulce. Queretaro, Mexico. Abril 2014. Oral

97. Base Energética Alóctona o Autóctona de la ed Alimentaria de los Insectos Acuáticos en dos Arroyos de Bosque Nuboso del Centro de Veracruz, México. P. Ernesto García, R. Novelo-Gutiérrez, G. Vázquez y A. Ramírez. 2ndo Congreso Latino Americano de Macroinvertebrados de Agua Dulce. Queretaro, Mexico. Abril 2014. Oral

98. Biodiversidad y Productividad de los Macroinvertebrados Acuáticos de un Río Urbano Tropical, Puerto Rico. A. Ramírez, P.E. Gutiérrez-Fonseca, K. Wagner, J. Sánchez, K. Rosas, B. Vázquez. 2ndo Congreso Latino Americano de Macroinvertebrados de Agua Dulce. Queretaro, Mexico. Abril 2014. Poster

99. Suárez, M. et al. Rediscovering Eugenia fajardensis: Building a research infrastructure for a rare and possibly endangered species. 49th ACS Junior Technical Meeting, 34th Puerto Rico Interdisciplinary Scientific Meeting, 29 de marzo de 2014, University of Puerto Rico, Cayey Campus

100. Meléndez-Ackerman, E.J*. Invited lecture for Island Biology Course, Undergraduate Program Biology University of PR Rio Piedras, San Juan PR March 2014

101. How do people get their yard plants?. Khrisia Torres*, Sofia Olivero, Angélica Erazo, José Fontanez, Elizabeth Díaz, Karla Torres, Nicolás Correa y Elvia Meléndez-Ackerman, Segundo Encuentro Subgraduado de Investigación y Creación (SESIC), Iniciativas de Investigación y Actividad Creativa Subgraduada, 3 y 4 abril de 2014, Hotel Condado Plaza, San Juan

102. How do people get their yard plants? Plants sources in a urban environment. Khrisia Torres*, Sofia Olivero, Angelica Erazo, Jose Fontanez, Elizabeth Diaz, Karla Torres, Nicolas Correa y Elvia Melendez-Ackerman, 49th ACS Junior Technical Meeting, 34th Puerto Rico Interdisciplinary Scientific Meeting, 29 de marzo de 2014, University of Puerto Rico, Cayey Campus

103. Meléndez-Ackerman, E.J*. Invited lecture for Invasion Biology Course Undergraduate Program Biology, University of PR Rio Piedras, San Juan PR April 2014

104. Mervin E. Pérez and Elvia Meléndez-Ackerman . XXIX Symposium of Flora and Fauna from the Caribbean. Breeding system and pollination of Gesneria pauciflora a threatened caribbean species: Brief island reproductive syndrome analysis in Gesneriaceae species

105. Mervin E. Pérez and Elvia Meléndez-Ackerman. 2014 ESA. Suarez, M et al. Rediscovering Eugenia fajardensis: Building a research infrastructure for a rare and possibly endangered species. Sacramento CA August 2014

106. . Effects of hurricane disturbance and feral goat herbivory on the structure of a Caribbean dry forest. Julissa Rojas-Sandoval, Elvia J. Meléndez-Ackerman, José Fumero-Cabán, Miguel A. García-Bermúdez, José Sustache, Susan Aragón, Mariely Morales & Denny S. Fernández. 2do. Congreso de ÁreasNaturales Protegidas, The Nature Conservancy and DRNA, Conservatorio de Música de Puerto Rico, San Juan. 28-29 de Agosto del 2014.

107. Ortiz-Zayas, J.R. Los embalses de Puerto Rico: desarrollo histórico, impactos ambientales y retos para su manejo sustentable. Seminario del Departamento de Biología. 25 de noviembre de 2014.

108. Ortiz-Zayas, J.R. and Hernández, O. Proyecto Interdisciplinario para mejorar el aprendizaje de las matemáticas y las ciencias (PIMAMC). Actividad de Cierre de la Academia Sabatina. 12 April 2014. Escuela de Educación, Universidad de Puerto Rico, Recinto de Rio Piedras.

109. Ortiz-Zayas, J.R. Hacia un manejo sustentable del agua en Puerto Rico: el caso del Rio Fajardo. Academia Sabatina. Proyecto Interdisciplinario para Mejorar el Aprendizaje de las Matemáticas y las Ciencias. 29 March 2014. Escuela de Educación, Universidad de Puerto Rico, Recinto de Rio Piedras.

110. Ortiz-Zayas, J.R. Sistemas no convencionales de tratamiento de aguas en Puerto Rico. Academia Sabatina. Proyecto Interdisciplinario para Mejorar el Aprendizaje de las Matemáticas y las Ciencias. 1 March 2014. Escuela de Educación, Universidad de Puerto Rico, Recinto de Rio Piedras.

111. O. L. Mayol-Bracero AGU 2014

112. Valle-Díaz, C.J., E. Torres-Delgado, T. Lee, J.L. Collett Jr., W.H. McDowell, L.A. Cuadra-Rodríguez, K.A. Prather, O.L. Mayol-Bracero, Impact of long-range transported African dust events on cloud chemistry at a Caribbean tropical montane cloud forest. Abstract S3.3, presented at 13th Quadrennial iCACGP Symposium - 13th IGAC Science Conference on Atmospheric Chemistry, Natal, Brazil, 22-26 Sep 2014. Poster

113. Torres-Delgado, E., C. J. Valle-Díaz, D. Baumgardner, W. H. McDowell, O. L. Mayol-Bracero, Rain chemistry and cloud composition and microphysics in a tropical cloud forest under the influence of African dust, presented at the 13th Quadrennial ICACGP Symposium 13th IGAC Science Conference on Atmospheric Chemistry, Natal, Brazil 23 Sep 2014. Poster

114. O. L. Mayol-Bracero Jr Tech Presentations 2014

115. Quiñones, M., O. L. Mayol-Bracero, P. Vallejo, I. Gutiérrez, E. Andrews, J. A. Ogren, and P. Formenti, African dust impact on the size distribution of aerosols in the Caribbean: Observations from Atmospheric Observatory in Cabezas de San Juan, Puerto Rico, Abstract S149. 6th Symposium on Aerosol-Cloud-Climate Interactions, 94th Annual Meeting, American Meteorological Society, Atlanta, Georgia, 2-6 Feb 2014. Poster

116. DeMott, P. J., T. C. Hill, M. J. Ruppel, K. A. Prather; D. B. Collins, J. L. Axson, T. Lee, C. Y. Hwang; R. C. Sullivan, G. R. McMeeking, R. Mason, A. K. Bertram, O. L. Mayol-Bracero, and E. R. Lewis (2014). Investigations of Marine Ice Nucleating Particles. Abstract 10.1. 6th Symposium on Aerosol-Cloud-Climate Interactions, 94th Annual Meeting, American Meteorological Society, Atlanta, Georgia, 2-6 Feb 2014. Oral.

117. Gervais, G.W. ¨Do We Have Enough Marine Real Estate to Produce Biofuels for Puerto Rico?" Annual Meeting of the Puerto Rico chapter of AAAS. Universidad del Turabo, Caguas, PR, 20 September, 2014.

118. Derilus, Dieunel, Massey E.S. Gervais, G.W & Louimé, C. ¨Characterization of the structure and dynamics of microbial communities in seawater anaerobic bioreactors using 454 pyrosequencing of 16s ribosomal RNA¨ Poster Presentation at the 4th International Conference on Algal Biomass, Biofuels & Bioproducts. Santa Fe, NM. June 15-18, 2014.

119. Derilus, D., Massey, S.E. and Gervais, G. ¨'Gaia in a bottle' – the metagenomics of biogas reactors ¨ Poster Presentation at the Society for Molecular Biology and Evolution meeting. San Juan, PR, June 8-12, 2014.

120. Derilus, Dieunel, Massey E.S. Gervais, G.W. ¨Characterization of the structure and the dynamics of microbial communities in saltwater anaerobic bioreactors using 454 pyrosequencing of 16s ribosomal RNA¨. Poster Presentation at the 49th ACS Junior Technical Meeting & 34rd Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico, Cayey, PR, March 29, 2014.

121. Gervais, G.W., Fortuné, J., Derilus, D., & Forestil, A. ¨Marine Biomass: Biofuel of Choice for the Caribbean?¨ EcoEco Alternatives. Sociedad Mesoamericana de Economía Ecológica. San José, Costa Rica. March 4 - 8, 2014.

122. Yu, M. and Gao, Q. Nov. 1 – 6, 2014. Poster presentation at the 7th National Summit on Coastal and Estuarine Restoration and 24th Biennial Meeting of The Coastal Society, Washington, DC. Distribution Patterns of Tropical Wetlands in the course of Reforestation and Urbanization.

123. Villanueva Cubero, L. and Yu, M. Nov. 1 – 6, 2014. Poster presentation at the 7th National Summit on Coastal and Estuarine Restoration and 24th Biennial Meeting of The Coastal Society, Washington, DC. Legal and Policy Framework as it Pertains to Puerto Rico Coastal Vegetative Wetlands.

124. Wang, C., Wang, X., Gao, Q., and Yu, M. Sep. 26, 2014. Poster presentation at the Ambientis Symposium at University of Turabo, PR. Land Cover and Land Use Changes in the Agro-Pastoral Transition Zone in 2001 – 2013.

125. Wang, X., Wang, C., Yu, M., and Gao, Q. Sep. 26, 2014. Poster presentation at the Ambientis Symposium at University of Turabo, PR. Detecting Vegetation Phenology along precipitation and temperature gradients using time-series MODIS 250 m EVI Data.

126. Villanueva Cubero, L. and Yu, M. Sep. 26, 2014. Oral presentation at the Ambientis Symposium at University of Turabo, PR. Legal and Policy Framework Pertaining Puerto Rico Coastal Vegetative Wetlands.

127. Gao, Q. and Yu, M. Aug. 9 – 15, 2014. Poster presentation at the Annual Meeting of the Ecological Society of America, Sacramento, CA. Land pattern dynamics of a tropical island in the context of urban sprawl and forest regrowth.

2013

128. Brokaw, N., S. Ward, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, C. Doyle, T. Beach, F. Valdez, J. Pagán. "Long-Term Change in the Maya forest: Human-Environment Interactions." Conference on Forest Management; Chetumal, Mexico; July 2013.

129. Brokaw, N., S. Ward, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, T. Beach, F. Valdez, J. Pagán. "The Ancient Maya and the Modern Forest". Annual Meeting of the Association of American Geographers; Los Angeles, California; April 2013.

130. Nieves, D., X. Perez, L. Diaz, M. Miller, and L. Roberson, Impact of 1,4 dichloro benzene on the Callinectes sapidus cardiac system, Emerging Researchers National (ERN) Conference in STEM, Washington, D.C., Feb 28 - Mar 2, 2013

131. Roberson, L. and L. Diaz, Impact of emerging contaminants on marine macroalgae, ASLO Annual Meeting, New Orleans, LA, Feb 19-24, 2013

132. Perez, X., L. Diaz, and L. Roberson, Presence and distribution of emerging contaminants in the San Juan Bay Estuary, PR (presented by X. Perez) Association for the Sciences of Limnology and Oceanography (ASLO) Annual Meeting, New Orleans, LA, Feb 19-24, 2013

133. Dec 7, 2013, Torres, S., M. Pastrano, Y. Pérez, X. Pérez, L. Díaz, L. Roberson, and M. W. Miller. Effects of Tributyl Phosphate (TBP) on the Cardiac Ganglion of the Blue Crab, Callinectes sapidus, 22nd Annual Puerto Rico Neuroscience Meeting, Ponce, PR, poster

134. 25 Sep 2013, Roberson, L., Moderator, Forum: UPR – Towards Sustainability, UPR Río Piedras, San Juan, PR, oral

135. 9 Sep 2013, Roberson, L., The Educational Initiative for a Sustainable Future at UPR, US DoEd Site Visit, UPR Río Piedras, San Juan, PR, oral

136. 6 Jun 2013, Roberson, L., Ongoing studies on local water quality in Puerto Rico, EPA Caribbean Science Consortium quarterly meeting, Ponce School of Medicine, Ponce, PR (invited), oral

137. 5 Jun 2013, Roberson, L., The role of environmental neuroscience in understanding and detecting impacts of emerging contaminants, EPA Region 2 Directors site visit, UPR Río Piedras, San Juan, PR, oral

138. 25 April 2013, Roberson, L., Panel on emerging issues in water quality, A FEW Ideas for the New Millennium, UPR Río Piedras, San Juan, PR, oral

139. 8 Mar 2013, L. Roberson, The role of environmental neuroscience in understanding and detecting impacts of emerging contaminants, Fish and Shellfish Consumption Advisory Group Kickoff Meeting, Department of Natural and Environmental Resources, San Juan, PR (invited), oral

140. Climate-driven acidification in lowland Neotropical streams: Insights from a 25-year dataset on ground water - surface water interactions. C.M. Pringle, G.E. Small, B. Bixby, A. Ramírez, J.H. Duff, M. Ardon, A.P. Jackman, M. Snyder, C.N. Ganong, P. Guttierez, & F.J. Triska. Annual meeting of the Ecological Society of America. Minneapolis, MN, August 2013. Oral presentation.

141. Carbon losses from tropical watersheds: Quantifying the effects of urbanization on concentrations of organic and inorganic carbon in coastal montane tropical rivers. W.H. McDowell, A. Ramírez, J.D. Potter, G. Gonzalez. Association for Tropical Biology and Conservation, San Jose, Costa Rica, June 2013. Oral presentation.

142. Long-term ecological research in lowland streams in Costa Rica: The importance of groundwater-surface water interactions on ecosystem dynamics. A. Ramírez, P.E. Gutiérrez-Fonseca, C.M. Pringle, M. Ardón, G.E. Small. Association for Tropical Biology and Conservation, San Jose, Costa Rica, June 2013. Oral presentation.

143. Long-term patterns of aquatic macroinvertebrate assemblages in lowland neotropical streams. P.E. Gutiérrez-Fonseca, A. Ramírez. Association for Tropical Biology and Conservation, San Jose, Costa Rica, June 2013. Poster presentation.

144. Stable isotope analysis of web-spinning spiders along a tropical headwater stream in Puerto Rico. S. P. Kelly, E. Cuevas, A. Ramírez. Society for Freshwater Sciences annual meeting, Jacksonville, FL, May 2013. Oral presentation.

145. Tropical stream ecology: a diversity of organisms and ecosystems. A. Ramírez. Society for Freshwater Sciences annual meeting, Jacksonville, FL, May 2013. Oral presentation.

146. Improving communication among aquatic researchers in Latin America: the Macrolatinos initiative. A. Ramírez. Society for Freshwater Sciences annual meeting, Jacksonville, FL, May 2013. Oral presentation.

147. Discharge as a driver of macroinvertebrate assemblage structure in urban tropical island streams. K.G. Rosas, A. Ramírez. Society for Freshwater Sciences annual meeting, Jacksonville, FL, May 2013. Oral presentation.

148. Effects of flood disturbance and episodic acidification events on aquatic macroinvertebrates in tropical lowland streams. P.E. Gutiérrez, A. Ramírez. Society for Freshwater Sciences annual meeting, Jacksonville, FL, May 2013. Poster presentation.

149. The Río Piedras watershed, Puerto Rico – a highly urbanized and diverse novel ecosystem. K. Wagner, A. Ramírez, K. Rosas, J. Seguinot-Barbosa, P. Mendez-Lazaro, A.E. Lugo. American Society of Limnology and Oceanography annual meeting, New Orleans, LA, February 2013. Oral presentation.

150. Land use effects on biodiversity and water quality at la Antigua watershed, Mexico. A. Ramírez, G. Vazquez, R. Novelo-Gutiérrez. American Society of Limnology and Oceanography annual meeting, New Orleans, LA, February 2013. Oral presentation.
151. Mervin E. Pérez and Elvia Meléndez-Ackerman Breeding system and pollination of Gesneria pauciflora urb. (Gesneriaceae): An endemic and threatened species of the Caribbean. Botany 2013: Celebrating Diversity! New Orleans, U.S.
152. Meléndez-Ackerman, E.J*. Invited lecture for Environmental Economics Class, Graduate School of Planning, University of PR Rio Piedras, San Juan PR October 2013
153. Meléndez-Ackerman, EJ*. Invited lecture for Sustainability Semianr, Graduate School of Public Health, University of PR medical Science Campus, San Juan PR February 2014.
154. Perceptions on Residential Green Infrastructure within the Rio Piedras Watershed. Olivero Lora, S*.; Meléndez-Ackerman, E. 2013.Local C4SI3: Ecosystem Services for Sustainability. Third Conference for Sustainability IGERTs, Portland, Oregon, USA September 26-29th, 2013
155. Local Perceptions on Residential Green Infrastructure within the Rio Piedras Watershed.. Olivero Lora, S.*; Meléndez-Ackerman, E. 2013. 2013 Annual Meeting: Developing the CLCC Strategic Conservation Framework, Caribbean Landscape Conservation Cooperative, Isla Verde, Puerto Rico December 12th, 2013
156. Meléndez-Ackerman, EJ*. 10. Evaluating the conservation status of the threatened cactus Harrisia portorriscensis in Mona Island Reserve. XXVII Simposio del Departamento de Recursos Naturales y Ambientales Las Especies Amenazadas y en Peligro de Extinción en Puerto Rico. Centro de Convenciones de PR Novembe 21,, 2013.
157. Ortiz-Zayas, J.R. Problematización e interdisciplinariedad en PIMAMC: Actividades y aprendizajes a través de la limnología. Academia Sabatina. Proyecto Interdisciplinario para Mejorar el Aprendizaje de las Matemáticas y las Ciencias. 23 November 2013. Escuela de Educación, Universidad de Puerto Rico, Recinto de Rio Piedras.
158. Ortiz-Zayas, J.R. El Rio Grande de Loíza: su embalse, historia, cuenca y limnología. Academia Sabatina. Proyecto Interdisciplinario para Mejorar el Aprendizaje de las Matemáticas y las Ciencias. 13 September 2013. Escuela de Educación, Universidad de Puerto Rico, Recinto de Rio Piedras.
159. Valle-Diaz, C.J., E. Torres-Delgado, T. Lee, J. L. Collett, L, A. Cuadra-Rodriguez, K. A. Prather, O. L. Mayol-Bracero, Impact of Long-Range Transported African Dust Events on Cloud Chemistry at a Caribbean Tropical Montane Cloud Forest, Abstract A41G-0160, presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec 2013. Poster
160. Martínez-Sánchez, O., O. L. Mayol-Bracero, P. Sepulveda-Vallejo, A. Heymsfield, Low and Mid Level Tropical Atmosphere Characterization during African Dust Outbreaks Using Particle Size Distribution Data Retrieved from ICE-T and PRADACS Field Studies, Abstract A23E-0307, presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec 2013. Poster.
161. DeMott, P. J., T. C. Hill, M. J. Ruppel, K. A. Prather, D. B. Collins, J. l. Axson, T. Lee, C. Y. Hwang, R. C. Sullivan, G. R. McMeeking, R. Mason, A. K. Bertram, O. L. Mayol-Bracero, Ernie R. Lewis, Measurements to Fill Knowledge Gaps on Ice Nucleating Particle Sources over Oceans, Abstract A32C-05, presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec 2013. Oral
162. Weinzierl, B., A. Ansmann, O. Reitebuch, V. Freudenthaler, T. Müller, K. Kandler, D. Althausen, R. Busen, M. Dollner, A. Dörnbrack, D. A. Farrell, S. Gross, K. Heimerl, A. Klepel, T. B. Kristensen, O. L. Mayol-Bracero, A. Minikin, D. Prescod, J. M. Prospero, S. Rahm, M. Rapp, D. N. Sauer, A. Schaefler, C. Toledano, M. Vaughan, M. Wiegner, The

Saharan Aerosol Long-range Transport and Aerosol-Cloud-Interaction Experiment SALTRACE 2013 – Overview and Early Results, Abstract A52D-02, presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec 2013. Oral
163. Spiegel, J.K., N. Buchmann, O. L. Mayol-Bracero, C. J. Valle-Diaz, L A. Cuadra-Rodriguez; K.A. Prather; S. Mertes; W. Eugster, Do cloud properties in a Puerto Rican tropical mountain cloud forest depend on long-range transport of African dust? 6th International Conference on Fog, Fog Collection and Dew, Yokohama, Japan, May 2013. Oral
164. Scholl, M., O.L. Mayol-Bracero, C.J. Valle-Diaz, and T. Heartsill-Scalley, Quantifying cloud water in the hydrologic budget of the Luquillo Mountains, Puerto Rico, 6th International Conference on Fog, Fog Collection and Dew, Yokohama, Japan, May 2013. Poster
165. Mayol-Bracero, O. L., Puerto Rico African Dust and Cloud Study (The PRADACS Project), Escuela Superior Isidro A. Sánchez, Luquillo, PR, May 2013, Invited (Oral)
166. Mayol-Bracero, O. L., PRADACS and Dust-ATtaCk, Dust-ATtACk Symposium, University of Paris East, March 2013. Oral
167. Quiñones-Rosado, M., O. L. Mayol-Bracero, P. Vallejo, E. Andrews, J. A. Ogren, K. Desboeufs, and P. Formenti, African dust impact on the size distribution of aerosols in the Caribbean: Observations from Atmospheric Observatory in Cabezas de San Juan, Puerto Rico, 33rd PUERTO RICO INTERDISCIPLINARY SCIENTIFIC MEETING 48th JUNIOR TECHNICAL MEETING, Universidad del Turabo, Gurabo, PR, March 2013. Oral
168. Torres Delgado, E., C. J. Valle Diaz, T. Lee, J. Collett, M. J. Sanchez, W. McDowell, O. L. Mayol-Bracero, Chemical Speciation of Water Soluble Ions and Metals of Cloud and Rain Water During the Puerto Rico African Dust and Clouds Study (PRADACS) Campaigns, 33rd PUERTO RICO INTERDISCIPLINARY SCIENTIFIC MEETING 48th JUNIOR TECHNICAL MEETING, Universidad del Turabo, Gurabo, PR, March 2013. Oral
169. Venero Velez, I., O. L. Mayol – Bracero and J. Anderson, Composition and Morphology of Major Particle Types from Airborne Measurements during ICE-T and PRADACS Field Studies, 33rd PUERTO RICO INTERDISCIPLINARY SCIENTIFIC MEETING 48th JUNIOR TECHNICAL MEETING, Universidad del Turabo, Gurabo, PR, March 2013. Oral
170. Valle Diaz, C.J., E. Torres Delgado, F. Zurcher, A. Gioda, T. Lee, J. Collett, E. M. Fitzgerald, M. D. Zauscher, L. A. Cuadra Rodríguez, K. A. Prather, J. K. Spiegel, W. Eugster, S. Mertes, L. Schenk, A. Roth, J. Schneider, D. Baumgardner, O. L. Mayol-Bracero An Overview of the Puerto Rico African Dust and Clouds Study (PRADACS) – Aerosol and Cloud Measurements at a Caribbean Tropical Montane Cloud Forest, 33rd PUERTO RICO INTERDISCIPLINARY SCIENTIFIC MEETING 48th JUNIOR TECHNICAL MEETING, Universidad del Turabo, Gurabo, PR, March 2013. Poster
171. Vallejo, P., O. L. Mayol-Bracero, M. Quiñones, I. Gutiérrez, E. Andrews, J. A. Ogren, S. Chevaillier, C. Di Biagio, K. Desboeufs, and P. Formenti, African dust in the Caribbean: chemical, physical and optical properties of transported African dust across the Atlantic: observations from Atmospheric Observatory in Cabezas de San Juan, Puerto Rico, 33rd PUERTO RICO INTERDISCIPLINARY SCIENTIFIC MEETING 48th JUNIOR TECHNICAL MEETING, Universidad del Turabo, Gurabo, PR, March 2013. Poster
172. Mayol-Bracero, O. L. Atmospheric Chemistry in Puerto Rico, 1st America's Working Group, Bogota, Colombia, January 2013. Invited (Oral)
173. Mayol-Bracero, O. L., Puerto Rico African Dust and Cloud Study, LTER Annual Meeting, UPRRP, January 2013. Invited (Oral)
174. Fortuné, J, A. Forestil. Gervais, G.W. "Nutrient flows and recovery in multistage anaerobic bioreactors fed with Sargassum spp.". Poster Presentation at the

48th ACS Junior Technical Meeting & 33rd Puerto Rico Interdisciplinary Scientific Meeting (PRISM), Universidad del Turabo, Caguas, PR, March 9, 2013.

175. Rosario-Rodriguez,K. ; Martínez-Morales, E. ; Gervais, G.W. ¨Biogas yield and composition of bench scale anaerobic digesters fed with marine macroalgae under saline conditions¨. Poster Presentation at the 48th ACS Junior Technical Meeting & 33rd Puerto Rico Interdisciplinary Scientific Meeting (PRISM), Universidad del Turabo, Caguas, PR, March 9, 2013.

176. Villanueva Cubero, L. and Yu, M. Nov. 3, 2013. Poster at the Coastal and Estuarine Research Federation Conference, San Diego, CA. Puerto Rico's Coastal Vegetative Wetlands in the context of Socio-Economic and Climate Changes

177. Yu, M. and Qiong Gao. Apr. 2, 2013. Presentation at the Annual Science Meeting of NASA Land Cover and Land Use Change Program, Washington, D.C. Vulnerability and Adaptive Management of Tropical Coastal Wetlands in the context of Land Use and Climate Changes.

178. Villanueva Cubero, L. and Yu, M. Apr. 2, 2013. Poster at the Annual Science Meeting of NASA Land Cover and Land Use Change Program, Washington, D.C. Changes in Vegetative Wetland and Coastal Forest Cover in the Northeast Ecological Corridor after Agriculture Decline in Puerto Rico.

2012

179. Roberson, L. and J. Rosenthal, A mechanistic understanding of calcification in corals, WHOI climate group meeting, Woods Hole, MA, 2 Aug 2012

180. Perez, X., L. Diaz, and L. Roberson, Contaminants of emerging concern in the San Juan Bay Estuary System, NJ Region 2 EPA Lab, New Jersey (invited), 6 June 2012

181. Roberson, L., Use of marine algal biomass for biofuel production, 3rd Annual Renewable and Sustainable Fuel Solutions Summer Symposium, Rutgers University, New Jersey (invited), 4-5 June 2012

182. 31 Oct 2012, Perez, X., L. Diaz, and L. Roberson, Contaminants of emerging concern in the San Juan Bay Estuary System, Department of Natural and Environmental Resources, San Juan, PR (invited), oral

183. 24 Aug 2012, Melendez, J., N. Quinones, G. Gervais, K. Griebenow and L. Roberson, Habitat and feasibility mapping for the determination of optimal algal biomass mariculture sites in coastal areas of Puerto Rico, 3rd Conference on the planning and management of marine spaces, Puerto Rico Departament of Natural and Environmental Resources, San Juan, PR, poster

184. 1 June 2012, Roberson, L., Use of macroalgal biomass for production of biofuels, DoD Site Visit, UPR Río Piedras, San Juan, PR, oral

185. Organic matter dynamics in tropical island streams: allochthonous inputs, particulate exports and benthic standing stocks. C. Colon-Gaud, A. Ramírez; K. Rosas; P. Olaya. Society for Freshwater Sciences annual meeting, Louisville, KY, May 2012. Oral presentation.

186. Importance of long-term sampling in the assessment of tropical stream biodiversity. Gutiérrez-Fonseca, P.; Ramírez, A. Society for Freshwater Sciences annual meeting, Louisville, KY, May 2012. Poster presentation.

187. Trophic basis of insect secondary production in a tropical urban river. Rosas, K. G.; Gutiérrez Fonseca, P. E.; Ramírez, A. Society for Freshwater Sciences annual meeting, Louisville, KY, May 2012. Poster presentation.

188. Macroinvertebrate and fish assemblages in a tropical urban watershed, Puerto Rico. Wagner, K. M.; Ramírez, A. Society for Freshwater Sciences annual meeting, Louisville, KY, May 2012. Poster presentation.

189. Riparian forest removal alters the energy basis of montane cloud forest streams in Mexico. Ramírez, A.; García, P.; Vázquez-Hurtado, G.; Novelo-Gutiérrez, R. Society for Freshwater Sciences annual meeting, Louisville, KY, May 2012. Poster presentation.

190. Mayfly diets on montane cloud forest streams in Mexico. García, P. E.; Ramirez, A.; Novelo-Gutiérrez, R.; Vázquez, G. Society for Freshwater Sciences annual meeting, Louisville, KY, May 2012. Poster presentation.

191. Composición y estructura de los ensamblajes de macroinvertebrados de una cuenca tropical urbana en Puerto Rico. K. Wagner & Ramírez, A. Primer Congreso Latino Americano de Macroinvertebrados Acuáticos. San José, Costa Rica. Febrero 2012. Oral presentation.

192. Crecimiento y duración del estadio larval de quironómidos y efemerópteros en un río tropical, Puerto Rico. K. Rosas & Ramírez, A. Primer Congreso Latino Americano de Macroinvertebrados Acuáticos. San José, Costa Rica. Febrero 2012. Oral presentation.

193. ¿Qué tan estables son los ensamblajes de macroinvertebrados de las quebradas tropicales? P. Gutierrez & Ramírez, A. Primer Congreso Latino Americano de Macroinvertebrados Acuáticos. San José, Costa Rica. Febrero 2012. Oral presentation.

194. Alta similitud interespecífica en larvas de Odonata: el caso de Cora (Polythoridae) y Heteragrion (Megapodagrionidae). Ramírez, A. & P. Gutierrez. Primer Congreso Latino Americano de Macroinvertebrados Acuáticos. San José, Costa Rica. Febrero 2012. Oral presentation.

195. Plant diversity of residential yards across the Río Piedras watershed. Cristina Vila, Elvia Meléndez-Ackerman, Raul Santiago, Diana Garcia-Montiel, Lourdes Lastra, Cielo Figuerola. PR Interdisicplinary Science Meeting (PRISM) . UPR Carolina March 2012

196. Biodiversity Conservation in Cities and Links to Sustainability. E. Meléndez-Ackerman. Invited Speaker: Sustainability Science Class (CIAM 8405), Environmental Sciences Graduate Program; University of Puerto Rico Rio Piedras April 13, 2012.

197. Effects of Grass Invasions on the endangered cactus, Harrisia portoriscensis in Mona Island Reserve. E. Meléndez-Ackerman. Invited Speaker: Conservation Biology (Biol 6145), Biology Graduate Program; University of Puerto Rico Rio Piedras April 17, 2012

198. Species Invasions. E. Meléndez-Ackerman. Invited Speaker: Conservation Biology (Biol. 6145), Biology Graduate Program; University of Puerto Rico Rio Piedras April 19, 2012

199. Your research is important to us! A discussion about the societal role of science careers and survival tips from an old lady. E. Meléndez-Ackerman. Invited Speaker. Second Undergraduate Research Symposium – Biology Department UPR Mayaguez , Mayaguez, PR May 5, 2012

200. Evolution of Reproductive Mechanisms in Island Ecosystems. E. Meléndez-Ackerman. Invited Speaker: Island Biology (Biol 4990), Biology Program; University; University of Puerto Rico Rio Piedras April 23, 2012.

201. Mayol-Bracero, O. L., Atmospheric Observatory at CSJ, Fideicomiso Conservación de Puerto Rico, San Juan, PR, December 13, 2012. Oral

202. Vallejo, P., O. L. Mayol-Bracero, M. Quiñones, I. Gutiérrez, E. Andrews, J. A. Ogren, S. Chevaillier, C. Di Biagio, K. Desboeufs, and P. Formenti, African dust in the

Caribbean: chemical, physical and optical properties of transported African dust across the Atlantic: observations from Atmospheric Observatory in Cabezas de San Juan, Puerto Rico, Abstract A23F-0304, presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec 2012. Poster
203. Valle Diaz, C., E. Torres Delgado, T. Lee, J. Collett, L.A. Cuadra Rodríguez, K. A. Prather, J. K. Spiegel, W. Eugster, Olga L. Mayol-Bracero, Impact of Long-Range Transported African Dust Events on Cloud Composition and Physical Properties at a Caribbean Tropical Montane Cloud Forest, Abstract A23F-0299, presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec 2012. Poster
204. Venero Velez, I., O. L. Mayol – Bracero, and J. Anderson, Composition and Morphology of Major Particle Types from Airborne Measurements during ICE-T and PRADACS Field Studies, Abstract A23F-0303, presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec 2012. Poster
205. Mertes, S., L. Schenk, J. Schneider, A. Roth, O. L. Mayol-Bracero, Physico-chemical characterization of cloud drop residues and interstitial particles observed inside trade wind cumuli during the Puerto Rican African Dust And Cloud Study (PRADACS), Abstract A23F-0295, presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec 2012. Oral
206. Valle-Díaz, C.J., Torres-Delgado, E., Zurcher F., Gioda A., Lee, T., Collett J., Fitzgerald E.M., Zauscher, M.D., Cuadra-Rodríguez, L.A., Prather, K.A., Spiegel J.K., Eugster, W., Mertes, S., Schenk, L., Roth, A., Schneider, J., Baumgardner, D., Mayol-Bracero, O.L. An Overview of the Puerto Rico African Dust and Clouds Study (PRADACS) – Aerosol and Cloud Measurements at a Caribbean Tropical Montance Cloud Forest. International Global Atmospheric Chemistry Conference, Beijing, China, September 2012. Poster
207. Baumgardner, D., R. Newton, O.L. Mayol-Bracero, C.J. Valle-Diaz, F. Zurcher, S. Mertes, Identifying cloud processed aerosol particles with light depolarization, European Aerosol Conference, Granada, Spain, September 2012. Oral
208. Schneider, J., A. Roth, J. Schmale, S. Mertes, L. Schenk, O. L. Mayol-Bracero, C. J. Valle, F. Zurcher, and S. Borrmann, Mass spectrometric analysis of cloud residuals in tropical trade wind cumuli at Pico Este, Puerto Rico, during PRADACS 2011, European Aerosol Conference, Granada, Spain, September 2012. Poster
209. Mertes, S., L. Schenk, J. Schneider, J. Schmale, F. Zurcher, O.L. Mayol-Bracero, Aerosol particle activation and cloud drop charges observed inside trade wind cumuli during the Puerto Rican African Dust And Cloud Study, International Conference of Clouds and Precipitation, Leipzig, Germany, July 2012. Poster
210. Valle-Díaz, C.J., Torres-Delgado, E., Zurcher F., Gioda A., Lee, T., Collett J., DeMott P.J., McMeeking, G., Hill T., Franc G., Díaz-Martínez, M., Fitzgerald, E.M., Zauscher, M.D., Cuadra-Rodríguez, L.A., Prather, K.A., Spiegel J.K., Eugster, W., Mertes, S., Schneider, J., Mayol-Bracero, O.L. The Puerto Rico African Dust and Clouds Study (PRADACS) – Aerosol and Cloud Measurements at a Caribbean Tropical Montance Cloud Forest. International Conference of Clouds and Precipitation, Leipzig, Germany, July 2012. Poster
211. Mayol-Bracero, O.L. and J. M. Prospero, Improving our Understanding of African Dust Transport using the Caribbean Basin as the Receptor, Universidad Autónoma de México, México DF, June 6, 2012. Invited (Oral)
212. Mayol-Bracero, O.L., Measurements of Atmospheric Particles in the Tropics: From the 90s to the Present, Seminars for Volunteers at the LFDP, El Verde Field Station, Río Grande, Puerto Rico, March 2012. Invited (Oral)
213. Torres-Delgado, E., C. J. Valle Diaz, F. Zurcher, T. Lee, J. Collett, E. Fitzgerald, L. Cuadra, K. A. Prather, O. L. Mayol-Bracero, Size-resolved Chemical Composition of Cloud

and Rain Water Collected during the Puerto Rico African Dust and Clouds Study (PRADACS) Campaign, Puerto Rico Louis Stokes' AMP Junior Technical Meeting, University of Puerto Rico, Carolina, PR, March 2012. Oral
214. Marrero-Ortiz, W., O. L. Mayol-Bracero, Chemical Characterization of Atmospheric Particles from Different Sources in the Guanica's Dry Forest: Inorganic and Organic Fraction, Puerto Rico Louis Stokes' AMP Junior Technical Meeting, University of Puerto Rico, Carolina, PR, March 2012. Oral
215. Venero Velez, I., O. L Mayol–Bracero, and J. Anderson, Composition and Morphology of Major Particle Types from Ground-Based and Aircraft Platforms during ICE-T and PRADACS Field Studies, Puerto Rico Louis Stokes' AMP Junior Technical Meeting, University of Puerto Rico, Carolina, PR, March 2012. Oral
216. Vila, C. P., A. R. Ruiz, S. Raizada, C. Tepley, F. Zurcher, I. Venero, O. L. Mayol-Bracero, Aerosol Optical Thickness in the Presence and Absence of African Dust using AERONET and Microtops II Sunphotometers, Puerto Rico Louis Stokes' AMP Junior Technical Meeting, University of Puerto Rico, Carolina, PR, March 2012. Oral
217. Valle-Diaz, C., E. Torres Delgado, F. Zurcher, T. Lee, J. Collett, E. Fitzgerald, K. A. Prather, O. L. Mayol-Bracero, The Puerto Rico African Dust and Clouds Study (PRADACS): Chemical Composition of Cloud Water and Rain Water at Pico del Este Tropical Montane Cloud Forest, Puerto Rico Louis Stokes' AMP Junior Technical Meeting, University of Puerto Rico, Carolina, PR, March 2012. Poster
218. Diaz Martinez, M., O. L. Mayol-Bracero, P. J. DeMott, G. R. McMeeking, T. C. Hill, G. D. Franc, A. Danielczok, H. Bingemer, I. Venero, J. R. Anderson, J. R. Snider, G. Sever, and R. C. Sullivan, African Dust and Other Aerosols as Sources of Ice Nuclei in the Eastern Caribbean Region, Puerto Rico Louis Stokes' AMP Junior Technical Meeting, University of Puerto Rico, Carolina, PR, March 2012. Oral
219. Melendez-Diaz, J. , N. Quiñones-Vilches , A. Rodriguez, K. Ruiz, G. Gervais, L. Roberson, K. Griebenow.. Habitat and Biodiversity Mapping, for the Determination of Algal Biomass Aquaculture Sites in the Coastal Areas of Puerto Rico. Poster Presentation at the BIOMASS2012 (USDOE). Washington Convention Center, Washington, D.C. July 10 -11, 2012.
220. Invited Speaker: "Marine Biomass: The Biofuel of Choice for the Caribbean?" Interdisciplinary Symposium on Energy Technology, Policy and Design. University of Puerto Rico Río Piedras Campus, 12 April, 2012.
221. Martínez-Morales, E. ; Marty-Rivera, M. ; Gervais, G.W. "Seeding and Startup of Bench Scale Anaerobic Digesters for Biogas Production from Algal Biomass". Joint ACS Jr. Technical Meeting & PR Inter-disciplinary Scientific Meeting (PRISM), UPR Carolina Campus, March 10, 2012.
222. Rodriguez-Santos, A.;Quinones, N.; Melendez, J.; Roberson, L.; Gervais, G. "Exploring the regulatory and technical viability of a hypothetical macroalgal mariculture operation in Puerto Rico" Joint ACS Jr. Technical Meeting & PR Interdisciplinary Scientific Meeting (PRISM), UPR Carolina Campus, March 10, 2012.
223. Chen, D. and Yu, M. Sep. 10 -13, 2012. Patterns of soil organic matter and respiration along an elevation gradient in the Luquillo Mountains of Northeastern Puerto Rico. LTER All Scientist Meeting, Estes Park, Colorado.
224. Yu, M. and Qiong Gao. Apr. 3, 2012. Presentation at the Annual Science Meeting of NASA Land Cover and Land Use Change Program, Washington, D.C. Vulnerability and Adaptive Management of Tropical Coastal Wetlands in the context of Land Use and Climate Changes.
225. Yu, M. Mar. 30, 2012. Invited presentation at the Sustainability Course of Department of Environmental Science, UPR. Sustainability for Dryland Development.

226. Yu, M. Feb. 13, 2012. Invited presentation at the UPR-IGERT program. Leaf traits and growth allometry explain competition and differences in response to climate change.

2011

227. Brokaw, N., S. Ward, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, C. Doyle, T. Beach, F. Valdez, J. Pagán. "The Ancient Maya and the Modern Forest". Annual Meeting of the Society for American Archaeology; Sacramento, California; April 2011.

228. Brokaw, N., S. Ward, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, C. Doyle, T. Beach, F. Valdez, J. Pagán. "The Ancient Maya and the Modern Forest". University of Central Florida; Orlando, Florida; March 2011.

229. Roberson, L., The Educational Initiative for a Sustainable Future at UPR, Renewable Energy Education meeting, University of Illinois-Urbana-Champagne (invited), 12 Oct 2011

230. Roberson, L., Effects of water quality on seagrass community productivity and biodiversity, Annual Benthic Ecology Meeting, Mobile, AL, 16-18 Apr 2011

231. Acidificaciones periódicas en quebradas de Estacion Biologica La Selva. Ramírez, A. Seminario en la Universidad de Costa Rica. Noviembre 2011. Oral presentation.

232. Acidificaciones periódicas en quebradas tropicales en Costa Rica y sus impactos sobre los ensamblajes de macroinvertebrados acuáticos. Ramírez, A. XLVI Congreso Nacional de Ciencias Biologicas, Antioquia, Colombia. Octubre 2011. Oral presentation.

233. Impacto del uso de terreno en el funcionamiento de los ecosistema de río. Ramírez, A. XLVI Congreso Nacional de Ciencias Biologicas, Antioquia, Colombia. Octubre 2011. Oral presentation.

234. Effect of river gobies on benthic periphyton in tropical urban streams, Puerto Rico. Vazquez, S., Ramírez, A. North American Benthological Society meeting, Providence, RI, May 2011. Poster presentation.

235. Potential direct and indirect effects of omnivorous shrimps on mayfly naiads in tropical island streams: a laboratory study. Macias, N.A., Colon-Gaud, C., Ramírez, A., Torres, P.J. North American Benthological Society meeting, Providence, RI, May 2011. Poster presentation.

236. Temporal variation in benthic macroinvertebrate assemblages in two tropical headwater streams in Costa Rica. Gutiérrez-Fonseca, P.E., Ramírez, A. North American Benthological Society meeting, Providence, RI, May 2011. Poster presentation.

237. Do nutrient-rich urban streams have a higher diversity of microbial communities in benthic biofilms? Burgos, S., Ramírez, A. American Society of Limnology and Oceanography, San Juan, Puerto Rico. Feb. 2011. Poster presentation.

238. Exploring the microbial world: assessing benthic biofilms composition to the response of different nutrient conditions. Burgos, S., Ramírez, A., Recart, W. American Society of Limnology and Oceanography, San Juan, Puerto Rico. Feb. 2011. Poster presentation.

239. Benthic insect assemblage composition and structure of a tropical island urban stream. Rosas, K. G., Ramírez, A. American Society of Limnology and Oceanography, San Juan, Puerto Rico. Feb. 2011. Poster presentation.

240. The effects of instream habitat and channelization on fish assemblage structure in a tropical urban watershed. Engman, A.C., Ramírez, A. American Society of Limnology and Oceanography, San Juan, Puerto Rico. Feb. 2011. Poster presentation.

241. Nitrogen-enriched food webs in tropical urban streams, Puerto Rico Martinó-Cardona, D.M., Ramírez, A. American Society of Limnology and Oceanography, San Juan, Puerto Rico. Feb 2011. Poster presentation.

242. Experimental acidification of two Neotropical streams illustrates the sensitivity of invertebrate assemblages and importance of bicarbonate buffering. Ardon, M., Duff, J. H., Ramírez, A., Small, G. E., Jackman, A.P., Triska, F.J., Pringle, C.M. American Society of Limnology and Oceanography, San Juan, Puerto Rico. Feb. 2011. Oral presentation.

243. B Castro-Escobar, E Melendez-Ackerman and B Crain Variation in Native, and Cactaceae Seeds in the Soil as a Function of an Invasive Exotic Grass in Mona Island Reserve PRISM March 2011

244. Lourdes Lastra, Lorna Moreno, Elvia Melendez Effect of Megathyrsus maximus, exotic grass, on soil mites in Mona Island Reserve. Presented at PRSIM March 2011

245. E. Meléndez-Ackerman. San Juan ULTRA Annual Meeting Research opportunities San Juan of ULTRA-ex: Vegetation Health and Urban Vulnerabilities. Fundación Puertorriqueña para la Conservación, San Juan PR Match 2011

246. Invited lecturer. Bio Conservation Course– Biology Graduate Program Dept. of Biology UPR-Rio Piedras (Two lectures) Titles: a. Effects of Exotic Grass on Native Biota. Match 2011

247. Invited lecturer. Bio Conservation Course– Biology Graduate Program Dept. of Biology UPR-Rio Piedras (Two lectures) Title Species Invasions March 2011

248. Invited Lecturer Urban Environments Course CIAM Environmental Sciences Graduate Program UPR-Rio Piedras Title: Research opportunities San Juan of ULTRA-ex: Vegetation Health and Urban Vulnerabilities March 2011

249. E Meléndez-Ackerman. Outreach at the NSF-CREST Center for Applied Tropical Ecology and Conservation. National Science Foundation, VA Match 2011

250. E Melendez-Ackerman. Effects of Exotic Grass on Native Biota in Mona Island Reserve. Universidad Interamericana de Bayamon. Bayamon PR 30 de Abril, 2011

251. ULTRA Meeting with Stakeholders;: Research opportunities San Juan of ULTRA-ex: Vegetation Health and Urban Vulnerabilities at Fundación Puertorriqueños por PR, San Juan PR April 2011

252. E Melendez-Ackerman Investigación en las ciencias relacionadas al ambiente y botánica en PR: Plataforma de integración de materias y elemento atractivo en la enseñanza en nuestras escuelas. Jornadas para maestros de Ciencias nivel elemental – Tema: La Ciencia en la Educación. Hotel Melia Rio Grande PR May 2011

253. REU E Melendez-Ackerman. Effects of Exotic Grass on Native Biota. Seminar series at the El Verde Field Station. Rio Grande PR June 2011

254. E Melendez-Ackerman. Investigación en las ciencias relacionadas al ambiente y botánica en PR: Plataforma de integración de materias y elemento atractivo en la enseñanza en nuestras escuelas. Taller Programa GK-12, UPR Rio Piedsras July 5th 2011

255. Castro, B. E. Melendez-Ackerman and B. Crain. Variation in Native and Cactaceae Seeds in the Soil as a Function of an Invasive Exotic Grass in Mona Island Reserve. Botanical Society of America, St. Louis Missouri, Jul 9-14

256. Melendez-Ackerman, E.. Professional Training and Graduate Education Needs for Warfare Ecology . Annual Meeting of the Ecological Society of America. August 7-12, 2011

257. Rojas Sandoval J., E. Melendez-Ackerman, D. Fernandez. Vegetation community dynamics of a tropical semi-arid system following experimental removals of an exotic grass . Annual Meeting of the Ecological Society of America. August 7-12, 2011

258. Invited Lecturer – CINA 4071. Seminar in Environmental Sciences: Research opportunities San Juan of ULTRA-ex: Vegetation Health and Urban Vulnerabilities

259. Experimentos de exclusión de exóticos en condiciones de alta heterogeneidad espacial: ejemplos de la Isla Reserva de Mona, Puerto Rico. E. J. Meléndez Ackerman, J. Rojas-Sandoval, D Fernández. Taller de restauración ecológica: de lo exótico a lo nativo auspiciado por el Centro de Estudios Conservacionistas (CECON) en Ciudad Guatemala, Guatemala. Oct. 4-9, 2011

260. Biodiversidad Urbana dentro del Marco de la Socio-Ecología. 5th Congress on EcoUrbanism Symposium Enrique Marti-Coll: ¿Ecologia, Sociología o Socio-Ecología? Universidad Sagrado Corazón, San Juan PR Nov 10, 2011

261. Biodiversidad Urbana – Estudio de San Juan ULTRA. E. Meléndez-Ackerman. Conversatorio de Panel de Expertos de Ecología y Sociología: Las Ciudades y el Ambiente que las Rodea. Auspiciado por Escuela Graduada de Planificación. Centro de Recursos para Ciencias e Ingeniería. Universidad de Puerto Rico Rio Piedras November 5, 2011.

262. Vegetation Biodiversity of the Rio Piedras Watershed (RPWS). Vila, CP, L Lastra, E. Meléndez-Ackerman Simposio de Investigación Presentación de posters Escuela Graduada de Planificación, Universidad de Puerto Rico Recinto de Rio Piedras. Diciembre 5, 2011

263. Ortiz-Zayas, J.R. Desarrollo de escenarios de cambio en uso de terreno en Puerto Rico para las cuencas del Río Grande de Manatí y del Río de La Plata. Presentación final del Proyecto de Escenarios Costeros del Caribe. Interamerican Institute for Climate Change, Center for Applied Tropical Ecology and Conservation, The Nature Conservancy, Coticam . 8 November 2011. Manati Municipal Library. Manatí, P.R.

264. Ortiz-Zayas, J.R. Cambio climático y su potencial efecto sobre las cuencas y la alteración de los caudales de los ríos en Puerto Rico. Seminario sobre Caudales Ambientales, Índices de Alteración Hidrológica y Cambio Climático. Universidad Nacional Pedro Henríquez Ureña (UNPHU), Santo Domingo, República Dominicana. 18 de enero de 2011.

265. Ruiz, A., S. Raizada, C. Tepley, F. Zurcher, I. Venero, O. L. Mayol-Bracero, Aerosol Optical Thickness in the Presence and Absence of African Dust using AERONET and Microtops II Sunphotometers, Abstract A21A-0022, presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec 2011. Poster

266. Torres, E., Valle C., Zurcher F., Lee, T., Collett, J., Fitzgerald, E., Cuadra, L., Prather, K., Mayol-Bracero, O.L., Size resolved chemical composition of cloud and rainwater during the Puerto Rico African Dust and Cloud Studies (PRADACS) campaign. Abstract GC51G-1089, presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec 2011. Poster

267. McMeeking, G., A. Danielczok, H. Bingemer, H. Klein, T. C. Hill, G. D Franc, M. D. Martinez, I. Venero, O. L. Mayol-Bracero, K. Ardon-Dryer, Z. Levin, J. Anderson, C. Twohy and P. J DeMott, Measurements of ice nuclei concentrations and compositions in the maritime tropics, Abstract A13A-0203, presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec 2011. Poster

268. Mayol-Bracero, O. L., Atmospheric Chemistry at ITES UPR-RP: Chemical and Physical Characterization of Atmospheric Particles in the Tropics, AAAS Workshop, Cuba, December 2011, Invited (Oral)

269. Mayol-Bracero, O.L., Atmospheric Chemistry at ITES UPR-RP: Chemical and Physical Characterization of Atmospheric Particles in the Tropics, Invited, Seminar Environmental Science Graduate Program, UPR-RP, October 29, 2011, Invited (Oral)

270. Valle-Díaz, C.J., Torres-Delgado, E., Mayol-Bracero, O.L., Zurcher, F., Gioda, A.; Lee, T., Collett, J., Prather, K.A. Size-Resolved Chemical Composition of Cloud and Rain Water Collected During the Puerto Rico African Dust and Clouds Study (PRADACS). First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Poster

271. Gioda, A., C. J. Valle-Diaz, O. L. Mayol-Bracero, Impact of African Dust Events in the Chemical Composition of Cloud Water Sampled at Pico Este, Puerto Rico, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Oral

272. DeMott, P., Gavin R. McMeeking, Myrelis Diaz Martinez, Thomas C. Hill, Gary D. Franc, Anja Danielczok, Heinz Bingemer, Ingrid Venero, James R. Anderson, O. L. Mayol-Bracero, J. R. Snider, Göhkan Sever and Ryan C. Sullivan, African Dust and Other Aerosols as Sources of Ice Nuclei in the Eastern Caribbean Region, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Oral

273. Spiegel, J. K., T. Peter, O. L. Mayol-Bracero, C. J. Valle, F. Zurcher, N. Buchmann, and W. Eugster, Does long-range transported African Dust affect cloud droplet size distributions in a Tropical Montane Cloud Forest in Puerto Rico?, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Poster

274. Baumgardner, D., R. Newton, O. L. Mayol-Bracero, C. J. Valle-Diaz, F. Zurcher, S. Mertes, Cloud Processing of Dust Preliminary Results From ICE-T and PRADACS, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Poster

275. Vallejo, P., P. Formenti, S. Chevaillier and O. L. Mayol-Bracero, African Dust in the Caribbean: Impact on the Chemical and Physical Composition of Aerosols at the Atmospheric Observatory in Cabezas de San Juan, Puerto Rico, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Poster

276. Marrero, W., O. L. Mayol-Bracero, Chemical Characterization of Atmospheric Particles from Different Sources in the Guanica's Dry Forest: Inorganic and Organic Fraction, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Poster

277. Santos-Figueroa, G., M. Díaz-Martinez, O. L. Mayol-Bracero, Chemical and Molecular Characterization of Primary Biogenic Aerosol Particles in the Caribbean During African Dust Events, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Poster

278. Morales-García, F., A. Kasper-Giebl, H. Puxbaum, S. Metzger, S. Decesari, O. L. Mayol-Bracero, Origin and Composition of Aerosols Collected in the Caribbean: Marine Air, African Dust, and Anthropogenic Pollution, First International Workshop on the Long-Range Transport and Impacts of African Dust on the Americas. San Juan, PR, October 2011. Poster

279. Torres Delgado, E., C. J. Valle Diaz, O. L. Mayol-Bracero, F. Zurcher, A. Gioda, T. Lee, J. Collett, E. Fitzgerald, M. Zauscher, K. A. Prather, Size resolved chemical composition of cloud and rain water during the Puerto Rico African Dust and Cloud Studies (PRADACS) campaign, 46th IUPAC General Assembly and 70th Colegio de Químicos Annual Conference and Exhibition, San Juan, Puerto Rico, August 2011. Poster

280. Vallejo, P, K. Mendez, P. Formenti, S. Chevaillier, and O. L. 88 Mayol-Bracero, African dust in the Caribbean: impact on the chemical and physical composition of aerosols at the Atmospheric Observatory in 88 Cabezas de San Juan, Puerto Rico, 43rd IUPAC World Chemistry Congress, 46th IUPAC General Assembly and 70th Colegio de Químicos Annual Conference and Exhibition, San Juan, Puerto Rico, August 2011. Poster

281. Santos-Figueroa, G., F. Morales-García, O. L. Mayol-Bracero, The Carbonaceous Fraction of Atmospheric Aerosols in the Caribbean Region, 10th ICCPA Conference, Vienna, Austria, June 2011. Poster

282. Mayol-Bracero, O.L., The Impact of Transport on the Physico-Chemical Properties of Caribbean Aerosols during RICO: African Dust and Pollution from North America, Invited, African dust workshop for teachers, NASA & Hampton University – UPR-M, Parguera, June 2011. Invited (Oral)

283. Valle-Díaz, C.J., Mayol-Bracero, O.L., Zurcher, F., Gioda, A.; Lee, T., Collett, J., Prather, K.A., Size-Resolved Chemical Composition of Cloud and Rain Water Collected During the Puerto Rico African Dust and Clouds Study (PRADACS), Geophysical Research Abstracts, Vol. 13, EGU2011-9594, 2011. Poster

284. Valle-Diaz, C.J., Olga L. Mayol-Bracero, Felix Zurcher, Adriana Gioda, Taehyoung Lee, Jeff Collett, Kim A. Prather, Size-Resolved Chemical Composition of Cloud And Rain Water Collected During the Puerto Rico African Dust and Clouds Study (PRADACS), 31st Puerto Rico Interdisciplinary Scientific Meeting (PRISM), 46th ACS Junior Technical Meeting, 12 March 2011, Bayamón, Puerto Rico. Oral

285. Rivera, H., J. A. Ogren, E. Andrews, P. Sheridan, A. Carrion, O. L. Mayol-Bracero, Variability of Aerosol's Optical, Physical and Chemical Properties of Marine, African Dust and Volcanic Ash Air Masses in the Eastern Caribbean, 31st Puerto Rico Interdisciplinary Scientific Meeting (PRISM), 46th ACS Junior Technical Meeting, 12 March 2011, Bayamón, Puerto Rico. Poster

286. Santos-Figueroa, G., A. Morales, F., Mayol-Bracero, O.L., The Carbonaceous Fraction of Atmospheric Aerosols in the Caribbean Region, 31st Puerto Rico Interdisciplinary Scientific Meeting (PRISM), 46th ACS Junior Technical Meeting, 12 March 2011, Bayamón, Puerto Rico. Oral

287. Morales-García, F., A. Kasper-Giebl, H. Puxbaum, S. Metzger, S. Decesari, O. L. Mayol-Bracero, The Carbonaceous Fraction of Atmospheric Aerosols in the Caribbean Region, 31st Puerto Rico Interdisciplinary Scientific Meeting (PRISM), 46th ACS Junior Technical Meeting, 12 March 2011, Bayamón, Puerto Rico. Poster

288. Marrero-Ortiz, W., O. L. Mayol-Bracero, Impacts of Atmospheric Particles from different sources in the Guánica's Dry Forest: Inorganic and Organic Fraction. 31st Puerto Rico Interdisciplinary Scientific Meeting (PRISM), 46th ACS Junior Technical Meeting, 12 March 2011, Bayamón, Puerto Rico. Oral

289. Erazo-Oliveras, A., Mayol-Bracero, O.L., Ríos-Dávila, R.A., Improving Slow Sand Filters for Communities with Low Incomes and Limited Water, 31th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), 46th ACS Junior Technical Meeting, 12 March 2011, Bayamón, Puerto Rico. Poster

290. Mayol-Bracero, O.L., Atmospheric Chemistry and Aerosols, Experiences of an Atmospheric Scientist, PR-SLAMP, Rio Piedras, PR, February 2011. Invited (Oral)

291. Mayol-Bracero, O. L., Atmospheric Chemistry and Aerosols at ITES UPR-RP: Chemical and Physical Characterization of Atmospheric Particles in the Tropics, IGERT Meeting, January 2011. Invited (Oral)

292. Melendez, J., N. Quiñones-Vilches, A. Rodriguez, K. Ruiz, G. Gervais, L. Roberson & K. Griebenow "Habitat and Biodiversity Mapping for the Determination of Algal Biomass Aquaculture Sites in the Coastal Areas of Puerto Rico" La novena reunión

nacional de Percepción Remota y Sistemas de Información Geográfica (PRYSIG), auspiciado por COHEMIS. University of Puerto Rico Mayagüez Campus, Puerto Rico, 2 December, 2011.

293. G. Gervais Invited Speaker: "Las Algas Marinas y la Conversión de su Biomasa Cruda a Combustibles: El Centro de Energía Renovable UPR/UGA". 8th Annual Science Teachers Symposium, sponsored by the PR Chapter of AAAS and the Asociación de Maestros, C3TEC Institute, Caguas, PR. 21 September, 2011.

294. G. Gervais Invited Speaker: "Como calcular la huella de carbon de tu familia por el consumo de electricidad.". A Workshop for Science Teachers. 8th Annual Science Teachers Symposium, sponsored by the PR Chapter of AAAS and the Asociación de Maestros, C3TEC Institute, Caguas, PR. 21 September, 2011.

295. G. Gervais Presentation: "Las Algas Marinas y la Conversión de su Biomasa Cruda a Combustibles: El Centro de Energía Renovable UPR/UGA". Segundo Ciclo de Conferencias del Departamento de Recursos Naturales sobre Planificación y Uso de los Espacios Marinos". Sheraton Hotel, Old San Juan, PR. 5 August, 2011.

296. G. Gervais Invited Speaker: "Macroalgas marinas como fuente de energía para Puerto Rico". Café de Ciencias. Restaurant Los Cidrines, San Juan, PR. 5 April, 2011.

297. Yu, M. March 17, 2011. Invited presentation at the Department of Biology, University of Puerto Rico - Mayaguez. Geospatial analysis and Modeling in Ecohydrology.

298. Yu, M. April, 2011. USDA project workshop, University of Puerto Rico – Rio Piedras. Strengthening educational capacities in geospatial science and technology in agricultural and natural resources management.

299. Yu, M. April, 2011. USDA project workshop, University of Puerto Rico – Rio Piedras. Hydrological analysis using ArcGIS – a case study for watersheds in Northeastern Puerto Rico.

2010

300. Brokaw, N. "Forest Resistance and Resilience to Hurricane Damage." Annual Meeting of the Ecological Society of America; Pittsburgh, Pennsylvania; August 2010.

301. Brokaw, N., S. Ward, M. Cortes-Rincon, S. Walling, S. Luzzadder-Beach, C. Doyle, T. Beach, F. Valdez, J. Pagán. "The Ancient Maya and the Modern Forest". Georgetown University; Washington, DC; March 2010.

302. Impacto de la urbanización en los ecosistemas de río: el caso de Puerto Rico. Ramírez, A. Seminario especial, Universidad de Costa Rica, Noviembre 2010. Oral presentation.

303. Feeding preferences and growth of Tallaperla sp. (Plecoptera: Peltoperlidae): a cross-site comparison using tropical and temperate leaves. Colon-Gaud, C., Ramírez, A. North American Benthological Society, 58th Annual Meeting, NM. 2010. Poster presentation.

304. The effects of flow reduction reduced flow on leaf decomposition rates in a tropical urban stream. Engman, A., Ramírez, A. North American Benthological Society, 58th Annual Meeting, NM. 2010. Poster presentation.

305. Macroconsumer effects on stream benthos and organic matter processing in a tropical headwater stream: are shrimps more active at night? Negroni-Miranda, A., Shea, C., Torres, P. J., Colon-Gaud, C., Ramírez, A. North American Benthological Society, 58th Annual Meeting, NM. 2010. Poster presentation.

306. Aquatic insect diversity along a tropical island stream continuum in Puerto Rico. Ramírez, A., Bernard-Flores, M.A. North American Benthological Society, 58th Annual Meeting, NM. 2010. Poster presentation.

307. Benthic stream biofilm metabolism along a land use gradient in tropical in Puerto Rico. Burgos, S., Ramírez, A. North American Benthological Society, 58th Annual Meeting, NM. 2010. Poster presentation.

308. Storage, retention and transformations of phosphorus in a lowland neotropical stream during an 8-year phosphorus enrichment experiment. Small, G.E., Ardon, M., Ramírez, A., Duff, J.H., Jackman, A.P., Bixby, R. J., Triska, F.J., Pringle, C.M. North American Benthological Society, 58th Annual Meeting, New Mexico, 2010. Oral presentation.

309. Variation in Native and Cactaceae Seeds in the Soil as a Function of an Invasive Exotic Grass in Mona Island Reserve-B Castro-Escobar, E Melendez-Ackerman and B Crain. Presented at an Oral Session in Life Sciences at the 30th Puerto Rico Interdisciplinary Scientific Meeting (PRISM) in the University of Puerto Rico, Mayaguez Campus, Mar 13, 2010.

310. Effect of Megathyrsus maximus, exotic grass, on soil mites in Mona Island Reserve. Lourdes Lastra, Lorna Moreno, Elvia Melendez. Presented at an Oral Session in Life Sciences at the 30th Puerto Rico Interdisciplinary Scientific Meeting (PRISM) in the University of Puerto Rico, Mayaguez Campus, Mar 13, 2010.

311. Effect of invasive grass, Megathyrsus maximus, on Soil and Plant Communities of Mona Island Reserve. Lorna M. Moreno, Elvia Meléndez- Ackerman, Christopher Cheleuitte, Brenda Castro, Josue Sanchez, Alexandra López, Nicole Rivera, Laura Yunes, Ricardo Rodriguez, Lourdes Lastra, Fabio Cristallini. Presented at an Oral Session in Life Sciences at the 30th Puerto Rico Interdisciplinary Scientific Meeting (PRISM) in the University of Puerto Rico, Mayaguez Campus, Mar 13, 2010.

312. Elvia Melendez-Ackerman. Estudiando Ecologia Tropical y Ciencias Ambientales en al Universidad de Puerto Rico Recinto de Rio Piedras. July 30, 2010, UPR Rio Piedras, Facultad de Ciencias Naturales. Presentacion a delegación de estudiantes de Haiti.

313. Variation in Native, and Cactaceae Seeds in the Soil as a Function of an Invasive Exotic Grass in Mona Island Reserve-B Castro-Escobar, E Melendez-Ackerman and B Crain. Presented at Poster Session in Invasive Species at the 95th ESA Annual Meeting in Pittsburgh, Pennsylvania, Aug 1-6, 2010

314. Unexpected generalized pollination system in a tropical island herb, Heliconia caribaea. Stephanie Cruz Maysonet, Elvia Meléndez-Ackerman, Silvana Martén-Rodríguez, Presented at Poster Session at the 95th ESA Annual Meeting in Pittsburgh, Pennsylvania, Aug 1-6, 2010

315. Effect of Megathyrsus maximus, exotic grass, on soil mites in Mona Island Reserve. Lourdes Lastra, Lorna Moreno, Elvia Melendez. Presented at Poster Session at the 95th ESA Annual Meeting in Pittsburgh, Pennsylvania, Aug 1-6,

316. Invited Lecturer Biol 6802 Advanced Evolution Course– Dept. of Biology UPR-Rio Piedras Title: Population Genetics: Microevolutionary Processes . October 2010.

317. Invited Lecturer Biol 6190 Advanced Ecology - Dept. of Biology UPR-Rio Piedras Title: Plant-Animal Interactions October 2010.

318. E Melendez-Ackerman Investigación en las ciencias relacionadas al ambiente y botánica en PR: Plataforma de integración de materias y elemento atractivo en la enseñanza en nuestras escuelas. Jornadas para maestros de Ciencias nivel elemental – Tema: La Ciencia en la Educación. Centro de Convenciones de Puerto Rico San Juan PR Noviembre 2010

319. E Melendez-Ackerman. Leyes Ambientales de Puerto Rico. Grupo 4to Grado Escuela Antonio S Pedreira. Noviembre 2010

320. Marrero-Ortiz, W., O.L. Mayol-Bracero, Inorganic and Organic Chemical Composition of Atmospheric Particles in the Guánica's Dry Forest, Abstract A41A-0048 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 December 2010. Poster

321. Valle-Diaz, C. J., O.L. Mayol-Bracero, F. Zurcher, A. Gioda, T. Lee, J. L. Collet Size-resolved Chemical Composition of Cloud and Rain Water Collected during the Puerto Rico African Dust and Clouds Study (PRADACS) Campaign, Abstract 13A-0179 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 December 2010. Poster

322. Morales-García, F., A. Kasper-Giebl, H. Puxbaum, S. Metzger, S. Decesari, O. L. Mayol- Bracero, The Organic Fraction of Aerosols in the Caribbean, IGAC-ICACGP Joint Conference, Canada, July 2010. Poster

323. Mayol-Bracero, O.L., H. Rivera, J.A. Ogren, E. Andrews, P. Sheridan, Overview of the Physical and Radiative Properties of Atmospheric Particles at Cape San Juan, Puerto Rico (CPR station), NOAA ESRL Annual Conference, Boulder, Colorado, March 2010. Poster

324. Deliz-Delgado, A., O.L. Mayol-Bracero, M. Eglee-Perez, Does the increase in the concentrations of athmospheric particles affect the precipitation in Puerto Rico?,30th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico-Mayaguez, March 2010. Oral

325. Santos-Figueroa, G., A. Gioda, O. L. Mayol-Bracero, The Size-Resolved Carbonaceous Fraction of African Dust Particle over the Caribbean, 30 Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico, Mayaguez Campus, March 2010. Oral

326. Morales-García, F., J. K. Otero-Montañez, L. L. Soto-García, I. J. López-Alvarado, O. L. Mayol-Bracero, A. R. Mayol. H. J. Álvarez, Atmospheric Chemistry Research as a Tool to Augment Students' Scientific Inquiry, 30th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico-Mayagüez, PR, March 2010. Poster

327. Marrero-Ortiz, W., O. L. Mayol-Bracero, Inorganic and Organic Chemical Composition of Atmospheric Particles in the Guánica's Dry Forest. 30th Puerto Rico Interdisciplinary Scientific meeting (PRISM), University of Puerto Rico, Mayagüez, Puerto Rico, March 2010. Oral

328. Erazo-Oliveras, A., Mayol-Bracero,O.L., Ríos-Dávila, R.A., Improving Slow Sand Filters for Communities with Low Incomes and Limited Water, 30th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico-RUM, PR, March 2010. Oral

329. Marrero-Ortiz, W. O. L. Mayol-Bracero, Chemical composition of atmospheric particles in the Guanica's dry forest: carbonaceous aerosols in African dust, LTER Annual Meeting, University of Puerto Rico, Rio Piedras, January 2010. Oral

330. Erazo, A., R. Rios-Davila, O.L. Mayol-Bracero, Improving Slow Sand Filters (SSF) for communities with low incomes and limited water Access, LTER Annual Meeting, University of Puerto Rico, Rio Piedras, January 2010. Poster

331. Yu, M. Jan. 2010. Biodiversity workshop, Beijing. Large-scale biodiversity analysis and decision support platform.

332. Dai, W. and Yu, M. Aug. 2010. Annual Meeting of Ecology Society of America, Pittsburg, PA. Ecological Stoichiometry and distribution of dominant woody species in a subtropical evergreen forest.

2009
333. Urban streams in Puerto Rico: understanding stream ecosystems outside the Luquillo forest. Ramírez, A., S. Burgos, A. Engman, N. Martínez, J. Ortiz-Zayas, A. Covich, C.Pringle, P. Torres, T. Crowl, O. Perez, W. McDowell, D. Figueroa, F. Scatena, and C. Phillips. All Scientists Meeting, LTER program, Estes Park, CO. 2009. Poster presentation.
334. Undergraduate research training in tropical ecology at the Luquillo LTER, Puerto Rico. Ramírez, A. All Scientists Meeting, LTER program, Estes Park, CO. 2009. Poster presentation.
335. The neotropical damsefly genus Cora: new larval descriptions and a comparative analysis of known species (Zygoptera: Polythoridae). A. Ramírez, P. Gutiérrez-Fonseca & M. Springer. 6th meeting of the Word Dragonfly Association. Xalapa, Mexico. 2009. Poster presentation.
336. Is the diversity and functioning of benthic biofilms affected by watershed land use in tropical streams? Burgos-Caraballo, S. & A. Ramirez. North American Benthological Society, 57th Annual Meeting, MI. 2009. Poster presentation.
337. Do macroconsumers play a role in leaf litter breakdown in tropical urban streams? Martinez, N. & A. Ramírez. North American Benthological Society, 57th Annual Meeting, MI. 2009. Poster presentation.
338. Effects of land use on microbial Eukarya diversity in stream benthic biofilms. Burgos Caraballo, S. & A. Ramírez. 2nd Symposium Frontiers in Environmental Microbiology: a Caribbean Perspective. Universidad del Turabo. March 2009. Poster presentation.
339. Lizzette Velazquez, Frances Figarella, Linda Clark, Pablo Hernández, Rosaura Ramírez, Elvia Meléndez-Ackerman y Jorge Ortiz. Creación de una comunidad de investigadores entre estudiantes del nivel elemental y futuros maestros de ciencia para el estudio de una especie exótica en ecosistema acuático de PR, Xmo Congreso Puertorriqueño de Educación 11-13, March 2009.
340. Jean Carlos Curbelo and Elvia Melendez-Ackerman. Flower visitors of Mammilaria nivosa in Mona Island. Puerto Rico Interdisciplinary Scientific Meeting. San Juan PR. March 4 2009.
341. Juan García and Elvia Melendez-Ackerman. Life inside the mat: links between Lepanthes rupestris orchids and bryophyte presence in the Luquillo Experimental Forest, Puerto Rico Puerto Rico Interdisciplinary Scientific Meeting. San Juan PR. March 4 2009.
342. Elvia Melendez-Ackerman. NSF-CREST Center for Applied Tropical Ecology and Conservation. 2009. NSF Joint Annual Meeting, Washington DC June 8-11.
343. The effect of climatic change on the subpopulations dynamic of Lepanthes rupestris STIMSON, (Orchidaceae). Paola A. Olaya A., Elvia Meléndez-Ackerman, Raymond Tremblay, Maria Eglee Pérez. Ecological Society of America Annual Meeting August 2009, Albuquerque, NM
344. Life inside the mat: links between Lepanthes rupestris orchids and bryophyte presence in the Luquillo Experimental Forest, Puerto Rico. Garcia Cancel, Meléndez-Ackerman, Elvia, , Juan Olaya, Paola, Merced Amelia, Flores Nadia, Tremblay Raymond. Ecological Society of America Annual Meeting August 2009, Alburquerque, NM
345. Pollinator communities of Guaiacum sanctum (Zygophylaceae), J. Fumero-Cabán, E. Melendez-Ackerman and L. Lastra et.al. 2009, August 2009, Ecological Society of America, Albuquerque, NM.
346. Effects of climate change on Lephanthes rupestris, P. Olaya and E. Meléndez-Ackerman, September 2009, AAA's PR Chapter.

347. Effect of exotic grass, Megathyrsus maximus, on native biodiversity in Mona Island Reserve, Moreno et al., November 2009, CATEC Symposium, San Juan, PR.

348. Effect of exotic grass Megathyrsus maximus on soil mites fauna in Mona Island Reserve., Lastra et al., November 2009, CATEC Symposium, San Juan, PR.

349. Factors affecting seed germination and seedling establishment of Harrisia portoricensis (Cactaceae) in Mona Island, Rojas and Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

350. Pollination Biology of Harrisia portoricensis (Cactaceae), an Endangered Caribbean Species, Rojas and Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

351. Arthropod diversity in caves with moderate and high anthropogenic presence, Toro and Rojas and Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

352. Breeding System of Guaiacum sanctum, Fumero and Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

353. Variation in Cactaceae Seeds in the Soil as a Function of an Invasive Exotic Grass in Mona Island Reserve, Castro et.al., November 2009, CATEC Symposium, San Juan, PR.

354. Spatial analysis of foraging activity of the Polygynous Red Imported Fire Ant Solenopsis invicta (Hymenoptera:Formicidae), Orengo, Charito and E. Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

355. Evaluation of potential demographic differences in the subpopulations of the Mona island iguana Cyclura cornuta stejnegeri across different forest types in Mona island, Puerto Rico, Figuerola and E. Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

356. Effects of climate change on Lepanthes rupestris, P. Olaya and E. Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

357. Breeding System of Guaiacum sanctum. J. Fumero-Cabán and E. Meléndez-Ackerman, November 2009, CATEC Symposium, San Juan, PR.

358. Professional Training and Graduate Education needs in Warfare Ecology. Presented at NATO Advanced Research Workshop (ARW) Warfare Ecology: Synthesis, Priorities, and Policy Implications for Peace and Security celebrado en Vieques PR. Sponsored by NATO

359. Ortiz-Zayas, J.R. Potential ecosystem-level implications of climate change in a coastal ephemeral lagoon in the Guanica Biosphere Reserve, Puerto Rico. Annual Conference Faculty Resource Network: Carbon and Climate Change. 14 January 2009. University of Puerto Rico, Rio Piedras.

360. Rivera H.; J. A. Ogren; P. J. Sheridan; O. L. Mayol-Bracero, Physical and Radiative Properties of Aerosol Particles across the Caribbean Basin: A Comparison between Clean and Perturbed African Dust and Volcanic Ash Air Masses, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract A13A-0189, 2009. Poster

361. Soto-Garcia, L.; M. O. Andreae; P. P. Artaxo; W. Maenhaut; T. Kirchstetter; J. C. Chow; O. L. Mayol-Bracero, Carbonaceous and Inorganic Composition of Aerosols in the Brazilian Amazon, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract A53E-02, 2009. Poster

362. Mayol-Bracero, O.L., Carbonaceous aerosols over the Caribbean Region, SOLAS Open Science Conference, November 2009, Barcelona, Spain. Invited (Oral)

363. Mayol-Bracero, O. L., F. Morales-García, J.J.N. Lingard, J.B. McQuaid, L. Gomes, G.P. Frank, M.O. Andreae, L. Di Girolamo, A. Kasper-Giebl, H. Puxbaum, The Impact of Transport on the Physico-Chemical Properties of Caribbean Aerosols: African Dust and Pollution from North America. IGAC SSC Meeting, October 2009, Kyoto University, Kyoto, Japan. Poster

364. Soto-García, L.L., M. O. Andreae, T. W. Andreae, P. Artaxo, W. Maenhaut, T. Kirchstetter, T. Novakov, J. C. Chow and O. L. Mayol-Bracero, Carbonaceous and Inorganic Composition of Aerosols in the Brazilian Amazon, SERMACS, 23 October, 2009. San Juan, Puerto Rico. Poster

365. Rivera, H., J. A. Ogren, P. Sherida, O L. Mayol-Bracero, Physical and Radiative Properties of Aerosol Particles across the Caribbean Basin: A Comparison between the Clean and Perturbed African Dust and volcanic Volcanic Ash Air Masses, SERMACS, 23 October, 2009. San Juan, Puerto Rico. Poster

366. Mayol-Bracero, O. L. Atmospheric Chemistry and Aerosols: Experiences of an Atmospheric Scientist, PRLSAMP Meeting, 11 September 2009, UPR-RP, San Juan, PR. Invited (Oral)

367. Morales-García, F., O. L. Mayol-Bracero, M. Repollet-Pedrosa, A. Kasper-Giebl, C. Ramírez-Santa Cruz, H. Puxbaum, Aerosol Collected at a Tropical Marine Environment: Size-Resolved Chemical Composition Using IC, TOC, and Thermal-Optical Analyses, AGU 2009 Joint Assembly, Toronto, Canada, May 2009. Poster

368. Colon, L., O. L. Mayol-Bracero, P. Formenti, F. Mazzei, Atmospheric Aerosols in the Guánica Dry Forest, AGU 2009 Joint Assembly, Toronto, Canada, May 2009. Poster

369. Mayol-Bracero, O. L., The Environmental Impact of Atmospheric Particles, Academia Bautista de Puerto Nuevo, Día del Planeta Tierra, PR, May 2009. Oral

370. Mayol-Bracero, O. L., The Chemical Composition of Aerosols, Clouds, and Rainwater in a Caribbean Tropical Montane Cloud Forest, European Geophysical Union Conference, Vienna, Austria, April 2009. Poster

371. Morales-García, F., O. L. Mayol-Bracero, M. Repollet-Pedrosa, A. Kasper-Giebl, C. Ramírez-Santa Cruz, H. Puxbaum, Aerosols collected at a tropical marine environment: Size-resolved chemical composition using IC, TOC, and thermal-optical analyses, 29th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico-RP, PR, March 2009. Poster

372. Vallejo, P., R. O. Rivera-Hernández, A. Gioda, O. L. Mayol-Bracero, Atmospheric Particles in the Caribbean: Impact on the chemical composition of aerosols, clouds and rainwater at a tropical montane cloud forest, 29th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico-RP, PR, March 2009. Poster

373. Santos, G., A. Gioda, O. L. Mayol-Bracero, Size-Resolved Chemical Composition of African Dust Particles over the Caribbean: Focusing in the Carbonaceous Fraction, 29th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico-RP, PR, March 2009. Oral

374. Colon, L., O. L. Mayol-Bracero, P. Formenti, F. Mazzei, Atmospheric Aerosols in the Guánica Dry Forest, 29th Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico-RP, PR, March 2009. Oral

375. Mayol-Bracero, O. L., Measurements of Atmospheric Particles in Cabezas de San Juan: From the 90s to the present, Fideicomiso de Conservación de PR, Reserva Natural de Cabezas de San Juan, Fajardo, PR, March 2009. Invited (Oral)

376. Mayol-Bracero, O. L., The Environmental Impact of Atmospheric Particles: Results from Studies over the Tropics, Salud Pública, Recinto de Cs Médicas, UPR, PR, March 2009. Invited (Oral)

377. Mayol-Bracero, O. L., The Impact of Transport on the Physico-Chemical Properties of Caribbean Aerosols during RICO: African Dust and Pollution from North America, Institute of Geophysics, University of Warsaw, Poland, February 2009. Invited (Oral)
378. Mayol-Bracero, O. L., Aerosols and Climate in Tropical Regions: Carbonaceous Aerosols from Biomass Burning in the Brazilian Amazon, Carbon Cycling and Climate Change Symposium, University of Puerto Rico-RP, PR, January 2009. Invited (Oral)
379. G. Gervais Presentation: ¨Marine Biomass Energy for Puerto Rico¨. 2da Convención de Energía Renovable en Puerto Rico y El Caribe. PR Convention Center, San Juan, Puerto Rico, 27 August, 2009.
380. G. Gervais Presentation: ¨Bioenergy: Industrial Wastewater as a Resource for Renewable Energy¨ 52nd Annual Convention of the Puerto Rico Society of Microbiologists (ASM Branch). PR Convention Center, San Juan, Puerto Rico, June 18, 2009.
381. Yu, M. March, 2009. Invited presentation at the Graduate School of Chinese Academy of Science, Beijing. Application of GIS and Species Distribution Models in Conservation Biogeography.
382. Yu, M. Sep. 2009. Invited seminar at the Environmental Science Program, University of Puerto Rico, Geospatial analysis and modeling in plant ecology.
383. Gao, Q. and Yu, M. Aug. 2009. Annual Meeting of Ecology Society of America, Albuquerque, NM. Quantifying the behavior of stomatal conductance of plant functional types based on data over China.
384. Gao, Q. and Yu, M. Aug. 2009. Annual Meeting of Ecology Society of America, Albuquerque, NM. Modeling ecosystems with physiological and morphological adaptation.

Table 3.4.D. Student Funding and Travel

Year	Amount of Research Assistants	Mount of Teachinig Assistants	Travel Funds	Amount of trip for Research Disemmination
2009	2	2	unkown	21
2010	0	0	unkown	18
2011	3	3	unkown	22
2012	7	7	unkown	26
2013	17	17	unkown	36
2014	12	12	unkown	31
2015	2	2	unkown	39
***Probably external and institutional funds**				

Table 5.6.C STUDENT PRODUCTIVITY METRICS (Based on Students' CV's)

Year	Title	Type	Info	Location	Student	Advisor
2009	Research Manager	investigation	Luquillo Long-Term Ecological Research (LTER) Program	Puerto Rico	Christopher Nytch	Elvia Melendez
2009	Hydrologic impacts and community perceptions of land use change in the southern aquifer recharge area, Santa Isabel and Salinas, Puerto Rico	presentation	CATEC Annual Conference	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez
2009	Director Geoinformatics Division	investigation	Department of Natural and Environmental Resources	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2009	Niche breadth rather than reproductive traits explains the response of wetland monocotyledons to land-cover change.	publication	Applied Vegetation Science, 12(1), 119–130. Pino, J., Vilà, M., Álvarez, N., Seguí, J. M., & Guerrero, C. (2009).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2010	Research Manager	investigation	Luquillo Long-Term Ecological Research (LTER) Program	Puerto Rico	Christopher Nytch	Elvia Melendez
2010	Hydrologic impacts and community perceptions of land use change in the southern aquifer recharge area, Santa Isabel and Salinas, Puerto Rico	presentation	LTER Annual Conference	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez

Year	Title	Type	Info	Location	Student	Advisor
2010	Active participator and speaker in international congresses of water treatment	investigation	American Water Works Association ACE Conference (AWWA)	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2010	Outreach activities "Nanodays" and nanotechnology demonstrations in schools and universities	investigation	National Science Foundation (NSF) under the Bridge to the Doctorate and GK – 12 Program	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2010	Workshop developer and speaker: Slow sand filtration and drinking water improvement practices.	workshop	Seminario Intercultural Mayense, Chiapas, Mexico, 4/2010.	Mexico	Angélica Erazo – Oliveras	Rafael Rios
2010	Director Geoinformatics Division	investigation	Department of Natural and Environmental Resources	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2011	Research Assistant Data Collector & 2011 Tree Census	investigation	Luquillo Forest Dynamics Plot (LFDP), El Verde, PR	Puerto Rico	Aaron Hogan	Jess Zimmerman
2011	Research Manager	investigation	Luquillo Long-Term Ecological Research (LTER) Program	Puerto Rico	Christopher Nytch	Elvia Melendez
2011	NSF Igert Online Poster Competition	presentation	Education and history as promoters of community involvement	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez
2011	The Agricultural Dilemma of land use change in the Santa Isabel/Coamo Area, Southern Puerto Rico	presentation	ASLO Annual Conference	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez

Year	Title	Type	Info	Location	Student	Advisor
2011	Active participator and speaker in international congresses of water treatment	investigation	Center for Environmental Education, Conservation and Research (CECIA)	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2011	Session moderator, 46th ACS Junior Technical Meeting 31th Puerto Rico Interdisciplinary Scientific Meeting (PRISM)	investigation	Inter - American University of Puerto Rico – Bayamon	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2011	Outreach activities "Nanodays" and nanotechnology demonstrations in schools and universities	investigation	National Science Foundation (NSF) under the Bridge to the Doctorate and GK – 12 Program	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2011	Instructor, Preparing and conducting a 3-day GIS and GPS workshop for academic professionals.	workshop	Miami Dade College, Mar 2011	USA	Nora L. Álvarez-Berríos	Mitchell Aide
2011	Economics of Information, Studiously Ignored in the Nagoya Protocol on Access to Genetic Resources and Benefit Sharing	publication	The. Law, Environment and Development Journal, 7. Vogel, J. H., Alvarez-Berrios, N., Quinones-Vilches, N., & Medina-Muniz, J. L. (2011).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide

Year	Title	Type	Info	Location	Student	Advisor
2011	Qualitative Investigation Workshop	workshop	IGERT-UPR, Aug. 2011	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2011	Environmental film making and science communication	workshop	Science Film Organization, 2011	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2011	Puerto Rico Aquatic Gap. International Institute of Tropical Forestry.	investigation	US Forest Service, San Juan Puerto Rico. PI. PhD. William Gould.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2012	Research Technician	investigation	NEON (National Ecological Observation Network) vegetation monitoring site - Guanica, PR Columbia University – Dr. Maria Uriarte – Guanica Biosphere Reserve	Puerto Rico	Aaron Hogan	Jess Zimmerman
2012	Research Manager	investigation	Luquillo Long-Term Ecological Research (LTER) Program	Puerto Rico	Christopher Nytch	Elvia Melendez
2012	Outreach activities “Nanodays” and nanotechnology demonstrations in schools and universities	investigation	National Science Foundation (NSF) under the Bridge to the Doctorate and GK – 12 Program	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2012	Environmental Quality Inspector	investigation	Puerto Rico Environmental Quality Board	Puerto Rico	Sofía Olivero Lora	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2012	Environmental Social Science: Human-Environment Interactions and Sustainability.	publication	Conservation and Society, 10(4), 386–387. Bonilla-Moheno, M., Aide, T., Alvarez-Berrios, N., Andrade-Nunez, M., Arache-Martinez, A., Roman, G., & Sanchez-Cuervo, A. (2012).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2012	Worked assisting in field sample collection of Coral Porites astreoides larvae for RNA analysis, collection of adult corals for zooxanthellae counts and, collection and preparation of macro algae for lipid, carbohydrate and pigment extraction with GC-MS.	investigation	College of Natural Science, Department of Environmental Science, University of Puerto Rico, Río Piedras Campus; Mentor: Dr. Loretta Roberson	Puerto Rico	Mayra Sánchez García	Loretta Roberson
2012	Restoring the Pine-Oak Ecosystem in Guatemala	investigation	National Consul in Science and Technology (CONCYT)	Guatemala	Mervin E. Pérez Pérez	Elvia Melendez
2012	Tropical Ecosystem Restoration Graduate Course	investigation	University San Carlos de Guatemala and Wetlands International.	Guatemala	Mervin E. Pérez Pérez	Elvia Melendez
2012	Implementation of Brahms database in the USCG Herbarium	investigation	University San Carlos de Guatemala and Atlatea Program (Puerto Rico).	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2012	Bryophyte Species Diversity in Secondary Forest Dominated by the Introduced Species Spathodea campanulata Beauv. in Puerto Rico.	publication	Pérez, M.E., I. Sastre-De Jesús, A.E. Lugo, and O. Abelleira-Martínez. 2012. Biotropica, 44: 763-770.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez
2012	Listado preliminar de los musgos (Briophyta) y hepáticas (Marchantiophyta) del departamento de Alta Verapaz, Guatemala.	publication	Pérez, M.E. y G. López-Medina. 2012. Revista Guatemalensis, 15:	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez
2012	La colección del Herbario USCG.	publication	Pérez, M.E., R. Rodas, J.J. Vega, E. Reyes. 2012. Ciencia y Conservación, 2: 30-41.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez
2012	Introducción a los Desperdicios Sólidos, Unidad 1: Composición y Generación de los Desperdicios Sólidos, Nivel Secundario.	publication	Center for Science and Math Education Research-University of Puerto Rico, Río Piedras Campus. 80 pp. Padró P, Ramírez C, Soto F, Gutiérrez I. 2012.	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2012	Introducción a los Desperdicios Sólidos, Unidad 2: Composición y Generación de los Desperdicios Sólidos, Nivel Secundario.	publication	Center for Science and Math Education Research-University of Puerto Rico, Río Piedras Campus. 80 pp. Padró P, Ramírez C, Soto F, Gutiérrez I. 2012.	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat

Year	Title	Type	Info	Location	Student	Advisor
2012	Incidence and Spatial Distribution of Caribbean Yellow Band Disease in La Parguera, Puerto Rico.	publication	Journal of Marine Biology, vol. 2012, Article ID 510962, 7 pp. Francisco J. Soto-Santiago and Ernesto Weil. 2012.	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2012	Impacts of internal and external policies on land change in Uruguay, 2001 - 2009	publication	Daniel J. Redo, T. Mitchell Aide, Matthew L. Clark and María José Andrade-Núñez. 2012. Environmental Conservation.39:122–131.	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2012	Environmental Social Science: Human-Environment Interactions and Sustainability.	publication	Bonilla-Moheno, M., Aide, T.M., Álvarez-Berríos, N., Andrade-Núñez, M.J., AracheMartínez, A. V., Roman, G. P. and Sánchez-Cuervo, A. 2012. Conservation and Society 10(4): 386-387.	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2012	Sistema de Evaluación de Peligro de Incendios en Puerto Rico: Sus implicaciones en el manejo de Áreas Naturales Protegidas.	presentation	Primer Congreso de Áreas Naturales Protegidas de Puerto Rico, San Juan, Puerto Rico. June, 2012	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2012	Research contractor. Fire Danger Rating System Project.	investigation	IITF. USDA. Forest Service. San Juan, Puerto Rico.	Puerto Rico	María José Andrade-Núñez	Rosana Grafals

Year	Title	Type	Info	Location	Student	Advisor
2013	Tree core samples collected from a stratified sample of tropical trees	investigation	Data Collector – LFDP Gentry Transects	USA	Aaron Hogan	Jess Zimmerman
2013	Samples collected and preserved for microbial analyses	investigation	Site Project Manager – Bento Bag Decomposition Experiment (LFDP)	USA	Aaron Hogan	Jess Zimmerman
2013	Master's thesis investigated the shifts in tropical tree species in the LFDP in space and time with respect to both environmental and land-use disturbance histories.	investigation	LTER (Long- Term Ecological Research) Graduate Student	Puerto Rico	Aaron Hogan	Jess Zimmerman
2013	Measuring the effects of Hurricanes on Tropical Forest Dynamics in Puerto Rico	presentation	50th Annual Association for Tropical Biology and Conservation Association Conference in San Jose, Costa Rica, June 2013	Costa Rica	Aaron Hogan	Jess Zimmerman
2013	Research Manager	investigation	Luquillo Long-Term Ecological Research (LTER) Program	Puerto Rico	Christopher Nytch	Elvia Melendez
2013	Scale-dependent relationships between tree species richness and ecosystem function in forests.	publication	Chisholm, R. A., Muller-Landau, H. C., Rahman, K. A., Bebber, D. P., Bin, Y., Bohlman, S. A., many others & Nytch, C. J. (2013). Journal of Ecology, 101, 1214-1224.	Puerto Rico	Christopher Nytch	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2013	Working Group 2: Ecology and Biodiversity. In Puerto Rico's state of the climate 2010-2013: Assessing Puerto Rico's social-ecological vulnerabilities in a changing climate.	conference	Puerto Rico Coastal Zone Management Program, Department of Natural and Environmental Resources. San Juan, PR.	Puerto Rico	Christopher Nytch	Elvia Melendez
2013	Measuring the effects of hurricanes on tropical forest dynamics in Puerto Rico.	conference	Association for Tropical Biology and Conservation conference, San José, Costa Rica. 2013, June	Costa Rica	Christopher Nytch	Elvia Melendez
2013	Twenty years of change in the Luquillo Forest Dynamics Plot.	conference	Ecological Society of America annual meeting, Portland, OR. 2013, August	USA	Christopher Nytch	Elvia Melendez
2013	Clouds and temperature drive dynamic changes in tropical flower production.	publication	Pau, S., Wolkovich, E. M., Cook, B.I., Nytch, C. J., Regetz, J., Zimmerman, J. K., & Wright, S. J. (2013). Nature Climate Change, , 3(9), 838-842. DOI: 10.1038/nclimate1934	Puerto Rico	Christopher Nytch	Elvia Melendez
2013	El Corredor del Yaguazo: Mas de 30 años conservando el ambiente, mejorando la calidad de vida de Cataño y de Puerto Rico	publication	Betzaida Ortiz, Revista Educativa Puertorriquena Ano 5 Vol. 1, Ene-Abr 2013.	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez

Year	Title	Type	Info	Location	Student	Advisor
2013	Chapter for the book: “La financiación y fungibilidad del Museo de Bioprospección, la Propiedad Intelectual y el Dominio Público”	publication	Joseph Henry Vogel, Nora Álvarez-Berríos, Betzaida Ortiz-Carrión and Omar Oduardo-Sierra, edited volume by Elizabeth Hodson de Jaramillo and Teodora Zamudio, Biotecnologías e innovación (Bogotá: Editorial de la Potificia Universidad Javeriana de Colombia), 2013, pp. 283-300.	Colombia	Betzaida Ortiz Carrion	Jorge Rodriguez
2013	Water Cycle and waste management	investigation	Master Teachers Workshop, April 2013	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez
2013	Research titled Maximizing Yield Through Integration (I3) projected entitled: Design and Scholar Project Development.	investigation	Center for Science and Math Education Research (CSMAR) UPR-RP and the National Science Foundation.	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2013	The Watershed Academy Web-Based Training Program Certificate	workshop	United States Environmental Protection Agency (EPA), December 1, 2013	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2013	Certification for participation in the Conference of Population Studies of Puerto Rico	workshop	Institute of Statistics of Puerto Rico and University of Puerto Rico, Cayey Campus. November 15, 2013	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno

Year	Title	Type	Info	Location	Student	Advisor
2013	Certificate for participation in the workshop coordinated by the Maximizing Yield Through Integration (I3) projected entitled: Design and Scholar Project Development	workshop	Center for Science and Math Education Research (CSMAR) of the University of Puerto Rico, Rio Piedras Campus, September 7, 2013	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2013	Certificate of participation of to the workshop: Integrity and Research Ethics	workshop	Dr. Ingrid Montes, professor of Natural Science Faculty in University of Puerto Rico, Río Piedras Campus, July 11, 2013	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2013	It's the Network: how personal connections shape decisions about private forest use.	publication	Kittredge, D., M. Rickenbach, T. G. Knoot, E. Snellings, A. Erazo. 2013. Northern Journal of Applied Forestry 30: 67 - 74.	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2013	Active participator and speaker in international congresses of water treatment	investigation	Research and Development Institute in Water Supply, Environmental Sanitation and Water Resources Conservation Conference	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios

Year	Title	Type	Info	Location	Student	Advisor
2013	C4SI3: Ecosystem Services for Sustainability: Third Conference for Sustainability IGERTs, Portland State University, Portland	conference	Organizing Committee member	USA	Angélica Erazo – Oliveras	Rafael Rios
2013	Teaching Socio-Environmental Synthesis with Case Studies	workshop	National Socio-Environmental Synthesis Center (SESYNC), August 2013	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2013	Tree functional traits approach to assess ecosystem services.	conference	FUNCiTree Final Conference: The role of functional diversity for ecosystem services in multi-functional agroforestry. Gløshaugen University Campus, May 23-25, 2013.	Norway	Sofía Olivero Lora	Elvia Melendez
2013	Local Perceptions on Residential Green Infrastructure within the Río Piedras Watershed.	conference	2013 Annual Meeting: Developing the CLCC Strategic Conservation Framework, Caribbean Landscape Conservation Cooperative, Isla Verde, December 12, 2013.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2013	Tree functional traits approach to assess ecosystem services. VII Henry A.	conference	Wallace/CATIE Inter-American Scientific Conference Series: Climate-smart territories in the tropics: Production, mitigation and adaptation for improved wellbeing. CATIE, Turrialba, Costa Rica. September 30-October 4, 2013.	Costa Rica	Sofía Olivero Lora	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2013	Local Perceptions on Residential Green Infrastructure within the Rio Piedras Watershed.	conference	C4SI3: Ecosystem Services for Sustainability. Third Conference for Sustainability IGERTs, Portland State University, Portland, Oregon, USA, September 26-29, 2013.	USA	Sofía Olivero Lora	Elvia Melendez
2013	Contrasting patterns of urban expansion in Colombia, Ecuador, Peru, and Bolivia between 1992 and 2009.	publication	Ambio, 42(1), 29–40. Alvarez-Berríos, N. L., Parés-Ramos, I. K., & Aide, T. M. (2013).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2013	Land Change in the Greater Antilles between 2001 and 2010.	publication	Land, 2(2), 81 –107. Álvarez-Berríos, N., Redo, D., Aide, T., Clark, M., & Grau, R. (2013).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2013	Mapping Urbanization Dynamics in Major Cities of Colombia, Ecuador, Per, and Bolivia Using Night-Time Satellite Imagery.	publication	Land, 2(1), 37–59. Parés-Ramos, I., Álvarez-Berríos, N., & Aide, T. (2013).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2013	La financiación y fungibilidad del Museo de Bioprospección, la Propiedad Intelectual y el Dominio Público.	publication	In E. Hodson de Jaramillo & T. Zamudio (Eds.), Biotecnologías e Innovación: el compromiso social de la ciencia (pp. 283–300). Vogel, J., Alvarez-Berríos, N. L., Ortíz-Carrión, B., & O., O.-S. (2013).	colombia	Nora L. Álvarez-Berríos	Mitchell Aide

Year	Title	Type	Info	Location	Student	Advisor
2013	Contrasting Patterns of Urban Expansion in Colombia, Ecuador, Peru and Bolivia Between 2001 and 2009	presentation	Environmental Science Departmental Seminar, University of Puerto Rico. Nov 2013	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2013	Woody cover changes between 2001 and 2010 due to gold mining expansion in Latin America and the Caribbean (poster).	conference	ATBC-OTS Meeting 2013 – Association for Tropical Biology. San José, Costa Rica, Jun 2013	Costa Rica	Nora L. Álvarez-Berríos	Mitchell Aide
2013	Worked assisting in field sample collection of Coral Porites astreoides larvae for RNA analysis, collection of adult corals for zooxanthellae counts and, collection and preparation of macro algae for lipid, carbohydrate and pigment extraction with GC-MS.	investigation	College of Natural Science, Department of Environmental Science, University of Puerto Rico, Río Piedras Campus; Mentor: Dr. Loretta Roberson	Puerto Rico	Mayra Sánchez García	Loretta Roberson

Year	Title	Type	Info	Location	Student	Advisor
2013	Use of *Lutjanus jocu* as a bio-indicator of emerging contaminants and changes in environmental condition	conference	Puerto Rico Center for Environmental Neuroscience Annual Retreat, Octubre 2013	Puerto Rico	Mayra Sánchez García	Loretta Roberson
2013	Ecology and Biodiversity WG2, 85 – 250. In Puerto Rico's State of the Climate 2010-2013: Assessing Puerto Rico's Social-Ecological Vulnerabilities in a Changing Climate.	publication	Eds. Jacobs, K.R., L. Carrubba, E. Diaz. Puerto Rico Coastal Zone Management Program, Department of Natural and Environmental Resources, NOAA Office of Ocean and Coastal Resource Management. San Juan, PR.	Puerto Rico	Mayra Sánchez García	Loretta Roberson
2013	urban development in surrounding lands of protected areas in Puerto Rico. International Institute of Tropical Forestry.	investigation	US Forest Service, San Juan Puerto Rico. PI. PhD. William Gould.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2013	The socio-environmental problema behind free-ranging cats in Old San Juan, Puerto Rico.	conference	Agents of Change Project, University of Puerto Rico. IGERT Video and Poster competition.	Puerto Rico	Jessica H. Castro Prieto	William Gould

Year	Title	Type	Info	Location	Student	Advisor
2013	Spatial analysis of Puerto Rico's terrestrial protected areas.	publication	1:240,000. IITF-RMAP-03. Río Piedras, PR. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, Quiñones, M. Gould, W., Castro, J. and Martinuzzi, S. 2013.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2013	Conservation of sea turtles in Puerto Rico: from scientific research to community-based management.	conference	Proceedings of the 33rd Annual Symposium on Sea Turtle Biology and Conservation, Baltimore, Maryland, USA, February 2-8.	USA	Jessica H. Castro Prieto	William Gould
2013	U.S. Virgin Islands Gap Analysis Project – Final Report.	publication	Gould WA, Solórzano MC, Potts GS, Quiñones M, Castro-Prieto J, Yntema LD. 2013. USGS, Moscow ID and the USDA FS International Institute of Tropical Forestry, Río Piedras, PR. 163 pages and 5 appendices.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2013	Impact of Long-Range Transported African Dust Events on Cloud Chemistry at a Caribbean Tropical Montane Cloud Forest	conference	2013 Fall Meeting, AGU, San Francisco, California, 9-13 Dec 2013.	USA	Elvis Torres Delgado	Olga Mayol

Year	Title	Type	Info	Location	Student	Advisor
2013	Chemical Speciation of water-soluble ions and metals in cloud and rain water during the Puerto Rico African Dust And Cloud Studies (PRADACS) campaigns	workshop	PanAmerican Advanced Studies Institute (PASI) Atmospheric Processes in Latin America and the Caribbean Short Course and Workshop, Cartagena, Colombia, 27 May-7 Jun 2013.	colombia	Elvis Torres Delgado	Olga Mayol
2013	Chemical Speciation of water-soluble ions and metals in cloud and rain water during the Puerto Rico African Dust And Cloud Studies (PRADACS) campaigns	conference	the American Geophysical Union Meeting of the Americas (AGU MOA), Cancún, México, 14-17 May 2013.	Mexico	Elvis Torres Delgado	Olga Mayol
2013	Chemical Speciation of water-soluble ions and metals in cloud and rain water during the Puerto Rico African Dust And Cloud Studies (PRADACS) campaigns	conference	33rd Puerto Rico Interdisciplinary Scientific Meeting 48th Junior Technical Meeting, Universidad del Turabo, Gurabo, Puerto Rico, 9 Mar 2013.	Puerto Rico	Elvis Torres Delgado	Olga Mayol

Year	Title	Type	Info	Location	Student	Advisor
2013	An Overview of the Puerto Rico African Dust and Clouds Study (PRADACS) – Aerosol and Cloud Measurements at a Caribbean Tropical Montane Cloud Forest	conference	33rd Puerto Rico Interdisciplinary Scientific Meeting 48th Junior Technical Meeting, Universidad del Turabo, Gurabo, PR, March 2013.	Puerto Rico	Elvis Torres Delgado	Olga Mayol
2013	Size resolved chemical composition of cloud and rain water during the Puerto Rico African Dust and Cloud Studies (PRADACS) campaign, presented at the NASA STEM Educational and Research Projects	conference	Universidad de Puerto Rico, Mayagüez Campus, Mayagüez, Puerto Rico, 1-6 Oct 2013.	Puerto Rico	Elvis Torres Delgado	Olga Mayol
2013	The occupational safety and health administration (OSHA) and hazard communication (HazCom) standard certification (29 CFR 1910, 1200)	workshop	University of Puerto Rico, Rio Piedras Campus, Puerto Rico, November 2013	Puerto Rico	Antonin Forestil	Gary Gervais

Year	Title	Type	Info	Location	Student	Advisor
2013	Nutrients flows and recovery in multistage anaerobic bioreactors feed with the marine macroalgae, Sargassum spp.	conference	48th ACS Junior Technical Meeting & 33rd Puerto Rico interdisciplinary scientific meeting (PRISM), Universidad del Turabo, Caguas, Puerto Rico, March 9, 2013	Puerto Rico	Antonin Forestil	Gary Gervais
2013	Hepatic flora of a Guatemalan cloud forest.	publication	Freire, V., M. Pérez, F. Ramírez, and M.V. Ríos. 2013. Tropical Bryology, 35: 1-13.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez
2013	Integración del conocimiento científico y el tradicional en los procesos de restauración de los bosques de pinabete (Abies guatemalensis Rehder), San Marcos, Guatemala.	publication	Martínez Arévalo, J.V., M. Pérez, C.O. Rivera Mazariegos, M.M. Velásquez Villatoro. 2013. Tikalia, 31: 73-91.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2013	Cambios en la composición, abundancia y distribución espacial de la vegetación vascular herbácea de la sierra de los Cuchumatanes y de la Península Antártica y posibles relaciones con el cambio climático	investigation	Rafael Landivar University, Ricardo A. Molina Herrera, Engineer in Environmental Management,	Guatemala	Mervin E. Pérez Pérez	Elvia Melendez
2013	Breeding system and pollination of Gesneria pauciflora urb. (Gesneriaceae): An endemic and threatened species of the Caribbean.	conference	Botanical Society of America, annual meeting, New Orleans, U.S. 2013	USA	Mervin E. Pérez Pérez	Elvia Melendez
2013	The Río Piedras Campus Pond: an underused ecosystem service.	conference	2nd. Graduate Research Student Congress, University of Puerto Rico, Rio Piedras Campus, San Juan, Puerto Rico.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez
2013	Breeding system and pollination of Gesneria pauciflora urb. (Gesneriaceae): An endemic and threatened species of the Caribbean.	presentation	XVII Symposium of the Department of Natural Resources: The threatened and endangered species in Puerto Rico.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2013	Moving forward: fostering the next generation of Earth stewards in the STEM disciplines.	publication	Frontiers in Ecology and the Environment 11(7): 383-391. Ricardo J Colón-Rivera, Kellen Marshall, Francisco J SotoSantiago, Dorimar Ortiz-Torres, and Charles E Flower. 2013.	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2013	The Sea Urchin Diadema antillarum (Echinodermata, Equinoidea), algal cover and juvenile coral densities in La Parguera, Puerto Rico.	publication	Research Journal of the Costa Rican Distance Education University, 5(1): 33-40. Francisco J. Soto-Santiago and Emmanuel Irizarry-Soto. 2013.	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2013	A social-ecological approach for coral reef conservation in Eastern Puerto Rico.	conference	Third Conference for Sustainability IGERTs, Portland State University, Portland, Oregon September 2013	USA	Francisco J. Soto Santiago	Alberto Sabat
2013	Worked with the Coalition for the Northeast Ecological Corridor on the draft for a Co-Management Plan for the Northeast Ecological Corridor Nature Reserve, organized a series of informative forums for the local and academic community, and organized non-profit display section for 30 organizations at the Leatherback Turtle Festival in Luquillo	investigation	Agents of Change IGERT Community Service Requirement	Puerto Rico	Luis Villanueva-Cubero	Mei Yu

Year	Title	Type	Info	Location	Student	Advisor
2013	Atmospheric Chemistry and Aerosol Laboratory	investigation	"Las Cabezas de San Juan" National Reserve Air quality field station	Puerto Rico	Ingrid M. Venero Velez	Olga Mayol
2013	Composición de aves acuáticas de la laguna Secreta en la ciénaga las Cucharillas, Cataño. "Waterbirds community composition of Secreta Lagoon in Cataño, Puerto Rico".	publication	Perspectivas en Asuntos Ambientales, 2(1), 67-81. Fidalgo De Souza, L. L. & Bauzá-Ortega, J. F. (2013).	Puerto Rico	Laura L. Fidalgo De Souza	Joseph Wunderle
2013	Educar con la Carta de la Tierra	workshop	University of Puerto Rico's UNESCO Chair in Education for Peace workshop (3 hours)	Puerto Rico	Laura L. Fidalgo De Souza	Joseph Wunderle
2013	Ultra Participatory Mapping Workshop	workshop	San Juan Ultra workshop (6 hours)	Puerto Rico	Laura L. Fidalgo De Souza	Joseph Wunderle
2013	Waterbird Community Assessment of the San Juan Bay Estuary Program in Puerto Rico, USA	conference	37th Waterbird Society Meeting and International Wander Group Conference in Wilhelmshaven, Germany	Germany	Laura L. Fidalgo De Souza	Joseph Wunderle

Year	Title	Type	Info	Location	Student	Advisor
2013	Deforestation and reforestation of Latin America and The Caribbean (2001 - 2010)	publication	T. Micthell Aide, Matthew Clark, H. Ricardo Grau, David López-Carr, Marc A. Levy, Daniel Redo, Martha Bonilla-Moheno, George Riner, María J. Andrade-Núñez, and María Muñiz. 201 3. Biotropica.DOI: 10.1111/j.1744-7429.2012.00908.x.	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2013	Sistema de Evaluación de Peligro de Incendios en Puerto Rico.	presentation	IGERT Retreat Environmental Science University of Puerto Rico. March, 2013	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2014	Seawater Anaerobic Bioreactors Using 454 Pyrosequencing of 16S Ribosomal RNA.	conference	Third Student Research Symposium in Microbiology presented by the Puerto Rico Society of Microbiologist (PRSM), October 25th, 2014.	Puerto Rico	Derilus Dieunel	Gary Gervais
2014	Next generation sequencing reveals a lack of methanogenic Archaea in saltwater bioreactors that use macroalgal feedstock	conference	4th International Conference on Algal Biomass, Biofuels and Bioproducts, Santa Fe, 15th-18th June	USA	Derilus Dieunel	Gary Gervais
2014	Gaia in a bottle' – the metagenomics of biogas reactors.	conference	Society for Molecular Biology & Evolution annual meeting, Hotel Caribe Hilton, San Juan, Puerto Rico, June 8th - 12th 2014.	Puerto Rico	Derilus Dieunel	Gary Gervais

Year	Title	Type	Info	Location	Student	Advisor
2013	Deforestation and reforestation of Latin America and The Caribbean (2001 -2010)	publication	T. Micthell Aide, Matthew Clark, H. Ricardo Grau, David López-Carr, Marc A. Levy, Daniel Redo, Martha Bonilla-Moheno, George Riner, María J. Andrade-Núñez, and María Muñiz. 201 3. Biotropica.DOI: 10.1111/j.1744-7429.2012.00908.x.	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2013	Sistema de Evaluación de Peligro de Incendios en Puerto Rico.	presentation	IGERT Retreat Environmental Science University of Puerto Rico. March, 2013	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2014	Seawater Anaerobic Bioreactors Using 454 Pyrosequencing of 16S Ribosomal RNA.	conference	Third Student Research Symposium in Microbiology presented by the Puerto Rico Society of Microbiologist (PRSM), October 25th, 2014.	Puerto Rico	Derilus Dieunel	Gary Gervais
2014	Next generation sequencing reveals a lack of methanogenic Archaea in saltwater bioreactors that use macroalgal feedstock	conference	4th International Conference on Algal Biomass, Biofuels and Bioproducts, Santa Fe, 15th-18th June	USA	Derilus Dieunel	Gary Gervais
2014	Gaia in a bottle' – the metagenomics of biogas reactors.	conference	Society for Molecular Biology & Evolution annual meeting, Hotel Caribe Hilton, San Juan, Puerto Rico, June 8th - 12th 2014.	Puerto Rico	Derilus Dieunel	Gary Gervais

Year	Title	Type	Info	Location	Student	Advisor
2014	Molecular Detection, Quantification And Diversity Assessment Of Microalgae In Brackish And Fresh Water.	conference	Third Symposium of An Interdisciplinary Journal of the Environment "AMBIeNTIS", November 25-26th 2014	Puerto Rico	Derilus Dieunel	Gary Gervais
2014	Characterization of the structure and dynamics of microbial anaerobic bioreactors using 454 pyrosequencing of 16S rRNA	conference	34th Puerto Rico Interdisciplinary Scientific Meeting, Cayey Puerto Rico, March 29th 2014	Puerto Rico	Derilus Dieunel	Gary Gervais
2014	Microbial diversity and population dynamics in high salinity two-stages anaerobic reactors fed with marine macro algae using 454 pyrosequencing analysis.	presentation	Universite d'Etat D'Haiti : Ecole Normale Superieure (December 21 th , 2014)	Haiti	Derilus Dieunel	Gary Gervais
2014	Mentor for Katherine Walston	investigation	El Verde REU (Research Experience for Undergraduates)	Puerto Rico	Aaron Hogan	Jess Zimmerman
2014	Graduate Student Workshop: "Current Issues in Statistical Ecology"	workshop	University of Tennessee-Knoxville – NiMBioS (National Institute of Mathematical Biology and Statistics). April 2014	USA	Aaron Hogan	Jess Zimmerman

Year	Title	Type	Info	Location	Student	Advisor
2014	Using PC-ORD to analyze Multivariate Community Ecology Data.	workshop	Instructor – Dr. Jerilyn Peck (Penn State University) USFS Southern Research Station – Knoxville, March 2014	USA	Aaron Hogan	Jess Zimmerman
2014	Seven-year responses to experimental hurricane effects in a tropical rainforest, Puerto Rico	publication	Jess K. Zimmerman, James Aaron Hogan, Aaron B. Shiels, John Bithorn, Samuel Motta and Nicholas Brokaw. Forest Ecology and Management, DOI:10.1016/j.foreco.2014.02.029	Puerto Rico	Aaron Hogan	Jess Zimmerman
2014	Responses of trees over a nine year period to an experimentallyinduced hurricane in the Luquillo Experimental Forest, Puerto Rico	presentation	Island Biology Conference 2014 in Hawaii, May 2014	Hawaii	Aaron Hogan	Jess Zimmerman
2014	Verbal presentation, Land-use Legacies affect Puerto Rican Forests at decadal and century time scales.	presentation	University of Puerto Rico Junior Scientific Technical Meeting PRISM, March 2014	Puerto Rico	Aaron Hogan	Jess Zimmerman
2014	USGBC Education Provider Certified Course Instructor in coordination with Dr. Fernando Abruña.	investigation	Center of Studies for Sustainable Development [CEDES] Metropolitan University of Puerto Rico.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	

Year	Title	Type	Info	Location	Student	Advisor
2014	LEED Consultants for F&R Construction Group. LEED for Schools Certification Process.	investigation	San Isidro Vocational School, Canóvanas, P.R.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	
2014	LEED Consultants for Puerto Rico Conservation Trust. LEED for New Construction Certification Process.	investigation	Hacienda La Esperanza.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	
2014	LEED Consultants. LEED EB+OM	investigation	School of Arquitecture. University of Puerto Rico, Río Piedras P.R.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	
2014	Educational Level 100 and 200. Coordinator and/or Main Speaker of multiple events.	workshop	USGBC U.S. Caribbean Chapter. LEED and LEED AP Introduction Courses and Technical Workshops.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	
2014	USGBC Caribbean Chapter. Instructor,Training Courses I & II.	investigation	School's Energy & Environmental Delegates [SEEDs]	Puerto Rico	Brenda L. Martínez Quiñones	, M.Arch
2014	Local spatial structure of forest biomass and its consequences for remote sensing of carbon stocks.	publication	Réjou-Méchain, M., Muller-Landau, H. C., Detto, M., Thomas, S. C., LeToan, T., many others & Nytch, C. J. (2014). Biogeosciences, 11, 5711-5742. DOI: 10.5194/bgd-11-5711 -2014	Puerto Rico	Christopher Nytch	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2014	Modeling rainfall-runoff dynamics in tropical, urban social-hydrological systems: Green infrastructure and variable precipitation interception.	conference	American Geophysical Union Fall Meeting, San Francisco, CA. 2014, December	USA	Christopher Nytch	Elvia Melendez
2014	Ontogenetic shifts in trait-mediated mechanisms of community assembly.	conference	Ecological Society of America annual meeting, Sacramento, CA. 2014, August	USA	Christopher Nytch	Elvia Melendez
2014	An assessment of residents' satisfaction and short-term visions for urban yards in San Juan, Puerto Rico.	conference	Ecological Society of America annual meeting, Sacramento, CA. 2014, August	USA	Christopher Nytch	Elvia Melendez
2014	Efecto del cambio de uso de terreno en la hidrología del acuífero de Santa Isabel, Puerto Rico	presentation	3er Simposio de Ambientis, Universidad del Turabo	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez
2014	Community Leadership and Environmental Challenges	investigation	Cataño Puerto Rico, May 2014	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez
2014	"Si el agua es vida, por qué la contaminas"	investigation	Workshop offered to high school students, Universidad del Sagrado Corazón, May 2014	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez

Year	Title	Type	Info	Location	Student	Advisor
2014	An assessment of residents' satisfaction and short-term visions for urban yards in San Juan, Puerto Rico.	conference	Annual Conference 2014, 'Urban landscape ecology: science, policy and practice' at King's College London, Guy's Campus. 1-3 September 2014	UK	Marianne Cartagena-Colon	Gabriel Moreno
2014	Research titled Natural Hazard and Social Risk Profile of Juana Matos community in Cataño, Puerto Rico.	investigation	Integrative Graduate Education and Research Traineeship (IGERT) National Science Foundation (NSF).	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2014	Research titled An assessment of residents' satisfaction and short-term visions for urban yards in San Juan, Puerto Rico.	investigation	San Juan Urban Long-Term Research Area (ULTRA), USDA Forest Service and the National Science Foundation (NSF).	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2014	Research titled Bio-conservation of tropical dry forest ecosystems with focus on Mona Island Puerto Rico.	investigation	Institute for Tropical Ecosystem Studies (ITES), UPR-RP.	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2014	Earth Workshop: Sustainability and Ecopedagogy	workshop	UNESCO Chair in Education for Peace, University of Puerto Rico. (February 26, 2014).	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno

Year	Title	Type	Info	Location	Student	Advisor
2014	Starting a Citizen Science and Volunteer Monitoring	workshop	United States Environmental Protection Agency (EPA) at School of Architecture of UPR-RP, September 12	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2014	Attended to SESYNC's 2014 Computational Summer Institute (CSI)	workshop	National Socio-Environmental Synthesis Center (SESYNC) Faculty and University of Maryland at Annapolis, MD, USA, July 7- July 11	USA	Marianne Cartagena-Colon	Gabriel Moreno
2014	Active participator and speaker in international congresses of water treatment	investigation	XXXIV Inter – American Congress of Sanitary and Environmental Engineering (AIDIS)	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2014	Slow sand filtration for water treatment at disadvantaged communities	investigation	Competitive Small Grant Program	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2014	Outreach activities "Nanodays" and nanotechnology demonstrations in schools and universities	investigation	National Science Foundation (NSF) under the Bridge to the Doctorate and GK – 12 Program	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2014	Costa Rica Tropical Biology: An Ecological Approach Program	investigation	Organization for Tropical Studies / University of Costa Rica	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2014	Scientific consultant GK-12 Fellow	investigation	Biology and Scientific Research, Angel P. Millán Public School, Carolina, Puerto Rico	Puerto Rico	Sofía Olivero Lora	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2014	Teaching assistant for Principles of Ecology	investigation	Biology Department, University of Puerto Rico	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2014	An Interdisciplinary Challenge: The Rivas Case Study	publication	National Socio-Environmental Synthesis Center (SESYNC), Olivero, S. & E. Meléndez-Ackerman. 2014.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2014	Local Perceptions on Residential Green Infrastructure within the Río Piedras Watershed.	conference	3rd Student Conference for Graduate Investigation, Office of the Dean fro Graduate Studies and Research, University of Puerto Rico, San Juan, Puerto Rico. April 24, 2014.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2014	Perspective: Globalization and land use in Latin America.	publication	GLP News, 5–7. Bonilla-Moheno, M., Ricardo Grau, H., Aide, T. M., Alvarez-Berríos, N. L., & Babot, J. (2014).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2014	The gold mining boom: Increase in global demand for gold and its consequences for land change in Latin America between 2001 and 2013.	presentation	Impact of mine-led migration, urbanization & remittances on forest resources in Africa and Latin America (MURFALA) Workshop, CIFOR. Bagamoyo, Jun 14, 2014	Tanzania	Nora L. Álvarez-Berríos	Mitchell Aide
2014	Contrasting patterns of urban expansion in Colombia, Ecuador, Peru and Bolivia between 1992 and 2009.	presentation	Latin American, Caribbean and Iberian Studies Program lunchtime lecture series, University of Wisconsin, Madison. Apr 29, 2014	USA	Nora L. Álvarez-Berríos	Mitchell Aide

Year	Title	Type	Info	Location	Student	Advisor
2014	The gold mining boom: Increase in global demand for gold and its consequences for land change in Latin America between 2001 and 2013.	presentation	Global Land Project – Open Science Meeting (GLP-OSM). Berlin, Germany. Mar 19, 2014	Germany	Nora L. Álvarez-Berríos	Mitchell Aide
2014	Participatory Mapping and Workshop Facilitation Training	workshop	NOAA and IGERT-UPR, Dec. 2014	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2014	Text Analysis: Systematic Methods for Analyzing Qualitative Data	workshop	University of Florida-Gainesville and UPR-Cayey, Jan. 2014	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2014	Worked assisting in field sample collection of Coral Porites astreoides larvae for RNA analysis, collection of adult corals for zooxanthellae counts and, collection and preparation of macro algae for lipid, carbohydrate and pigment extraction with GC-MS.	investigation	College of Natural Science, Department of Environmental Science, University of Puerto Rico, Río Piedras Campus; Mentor: Dr. Loretta Roberson	Puerto Rico	Mayra Sánchez García	Loretta Roberson

Year	Title	Type	Info	Location	Student	Advisor
2014	Use of Lutjanus jocu (Dog snapper) as a bio-indicator of emerging contaminants and changes in environmental condition	conference	17th biennial Ocean Sciences Meeting, February 2014	Hawaii	Mayra Sánchez García	Loretta Roberson
2014	Urban development in surrounding lands of protected areas in Puerto Rico. International Institute of Tropical Forestry.	investigation	US Forest Service, San Juan Puerto Rico. PI. PhD. William Gould.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2014	Housing growth around protected areas in Puerto Rico.	conference	XXVIII Simposio del Departamento de Recursos Naturales y Ambientales de Puerto Rico: Manejo del Paisaje en Puerto Rico, 6-7 Noviembre Centro de Convenciones, San Juan, PR.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2014	Housing growth around protected areas in Puerto Rico.	conference	Simposio de Investigación Estudiantil Ambientis. 26 de Septiembre, Universidad del Turabo, PR.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2014	Summer Workshop On Data Analysis Of Cloud Microphysical Measurements	workshop	Boston, Massachusetts, USA, 5-6 July, 2014.	USA	Elvis Torres Delgado	Olga Mayol
2014	Droplet Measurement Technologies	conference	WIBS 4-A User Group Meeting. 8-9 May, 2014.	USA	Elvis Torres Delgado	Olga Mayol

Year	Title	Type	Info	Location	Student	Advisor
2014	Rain chemistry and cloud composition and microphysics in a tropical cloud forest under the influence of African dust	conference	the 13th Quadrennial ICACGP Symposium 13 th IGAC Science Conference on Atmospheric Chemistry, Natal, Brazil, 23 Sep 2014.	Brazil	Elvis Torres Delgado	Olga Mayol
2014	Impact of African dust on cloud microphysical properties	conference	34rd Puerto Rico Interdisciplinary Scientific Meeting 49th Junior Technical Meeting, Universidad de Puerto Rico, Cayey Campus, Cayey, Puerto Rico, 29 Mar 2014.	Puerto Rico	Elvis Torres Delgado	Olga Mayol
2014	Impact of African dust on cloud and rainwater compositionon a tropical montane cloud forest	presentation	34rd Puerto Rico Interdisciplinary Scientific Meeting 49th Junior Technical Meeting, Universidad de Puerto Rico, Cayey Campus, Cayey, Puerto Rico, 29 Mar 2014.	Puerto Rico	Elvis Torres Delgado	Olga Mayol
2014	Nutrients demand and balance in a bench scale anaerobic digester producing biogas from marine macroalgae.	conference	49th ACS Junior Technical Meeting & 34rd Puerto Rico interdisciplinary scientific meeting (PRISM), Universidad del Turabo, Cayey, Puerto Rico, March 29, 2014	Puerto Rico	Antonin Forestil	Gary Gervais
2014	Description of the Natural History and Immature Stages of Postplatyptilia caribica Gielis in Puerto Rico (Lepidoptera: Pterophoridae).	publication	Matthews, D.L. and M.E. Pérez. 2014. Zootaxa, 3821: 363-372.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2014	Cambios en la composición, abundancia y distribución espacial de la vegetación vascular herbácea de la sierra de los Cuchumatanes y de la Península Antártica y posibles relaciones con el cambio climático	investigation	Rafael Landivar University, Ricardo A. Molina Herrera, Engineer in Environmental Management,	Guatemala	Mervin E. Pérez Pérez	Elvia Melendez
2014	Adaptation or extinction: effects of climate change on biodiversity, ecosystem services, and human communities.	presentation	University of San Carlos de Guatemala-Zacapa Campus, Guatemala	Guatemala	Mervin E. Pérez Pérez	Elvia Melendez
2014	The “Selfie” in the Caribbean: Analysis of Baker’s hypothesis in the Gesneriaceae family.	presentation	Universidad de San Carlos de Guatemala- Central Campus, Guatemala.	Guatemala	Mervin E. Pérez Pérez	Elvia Melendez
2014	The “Selfie” in the Caribbean: Analysis of Baker’s hypothesis in the Gesneriaceae family.	presentation	Third Student Research Symposium-Ambientis, Caguas, Puerto Rico.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2014	Breeding system and pollination of Gesneria pauciflora a threatened caribbean species: brief island reproductive syndrome analysis in Gesneriaceae species.	presentation	XXIX Symposium of Flora and Fauna from the Caribbean, Humacao, Puerto Rico.	Puerto Rico	Mervin E. Pérez Pérez	Elvia Melendez
2014	Cornell Remote Sensing Summer Training	investigation	Cornell University, Ithaca, New York, June 2014	USA	Francisco J. Soto Santiago	Alberto Sabat
2014	NSF “Grant Writing” Workshop	workshop	University of Puerto Rico, Río Piedras Campus, February 2014	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2014	Light and Photosynthesis in Coral Reefs Course	investigation	Universidad Autónoma de México, Puerto Morelos, México, January2014	Mexico	Francisco J. Soto Santiago	Alberto Sabat
2014	Affiliate Researcher/ Outreach Specialist: Conducting anthropological studies within the northeast coast of Puerto Rico. Also, leading outreach efforts within the marine environment in Eastern Puerto Rico.	investigation	Centro para la Conservación del Paisaje Inc.	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat

Year	Title	Type	Info	Location	Student	Advisor
2014	Field interviewer for NOAA commercial fisheries statistics in the north and east coasts of Puerto Rico.	investigation	University of Miami, Rosenstiel School of Marine and Atmospheric Sciences Cooperative Institute of Marine and Atmospheric Studies	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2014	Demography of Porites astreoides and Orbicella annularis: a resilient and susceptible coral species	presentation	IV Congreso Colombiano de Zoología, Centro de Convenciones, Cartagena de Indias, Colombia, December 2014	colombia	Francisco J. Soto Santiago	Alberto Sabat
2014	Abundance and size structure of a resilient and susceptible coral species in Eastern, Puerto Rico.	presentation	American Society of Limnology and Oceanography (ASLO) Meeting, Hawaii Convention Center, Honolulu, Hawaii, February 2014	Hawaii	Francisco J. Soto Santiago	Alberto Sabat
2014	A social-ecological approach for coral reef conservation in Eastern Puerto Rico.	presentation	Light and Photosynthesis in Coral Reefs Course, Universidad Autónoma de México, Puerto Morelos, México, January 2014	Mexico	Francisco J. Soto Santiago	Alberto Sabat
2014	Green Area Loss in San Juan's Suburban Neighborhoods: Estimation Methods, Environmental Consequences, and Preliminary Identification of Precipitating Factors and Process	publication	Luis E. Ramos-Santiago, Luis VillanuevaCubero, Luis E. Santiago-Acevedo, Yasha Rodríguez-Meléndez, Ecology and Society, April 2014	Puerto Rico	Luis Villanueva-Cubero	Mei Yu

Year	Title	Type	Info	Location	Student	Advisor
2014	Atmospheric Chemistry and Aerosol Laboratory	investigation	"Las Cabezas de San Juan" National Reserve Air quality field station	Puerto Rico	Ingrid M. Venero Velez	Olga Mayol
2014	NOAA participatory mapping and meeting facilitation workshop	workshop	NOAA and IGERT-UPR	Puerto Rico	Laura L. Fidalgo De Souza	Joseph Wunderle
2014	The National Socio-Environmental Synthesis Center - SESYNC's 2014 Computational Summer Institute (CSI).	workshop	University of Maryland, Annapolis, MD (5 days).	USA	Laura L. Fidalgo De Souza	Joseph Wunderle
2014	The spatial scale of response of two mammal species in a human dominated landscape in Rivera Uruguay.	presentation	III Congreso Uruguayo de Zoología, Montevideo, Uruguay. December,2014	Uruguay	María José Andrade-Núñez	Rosana Grafals
2014	OTS FIELD ECOLOGY	investigation	San Jose, Costa Rica, December 2014 - January 2015	Costa Rica	Paul R. Furumo	Mitchell Aide
2014	Impact of thermal stress on growth and photosynthesis on larvae and adult stages in Porites astreoides.	investigation	UPR-RP, San Juan, Puerto Rico	Puerto Rico	Neidibel Martínez González	Loretta Roberson

Year	Title	Type	Info	Location	Student	Advisor
2014	Effect of temperature and salinity in photosynthetic activity in P. astreoides	presentation	The Puerto Rico Interdisciplinary Scientific Meeting (PRISM)	Puerto Rico	Neidibel Martínez González	Loretta Roberson
2014	An assessment of residents' satisfaction and short-term visions for urban yards in San Juan, Puerto Rico.	conference	International Association of Landscape Ecology Conference, September 2014, London, U.K.	UK	Molly Ramsey	Elvia Melendez
2014	Transforming Institutions and Urban Social-Ecological Systems for Sustainable Flood Management	presentation	NOAA Social Coast Forum, 'Exploring the Values of the Coast', Charleston, South Carolina, February 2014.	USA	Molly Ramsey	Elvia Melendez
2014	Socio-Environmental Synthesis Center (SESYNC) Data Computation Workshop	workshop	Annapolis, Maryland.	USA	Molly Ramsey	Elvia Melendez
2015	Plant Evolution and Phylogenetics, Plant Systematics and Taxonomy, Field Identification of plants, Herbarium preparation of plant specimens	investigation	Phylogenetic Evolution and Biogeographic Distributions of Costa Rican Burseraceae	Costa Rica	Aaron Hogan	Jess Zimmerman

Year	Title	Type	Info	Location	Student	Advisor
2015	Mentor for Sylvette Mallorking	investigation	El Verde REU (Research Experience for Undergraduates)	Puerto Rico	Aaron Hogan	Jess Zimmerman
2015	Revisiting the interaction of land Use and the Environment in a Puerto Rican Subtriopical Wet Forests	presentation	52nd Annual Association for Tropical Biology and Conservation Association Conference in Hawaii, June 2015	Hawaii	Aaron Hogan	Jess Zimmerman
2015	Verbal presentation, Successional trajectories of recovering a Puerto Rican forest to an experimental hurricane: spatial variability in tree community responses.	presentation	University of Puerto Rico Junior Scientific Technical Meeting PRISM, March 2015	Puerto Rico	Aaron Hogan	Jess Zimmerman
2015	Revisiting the Interaction of Land-use and the Environment in a Puerto Rican subtropical wet forest	presentation	ESA Annual Meeting 2015, August 2015	Puerto Rico	Aaron Hogan	Jess Zimmerman
2015	USGBC Education Provider Certified Course Instructor in coordination with Dr. Fernando Abruña.	investigation	Center of Studies for Sustainable Development [CEDES] Metropolitan University of Puerto Rico.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	

Year	Title	Type	Info	Location	Student	Advisor
2015	LEED Consultants for F&R Construction Group. LEED for Schools Certification Process.	investigation	San Isidro Vocational School, Canóvanas, P.R.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	
2015	LEED Consultants for Puerto Rico Conservation Trust. LEED for New Construction Certification Process.	investigation	Hacienda La Esperanza.	Puerto Rico	Brenda L. Martínez Quiñones, M.Arch.	
2015	LEED Consultants. LEED EB+OM	investigation	School of Arquitecture. University of Puerto Rico, Río Piedras P.R.	Puerto Rico	Brenda L. Martínez Quiñones	M.Arch
2015	Educational Level 100 and 200. Coordinator and/or Main Speaker of multiple events.	workshop	USGBC U.S. Caribbean Chapter. LEED and LEED AP Introduction Courses and Technical Workshops.	Puerto Rico		
2015	USGBC Caribbean Chapter. Instructor,Training Courses I & II.	investigation	School's Energy & Environmental Delegates [SEEDs]	Puerto Rico	Brenda L. Martínez Quiñones	M.Arch.
2015	Research Program Support	investigation	US Forest Service - International Institute of Tropical Forestry, Puerto Rico	Puerto Rico	Christopher Nytch	Elvia Melendez
2015	Diversity enhances carbon storage in tropical forests.	publication	Poorter, L. van der Sande, M., Thompson, J., Arets, E., Alarcon, A., many others &Nytch, C. Global Ecology and Biogeography. DOI: 10.1111/geb.12364, 2015	Puerto Rico	Christopher Nytch	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2015	Ontogenetic shifts in trait-mediated mechanisms of plant community assembly.	publication	Lasky, J. R., Bachelot, B., Muscarella, R., Schwartz, N., Forero-Montaña, J., Nytch, C.J., Swenson, N. G., Thompson, J., Zimmerman, J. K., & Uriarte, M. (2015). Ecology, 96(8), 2157-2169. DOI: 10.1890/14-1809.1	Puerto Rico	Christopher Nytch	Elvia Melendez
2015	The water budget of a tropical urban watershed.	conference	Ecological Society of America annual meeting, 2015, August, Baltimore, MD.	USA	Christopher Nytch	Elvia Melendez
2015	Inter-specific functional similarity and intraspecific negative density dependence underlie the seed to seedling transition in tropical trees.	publication	Umaña, M. N., Forero-Montaña, J., Muscarella, R., Nytch, C. J., Thompson, J., Uriarte, M., Zimmerman, J., & Swenson, N. G. Accepted in *American Naturalist.*	Puerto Rico	Christopher Nytch	Elvia Melendez
2015	An analysis of US Army Corps of Engineers documents supporting the channelization of the Río Piedras.	publication	Lugo, A. E., Ramsey, M., & Nytch, C. J. Submitted to Acta Científica.	Puerto Rico	Christopher Nytch	Elvia Melendez
2015	Avian conservation planning priorities for Puerto Rico and the U.S. Virgin Islands.	publication	Nytch, C. J., Hunter, W. C., Núñez-García, F., Fury, C., Quiñones, M., & Collazo, J. (2015). Atlanta: US Fish and Wildlife Service.	Puerto Rico	Christopher Nytch	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2015	HICE-PR sponsored by NASA	investigation	Research Assisstant at the Dr. Ortiz' Limnology Laboratory in Facundo Bueso Building at the UPR-RP	Puerto Rico	Rosa Saez	Jorge Ortiz
2015	TDS (Total Dissolved Solids): What we don't know is in our water	presentation	Best Practices Symposium - Turabo University	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez
2015	Conservación de hábitat y análisis de comportamiento de la Chiriría antillana Dendrocygna arborea en Cataño, Puerto Rico	publication	Betzaida Ortiz Carriónand Pedro Carrión Huertas. Acta Científica IGERTs Special Edition	Puerto Rico	Betzaida Ortiz Carrion	Jorge Rodriguez
2015	Vulnerability Social Index in response of Climate Change in Dorado, Puerto Rico.	investigation	Research project of the Center of Social Research, Planning Graduate School of the UPR-RP and Department of Natural Resources, Coastal Zone Government of Puerto Rico. July 8 – August 8	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2015	Risk Assessment of Juana Matos, Cataño, Puerto Rico.	conference	Fourth Symposium of Students Research,'Ambientis an Interdisciplinary Journal of the Environment' at Turabo University, Puerto Rico. 9 October 201 5	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2015	Research titled Exhibition of port systems and the sea level rise in Puerto Rico. Comparative Research between Manzanillo port in Mexico and San Juan port in Puerto Rico.	investigation	Graduate Research Student, Center of Social Research (CIS, in Spanish), UPR-RP.	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno

Year	Title	Type	Info	Location	Student	Advisor
2015	Research titled Emergency Management Policies Information flows, and Inter-Agency Decision Making.	investigation	Graduate Research Student, Center of Social Research (CIS, in Spanish), UPR-RP.	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2015	Research titled Sustainability Research Network: Urban Resilience to Climate Change - driven extreme events 2015 - 2018.	investigation	Graduate Research Student, Center of Social Research (CIS, in Spanish), UPR-RP.	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2015	Research titled Convergence of human and land uses: Urban development and alterations to the nitrogen cycle.	investigation	Graduate Research Student, Center of Social Research (CIS, in Spanish), UPR-RP.	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2015	EPA Region 2 Equipment Loan Program and Water Quality Monitoring Seminar	workshop	Environmental Protection Agency of United States (EPA), City View Plaza Guaynabo, August 11, 2015	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno
2015	Fundamentals of Quantum GIS, Parts I and II, version 2.6. Includes use of GRASS / GIS version 6.4.	workshop	Office of Management and Budget: Areas of Technology Government Information Unit, Geographic Information Systems. Government of Puerto Rico. January 13, 2015	Puerto Rico	Marianne Cartagena-Colon	Gabriel Moreno

Year	Title	Type	Info	Location	Student	Advisor
2015	Active participator and speaker in international congresses of water treatment	investigation	Center for Environmental Education, Conservation and Research (CECIA).	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2015	Outreach activities "Nanodays" and nanotechnology demonstrations in schools and universities	investigation	National Science Foundation (NSF) under the Bridge to the Doctorate and GK – 12 Program	Puerto Rico	Angélica Erazo – Oliveras	Rafael Rios
2015	Intrinsic and extrinsic drivers of yard vegetation in urban residential areas: implications for conservation planning	publication	Submitted to Urban Ecosystems, Torres-Camacho, K.; Meléndez-Ackerman, E.; Díaz, E.; Correa, N.; Vila, C.P.; Olivero-Lora, S.; Erazo, A.; Fontánez, J.; Santiago, L.S. & Seguinot-Barbosa, J. 2015.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2015	Colores para la enseñanza del código genético (Colors for teaching the genetic code)	publication	El Sol Journal, Year 56, Num.1, Teachers Association of Puerto Rico, Berríos, B.; S. Olivero; E. O. Ortiz-Quiles, S. Martinez Laureano. 2015.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2015	Los colores de mi tierra (The colors of my land)	publication	El Sol Journal, Year 56, Num. 1. 55-60. Teachers Association of Puerto Rico, Ortiz-Quiles, E. O.; S. Martínez Laureano; S. Olivero; Berríos, B. 2015.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2015	UPR-IGERT's Agents of Change Project: Best Practices for Interdisciplinary Work	publication	Submitted to Acta Científica, Meléndez-Ackerman, E.; S. Olivero-Lora; A. Erazo, J. Fontánez, K. Torres, Y. Hernández, C. Vila, E. Díaz, N. Correa, L. Santiago, R. Rodríguez & J, Seguinot, 2015.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2015	Perceived Ecosystem Services and Disservices of Residential Green Infrastructure within the Río Piedras Watershed.	presentation	The 5th World Sustainability Forum (wsf-5), Basel, Switzerland. September 7-9, 2015.	Switzerland	Sofía Olivero Lora	Elvia Melendez
2015	Socio-ecological assessment of ecosystem services by urban green infrastructure in residential yards of a tropical city.	presentation	56th Society for Economic Botany (SEB) Annual Meeting & Indigenous Plant Use Forum (IPUF), July 22, 2015.	South Africa	Sofía Olivero Lora	Elvia Melendez
2015	Local perception of ecosystem services and green infrastructure management in residential zones of the Río Piedras Watershed.	presentation	Environmental Science Department Seminar, University of Puerto Rico, San Juan, Puerto Rico, April 28, 2015.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2015	Local perception of ecosystem services and green infrastructure management in residential zones of the Río Piedras Watershed.	presentation	4th Student Conference for Graduate Investigation, Office of the Dean for Graduate Studies and Research, University of Puerto Rico, April 9, 2015.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez

Year	Title	Type	Info	Location	Student	Advisor
2015	Ecosystem services by urban green infrastructure in residential yards in a tropical city: Integrating information on social drivers, green infrastructure management and ecosystem assessment tools.	conference	35th Puerto Rico Interdisciplinary Meeting / 50th Junior Tech Meeting, San Juan, Puerto Rico. March 24, 2015.	Puerto Rico	Sofía Olivero Lora	Elvia Melendez
2015	Global demand for gold is another threat for tropical forests.	publication	Environmental Research Letters, 10(1), 014006. Alvarez-Berríos, N. L., & Mitchell Aide, T. (2015).	Puerto Rico	Nora L. Álvarez-Berríos	Mitchell Aide
2015	The gold mining boom: Increase in global demand for gold and its consequences for land change in Latin America between 2001 and 2013.	presentation	Workshop: 'The impact of mining on forests: information needs for effective policy responses'. Chatham House. British Academy, June 3, 2015	UK	Nora L. Álvarez-Berríos	Mitchell Aide
2015	The influence of international gold prices, national mining policy and land tenure on deforestation in the southeastern Peruvian Amazon from 1999 to 2014.	presentation	AAG 2015 Annual Meeting, Chicago, Illinois. Apr 21-25, 2015	USA	Nora L. Álvarez-Berríos	Mitchell Aide

Year	Title	Type	Info	Location	Student	Advisor
2015	Impact of hypoxia on startle response (C-start) of fish in a tropical urban estuary	conference	Puerto Rico Center for Environmental Neuroscience Annual Retreat, Octubre 2015	Puerto Rico	Mayra Sánchez García	Loretta Roberson
2015	Estuarine fishes as bio-indicators of changes in environmental conditions and emerging contaminants	presentation	Puerto Rico Center for Environmental Neuroscience Annual Retreat, Octubre 2015	Puerto Rico	Mayra Sánchez García	Loretta Roberson
2015	Protected Areas Conservation Action Team (PA-CAT).	investigation	Caribbean Landscape Conservation Cooperative (CLCC).	Puerto Rico	Jessica H. Castro Prieto	William Gould
2015	Digitalización de referencias y base de datos del "Programa de Tortugas Marinas" del Departamento de Recursos Naturales y Ambientales de Puerto Rico.	conference	V Simposio de Herpetología.	Puerto Rico	Jessica H. Castro Prieto	William Gould
2015	More housing units and less people around protected areas in Puerto Rico.	conference	World Congress of the International Association of Landscape Ecology. 5-10 July, Portland, Oregon.	USA	Jessica H. Castro Prieto	William Gould
2015	Comparabilidad de pH y conductividad de muestras de agua de lluvia tomadas en la Estación Pico del Este.	conference	San Juan, Puerto Rico, 22 Aug, 2015.	Puerto Rico	Elvis Torres Delgado	Olga Mayol

Year	Title	Type	Info	Location	Student	Advisor
2015	Understanding the effect of African dust particles on cloud chemistry and microphysics in a tropical montane cloud forest in the Caribbean.	conference	Latin American and Caribbean Aerosol Measurements School: From measurements technologies to applications, La Paz, Bolivia, 24 Jun, 2015.	Bolivia	Elvis Torres Delgado	Olga Mayol
2015	Rain chemistry and cloud composition and microphysics in a Caribbean tropical montane cloud forest under the influence of African dust	conference	European Geosciences Union General Assembly 2015, EGU, Vienna, Austria, 16 Apr 2015.	Austria	Elvis Torres Delgado	Olga Mayol
2015	Impact of African dust on cloud and rain chemistry and cloud microphysics in Caribbean cloud forest	conference	35rd Puerto Rico Interdisciplinarity Scientific Meeting 50th Junior Technical Meeting, 29 Mar 2015.	Puerto Rico	Elvis Torres Delgado	Olga Mayol
2015	The role of Phylloicus pulchrus (Trichoptera: Calamoceratidae) in the decomposition of leaf litter: evaluating leaf species and case building effects.	conference	Society for Freshwater Science 2015 Annual Meeting, Milwaukee, Wisconsin.	USA	Limarie Judith Reyes Torres	

Year	Title	Type	Info	Location	Student	Advisor
2015	The role of Phylloicus pulchrus (Trichoptera: Calamoceratidae) in the decomposition of leaf litter: evaluating leaf species and case building effects.	presentation	Junior Technical Meeting (JTM) and the Puerto Rico Interdisciplinary Meeting (PRISM), University of Puerto Rico Rio Piedras.	Puerto Rico	Limarie Judith Reyes Torres	
2015	life history, phenology and role in organic matter processing of P. pulchrus in the streams of Puerto Rico	investigation	University of Puerto Rico Rio Piedras	Puerto Rico	Limarie Judith Reyes Torres	
2015	Project manager for the El Yunque National Forest, Children's Tropical Forests project.	investigation	Centro para la Conservación del Paisaje Inc.	Puerto Rico	Francisco J. Soto Santiago	
2015	Affiliate Researcher/ Outreach Specialist: Conducting anthropological studies within the northeast coast of Puerto Rico. Also, leading outreach efforts within the marine environment in Eastern Puerto Rico.	investigation	Centro para la Conservación del Paisaje Inc.	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat

Year	Title	Type	Info	Location	Student	Advisor
2015	Field interviewer for NOAA commercial fisheries statistics in the north and east coasts of Puerto Rico.	investigation	University of Miami, Rosenstiel School of Marine and Atmospheric Sciences Cooperative Institute of Marine and Atmospheric Studies	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2015	Variability in prevalence of Caribbean Yellow Band Disease in La Parguera, Puerto Rico.	publication	Francisco J. Soto-Santiago and Ernesto Weil. 201 5. Caribbean Journal of Science. In press	Puerto Rico	Francisco J. Soto Santiago	Alberto Sabat
2015	Atmospheric Chemistry and Aerosol Laboratory	investigation	“Las Cabezas de San Juan” National Reserve Air quality field station	Puerto Rico	Ingrid M. Venero Velez	Olga Mayol
2015	Risk Assessment of Juana Matos Community, Cataño, Puerto Rico	conference	Simposio de Investigación Estudiantil Ambientis Conference in Universidad del Turabo, Puerto Rico.	Puerto Rico	Laura L. Fidalgo De Souza	Joseph Wunderle
2015	Conference on Biological Stoichiometry 2015.	conference	Peter Gzowski College, Trent University, Canada.	Canada	Laura L. Fidalgo De Souza	Joseph Wunderle
2015	Public perception towards stray cats in Old San Juan, Puerto Rico.	publication	Jessica Castro-Prieto and María José Andrade-Núñez. Submitted. Acta Científica.	Puerto Rico	María José Andrade-Núñez	Rosana Grafals
2015	Base de datos y biblioteca digital en línea del Programa de Manejo y Conservación de tortugas marinas de Puerto Rico.	presentation	Quinto Simposio de Herpetología Puertorriqueña, Arecibo, Puerto Rico. October 2015	Puerto Rico	María José Andrade-Núñez	Rosana Grafals

Year	Title	Type	Info	Location	Student	Advisor
2015	High Conservation Value (HCV) Assessor Course	investigation	Santa Marta, Colombia, September 2015	colombia	Paul R. Furumo	Mitchell Aide
2015	TÉCNICAS DE REALIZACIÓN DE REPORTAJE DOCUMENTAL PARA INVESTIGADORES CIENTÍFICOS	investigation	UPR-RP, San Juan, Puerto Rico, April 2015	Puerto Rico	Paul R. Furumo	Mitchell Aide
2015	Revisiting the population status of the sea urchin Diadema antillarum in northern Puerto Rico.	publication	Mercado-Molina, A. E., Montañez-Acuña, A., Rodríguez-Barreras, R., Colón-Miranda, R., Díaz-Ortega, G., Martínez-González, N., Sabat, A. M. (2015). Journal of the Marine Biological Association of the United Kingdom, 95(05), 1017–1024.	Puerto Rico	Neidibel Martínez González	Loretta Roberson
2015	Impact of thermal stress on Photosynthesis and growth in different stages in corals.	conference	Puerto Rico Center for Environmental Neuroscience, San Juan Puerto Rico	Puerto Rico	Neidibel Martínez González	Loretta Roberson

APPENDIX 2

IGERT Final report

Final Report

Award ID: 0801577
Final Report for Period: 2009 - 2016
Institution: University of Puerto Rico - Rio Piedras
Title: IGERT: Natural-Human Systems in the Urbanizing Tropics

Research Accomplishments

The main research framework of the program was the Agents of Change projects, which is an innovative program component that provided an opportunity for group research applying a social-ecological framework to current real-world problems. Agents of Change projects were aimed at giving the students the experience of working in groups in a complex applied research problem while aiding government agencies, non-profit organization and private groups who were actively working toward a more sustainable Puerto Rico. The students applied and integrated the knowledge acquired in the core courses to develop an applied research project and a report that presented plausible solutions to current environmental problems in Puerto Rico. Representative projects covered a diverse range of issues: 1) Combating effects of anthropogenic activities on coastal and marine systems in Puerto Rico's urbanizing northeast coast; 2) Social, institutional and economic drivers of Puerto Rico's urbanizing northeast coast; 3) Environmental issues of the low income communities in the watershed of the San Juan Bay; 4) Synthesis of socio-hydrological data and community surveys of flood experience for municipal planning and management of flooding in San Juan, Puerto Rico; and 5) Perceptions, attitudes, and awareness of urban green spaces: The case of Barrio Obrero de Santurce, PR.

The first project, which started in 2013, has continued work in its analysis of anthropogenic activities at the Aguas Prietas Lagoon, an inland water body in the area, and preliminary findings of samples taken by core-bore extraction and submitted to C-14 testing revealed that deposition of 1 meter of sedimentation has occurred during the past 1,300 years. Climatic events increased accrual at certain periods while initially deposition seems slightly less during the period known as The Little Ice Age due to drier climate. This information has bearing on current climate change work. XRF analysis indicated the presence of metals in some samples, which could also have additional implications on water quality.

The third project, also from 2013, had to do with the environmental issues of the low income communities in the watershed of the San Juan Bay Estuary. Once the project was finished, the work was published in the journal "Ecología Política". The students expanded the work in preparing and publishing a chapter in a book with the theme of "Citizen Participation" sponsored by the School of Planning and the School of Social Sciences of the University of Puerto Rico. The chapter outlines the experiences, hardships, work, projects, and dreams of a community that has united and taken responsibility of caring for their environment and improve their quality of life. It also describes the Ciénaga Las Cucharillas swamp restoration projects, the project that has been presented for legislation for the protection of local species, the decrease in crime that has been experienced in the community, and the health impact of the residents.

The San Juan Urban Long-Term Research Area (ULTRA) is a long-term network and research site established in the city of San Juan in 2009 by the USDA Forest Service and NSF to produce knowledge on urban areas and to support policy, education, and local initiatives in order to improve the quality-of-life and environmental conditions in the city. San Juan ULTRA is a collaborative research network composed of multiple academic institutions (including the University of Puerto Rico Rio Piedras), public agencies, non-profit partners, and community leaders, which seeks to conduct and support research about the city of San Juan as a social-ecological system, looking at the complex human-nature interactions, taking into consideration multiple spatial and temporal scales, and how these systems can adapt and be sustainable in the face of future changes, such as climate change. Through the Agents of Change activity, the SAN JUAN ULTRA research network was able to implement a research survey as a tool that explored the interaction of multiple social factors that influence the composition of yard plants. The goal of the project was to understand the factors that may limit or enhance the potential role of residential areas in urban biodiversity conservation. It involved 18 investigators (3 faculty, 5 graduate students, one technician and 10 undergraduate students). Participating faculty were from the Environmental Sciences Department and the Graduate School of Planning of UPR Rio Piedras and the Environmental Health Department of the Medical Sciences Campus. The work produced two presentations and is part of a PhD dissertation.

The first year of the project where we had students was 2009-2010. During that year we had one refereed journal publication and one oral presentation at an international conference. Last year, 2014-2015, we had four journal articles in refereed publications, two journal articles in non-refereed publications, one conference publications, 24 conference presentations (posters), and nine conference presentations (oral).

Educational Accomplishments

The goals of our IGERT program was to train Ph.D. students to apply an interdisciplinary and collaborative approach to environmental problems in urbanizing, tropical landscapes. The novel feature of the research theme was the focus on interactions between human and natural systems in the urbanizing tropics, rather than the more common focus on deforestation and related problems. The interdisciplinary feature was the research and training focus on interactions between human activity and ecological systems. Because of the interdisciplinary relationships between the natural and social sciences and the disciplines concerned with the built environment, we initially housed our project at the Environmental Sciences Program of the College of Natural Sciences and created the curriculum and dissertation structures for a graduate program in Environmental Sciences, offering both MS and PhD degrees. Over the life of the project, we tested and improved the graduate program and the interdisciplinary concepts, which are now a major part of the graduate program in Environmental Sciences. This new graduate program and its associated interdisciplinary culture is the firm, enduring legacy of our IGERT in Environmental Sciences at the now Department of Environmental Sciences at the University of Puerto Rico-Río Piedras.

The Environmental Sciences graduate program was created at the institutional level by Certification 49 2008-2009 of the Board of Trustees of the University of Puerto Rico, dated

March 11, 2009. This certification specifically recognized the importance of NSF-IGERT funding. On June 10, 2009 the Commonwealth accreditation agency, the Council of Higher Education, approved the start of the graduate program and the first 17students were admitted in August 2009. Of these, eight were IGERT Fellows, one of which has completed her PhD. Due to the rapid growth of the graduate program, the Environmental Sciences Program was merged with the Institute for Tropical Ecosystems Studies in January 24, 2012 to create the Department of Environmental Sciences (Certification 51 2011-2012 of the Board of Trustees of the University of Puerto Rico). As IGERT PI and Chairman of the Environmental Sciences Program and then Environmental Sciences Department (since August 2007 and up to February 2015), I can attest that none of this would have happened without the IGERT grant.

The graduate program in environmental sciences has 68 active students, about 20% of which are international. It has awarded one PhD and eight Master's degrees. There are currently 49 researchers in the graduate program which, reflecting its interdisciplinarity, include faculty from all the departments in the College of Natural Sciences, from the Geography, Psychology, Economics and Sociology departments from the College of Social Sciences, the Institute of Neurobiology, the Graduate School of Planning, the Graduate School of Public Health and others from the University of Puerto Rico and mainland institutions. The main areas of research are ecology, spatial analysis and modeling, environmental neurobiology, biochemistry, urban problems and remediation technologies.

The IGERT program had two aspects that provided exceptional 'added value' to the trainees' educational experience: the IGERT integrative core courses and the Agents-of-Change projects. Since most of today's scientific and social problems lie at the interface of many disciplines, the six, two credit hours each (taken over the course of one year, three per semester) integrative core courses incorporated components of social and natural science and other fields to provide training in the interdisciplinary approach to problems and opportunities in a tropical urbanizing environment. They were specially designed for the interdisciplinary thrust of the IGERT, and to immerse students in real-world problem solving. The components of this core, like the research theme, were based on vital social science and other disciplinary links, in the natural/human systems model and on the main research questions. The courses were: 1) Human Dimensions of Environmental Change; 2) Urban Environment, Expansion, and Design; 3) Ecosystem Services and Ecological Economics; 4) Policy and Ethics for the Environment; 5) Socio-Ecological Models and Ecological Informatics; and 6) Communication on the Environment. Specifically, these courses addressed how human activity alters ecosystems (1, 2), how altered ecosystems affect human activity (3), and on how research findings are used to shape solutions for environmental problems (4, 5, 6). Additional value of the courses was that they trained students to be conversant with informatics and modeling, to manage large databases, project trends, and test hypotheses. IGERT Fellows took this core in the first or second year of graduate study, depending on their previous experience. The IGERT core was open to all qualifying students, which helped enrich the perspective of our students with those from other specialties and graduate programs. Over the seven years of the project, the courses were offered three times and are now part of the regular offer of the Department of Environmental Sciences. Besides being taught by academic experts on the subject, we were able to have one taught by a former Secretary of Natural Resources of Puerto Rico and another one by the current Vice Chairman of the Planning Board, emphasizing the public policy, applied aspects of the program.

During the summer of 2015 we conducted an external evaluation of the project. We evaluated

results from the time each participant entered or started collaborating in the project (Pre time) and the end of the project or the time they ended their collaboration in the project (Post time).We obtained a 91% pre time response rate and a 79% post time rate from all graduate students who have been fellows in the project. Many fellows identified elements of the design and implementation of the Project as its main strengths, including the courses, workshops, professors' mentoring, collaborations and multidisciplinary approach. Two specific comments:

"The IGERT courses have introduced me to some of the important social science components that are relevant to modern environmental and ecological sciences, especially those pertaining to urban landscapes." "The IGERT courses. have provided me the tools and up-to-date scientific knowledge that allows me to understand environmental conditions in a broader context."

Our program required that all IGERT Fellows conduct group research. The Agents of Change projects were an innovative program component that provided an opportunity to apply a social-ecological framework to current real-world problems. These research projects were developed while students were engaged in the integrative core courses. Agents of Change projects were aimed at giving the students the experience of working in groups in a complex problem while aiding government agencies, non-profit organization and private groups who were actively working toward a more sustainable Puerto Rico. The students were to apply and integrate the knowledge learned in the core courses to develop a project and a report that presented plausible solutions to current environmental problems in Puerto Rico. Students would also model part of the social and natural components involved in the selected problems. During the summer before the commencement of the core courses a list of possible current environmental problems with relevant contact information was developed by the faculty and the external collaborators. It was required that students meet during the annual orientation week to discuss these problems, decide on groups with similar interest and form a tentative calendar and responsibility description for each member of the group. Then, an initial meeting was held between the students and the professors to determine how each course would provide information and integrate with each project. After the work was done the project and reports were presented to the proposing cooperating agency and evaluated by the IGERT Steering Committee.

As an example, the projects for the last year were: 1) Perceptions, attitudes, and awareness of urban green spaces: The case of Barrio Obrero de Santurce. PR; 2) Synthesis of socio-hydrological data and community surveys of flood experience for municipal planning and management of flooding in San Juan, PR; 3) Wetland restoration and community vulnerability of Torrecilla Baja barrio: Loiza, PR;4) Flooding and Green Infrastructure in the San Juan/Rio Piedras Watershed, PR; and 5) Evaluation of the current and future socio-environmental impact of interventions in empty spaces in Santurce, PR.

During the aforementioned external evaluation of the project we asked the students and the participating faculty if the IGERT project had been effective in preparing Ph.Ds. with interdisciplinary training in environmental sciences, and other disciplines, to serve as change agents in society? When considering the importance of the different aspects of the program, students and faculty also rated the contribution of IGERT components for fellows to become change agents for the solutions to environmental problems. Fellows rated the 'Agents of Change Project' as one of the three activities that most contributed in this regard. On the other hand, faculty identified the 'Agents of Change Project' firstly in this group.

Our project had other educational components that also provided added value to the trainees' educational experience. In the external evaluation, and again answering the question if the project had been effective in preparing PhDs. with interdisciplinary training in environmental sciences, and other disciplines, to serve as change agents in society, these experiences were rated by the students (mean values presented) as follows (Response format: 4: Very useful; 3: Somewhat useful; 2: Not very useful; 1: Not at all useful; 0: Does not apply): IGERT internship (3.27); Brown bag reading groups (3.25); IGERT workshops (3.25); Retreats (3.20); Teaching experiences (3.00); Fieldtrip experiences (2.91); and Other workshops (2.73).

Major Trainee Accomplishments

Betzaida Ortiz has been working with the El Yaguazo community since the beginning of her involvement in our IGERT project. This low income community, located in the outskirts of San Juan, is located in a highly sensitive environmental area. It has strong leadership that strongly supports environmental conservation efforts. Their leadership has presented various seminars at the Department of Environmental Sciences. Ms. Ortiz involvement with the El Yaguazo community has led to a higher community involvement in the preservation of an important wetland. Betzaida conducted population studies on a local bird species and water quality in the wetland. This work eventually led to a small grant from the Ford Motor Company from their conservation and environment program. This grant was specifically for the establishment of a community market garden for the restoration of the wetland. She then submitted a proposal to the San Juan Bay Estuary Program for a reforestation project to be conducted together with the community organization "El Corredor del Yaguazo, Inc." It was funded for $5,000. As part of her continued her involvement with the community. she obtained funds for a meteorological station that she installed in the Corredor del Yaguazo, a conservation area managed by the community where ecological research is also done. She was interviewed on November 13, 2013 in the television program called Puertorriqueñisimo, which addresses life in the different town in the Island. She discussed her work with the community and the importance of involving community leadership in conservation projects. Her involvement with the El Yaguazo community resulted in her being recognized by their Quijote annual prize. Betzaida was also involved in the community environmental education program, wrote an article titled "El Corredor del Yaguazo, Inc. más de 30 años conservando el ambiente, mejorando la calidad de vida de Cataño y de Puerto Rico" which was published in the general circulation magazine called Entre Parentesis, and was interviewed in the program Desde mi Pueblo aired by America TV.

Nora Alvarez is a student that has shown multiple abilities. At the end of her IGERT support she was awarded a Graduate Research Fellowship by NSF. She was awarded First Place and Audience Prize for Best Documentary for: "For the Love of Turtles" which competed at the Environmental Short Film Festival of the San Juan Bay Estuary. This documentary was produced as part of the IGERT Scientific Film Making Seminar. She came to the project with research interests in South America. During her Fellowship she traveled to the Peruvian Amazon in three occasions and developed working and research relationships with local and international NGOs working in Perú. She was then invited to participate in a collaborative research with the NGO CIFOR, looking at land changes due to gold mining activities in Latin

America and in Africa. Her paper (coauthored with her advisor) titled Global demand for gold is another threat for tropical forests was widely quoted in the international press. This study provided a regional assessment of gold mining deforestation in the tropical moist forest biome of South America. It analyzed the patterns of forest change in gold mining sites between 2001 and 2013, and evaluated the proximity of gold mining deforestation to protected areas. Annual maps of forest cover were used to model the incremental change in forest in ~1600 potential gold mining sites between 2001-2006 and 2007-2013. Approximately 1680 km2 of tropical moist forest was lost in these mining sites between 2001 and 2013. Deforestation was significantly higher during the 2007-2013 period, and this was associated with the increase in global demand for gold after the international financial crisis. More than 90% of the deforestation occurred in four major hotspots, and some of the more active zones of gold mining deforestation occurred inside or within 10 km of ~32 protected area. She concluded that here is an urgent need to understand the ecological and social impacts of gold mining because it is an important cause of deforestation in the most remote forests in South America, and the impacts, particularly in aquatic systems, spread well beyond the actual mining sites.

Eight of out trainees were involved in NSF's Maximizing Yield Through Integration (MYTI): Science and Math Education in the Context of a Disposing Society project. The central subject of the project is solid waste management in an urban environment. Their work included the development of teaching materials, one-on-one mentoring of master teachers in science and mathematics, and participating in monthly workshops with them. For example, one of the students worked with the Visual Arts School in San Juan in the relationship between solid wastes and water quality. The work included the establishment of a water quality measuring station in a nearby creek to determine flow, pH and nitrogen concentrations. The one-on-one mentoring included frequent emails and phone calls and visits by our students to the teacher's schools. This has enhanced the visibility of the IGERT project both inside and outside of the University and has taught our students valuable classroom techniques.

Our program required that all IGERT Fellows conduct group research. The Agents-of-Change reports and projects from three different groups of students proved to be an invaluable contribution to the student's training and to the communities and government/NGO groups that were involved. The projects were selected by students, in collaboration with NGOs, agencies or community groups. The reports (15), which covered a wide variety of issues (e. g. How to integrate the human population into a conservation plan for a river, disruptive development in a watershed, environmental issues of the low income communities in the watershed of the San Juan Bay Estuary, an evaluation of the current and future socio-environmental impact of interventions in empty spaces in Santurce, PR, and the interaction of development and the caves of Puerto Rico) were provided to and were very well received by the cooperating entity.

Accomplishments from the International Component

We did not have explicit funding for the international component. However, our research theme is relevant in many other countries and the environmental issues in the theme are affected by global changes in economics and climate. Therefore, international collaboration and experience was a part of the project with the purpose of broadening student experience and

dissertation research across sites, in order to achieve perspective and generality. The training purpose was to expose students to other cultures, issues, methods and study sites. We attempted to develop three kinds of opportunities. The first was participation in relevant research abroad in a well-established project. The second kind provided a variety of student experiences in order to establish original research abroad. Our faculty have many contacts with researchers abroad who work on topics related to the proposed and we made extensive use of them. The third option was to participate in a relevant international course or conference.

Our international experience started with an outreach activity early in the project, presenting the paper titled Doctoral Program in Natural-Human Systems in the Urbanizing Tropics", (Rios, R., Brokaw, N., & Ward, S. (2008)). at the XXXI Meeting of the InterAmerican Association of Environmental Engineering and Science at Santiago, Chile. It then continued with the three alternatives mentioned above.

As an example of our participation in a well-established project, we participated in the work of the Tropical Ecology Community Laboratory which is related to land change. It is mainly focused on Latin America and the Caribbean, but recently it has expanded its work to Africa. Part of this research has included the development of a web application for integrating satellite image data with training data from Google Earth to produce accurate and current land change maps. Some of the projects that IGERT students conducted with the application and maps were: 1) oil palm expansion in Latin America; 2) patterns of deforestation and reforestation in Haiti; 3) impacts of gold mining in Latin America, and 4) impacts of urban expansion in Latin America.

The participation of one of our students in the fourth item led to the establishment of original research abroad. Nora Alvarez traveled to the Peruvian Amazon in three occasions and developed working and research relationships with local and international NGOs working in Perú. She was then invited to participate in a collaborative research with the NGO CIFOR, looking at land changes due to gold mining activities in Latin America and in Africa. As summarized in Nature (Nature 517, 415 (22 January 2015), her article (coauthored with her advisor) titled Global demand for gold is another threat for tropical forests was widely quoted in the international press. She found that deforestation due to gold mining is increasing in South America, particularly around biodiversity hotspots, since gold mining has become more feasible in remote tropical forests owing to the drastic rise in demand and price of the metal over the past decade She analyzed satellite images of tropical forests in South America from 2001 to 2013 and found that roughly 1,700 square kilometers of forest had been cleared and only 250 km2 was regenerated in and around gold-mining sites. Although forest loss from gold mining is small compared with that from agriculture, for instance, it is accelerating - unlike deforestation as a result of other land-use changes. Moreover, nearly one-third of the losses are occurring within 10 km of protected areas. She concluded that here is an urgent need to understand the ecological and social impacts of gold mining because it is an important cause of deforestation in the most remote forests in South America, and the impacts, particularly in aquatic systems, spread well beyond the actual mining sites.

Another example of original research that started and is being conducted with collaboration abroad is the work of Angelica Erazo. She traveled to Cali, Colombia during the summer of 2013, hosted by the CINARA research institute at Universidad del Valle, to study small water treatment systems. In October 2013 she presented the paper titled Slow Sand Filters for Water Treatment at Disadvantaged Communities at AGUA 2013: Water Quality in Response to

Environmental Challenges, an international conference held at Cali, Colombia, and in November 2014 she presented the paper titled Metagenomic monitoring of the microbial communities of a slow sand filter in order to improve treatment efficiency at the XXXIV Congress of the InterAmerican Association of Sanitary Engineering, Monterrey, México. Since then she has continued work for her doctoral dissertation.

As part of the third option, to participate in a relevant international course or conference, eight of our students have traveled to international courses or attended training courses, visiting countries from Chile to the United Kingdom.

IGERT Project Personnel and Trainees

Principal Investigator(s)

Name: Rafael A. Rios
Project Years Active: 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016

Co-Principal Investigator(s) or Trainee/Associate Advisor(s)

Name: Juan Agar
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Mitchell Aide
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Richard S. Appeldoorn
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Josefina Arce
Project Years Active: 2010-2011, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Maritza Barreto
Project Years Active: 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Nicholas Brokaw
Project Years Active: 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Carlos Conde

Project Years Active: 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Carlos Corrada Bravo
Project Years Active: 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Elvira Cuevas
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Liz Diaz
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Jose A. Dumas
Project Years Active: 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Ruben Estremera
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Qiong Gao
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Gary Gervais
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: William Gold
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Rossana Grafals
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Hector R. Grau
Project Years Active: 2013-2014, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Edwin A Hernández Delgado
Project Years Active: 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Heelal Janwa
Project Years Active: 2010-2011, 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Ariel Lugo
Project Years Active: 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Olga L. Mayol
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Elvia J. Melendez-Ackerman
Project Years Active: 2009-2010, 2010-2011, 2012-2013, 2013-2014, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Thomas E. Miller
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Gabriel Moreno
Project Years Active: 2008-2009, 2009-2010, 2010-2011, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Criseida Navarro-Diaz
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Jorge Ortiz
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Alonso Ramirez
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Isabel Rivera-Collazo
Project Years Active: 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Loretta Roberson
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Manuel R. Rodriguez
Project Years Active: 2012-2013, 2013-2014, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Mario H. Rodríquez-Sánchez
Project Years Active: 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Osvaldo Rosario
Project Years Active: 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Alberto Sabat
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Luis Santiago
Project Years Active: 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Jenniffer Santos
Project Years Active: 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Victor Snyder
Project Years Active: 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Juan L Torres
Project Years Active: 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Alejandro Torres-Abreu
Project Years Active: 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Manuel Valdés-Pizzini
Project Years Active: 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Joseph H. Vogel
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Sheila Ward
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Mei Yu
Project Years Active: 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Trainee/Associate Advisor

Name: Jess K. Zimmerman
Project Years Active: 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
Role in Project: Co-PI and Trainee/Associate Advisor

Trainees

Name: Adail Alicea
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months
2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Natalia B. Alvarez
Total number of months funded: 16
Project Years Active:
2010-2011 Project Year - Trainee supported for 9 months
2011-2012 Project Year - Trainee supported for 7 months
2012-2013 Project Year - Trainee supported for 0 months

Name: Nora L. Alvarez
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months
2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Maria J. Andrade
Total number of months funded: 24
Project Years Active:
2012-2013 Project Year - Trainee supported for 10 months
2013-2014 Project Year - Trainee supported for 12 months
2014-2015 Project Year - Trainee supported for 2 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Arelis I. Arocho-Montes
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months

2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months
2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Benjamin L. Branoff
Total number of months funded: 24
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Marianne Cartagena
Total number of months funded: 24
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Jessica H. Castro
Total number of months funded: 24
Project Years Active:
2011-2012 Project Year - Trainee supported for 10 months
2012-2013 Project Year - Trainee supported for 12 months
2013-2014 Project Year - Trainee supported for 2 months
2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Argenis Y. Catala
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 11 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Abelardo Colon
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 11 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Daniel Davila
Total number of months funded: 21
Project Years Active:
2010-2011 Project Year - Trainee supported for 9 months
2011-2012 Project Year - Trainee supported for 12 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months
2014-2015 Project Year - Trainee supported for 0 months

2015-2016 Project Year - Trainee supported for 0 months

Name: Angelica Erazo
Total number of months funded: 24
Project Years Active:
2012-2013 Project Year - Trainee supported for 10 months
2013-2014 Project Year - Trainee supported for 12 months
2014-2015 Project Year - Trainee supported for 2 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Laura L. Fidalgo
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 11 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Paul Furumo
Total number of months funded: 24
Project Years Active:
2012-2013 Project Year - Trainee supported for 10 months
2013-2014 Project Year - Trainee supported for 12 months
2014-2015 Project Year - Trainee supported for 2 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Johnny Lugo-Vega
Total number of months funded: 24
Project Years Active:
2012-2013 Project Year - Trainee supported for 10 months
2013-2014 Project Year - Trainee supported for 12 months
2014-2015 Project Year - Trainee supported for 2 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Nilda I. Luhring
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months

Name: Aristides Martinez
Total number of months funded: 21
Project Years Active:
2010-2011 Project Year - Trainee supported for 9 months
2011-2012 Project Year - Trainee supported for 12 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months
2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Brenda L. Martinez
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 11 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Jeiger L. Medina
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months

Name: Roselyn Mendez
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 11 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Christopher Nytch
Total number of months funded: 24
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Glorynel Ojeda
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 11 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Sofia Olivero
Total number of months funded: 24
Project Years Active:
2012-2013 Project Year - Trainee supported for 10 months
2013-2014 Project Year - Trainee supported for 12 months
2014-2015 Project Year - Trainee supported for 2 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Betzaida Ortiz
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months

2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Osé Pauléus
Total number of months funded: 24
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Dionisio Perez
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months
2013-2014 Project Year - Trainee supported for 0 months

Name: Norberto Quinones
Total number of months funded: 24
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months
2012-2013 Project Year - Trainee supported for 0 months

Name: Molly M. Ramsey
Total number of months funded: 24
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Natalia M. Rodriguez-Ortiz
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 11 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Julio M. Santiago-Rios
Total number of months funded: 7
Project Years Active:
2011-2012 Project Year - Trainee supported for 7 months

Name: Sheila M. Soler
Total number of months funded: 14
Project Years Active:
2009-2010 Project Year - Trainee supported for 10 months
2010-2011 Project Year - Trainee supported for 4 months

Name: Francisco J. Soto
Total number of months funded: 24
Project Years Active:
2011-2012 Project Year - Trainee supported for 10 months
2012-2013 Project Year - Trainee supported for 12 months
2013-2014 Project Year - Trainee supported for 2 months
2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Name: Ana M. Trujillo
Total number of months funded: 24
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Hagmel A. Vega-Fontanez
Total number of months funded: 24
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Luis Villanueva-Cubero
Total number of months funded: 24
Project Years Active:
2011-2012 Project Year - Trainee supported for 10 months
2012-2013 Project Year - Trainee supported for 12 months
2013-2014 Project Year - Trainee supported for 2 months
2014-2015 Project Year - Trainee supported for 0 months
2015-2016 Project Year - Trainee supported for 0 months

Publications, Presentations, and Patents

Journal Articles in Refereed Publications

1. Alvarez*, N., & Aide, T. M. (2015) Gold-rush threat to tropical forests, Nature, 517, 415, 21 January 2015, doi:10.1038/517415d
2. Alvarez*, N. & Aide, T. M. (2015) Environmental Research Letters, 10, 1, 4006 doi:10.1088/1748-9326/10/1/014006
3. Alvarez*, N. (2014) Perspective: Globalization and land use in Latin America. GLP News. 10(10). 5-7. http://www.globallandproject.org/arquivos/GLPNews_Jun2014v3.pdf
4. Ramos-Santiago, L. E., Villanueva-Cubero*, L., Santiago-Acevedo, L. & Rodríguez-Meléndez, Y. N. (2014). Green area loss in San Juan's inner-ring suburban

neighborhoods: a multidisciplinary approach to analyzing green/gray area dynamics. Ecology and Society 19(2): 4.
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Colón-Rivera, R., Marshall, K., Soto-Santiago*, F., Ortiz-Torres, D., and Flower, C. (2013). Moving forward: fostering the next generation of Earth stewards in the STEM disciplines. Frontiers in Ecology and the Environment, 11: 383391.

Soto-Santiago*, F., Irizarry-Soto, E. (2013). The Sea Urchin Diadema antillarum (Echinodermata, Equinoidea), algal cover and juvenile coral densities in La Parguera, Puerto Rico Cuadernos de Investigación UNED (ISSN: 1659-4266) Vol. 5(1), Junio, 2013

Soto-Santiago, F. J.*, & Weil, E. (2012) Incidence and Spatial Distribution of Caribbean Yellow Band Disease in La Parguera, Puerto Rico. Journal of Marine Biology, vol. 2012, Article ID 510962, 7 pages, doi:10.1155/2012/510962

Alvarez-Berríos, N. L.*, Parés-Ramos, I. K. & Aide, T. M. (2012) Contrasting Patterns of Urban Expansion in Colombia, Ecuador, Peru, and Bolivia Between 1992 and 2009. AMBIO doi 10.1007/s13280-012-0344-8

Álvarez-Berríos, N.L.* Parés-Ramos, I.K. & Aide, T.M. Constrasting Patterns of Urban Expansion in Colombia, Ecuador, Peru and Bolivia Between 2001 and 2009. (2012) AMBIO 42, 29-40.

Bonilla-Moheno M, Aide T. M., Alvarez-Berrios, N. L.*, Andrade-Nunez, M.J.*, Arache-Martinez, A. V. , Roman, G. P. & Sanchez-Cuervo, A. M. (2012) Environmental Social Science: Human-Environment Interactions and Sustainability. Conservation and Society 10: 386-7

Álvarez-Berríos, N.L.* , Redo, D.J., Aide, T.M., Clark, M.L., & Grau, R. (2012) Land Change in the Greater Antilles between 2001 and 2010. Land 2013, 2, 81-107.

Parés-Ramos, I.K., Álvarez-Berríos, N.L.* & Aide, T.M. (2013) Mapping Urbanization Dynamics in Major Cities of Colombia, Ecuador, Perú, and Bolivia Using Night-Time Satellite Imagery. Land , 2, 37-59; doi:10.3390/land2010037.

Vogel JH, Álvarez-Berríos N*, Quiñones-Vilches N*, Medina-Muñiz JL*, Perez-Montes D*, Arocho-Montes A*, Vale-Merniz N, Fuentes-Ramirez R, Marrero-Girona G, Varcacel-Mercado E, Santiago-Rios J.* (2011). The Economics of Information, Studiously Ignored in The Nagoya Protocol on Access to Genetic Resources and Benefit Sharing. 7/1 Law, Environment and Development Journal, p. 52, available at

http://www.lead-journal.org/content/11052.pdf (Also published in Chinese, French, Spanish and Arabic).

Ortiz-Carrion, B*. and Medina-Muniz, J*. (2011) La voragine del desarrollo industrial y una biofilia prevaleciente: El caso de la comunidad Juana Matos, Cataño, Puerto Rico. Ecología Política. Editiorial Icaria Volumen 41: 62-66.

Vogel, J.H., *Álvarez-Berríos, N.,* Quiñones-Vilches, N.,* Medina-Muñiz, J.L., *Pérez-Montes, D., *Arocho-Montes, A. I., Vale-Merniz, N., Fuentes-Ramírez, R , Marrero-Girona, G., Varcarcel-Mercado, E., Santiago-Rios, J. (2011). The Economics of Information, Studiously Ignored in The Nagoya Protocol on Access to Genetic Resources and Benefit Sharing. Law, Environment and Development Journal, 1, available at http://www.lead-journal.org/content/10001.pdf

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Rivera, A. & Erazo*, A. (2015) Análisis formativo y el inquirir en el estudio de sistemas complejos. El Sol Journal, 56, 50-54 Teachers Association of Puerto Rico. ISSN 2372-9635

Ortiz-Quiles, E. O., Martínez, S., Olivero*, S., Berríos, B. (2015) Los colores de mi tierra (The Colors of My Land). El Sol Journal, 56, 55-60, Teachers Association of Puerto Rico. ISSN 2372-9635

Santiago-Ríos, J. M.* (2012), En aumento la basura-e en Puerto Rico. Diálogo Digital http://dialogodigital.upr.edu/index.php/En-aumento-la-Basura-e-en-Puerto-Rico.html

Books

Vogel, J. (2009). Economics of the Yasuni Initiative: Climate Change as if Thermodynamics Mattered. Arizona, Anthem.

Vogel, J. (2010). Museum of Bioprospecting, Intellectual Property and the Public Domain. Arizona, Anthem.

Book Chapters

Joseph Henry Vogel, Nora Álvarez-Berríos*, Betzaida Ortiz-Carrión* and Omar Oduardo-Sierra, (2013), La financiación y fungibilidad del Museo de Bioprospección, la Propiedad Intelectual y el Dominio Público, edited volume by Elizabeth Hodson de Jaramillo and Teodora Zamudio, Biotecnologías e innovación, Bogotá: Editorial de la Pontificia Universidad Javeriana de Colombia, pp. 283-300, ISBN: 978-958-716-587-6

Vogel, J. H., Álvarez-Berríos, N.* Ortiz-Carrión, B.*, & Oduardo-Sierra, O. (2013) La financiación y fungibilidad del Museo de Bioprospección, la Propiedad Intelectual y el Dominio Público, in E. Hodson de Jaramillo & T. Zamudio (Eds.), Biotecnologias y Responsabilidad (pp. 283-300) Bogotá, Colombia: Editorial de la Pontificia Universidad Javeriana de Colombia. ISBN: 978-958-716-587-6

Conference Publications

Alicea*, A. & Rios, R. (2014) Technical, Financial and Administrative Capacity Evaluations and Improvement of Small Community Water Systems in Puerto Rico., In G. Sorial and J. Hong (Eds.) Environmental Science and Technology. Paper presented at the Seventh International Conference on Environmental Science and Technology, June 2014. (pp. 128-133). Houston, TX

Conference Presentations

Colon*, A. (2015, June). Nano diamond Powder as Reusable & Bio-compatible Water Disinfection Material. Poster session presented at the XI International Interdisciplinary Congress of Science. Santo Domingo, Dominican Republic.

Posters

1. Lugo-Vega*, J., Villanueva-Cubero*, L., Soto*, F., Furumo*, P. (2015, May). A history of flood, drought and land use: El Niño Southern Oscillation influence over Aguas Prietas Lagoon in Fajardo, Puerto Rico during the Little Ice Age. Poster session presented at UPR Environmental Archeology Lab Inauguration UPR RP REB-121, San Juan, PR
2. Lugo-Vega*, J., Rosim-Fachini, E., Collazo-Martínez-Collazo, A., Piñeiro-González, C., Martínez-Noble, M. (2015, May). Conservation Science Research Project on Three (3) Historic Cannons and Forty (40) Artillery Munitions Shells. Poster session presented at National Park Service meeting, San Juan, PR
3. Lugo-Vega*, J., Rosim-Fachini, E., Collazo-Martínez-Collazo, A., Piñeiro-González, C., Martínez-Noble, M. (2015, May). Conservation Science Research Project on Three (3) Historic Cannons and Forty (40) Artillery Munitions Shells. Poster session presented at Segovia, España. Simposio "Metales España", Segovia, España 3-5 de octubre 2015
4. Villanueva-Cubero*, L., Soto*, F., Furumo*, P. (2015, May). The Northeast Ecological Corridor Forest Reserve and his landscape in 1930?s: An environmental history of El Yunque from a small struggled Hill. Poster session presented at 1st National Congress of History Students of Puerto Rico, San Juan, PR
5. Villanueva-Cubero*, L., M.P., Yu, Mei, PhD. (2014, November). Legal and Policy Framework as it Pertains to Puerto Rico Coastal Vegetative Wetlands. Poster session presented at Bi-Annual Symposium of the Restore America's Estuaries and The Coastal Society, Washington, DC
6. Villanueva-Cubero*, L., M.P., Yu, Mei, PhD. (2014, November). Legal and Policy Framework as it Pertains to Puerto Rico Coastal Vegetative Wetlands. Poster session presented at NASA Annual symposium on Land Cover, Denver, CO
7. Colon*, A. (2014, December). Nano diamond Powder as Reusable Nontoxic Water Disinfection Material. Poster session presented at EPSCOR Annual Meeting, San Juan,

PR
8. Andrade*, M. (2014, December). The Spatial Scale of Response of Two Mammal Species in a Human Dominated Landscape in Rivera Uruguay. Poster session presented at III Congreso Uruguayo de Zoología, Montevideo, Uruguay
9. Fidalgo*, L., Cartagena* , M., Trujillo*, A., Nytch*, C., Ramsey*, M., Vega-Fontanez*, H. (2014, August). An assessment of residents? satisfaction and short-term visions for urban yards in San Juan, Puerto Rico. Poster session presented at Ecological Society of America 2014 annual meeting, Sacramento, CA
10. Castro*, J., Quiñones, M. and Gould, W. (2014, June) Effectiveness Assessment of the Network of Terrestrial Protected Areas in Puerto Rico. Poster session presented at the Primer Congreso de Áreas Naturales Protegidas de Puerto Rico- The Nature Conservancy, San Juan, PR
11. Erazo*, A. (2014, September) Metagenomic Monitoring of the Microbial Communities of a Slow Sand Filter in Order to Improve Treatment Efficiency. Poster session presented at the EPA Region 2 Workshop at the University of Puerto Rico, Río Piedras Campus, San Juan, PR
12. Olivero*, S., & Meléndez-Ackerman, E. (2015, April) Local Perception of Ecosystem Services and Green Infrastructure Management in Residential Zones of the Río Piedras Watershed. Poster session presented at the 4th Student Conference for Graduate Research at the University of Puerto Rico, Río Piedras Campus, San Juan, PR
13. Olivero*, S., & Meléndez-Ackerman, E. (2015, March) Ecosystem services by urban green infrastructure in residential yards in a tropical city: Integrating information on social drivers, green infrastructure management and ecosystem assessment tools. Poster session presented at the 35th Puerto Rico Interdisciplinary Meeting / 50th Junior Tech Meeting, San Juan, PR
14. Ortiz*, B. (2014, September) Efecto del cambio de uso de terreno en la hidrología del acuífero de Santa Isabel, Puerto Rico. Poster session presented at the Symposium conducted at the Universidad del Turabo?s Ambientis Convention, Gurabo, PR
15. Ortiz*, B. (2015, April) Efecto del cambio de uso de terreno en la hidrología del acuífero de Santa Isabel, Puerto Rico. Poster session presented at the 4th Student Conference for Graduate Research at the University of Puerto Rico, Río Piedras Campus, San Juan, PR
16. Fidalgo*, L., Cartagena*, M., Trujillo*, A., Nytch*, C., Ramsey*, M., Vega-Fontanez*, H. (2014, September). An assessment of residents? satisfaction and short-term visions for urban yards in San Juan, Puerto Rico. Poster session presented at the International Association for Landscape Ecology-UK Region 2014 Meeting, Kings? College, London, United Kingdom.
17. Fidalgo*, L., Cartagena*, M., Trujillo*, A., Nytch*, C., Ramsey*, M., Vega-Fontanez,* H. (2014, August). An assessment of residents? satisfaction and short-term visions for urban yards in San Juan, Puerto Rico. Poster session presented at the Ecological Society of America 2014 annual meeting, Sacramento, CA
18. Nytch*, C. (2014, December) Modeling Rainfall-Runoff Dynamics in Tropical, Urban Social-Hydrological Systems ? Green Infrastructure and Variable Precipitation Interception. Poster session presented at the American Geophysical Union Fall Meeting, San Francisco, CA
19. Nytch*, C. (2015, April) Rainfall-runoff Dynamics in Tropical, Urban Social-Hydrological System: Evaluating the Interception Capacity of Green Infrastructure. Poster session presented at the 4th Student Conference for Graduate

Research at the University of Puerto Rico, Río Piedras Campus, San Juan, PR
20. Nytch*, C. (2015, August) The Water Balance of a Tropical Urban Watershed. Poster session presented at the Ecological Society of America 2015 Annual Meeting, Baltimore, MD
21. Castro*, J. (2014, September) Housing and Population in and Around Protected Areas in Puerto Rico. Poster session presented at the Symposium conducted at the Universidad del Turabo?s Ambientis Convention, Gurabo, PR
22. Castro*, J. & Gould, W. (2014, September) Urban Change and Housing Growth in and in the Borders of Protected Areas in Puerto Rico. Poster session presented at the Symposium conducted at the Universidad del Turabo?s Ambientis Convention, Gurabo, PR
23. Castro*, J., Quiñones, M. & Gould, W. (2014, November) Urban Development, Human Population and Housing in Adjacent Lands to Protected Areas in Puerto Rico. Poster session presented at the XXVIII DRNA Symposium: Manejo del Paisaje en Puerto Rico: Un Espacio de Intercambio Interdisciplinario para la Conservación y el Desarrollo Sustentable, Convention Center, San Juan, PR
24. Torres- Camacho, K., Meléndez-Ackerman, E., Díaz, E., Correa, N. Vila, C., Olivero*, S. , Erazo*, A., Fontanez, J., Santiago, L. & Seguinot, J., (2014, November) How Do People Get Their Yard Plants?. Poster session presented at the Symposium conducted at the Universidad del Turabo?s Ambientis Convention, Gurabo, PR

Oral presentations
1. Martinez*, A., Ortiz-Zayas, J.R., Barreto-Orta, M., Navarro-Díaz, C., Rosario-López, O & Díaz-Vázquez, L. (2014, September) Urban Expansion and Trace Metal Speciation in the Sediments of a Tropical Coastal Marsh, Ciénaga Las Cucharillas, Cataño, Puerto Rico. Paper presented at the Symposium conducted at the Universidad del Turabo's Gurabo Ambientis Convention, Gurabo, PR
2. Martinez*, A., Ortiz-Zayas, J.R., Barreto-Orta, M., Navarro-Díaz, C., Rosario-López, O. & Díaz-Vázquez, L. (2015, May) Land/Cover Use Patterns Relationship with Metal Fractionation at Cienaga Las Cucharillas Marsh, Puerto Rico. Paper presented at the Symposium conducted at the Industrial Association of Puerto Rico Convention at Hotel Conquistador, Fajardo, PR
3. Branoff*, B. (2015, February) What is Urbanness and How Does it Influence Urban Mangrove Ecology? A case study of the San Juan Bay Estuary. Paper presented at the Symposium conducted at the Association for the Sciences of Limnology and Oceanography, Granada, Spain.
4. Ortiz*, B. (2015, May) The Economic Benefits of Helping the Environment: Why Pay Being Green. Behaviors of La Chiriria Antillana, Hydrology of Laguna Secreta and Social Impacts of Reforestation in the Cienaga Las Cucharillas at Cataño, Puerto Rico. Paper presented at the Symposium conducted at the Industrial Association of Puerto Rico Convention at Hotel Conquistador, Fajardo, PR
5. Vega-Fontanez*, H. (2014, July) Política Pública sobre el Ambiente Urbano en el Municipio de San Juan, Puerto Rico: Un análisis desde la perspectiva de los espacios verdes en la ciudad. Paper presented at the Symposium at the II Congress of Policy, Law and Environmental Justice. X International Convention on the Environment and Development, La Habana, Cuba.
6. Villanueva-Cubero*, L. (2014, September). Wetland Regulations and Policies in the Commonwealth of Puerto Rico. Paper presented at the Third Student Research

Symposium: Interdisciplinary Approach on the Study of Environmental Sciences, San Juan, PR
7. Colon*, A. (2014, December). Nano diamond Powder as Reusable Nontoxic Water Disinfection Material. Paper presented at the Materials Research Society (MRS) Fall Meeting and Exhibit, Boston, MA
8. Trujillo*, A. (2015, March). Proyecto Imagina a Santurce San Juan, Puerto Rico: Experiencia de planificación participativa comunitaria. Paper presented at the Taller de Planificación Participativa para un Cambio Estructural con Igualdad sponsored by Comisión Económica Para América Latina - United Nations, Santiago, Chile.
9. Rios, R. & Erazo*, A. (2014, November) Metagenomic monitoring of the microbial communities of a slow sand filter in order to improve treatment efficiency. Paper presented at the XXXIV Congress of the Interamerican Association of Sanitary Engineering, Monterrey, México

Erazo*, Angelica, (2013, October). Filtración lenta con arena para el tratamiento de agua en comunidades desfavorecidas. Paper presented at AGUA 2013, Cali, Colombia

Rios, Rafael, (2013, October). Vulnerabilidad y Riesgos en Sistemas Pequeños de Agua y Saneamiento. Paper presented at AGUA 2013, Cali, Colombia

Soto-Santiago*, Francisco J., (2013, September). A social-ecological approach for coral reef conservation in Eastern Puerto Rico. Poster presented at Third Conference for Sustainability IGERTs. Portland State University, Portland, Oregon.

Lugo*, Johnny, (2013, September). The Northeast Ecological Corridor Forest Reserve and its landscape in 1930s: An environmental history of El Yunque from a small struggled Hill, Paper presented at 1st National Congress Of History Students of Puerto Rico, San Juan, Puerto Rico

Davila*, Daniel, (2013, October). Coquí Llanero SLAMM Vulnerability of the coquí llanero, Eleutherodactylus juanariveroi, habitat to sea level rise, Poster presented at Cuarto Simposio de Herpetología Puertorriqueña, Arecibo, Puerto Rico

Davila*, Daniel, (2013, November). El Hábitat del Coqui Llanero, Eleutherodactylus juanariveroi, y el Aumento en el Nivel del Mar, Paper presented at the XXVII Symposium of the Department of Natural Resources, San Juan, Puerto Rico

Quiñones-Vilches, N.*, Melendez, A., Rodriguez, J., Gervais, G., Roberson, L. & Griebenow, K. (2013, February) Biodiversity Mapping for the determination of Macroalgae biomass mariculture sites in the coastal areas of Puerto Rico. Paper presented orally at the meeting of the Association for the Sciences of Limnology and Oceanography at New Orleans.

Quiñones-Vilches, N.*, Melendez, A., Rodriguez, J., Gervais, G., Roberson, L. & Griebenow, K. (2013, March) Biodiversity Mapping for the determination of Macroalgae

biomass mariculture sites in the coastal areas of Puerto Rico. Paper presented orally in the PRISM 2013 meeting at Turabo University, Puerto Rico.

Quiñones-Vilches, N.*, Melendez, A., Rodriguez, J., Gervais, G., Roberson, L. & Griebenow, K. (2012, July) Habitat and Biodiversity Mapping for the Determination Of Algal Biomass Mariculture Sites in Coastal Areas of Puerto Rico. Paper presented orally at the Biomass 2012 conference of the Department of Energy in Washington DC.

Quiñones-Vilches, N.*, Melendez, A., Rodriguez, J., Gervais, G., Roberson, L. & Griebenow, K. (2012, October) Habitat and Biodiversity Mapping for the Determination Of Algal Biomass Mariculture Sites in Coastal Areas of Puerto Rico. Paper presented orally at the Coastal Management Congress of the Department of Natural and Environmental Resources of Puerto Rico in Ponce, PR.

Santiago-Ríos, J. M. (2012), Emulemos a la naturaleza: La sustentabilidad en Puerto Rico. Poster sesión presented at the 5th Agroecology Symposium of Puerto Rico, UPR-Utuado.

Quiñones, N.*, Melendez, A., Rodriguez, J., Gervais, G., Roberson, L. Griebenow, K.. (2012) Habitat and Biodiversity Mapping for the Determination Of Algal Biomass Mariculture Sites In Coastal Areas Of Puerto Rico, Paper presented in the CESGI 2012 at University of Puerto Rico, Rio Piedras Campus.

Alicea, A.*, Robles, J. & Rios, R. (2011, May). Circuit Riders at Non PRASA Systems: A Tool to Reach Capacity Development Compliance in Small Systems. Paper presented at the Annual Meeting of the PR American Water Works Association. San Juan, PR.

Arocho, A.*, & Sabat, A. (2011, February) Change in Grouper (Serranidae) Stocks in Puerto Real, Cabo Rojo (Puerto Rico): A Test of Two Data Bases. Poster session presented at the Aquatic Sciences Meeting of the American Society of Limnology and Oceanography, San Juan, PR.

Medina-Muñiz, J.* et al (2011, February). Impacts of non-point source pollution in northeastern coral reefs. Poster session presented at the Aquatic Sciences Meeting of the American Society of Limnology and Oceanography, San Juan, PR.

Ortiz-Carrion, B.* & Ortiz, J. (2011, February). Agricultural Dilemma of Land Use Change in the Santa Isabel/Coamo Area, Southern Puerto Rico. Poster session presented at the Aquatic Sciences Meeting of the American Society of Limnology and Oceanography, San Juan, PR.

Ortiz-Carrion, B.* (2010, December) Yaguazo Corridor: Community initiative in the Juana Matos Area Cataño, Puerto Rico. Poster session presented at the 13th Caribbean Conference on Urban Forests and Communities, Ponce, PR.

Ortiz, B.* (2010, February). Hydrologic impacts and community perceptions of land use change in the Southern Aquifer Recharge Area in Santa Isabel and Salinas, Puerto Rico. Poster Session presented at the annual meeting of the Puerto Rico LTER, San Juan, PR.
Ortiz, B.* (2010, March). Hydrologic impacts and community perceptions of land use change in the Southern Aquifer Recharge of the Coamo Watershed, Puerto Rico. Poster Session presented at the annual meeting of the Puerto Rico CATEC, San Juan, PR.

Rios, R., Brokaw, N., & Ward, Sheila. (2008, October). Doctoral Program in Natural-Human Systems in the Urbanizing Tropics.
Paper presented at the XXXI Meeting of the InterAmerican Association of Environmental Engineering and Science,
Santiago, Chile

Outreach Activities

Title: Documentary at Film Festival
Media Outlet/Organization: San Juan Bay Estuary Program
Activity Date: 06/25/2011
Description: Nora Alvarez: First Place and Audience Prize for Best Documentary for: "For the Love of Turtles" Environmental Short Film Festival of the Estuary. Co-directed with Ana Elisa Pérez Quintero June 25, 2011

Title: Food security podcast
Media Outlet/Organization: CienciaPR
Activity Date: 01/25/2015
Description: Glorynel Ojeda participated on a podcast on food security for Puerto Rico, what it means and challenges that have to be met. Other participants included the Secretary of Agriculture of Puerto Rico.

Title: Interview in Desde mi Pueblo TV program
Media Outlet/Organization: America TV.
Activity Date: 05/13/2013
Description: Betzaida Ortiz was interviewed concerning her participation in environmental activities with the Cataño community.

Title: Interview of Betzaida Ortiz
Media Outlet/Organization: Radio Station Boricua 740
Activity Date: 12/12/2011
Description: Radio interview relative to article published by her on the Political Ecology Journal (Spain) concerning a local community (Juana Matos) that was being impacted by industrial development.

Title: Interview of Betzaida Ortiz
Media Outlet/Organization: Radio station WKAQ 580
Activity Date: 12/15/2011
Description: Radio interview relative to article published by her on the Political Ecology Journal (Spain) concerning a local community (Juana Matos) that was being impacted by industrial development.

Title: Magazine article
Media Outlet/Organization: EntreParentesis
Activity Date: 05/01/2013
Description: Betzaida Ortiz wrote an article titled "El Corredor del Yaguazo, Inc. más de 30 años conservando el ambiente, mejorando la calidad de vida de Cataño y de Puerto Rico"

Title: Magnifying glass: community and the environment
Media Outlet/Organization: El Nuevo Dia Newspaper
Activity Date: 03/22/2015
Description: Newspaper article on environmental research done by students at the Yaguazo community. Studies (bird population, water quality and hydrology) done by Betzaida Ortiz and Aristides Martinez are included.

Title: Newspaper article
Media Outlet/Organization: El Nuevo Dia newspaper
Activity Date: 04/13/2010
Description: One page article featuring the environmental sciences program, both graduate and undergraduate, where the PI of this project was interview. Two pictures of program activities were featured.

Title: Newspaper article on electronic wastes
Media Outlet/Organization: Dialogo electronic newspaper
Activity Date: 03/01/2012
Description: Santiago, Julio, Article titled En aumento la basura-e en Puerto Rico. (http://dialogodigital.upr.edu/index.php/En-aumento-la-Basura-e-en-Puerto-Rico.html) (Increase in electronic waste)

Title: Newspaper interview of Rafael Rios
Media Outlet/Organization: Dialogo Newspaper
Activity Date: 04/01/2012
Description: Full page article based on an interview of PI Rafael Rios concerning the solid waste problem in Puerto Rico. An IGERT created video (http://www.youtube.com/watch?v=IZEgwyHsgpY) is credited with providing information.

Title: Press conference
Media Outlet/Organization: El Nuevo Dia, Dialogo and other newspapers
Activity Date: 02/07/2012
Description: Press conference by the President of UPR to announce the creation of the Envi Sci Dept. The IGERT program was credited as being a significant reason for the creation of the graduate program. Rafael Rios, PI, was a participant and was interviewed.

Title: Researches study Little Ice Age in Puerto Rico
Media Outlet/Organization: El Nuevo Dia newspaper
Activity Date: 05/27/2015
Description: Newspaper article describing research work by IGERT students Johnny Lugo and Luis Villanueva

Title: Science in art restoration
Media Outlet/Organization: Puerto Rico Museum of Art
Activity Date: 02/13/2013
Description: Johnny Lugo gave a talk and demonstration of scientific techniques used for the conservation of the La Plena mural, a major art work at the Museum.

Title: Television interview
Media Outlet/Organization: WIPR Puerto Rico TV
Activity Date: 11/13/2013
Description: Betzaida Ortiz was interviewed in the program Puertorriqueñisimo, which addresses life in the towns on the Island. She discussed her work with the El Yaguazo community and the importance of involving community leadership in conservation efforts.

Title: Tiny Science. Big Impacts. Cool Videos
Media Outlet/Organization: The National Nanotechnology Coordination Office
Activity Date: 05/25/2015
Description: Abelardo Colon* and Jennifer Gil won first prize for the nanotechnology video contest for students for their video entitled Chlorination-less. The video explains a new method for disinfecting drinking water using a nanodiamond powder.

APPENDIX 3

Graduate Program Guidelines

APPENDIX 3 – GRADUATE PROGRAM REGULATIONS

University of Puerto Rico
Río Piedras Campus
College of Natural Sciences
Environmental Science Department
Graduate Program

REGULATIONS

These rules apply to studies directed toward the master's and doctoral degree in Environmental Science. These regulations have been approved by the Graduate Affairs Committee of the Environmental Science Program on September 16th, 2014 and are based on Certification 38 (2012-2013) of the Academic Senate of the University of Puerto Rico, Río Piedras Campus. The most recently updated regulations will always apply to all students admitted in Environmental Sciences Graduate Program. The latest version of these regulations is available in the "Graduates" section of our website http://envsci.uprrp.edu/ .

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I. Contact Information

Environmental Science Department (C-225)
cienciasambientales@upr.edu
787-764-0000 ext 1459

Graduate Program (C-323) 787-764-0000 ext. 1337
Graduate Program Coordinator – Dr. Rosana Grafals-Soto
rosana.grafals@upr.edu

DEGI
Physical Address: Edificio Hogar Masónico, Second floor
Phone: (787) 764-0000 ext. 86700
Fax: (787) 763-6011

Office of the Dean, College of Natural Sciences
Physical address: Natural Sciences Building, Phase II
Room C-135
Phone: (787) 764-0000 ext: 7611

II. Mission and Profile of the Graduate Program in Environmental Science

A. Program Mission

The Graduate Program in Environmental Science at UPR – Río Piedras (UPRRP) is directed towards preparing scientists and researchers with a profound and integrated knowledge of the environment via a rigorous and comprehensive education with a strong emphasis in research. The Graduate Program strives to include diverse scientific disciplines combined in innovative ways to understand and manage the environment, encompassing various interactions among the physical, chemical, and biological components of the biosphere as well as social, economic, and biomedical sciences and planning and legal studies related to environmental science. Environmental science in the Graduate Program at UPRRP is designed to provide an integrated, quantitative, and interdisciplinary focus to the study of coupled human-natural systems, as opposed to studies of environmental issues *per se*. The Program will provide the student with a solid scientific basis related to natural and anthropogenic processes which affect the environment and will also prepare them to define and analyze environmental problems, apply advanced methods and techniques in environmental analyses, create new knowledge and make decisions directed towards achieving a sustainable society.

B. Profile of Graduates from the Program

Graduates from this Program will have a solid conceptual base pertaining to environmental processes and problems associated with islands and tropical regions, as well as theoretical and practical command of the most modern methodologies for scientific analyses and research on the environment. The Program enables students to define and identify complex environmental problems composed of multiple variables, apply and develop research methodologies, use analytical instruments to obtain data, analyze critically the obtained data with an integrated vision of the environment, construct models that recreate the behavior of environmental systems and provide intelligent solutions that will ultimately address present and future environmental needs. In addition, students need to learn effective communication and teaching skills to disseminate their research and learning. This can be achieved by presentations at scientific meetings as well as working closely with faculty in classes and teaching independently in different settings. Students will work closely with their faculty advisor throughout this learning process and also meet regularly with their thesis/dissertation committee to encourage diverse perspectives on experimental questions and approaches.

C. Student Expectations and Responsibilities

1. Departmental Activities

Seminars

The seminar series is considered an integral part of the graduate program and graduate students are expected to attend program seminars as well as those offered by other programs that are relevant to their area of specialization.

Departmental Committees

Two graduate student representatives will attend all Graduate Affairs Committee meetings. The student representatives will have a voice, but not a vote. They can request, with reasonable advanced notice, that topics of interest to the graduate students be included in the agenda for the graduate faculty's future meetings. The student representatives may be asked to leave the meeting when confidential matters pertaining to a graduate student are discussed. An open meeting of all graduate students from the Program will be announced at the beginning of each academic year. The student representatives will be elected for that year at this meeting. The student representatives may call for graduate student meetings during the year to discuss problems or plan activities.

2. Honor Code

The institutional policy of the UPR Rio Piedras campus is to maintain the highest norms of intellectual and scientific integrity and to denounce all the violations of the same. Violations include plagiarism, falsification, false attribution and all the violations of the canons and practices of honesty accepted generally by the academic community, excepting those that result from involuntary errors or legitimate differences in the interpretation or handling of data or information. The norms, responsibilities and procedures for dealing with possible violations of the principles of intellectual and scientific honesty summarized above are detailed in Circular Letter no. 17 (21 May 1990), signed by the Chancellor of the Rio Piedras campus of the University of Puerto Rico. The disciplinary procedures are detailed in Chapter VI of the *Student Regulations of the Rio Piedras campus.*

D. Graduate Program Coordinator and Graduate Affairs Committee

The Graduate Program Coordinator and Graduate Affairs Committee are appointed by the Director of the Environmental Science Department. The Graduate Program Coordinator will lead the Committee and the Director will serve as *ex-officio* member. Members of the Graduate Affairs Committee shall be five and may be drawn from all members of the Graduate Faculty, but a majority of members must be from the Department of Environmental Science. This Committee evaluates the academic progress of all graduate students each academic semester together with the Coordinator of the Graduate Program, and decides on matters related to compliance with these regulations. Quorum for committee meetings will be 50% of the members plus one.

The Graduate Program Coordinator will met with students collectively and individually to provide orientation about the program requirements, courses, selection of graduate advisor , funding opportunities, among other subjects related to the students' effective progress.

III. Admission to the Graduate Program in Environmental Science

A. *Eligibility and Admission Process*

Students will only be admitted to begin the Graduate Program in August (Fall semester) of each year. To be admitted to the Environmental Science Graduate Program, the applicant must fulfill the following requirements:

- A Bachelor's or Master's in Science degree (or its equivalent) with a major in Environmental Science, Biology, Computer Science, Physics, Mathematics, Chemistry, or Engineering from an accredited university. Students that do not have a Bachelor's degree in Environmental Science may be admitted conditionally until approval of the undergraduate Introduction to Environmental Science course with a minimum grade of B during their first semester. This does not apply to students who have taken the course (or equivalent) as part of their previous degrees.

  Students with a Bachelor's or Master's from an accredited university but not majoring in any of the previously mentioned disciplines, can apply for admission to the graduate program once they have met the following requirements with a minimum 3.0 grade point average: one year of General Biology, one year of General Chemistry, Calculus I, one year of Physics with Calculus, one semester of statistics for science majors and the Introduction to Environmental Science course. **However, satisfactory approval of these courses does not guarantee admission to the program**.

- A minimum general grade point average (including all courses taken) of 3.00 (on a scale of 0-4) and a minimum grade point average in science of 3.0 at the undergraduate level.

- Two official copies of their most recent academic transcript.

- Three letters of recommendation from professors with whom they have conducted research or taken science courses.

- A statement of research interests that mentions a specific research question and a potential advisor from the Department of Environmental Sciences. Students are expected to contact Environmental Sciences professors during the admission process. Visit the website for updated information on ES faculty (http://envsci.uprrp.edu/)

- Results from the Graduate Record Examination (GRE) or the Examination for Admission to Postgraduate Studies (*Examen de Admisión a Estudios de Posgrado*; EXADEP) or evidence of having taken these exams.

- Basic knowledge of English and Spanish in both written and oral form.

- Results from the TOEFL exam (foreign students only).

- Attend an interview, if required by the Graduate Affairs Committee.

In special situations, the Program's Graduate Affairs Committee may award **conditional admission** to students with a Bachelor of Science (or its equivalent) from an accredited university, but who for some reason do not fulfill any of the admission requirements, including the required grade point average. Conditionally admitted students must fulfill all of the requirements of the Program's retention index (and any other imposed by the Committee depending on the case) and their continuation in the Program will be evaluated at the end of the second semester of their conditional admission.

B. *Financial aid*

The Graduate Program will make every effort to provide financial support (stipend and tuition) for full-time students accepted into the program who are making satisfactory progress toward degree completion. Master's students can receive institutional funds through DEGI for a maximum of two years and doctoral students for a maximum of three years. Support is in the form of either a teaching or research assistantship. The assistantships are assigned by the Director of the Department in consultation with the Graduate Program Coordinator and are subject to availability of funds and supervisors. Different research projects in the Department or in other departments might have funds to support students. Information about these and other types of assistance can be obtained from the Graduate Program Coordinator and the Dean of Graduate Studies and Research (DEGI).

All students are strongly encouraged to apply for outside fellowships for which they are eligible such as NSF, DOD, Ford Foundation, etc. Deadlines for these fellowships are generally in November. Contact Maria Ramos at DEGI (ext. 3654) or Lillian Cordero (ext 7611) at the Office of the Dean of Natural Sciences information about specific fellowship opportunities.

C. *Transfer of Credits*

As per Certification Num. 38, 2012-2013 of the Academic Senate, only graduate courses (or their equivalents) approved with a minimum of B-, taken within five years of the date of entrance to the ES Graduate Program can be considered for transfer credits. A maximum of a fourth (1/4) of the course credits required for the corresponding M.Sc. or Ph.D. (8 and 10 credits, respectively) that were earned at another institution (i.e., validation) or in the UPR system (i.e., substitution) can be accredited. This certification applies to students admitted on August 2013 and thereafter. To apply for the acceptance of transfer credits the student must first successfully approve 12 course credits, and then submit to the Graduate Program Coordinator an official copy of their academic record (if it is not already on file) and a copy of the form "Request for Transfer of Credits" (**Form 1**), as well as a description of the courses according to the University catalog where the graduate courses were taken, and a letter from their advisor justifying the need to transfer credits for specific courses as part of the student's emphasis area, especially if equivalent courses are not offered by the Environmental Sciences Program. Upon approval by the Graduate Coordinator, a formal request will be sent to the Dean of Graduate Studies and Research (DEGI) in support of the course validation or substitution.

IV. Degree requirements

A. Courses

This section briefly describes general course requirements for the Master's and Doctoral Degrees. Beyond the first year of core courses, in consultation with their Graduate Advisor, students pursue individualized course selections depending on their emphasis area (list) and additional requirements determined by the Graduate Advisor or externally-funded training programs. Consult Appendix A or the Graduate Program Coordinator for additional details on these offerings and requirements.

Master's Degree: Environmental Science Master's students must complete a total of 38 credits. Of this total, 18 credits (47%) will correspond to core courses. Typically, an additional 6 credits (16%) will correspond to emphasis areas, 2 credits (5%) to a graduate seminar, 6 credits (16%) to elective courses, and 6 credits (16%) to graduate research leading towards a Master's thesis.

Doctoral Degree: Environmental Science Doctoral students must complete a total of 60 credits. Of this total, 18 credits (30%) correspond to core courses. Typically, 9 credits (15%) will correspond to emphasis areas, 2 credits (3%) to a graduate seminar, 4 credits (7%) to an emphasis area seminar, 9 credits (15%) to elective courses, and 18 credits (30%) to graduate research leading towards a Doctoral dissertation.

B. Selection of the Graduate Advisor

The student should select a Graduate Advisor that is a full-time member of the Faculty of the Environmental Science Graduate Program. The list of faculty currently in the Graduate Program is provided in Appendix B; an updated list will be maintained on the departmental website. A student that wishes to do their research with an advisor outside the Environmental Science Graduate Program must chose a member of the Faculty of the Environmental Science Graduate Program who will be designated to serve as the student's co-advisor. The choice of (co-) advisors will be approved by the Graduate Affairs Committee at the time the student forms a Student Advisory Committee (SAC; next section). At the beginning of their second semester, the student will formally select their Graduate Advisor and inform it to the Graduate Program Coordinator.

The Graduate Advisor will meet regularly with the student and will provide effective guidance to help him/he succeed in graduate school. The Graduate Advisor will be involved in the decisions the student makes regarding all degree requirements including course selection, selection of Student Committee, Teaching requirement, Qualifying Exams, Proposal and Thesis or Dissertation defense. Additionally, the Graduate advisor should provide guidance regarding funding opportunities, networking opportunities, development of oral and written communication skills, scientific creativeness, and critical thinking.

C. Selection of the Student Advisory Committee (SAC)

The student's committee will consist of three (for MS students) or five (for Ph. D students) members including the student's Graduate Advisor who will serve as the SAC Chair. All committee members must be actively and constantly involved in all evaluation activities regarding the student, including but not limited to Exam B, Proposal defense and Thesis/Dissertation defense. Students have to formalize the selection of their Advisory Committee by submitting Form 2 to the Graduate Affairs Coordinator for approval of committee members **before the end of the second semester of study in the Graduate Program**. Students who do not submit Form 2 by the beginning of their third semester will be at risk of being placed on probation. Any change in the Student's Committee requires the approval of the Graduate Affairs Committee (see section D).

Students must pay careful attention to the following rules when forming their Advisory Committee:

1. Their Graduate Advisor must be from CIAM (See Appendix B) or if the student would like one of the External faculty to supervise their research, then one of the CIAM faculty must be chosen as a Co-Advisor.

2. One member of the committee MUST be and Environmental Sciences Core Faculty Member

3. The SAC must be composed of a majority of members from the internal faculty (see Appendix B). For MS students, two members must be internal and one member may be external. In the case of Ph.D. student, three members must be internal and two may be external.

4. In the case of students that select the interdisciplinary option, at least one committee member should be from outside the Environmental Sciences Graduate Department.

In the event that the student or the Graduate Advisor requires the participation of a SAC member who is not in Appendix B, the student should provide evidence that the proposed committee member is an "active researcher". Evidence for this is provided in the form of the researcher's curriculum vitae. Exceptions to the "active researcher rule," as approved by the Graduate Affairs Committee, may include committee members who are not active researchers but yet who provide expertise critical to the student's research goals, or any other scientist who provides critical knowledge for the development of the student's research program. However, no more than one exception may be granted in the formation of any one SAC. A copy of the Graduate Program's Regulations will be provided to all committee members.

D. Change of Advisor and/or Research Area

If a student decides to change research projects and at the same time change their research advisor, he or she should complete **Form 3**, which must be approved by the Graduate Affairs

Committee. If the change of graduate advisor involves a significant change in the research area, the change will not be approved until the Graduate Program Coordinator and the Graduate Affairs Committee complete an analysis of the student's academic file regarding qualifying exams and courses to guarantee that the student qualifies for the new area.

E. Qualifying Examinations

1. Qualifying Examination (Part A): After the first year as a graduate student, students will be required to take Part A of a qualifying exam integrating knowledge acquired in the core courses (CIAM 6115, 6117, 6118 and 6256). The examination will be offered during the summer of the first year.
The student will have two opportunities to pass the examination. The first opportunity will be a written examination based on the course content mentioned above in which the students are presented four questions written by the faculty teaching the core courses. The students choose two questions to be answered in a single eight-hour period. Questions are then graded by faculty on a 0-100 scale, with an 80 or above signifying "Pass" and 90 or above signifying "Exceptional." Any student which fails to achieve an average grade of 80 or above on the written portion of the examination will then go on to an oral examination. The oral examination, directed at the content of all four courses mentioned above, will be given by the four faculty teaching the core courses. The examination committee will have up to three hours to examine the student, at which point they will vote "Pass" vs. "Fail" on the student's performance. Failure to approve the oral examination by a supermajority vote (no more than one member voting "Fail") will result in dismissal of the student from the Graduate Program.

2. Qualifying Examination (Part B): During their fifth semester, students who wish to continue in the doctoral program must successfully complete the qualifying exam (Part B) prepared by the student's advisory committee (SAC) consisting of both a written and oral portion directed at the students' understanding of coursework and additional written material related to the student's research topic. The student should meet with each committee member to discuss the dissertation research topic so that the written material assigned is relevant to the student's interest and provides insight into their proposal development. Therefore, by the time the student takes Exam B, he/she should have a good idea of what the objectives and structure of the research proposal are.

The student and the SAC Chair should work a schedule together for both the written and oral portions of the Qualifying Examination (Part B). Once the schedule is defined and before the written portion of the exam begins, **Form 8** must be filled, signed by all committee members and submitted by the student to the Graduate Coordinator. The schedule must consider that the student has a maximum of ten (10) calendar days to answer the written exam, the committee has seven (7) calendar days to evaluate the written portion and send their evaluations and comments to the SAC Chair, and then the SAC Chair must send the evaluations and comments from the committee a minimum of three (3) calendar days before the oral portion of Exam B.

The written portion consists of five questions (one per each member of the committee) based on assigned literature by each committee member, of which the student must answer four. The SAC Chair should collect the questions and send them to the student, who will have a maximum of ten (10) calendar days to answer them. The exam is open book (students can use any books or other written or online resources), but students cannot consult with any person in answering the questions. The Committee expects the responses to be more than a mere review of the literature on the subject and should demonstrate critical thinking, original thought and effective communication (for more information see section *K. Criteria for evaluating Qualifying Examinations, Proposals and Thesis or Dissertation p. 14 and Appendix C***).** Each Committee member then receives from the student the response to the question they asked and has seven (7) calendar days to evaluate it and send their evaluation and comments to the SAC chair. The chair will collect the evaluated questions from all committee members and will send them to the student and the Graduate Coordinator to keep in the student's records. The student will have three (3) calendar days before the oral exam to review the evaluated questions.

The oral portion of Exam B should be taken ten (10) calendar days after the student hands in the answers to the written portion, and no less than three (3) calendar days after the student receives the evaluation and comments of the written portion from all committee members. The purpose of the oral portion is to emphasize the topics of the assigned literature but is not limited to them. The Evaluation Table (**Appendix C**) must be submitted by the SAC Chair to the Graduate Coordinator within seven (7) calendar days of the oral Exam B.

The assessment of the Exam B (written and oral portions) is: Approved, Action Requested for Approval, or Fail.

- If the student approves the exam, he/she can continue with the preparation and defense of their dissertation proposal.

-If action is requested for approval, the student must address the actions requested, to the satisfaction of the committee. The student will have a period of no more than one month from the day the SAC Chair submits to the student and the Graduate Coordinator a written document explaining the specific actions requested and the process of evaluating these actions. This document must be submitted within seven (7) calendar days of the oral Exam along with a report of the student's performance during the Oral exam B.

- Failure to approve the examination by a supermajority vote (no more than one member voting "Fail") will result in dismissal of the student from the Graduate Program. If the student fails, she/he cannot continue in the doctoral program but can, upon the recommendation of the SAC and with the approval of the Graduate Affairs Committee, complete the Master's program. This request must take the form of a letter submitted by the student to the Graduate Program Coordinator with the signature of all committee members.

Upon completion of the Qualifying Examination Part B, the student must submit a completed **Form 4** to the Graduate Coordinator.

Students who have not taken Exam B by the end of their fifth semester, must submit to the Graduate Coordinator a letter to fully justify their delay and a schedule showing the steps they are taking in preparation for the exam and the date they will take it. This letter must have the approval of the SAC and must be submitted a month before the end of the aforementioned fifth semester. A student who has not successfully approved Exam B by the end of their fifth semester nor submitted the letter described above, will be placed on probation.

F. *Teaching Requirements*

For all master's students a teaching experience of one semester is required, while for doctoral students, a minimum of two semesters is required. Students who have previous teaching experience may apply in writing to the Graduate Program Coordinator for an exemption from that requirement. The fulfillment of this teaching experience should be completed by the end of the third year and can be met in several ways:

1. Hold a TA position at the College of Natural Sciences or at another campus in the UPR system (with the approval of the Graduate Program Coordinator).
2. Hold a teaching assistant position in a NSF funded (e.g., "GK-12") or other K-12 program devoted to environmental education, subject to approval by the Graduate Program Coordinator
3. Effort equal to a TA in another position. The student must submit a letter requesting approval to the Graduate Coordinator.

Typical TA responsibilities include grading exams, holding regular office hours, preparation of course handouts and presentations, attending lectures, or for lab courses, setting up equipment and supervising cleanup. Students who wish to teach beyond the requirements may ask to be considered, however, first priority will be given to students who have not yet met their requirement. If you are offered institutional support in the form of a PEAF (this does NOT include Title V fellowships), you are expected to teach in a course or a lab during the semester even if you have already fulfilled your TA assignment.

G. *Language Requirements*

All students registered in the Program should have a working knowledge of both Spanish and English. This is recommended since most teaching is done in Spanish, while the textbooks, scientific articles, and references are in English. Moreover, most of the undergraduate teaching is done in Spanish. A student with a language deficiency can be admitted to the Program with the condition that he or she takes language courses that will help the student surmount this deficiency during their first year of studies. The Environmental Science Program can coordinate these courses with the Colleges of Humanities and/or General Studies.

H. Advancement to Candidacy

A student who wishes to obtain a graduate degree must first be admitted as a candidate for the degree by the Environmental Science Graduate Affairs Committee. Advancement to candidacy means that the student has demonstrated that he or she is capable of fulfilling the requirements for the degree and has sufficient training to pursue independent research.

Evaluation of Master's candidacy promotion will be carried out after the first year of graduate studies. In order to be promoted as a Master's degree candidate, academic performance, results of Qualifying Exam Part A and the Graduate Affairs Committee's decision are taken into consideration. In practice, once the Graduate Affairs Committee approves the first Annual Progress Report of the student, following successful completion of the Qualifying Examination Part A, the Graduate Program Coordinator will issue a letter promoting the student to Master's candidacy.

Evaluation of Ph.D. candidacy promotion will be carried out within three years of having been admitted to the Program. In order to be promoted as a Doctoral degree candidate, academic performance, Qualifying Examinations Part A and B, and the Graduate Affairs Committee's decision are taken into consideration. In practice, once the Graduate Affairs Committee approves the second (or, if necessary, third) Annual Progress Report of the student, following successful completion of Qualifying Examination Part B, the Graduate Program Coordinator will issue a letter promoting the student to Ph.D. candidacy.

I. Research Proposal

Students are required to prepare a written original research proposal explaining their plans for research within a year of passing qualifying exam Part A for Master's and Part B for Doctorate. Preparation of the proposal is done with the aid of the student's Graduate Advisor and the input from the student's committee. The student and his/her advisor should work a date together for the proposal defense considering the availability of all committee members. Once the date is defined, **Form 8** must be filled, signed by all committee members and submitted to the Graduate Coordinator. The proposal is then defended at a meeting with the student's committee. The written proposal must be presented to the committee members no less than one week before the proposal defense. The student must demonstrate critical thinking, original thought and effective communication in their written proposal and defense (for more information see section *K. Criteria for evaluating Qualifying Examinations, Proposals and Thesis or Dissertation P. 14 and Appendix C)*.

At the defense, the assessment is: Approved, Approved with Clarifications, or Fail. Any clarifications must be resolved within no more than two months. How and when the clarifications are addressed is at the discretion of the committee, but they can require that the student meet with the full committee for a second time. Upon successful defense of their proposal, students should submit a completed **Form 5** to the Graduate Program Coordinator.

Students must successfully defend their proposal during their fourth semester (M.S) or seventh semester (Ph.D.). Students who have not defended their proposal by then must submit to the Graduate Affairs Committee a letter to fully justify their delay and a schedule showing when they will be defending their proposal. This letter must have the approval of the student's thesis or dissertation committee and must be submitted a month before their proposal defense date. A student who has not successfully defended their proposal before the end of their fifth semester (M.S) and eighth semester (Ph.D.), nor submitted the letter described above, will be placed on probation.

J. Graduate Research

The student must prepare, present, and defend a Master's thesis or Ph.D. dissertation as a final requirement of the degree.

1. Thesis or Dissertation manuscript: Once the student has completed a written draft of their thesis or dissertation with the aid of their advisor(s), they will submit a copy to each committee member no less than two weeks in advance of the oral defense (see below).

The students have two options of format for the thesis or dissertation.

A) Journal thesis format:
   - Introduction, chapters are stand-alone publications, conclusion.
   - All articles must be related to the main thesis objective stated in the Introduction and to the final remarks in the conclusion to create a cohesive document.
   - Students must be first author in all articles included in their thesis or dissertation.

B) Classic thesis format:
   -Introduction, Theoretical and/or Empirical Chapters, Conclusion.

The dissertation must also conform to the format required by DEGI and Certification #38, 2012-2013 Academic Senate.

2. Oral defense: Immediately prior to the oral defense of the thesis or dissertation and after handing in the written draft of the thesis or dissertation to the committee, the student should present a public seminar in Natural Sciences based on their research. The date selected for the oral defense of the thesis or dissertation will be established by unanimous agreement between the student, the Graduate Advisor, and the remaining committee members. Once the date is selected, **Form 8** must be filled, signed by all committee members and submitted to the Graduate Coordinator. The seminar time and place should be publicly announced one week in advance of the presentation. Following the seminar, the public in attendance will be allowed to ask questions to the student. Thereafter, the student will meet privately with the committee to address additional

questions. At the conclusion of the questions, the committee will meet privately to determine if the student's thesis or dissertation is: Approved, Approved with Conditions, or Fail. If the student committee finds that the defense has not been done at the expected level for the master's or doctoral degree (Approved with Conditions), the student will be granted no more than three months to rectify the problems and defend it in front of the committee for the second and last time. Once the student has successfully defended the thesis or dissertation, they should submit a completed **Form 6** to the Graduate Program Coordinator.

The Committee expects both the thesis or dissertation and the oral defense to be more than a mere review of the literature and should demonstrate critical thinking, original thought and effective communication (See section below K. *Criteria for evaluating Qualifying Examinations, Proposals and Thesis or Dissertation and Appendix C*).

3. Requirement for publications: All doctoral students must present evidence of at least one publication or manuscript submitted for publication in a peer reviewed journal in which they were the major contributor before conducting the oral presentation and defense of the dissertation. The publication must contain all or part of the results obtained by the students during their dissertation work. Evidence of publication(s) should be submitted with **Form 6**.

K. Criteria for evaluating Qualifying Examinations, Proposals and Thesis or Dissertation

a. Critical Thinking

Identifies and appropriately formulates the problem, question, or topic: Clearly identifies the challenge and the intrinsic or implicit aspects of the subject. Identifies and explains essential relationships between and among concepts.

Presents, evaluates, analyzes, and uses data / evidence properly: Demonstrates that he/she has selected and evaluated the information. Examines the evidence and the sources from which it was obtained, questions the accuracy and relevance of the data or information gathered. Demonstrates clear organization of ideas according to the importance and impact that each entails.

Develops the argument using other perspectives and positions: Integrates perspectives from a variety of sources to justify the analysis. The analysis of other positions is accurate. Is immersed in a complex process of assessment and justification of challenging ideas.

b. Original Thought:

Develops, presents, and communicates own perspective, hypothesis or positions: Presents and justifies his/her own view or hypothesis while integrating contrary interpretations. Properly identifies own posture, applying experience and data/information gathered.

c. Effective communication:

The language communicates ideas clearly and efficiently. Words are consistent and orderly so that the approach can be understood easily. Uses language appropriate to the

discipline. Communication is rich and eloquent. The style is appropriate for the audience and the subject. The organization is clear, the transitions between ideas are smooth. Supports arguments with valid statements and sources. Sources are cited correctly, showing understanding of the concepts discussed.

L. Program Timeline

The Environmental Science Graduate Program expects that the students complete all requirements for the Master's degree in a period of 3 years or less. However, the general UPR M.S degree has a term not exceeding 4 years from the date of admission to meet degree requirements including defense and submission of thesis (Certification No.38 of the Academic Senate). This period may be extended by one (1) additional year. This extension will be regarded as exceptional and as such must be justified to the Graduate Affairs Committee, which notifies the applicant of the final decision. For more information on extensions to complete a graduate degree, please refer to Certification No. 38, 2012-2013 Academic Senate)

The Environmental Science Program expects that the students complete all requirements for the Ph.D. degree within a period of 6 years or less. For the doctoral students who entered the program with a bachelor's degree, the student must complete all requirements for the degree including the successful defense and submission of the dissertation within a maximum of 9 years from the date of admission (Certification No. 38 of the Academic Senate). For the doctoral students who entered the program with a master's degree, the student must complete all requirements for the degree including the successful defense and submission of the dissertation within a maximum of 7 years from the date of admission (Certification No. 38 of the Academic Senate). These terms can be extended for a period of one year at a time for a total period not to exceed two additional years. These extensions will be regarded as exceptional and as such must be justified to the Graduate Affairs Committee, which notifies the applicant of the final decision. For more information on extensions to complete a graduate degree, please refer to Certification No. 38, 2012-2013 Academic Senate). All courses officially expire five years after they have been taken (Certification No. 38 of the Academic Senate).

V. General Procedures

A. Orientation for New Students

New students will attend the Graduate Program's orientations before the beginning of their first semester. During this period, the student will receive an academic program based on their interests and the requirements of the Program. All students must attend the training for teaching assistants offered annually during July. They also should attend safety trainings for the chemistry laboratories that are offered annually by authorized personnel from the University of Puerto Rico. Students that will be working with human subjects (including conducting interviews) need to have a certificate of ethical conduct from NIH (http://phrp.nihtraining.com/users/login.php)

B. Registration

The registration of all environmental science graduate students (and other students who are taking environmental science graduate courses) will be done by the Graduate Program Coordinator. To avoid late registration problems, all entering graduate students will follow the procedure that will be described during the orientation period. Students continuing in the Program should do pre-registration. The Environmental Science Graduate Program will announce the courses that will be offered, place, and dates for pre-registration. Before pre-registration each student will:

1. Discuss their academic program with their Graduate Advisor. The Graduate Coordinator will serve as an advisor to new students that have not officially selected their Graduate Advisor. All questions or problems related with their program should be discussed with the Graduate Advisor, the Graduate Environmental Science Program Coordinator, and/or the Graduate Affairs Committee.

2. Obtain from the Graduate Program Office the form for pre-registration and fill it out.

3. Each form must be signed by the student's Graduate Advisor.

4. On the day assigned for the pre-registration process each student will submit the requested forms containing the signatures of the Graduate Advisor and the student to the Graduate Coordinator.

5. During the period of registration at the beginning of each semester, the student should pick up their registration materials according to the schedule announced by the College of Natural Sciences and complete their registration with the Registrar and Treasurer.

6. Changes in registration: Changes in registration are discouraged. A graduate student should plan their program carefully so that changes will not be necessary. If a student finds that it is essential to make a change to their schedule, he or she should consult the University calendar for the dates assigned for adding or dropping courses. The Graduate Program Coordinator will make the registration changes with the authorization of the student's Graduate Advisor.

C. Annual Progress Report

Students must meet with their Advisor each year to complete an Annual Progress Report, beginning in their 2nd st Semester of their first year. See **Form 7**. Each report should be a complete record of the student's progress at the date that the form is completed. This should be submitted to the Program Coordinator for approval by the Graduate Affairs Committee.

D. Research Thesis/Dissertation

A graduate student, either master's or doctorate, who has fulfilled all the requirements of the degree and has completed the experimental part of their research work, will be able to enroll in the Thesis/Dissertation Continuation course, CIAM 6896 (master) or CIAM 8996 (doctoral), in order to be a student of the University of Puerto Rico when applying for graduation.

E. Academic Progress

To be considered as a fulltime student, a student must be registered in at least nine credit hours during a regular semester, unless registered in Thesis or Dissertation(CIAM 6999 or 8999), or Continuation of Thesis or Dissertation (CIAM 6896 or 8996). It is expected that a first year student will take three graduate courses and a graduate seminar each semester.

The student's academic average is computed using course grades as a base, except those that the student has repeated, and in this case the best grade will be used to compute the average. A student is considered *bonafide* if their academic grade point average (GPA) is 3.00 or higher at the end of each semester. If a student receives a grade of C or less in any course, it cannot be used to satisfy the graduation requirements, even though the grade is included in their academic average. Any course with C, D or F grade can be repeated when the course is offered again. If the academic average is lower than 3.00 the student goes on probation at the beginning of the next semester at the discretion of the Graduate Program Coordinator and with the approval of the Graduate Affairs Committee. The student will be asked to explain in writing the reasons for their poor performance prior to any determination of their academic status.

By dropping a required course the student will enter probationary status. The student will remain on probation until he or she repeats and passes the required course the next time it is offered.

Any other significant violation of the regulations contained in this document will be considered sufficient reason to place a student on probation.

A student with probationary status will not be eligible for financial support, taking the qualifying exams, or be able to fulfill other degree requirements. Nevertheless, the student will be able to continue taking graduate courses and working on research at the discretion of their advisor. A student is removed from this probationary status as soon as they raise their academic average above 3.00, or, if placed on probation for other reasons, their situation is resolved to the satisfaction of the Graduate Affairs Committee. Requests for removal from probationary status must be made in writing by the student to the Graduate Program Coordinator. If a student remains on probation for one year, he or she will be dropped from the Program.

Any student dropped from the Graduate Program may apply for readmission only after having satisfied the deficiencies. Therefore, the student can continue to take graduate courses with the

approval of the Graduate Program Coordinator. The student should then follow the normal procedures to apply.

Readmission to the Graduate Program will not be considered if the student has been dropped from the Program as a result of:
1. Not passing the required qualifying exam.
2. Not fulfilling the admission requirements for candidacy in the time limit specified.
3. Not passing the proposal defense.
4. Not satisfying the thesis or dissertation requirements in the time limit specified.
5. Academic dishonesty

If a student decides to leave the Graduate Program before completing the degree, he or she must advise the Graduate Program Coordinator in writing of this decision. Similarly, if the student resigns from a teaching or research assistantship, he or she must submit their resignation by letter to the Graduate Program Coordinator.

Any student who fails to register for a semester must request readmission to the Graduate Program and to the University. Students can request, in writing, a leave of absence from the graduate program by submitting a letter to the Graduate Program Coordinator, co-signed by the Graduate Advisor, at least one week prior to registration. A leave of absence can be approved for up to one year, renewable for a second year. Beyond two years, the student must request readmission to the Graduate Program and the University.

F. Appeals

Requests to appeal any decision made under these regulations should be sent to the Graduate Affairs Committee by the student in written form. The reasons for appeal should be substantive and documented with additional materials as necessary and sent to the Committee no later than six months after the decision was taken. Once the request has been received, the Committee will have one month to investigate the reasons for the appeal and respond to the student. If the student is not satisfied with the decision, he or she may follow standard University of Puerto Rico appeals procedures.

G. Graduation

The student will fill out the graduation application in the Registrar's Office during the first week of the semester in which he or she expects to complete all requirements of the degree. At the time of applying for graduation, the student is responsible to have already applied for reclassification, validated courses, or has an extension for the validation of these courses if necessary. It is recommended that the student requests an evaluation of their academic record and status in the Graduate Program from the Graduate Program Coordinator at least one year before graduation. The student is responsible for removing any deficiencies and holding a 3.00 GPA at the time of graduation. Three bound copies and one electronic copy in pdf format of the thesis or dissertation should be handed into the Environmental Sciences Graduate Program no

later than four weeks before the semester ends. Two of these bound copies will be kept at the Library of Natural Sciences and the third one will be kept in the Environmental Science Graduate Program. An additional copy will be given to the Graduate Advisor. Additional electronic or bound copies can be distributed to the remaining committee members. It is the student's responsibility to be aware of and meet all the degree requirements. The Graduate Program Coordinator will advise the student on this. A Certification of Graduation will not be given until the student hands in the bound copies of the thesis or dissertation. It is a requirement of all doctoral students to register their dissertations in the international bibliography bank of University Microfilms Inc.

I. Review of this Document

This document must be reviewed by the Graduate Affairs Committee within three years of its approval. See cover sheet for date of last approval.

Appendix A. This section provides detailed information on course sequences based on emphasis area and program.

Core courses

The core courses will be taken both by Master's and Doctoral students in Environmental Science.

Code	Title	Credits	Hours
CIAM 6115	The terrestrial environment	3	45
CIAM 6116*	Tropical ecosystems	3	45
CIAM 6117	The coastal environment	3	45
CIAM 6118	The urban environment	3	45
CIAM 6235*	Remote sensing I	3	45
CIAM 6256	Methods for statistical analysis of environmental systems	3	45

* These courses (CIAM 6116: Tropical ecosystems and CIAM 6235: Remote Sensing I) are required for those students interested in completing a degree in Environmental Modeling and Spatial Analysis and in Sustainable Management of Islands and Tropical Regions. Students that wish to pursue an Interdisciplinary option are welcome to take CIAM 6116 and CIAM 6235 but can also take any other courses of content level 5000, 6000 or 8000 offered in any graduate programs of the College of Natural[1] Science or other graduate programs in the Rio Piedras Campus, with prior authorization of the Department Director or Environmental Science Program Coordinator. A few examples of these courses are:

BIOL 6145	Bioconservation
BIOL 6126	Population ecology
BIOL 6501	Cellular and molecular biology
BIOL 6360	Bioinformatics
BIOL 6367	Ecological genetics
BIOL 6996	Plant ecophysiology
BIOL 6995	Tropical biology
BIOL 6999	Special topics in modern biology
BIOL 5565	Fungi biology
BIOL 5548	Neurobiology
FISI 6441	Nuclear physics
FISI 6407	Advanced laboratory
MATE 6601	Probability and statistics I
MATE 6602	Probability and statistics II
MATE 6685	Computer applications
MATE 6686	Experimental design and advanced analysis
MATE 8990	Statistical methods and bioinformatics

[1] Many of the courses offered by other graduate programs of the College of Natural Sciences require, as a prerequisite, undergraduate level courses. If a student is interested in taking a core course which has an undergraduate prerequisite, the prerequisite must be taken without these undergraduate credits counting towards the Master's or Doctoral degree.

QUIM 6215	Theory of analytical chemistry
QUIM 6225	Theory of instrumental analysis
QUIM 6811	Advanced biochemistry I
QUIM 6812	Advanced biochemistry II
QUIM 6990	Tropospheric chemistry
PLAN 6020	Geographic information systems for planning
PLAN 6098	Environmental economics for planning
PLAN 6117	Computer applications for planners
PLAN 6135	Society, Environment and planning
PLAN 6526	Urban Space Design
PLAN 6619	Environmental studies for planning
PLAN 6995	Environmental Justice
PLAN 6608	Environmental control technologies
PLAN 6617	Environmental politics and natural resources

Emphasis area courses: Option in Environmental Modeling and Spatial Analysis
Master's students with the option in Environmental Modeling and Spatial Analysis must take at least two of the following three emphasis courses, while Doctoral students in this emphasis must take all three emphasis courses.

Code	Title	Credits	Hours
CIAM 8225	Methods in spatial analysis	3	45
CIAM 8236	Remote sensing II	3	45
CIAM 8257	Techniques for construction of environmental models	3	45

Emphasis area courses: Option in Sustainable Management of Islands and Tropical Regions
Master's students with the option in Sustainable Management of Islands and Tropical Regions must take at least two of the following three emphasis courses, while Doctoral students in this specialization must take all three emphasis courses.

Code	Title	Credits	Hours
CIAM 8425	Environmental geology	3	45
CIAM 8435	Environmental hydrology	3	45
CIAM 8445	Environmental meteorology	3	45

Emphasis area courses: Interdisciplinary option
Master's students in the interdisciplinary option, with prior authorization from the thesis advisor, may take any two courses in the Environmental Modeling and Spatial Analysis emphasis or Sustainable Management of Islands and Tropical Regions emphasis or substitute these for an equal amount of credits in level 6000 or above courses offered by other graduate programs in the College of Natural Sciences of the campus. Doctoral students in the interdisciplinary option, with prior authorization from the dissertation advisor, may take any three courses in the Environmental Modeling and Spatial Analysis or Sustainable Management of Islands and Tropical Regions emphasis or substitute these for an equal amount of credits in level 8000 courses offered by other graduate programs in the College of Natural Sciences or other graduate programs on campus. Among these courses are:

MATE 8990	Topics in applied mathematics I
MATE 8995	Topics in applied mathematics II
QUIM 8211	Advanced analytical chemistry I
QUIM 8212	Advanced analytical chemistry II
QUIM 8992	Special topics in analytical chemistry
QUIM 8996	Special topics in physical chemistry
QUIM 8998	Special topics in biochemistry
FISI 8105	Topics in materials science

Electives

Considering their research interest, students may take any graduate level course to fulfill their elective course requisite. Decisions on which electives to take must be taken with the help of their Graduate Advisor.

Students who which to rotate in a laboratory of interest or who which to start working on their research before defending their proposal may take **CIAM 6910** Supervised Graduate Research (Rotation) which counts as an elective course. This course may be taken up to two times for a maximum of 6cr for MS students and up to three times for a maximum of 9cr for Ph.D. students. This course is evaluated through the **Research Course Evaluation Form** found at the end of this document. This form has two section: one to be filled by student and research supervisor at the beginning and the other at the end.

Seminars

Code	Title	Credits	Hours	
CIAM 8901	Graduate seminar I	1	15	
CIAM 8902	Graduate seminar II	1	15	
CIAM 8205	Seminar in environmental modeling and spatial analysis I	2	30	
CIAM 8206	Seminar in environmental modeling and spatial analysis II		2	30
CIAM 8405	Seminar in sustainable management of tropical islands I		2	30
CIAM 8406	Seminar in sustainable management of tropical islands I		2	30

All Master's or Doctoral students will take the Graduate Seminar courses I and II during their first year (CIAM 6901). Doctoral students with an option in Sustainable Management of Islands and Tropical Regions and in Environmental Modeling and Spatial Analysis will take the topical seminars corresponding to their emphasis option. Doctoral students in the interdisciplinary option, with prior authorization from the dissertation advisor, can take any of these two seminar courses or substitute them for an equal amount of credits in advanced seminars offered by other graduate programs in the College of Natural Sciences or other graduate programs on campus. Among these are found:

BIOL 8368	Seminar in population biology
QUIM 8205	Seminar in analytical chemistry I
QUIM 8206	Seminar in analytical chemistry II
QUIM 8801	Seminar in Biochemistry
QUIM 8901	Graduate Seminar
QUIM 8205	Seminar in Analytic Chemistry
QUIM 8405	Seminar in Organic Chemistry

Research credits

Students who have defended their proposal, may take CIAM 6999 Graduate Masters Research (MS Students) or CIAM 8999 Graduate Doctorate Research (Ph.D. students) to work on their research thesis or dissertation respectively. MS students need to complete six (6) research credits while Ph.D. students need to complete eighteen (18).

These research credits are evaluated through the **Research Course Evaluation Form** found at the end of these regulations. This form has two section: one to be filled by student and research supervisor at the beginning and the other at the end. The first section of the form must be completed, signed by both student and graduate advisor, and submitted to the graduate coordinator during the first two weeks of the beginning of the semester the course is registered in. The second section must be completed, signed by both student and graduate advisor, and submitted to the graduate coordinator by the end of the semester the course is registered in.

Appendix B. Current faculty members of the Environmental Science Graduate Program (September 2014). Note: This list is subject to change. Yearly revisions are made to account for changes

The following are consider INTERNAL faculty members of Environmental Sciences

NAME	EMAIL ADDRESS	DEGREE AND SPECIALTY	AFFILIATION	RESEARCH AREA
James Ackerman	ackerman.upr@gmail.com	Ph.D. Taxonomy, plant ecology	UPR-RP Biology	Plant ecology, taxonomy, invasive plants
T. Mitchell Aide	tmaide@yahoo.com	Ph.D. Community ecology	UPR-RP Biology	Community ecology, socio-ecology
Rafael Arce	scoreupr@gmail.com	Ph.D. Physical chemistry	UPR-RP Chemistry	Photochemistry of atmospheric pollutants
Paul Bayman	bayman.upr@gmail.com	Ph.D. Botany	UPR-RP Biology	Mycology, plant pathology, biodiversity, secondary metabolism
Nicholas Brokaw	nvbrokaw@ites.upr.edu	Ph.D. Tropical forest ecology	UPR-RP Environmental Sciences	Forest ecology
Carlos Cabrera	carlos.cabrera2@upr.edu	Ph.D. Analytical Chemistry	UPR-RP Chemistry	Nanotechnology
Patricia Burrowes	paburrowes@uprrp.edu	Ph.D. Ecology, herpetology	UPR-RP Biology	Amphibian population dynamics
Nestor Carballiera	nmcarballeira@uprrp.edu	Ph.D. Biochemistry	UPR-RP Chemistry	Lipid chemistry, marine natural products
Carlos J. Corrada Bravo	carlos.corrada2@upr.edu	Ph.F. Electrical Envigeering	UPR-RP Computer Science	
Elvira Cuevas	epcuevas@gmail.com	Ph.D. Ecosystem Ecology	UPR-RP Biology	Terrestrial ecosystem processes, plant/soil interactions, nutrient cycling, and plant eco-physiology
Liz Díaz Vazquéz	lizvazquez8@gmail.com	Ph.D. Analytical chemistry	UPR-RP Chemistry	Semi-volatile pollutants in human sebum
Zomary Flores	zomary.flores@gmail.com	Ph.D. Microbiology	UPR-RP Biology	Bacterial genetics, symbiosis, host-microbe interactions, oxidative stress
Qiong Gao	shiqun.gao@gmail.com	Ph.D. Agriculture Engineering	UPR-RP Environmental Sciences	Ecosystem Modeling
Gary Gervais	ggervais@onelinkpr.net	Ph.D. Mircobiology	UPR-RP Environmental Sciences	Microbiology and Biofuels
Tugrul Giray	tgiray2@yahoo.com	Ph.D. Animal behavior	UPR-RP Biology	Animal behavior (bees)
Griselle González	ggonzalez@fs.fed.us	Ph.D. Ecology	UPR-RP Biology and ITTF	Soil ecology

William Gould	wgould@fs.fed.us	Ph.D. Landscape ecology	UPR-RP Biology and ITTF	Landscape ecology
Rosana Grafals-Soto	rosana.grafals@upr.edu	Ph.D. Geography	UPR-RP Environmental Sciences	Coastal Geomorphology, Spatial Analysis
Kai H. Griebenow	kai.griebenow@gmail.com	Ph.D. Biochemistry	UPR-RP Chemistry	Structure of proteins, bio-remediation, eco-physiology of marine marco- and micro-algae, bio-nanotechnology
Edwin Hernández*	coral_giac@yahoo.com	Ph.D. Marine ecology	UPR-RP Biology	Reef and coral ecosystems
Heera Lal Janwa	hjanwa@gmail.com	Ph.D. Mathematics	UPR-RP Mathematics	Coding theory; discrete mathematics, cryp-tography, number theory and algebraic geometry, bioinformatics, and ecological informatics.
Rafael L. Joglar	rjoglar@uprrp.edu	Ph.D. Ecology, herpetology	UPR-RP Biology	Herpetology
D. Jean Lodge	djlode@caribe.net	Ph.D. Mycology	UPR-RP Biology and ITTF	Mycology, phylogenetics, nutrient cycling
Clifford Louime	clifford.louime@upr.edu	Ph.D. Environmental Sciences	UPR-RP Environmental Sciences	Sustainable Production of Biofuels
Ariel Lugo	alugo@fs.fed.us	Ph.D. Tropical ecology	UPR-RP Biology and ITTF	Tropical forest ecology
Mariano Marcano	mmarcano@uprrp.edu	Ph.D. Applied mathematics and modeling	UPR-RP Mathematics	Numeric systems, linear and non-linear system optimization, mathematical modeling
Steve Massey	stevemassey@gmail.com	Ph.D. Biochemistry	UPR-RP Biology	Bioinformatics
Olga Mayol-Bracero	omayol@ites.upr.edu	Ph.D. Analytical chemistry	UPR-RP Environmental Sciences	Atmospheric Chemistry and Aerosols
Elvia Meléndez-Ackerman	elmelend@gmail.com	Ph.D. Plant ecology	UPR-RP Environmental Sciences	Endangered species, Conservation, Social-ecological Research
Gabriel Moreno	gmviquiera@prtc.net	Ph.D. Ecology and Evolution	UPR-RP Biology	Sustainable Cities, Environmental Design
Jorge Ortiz	jorgeortiz.ites@gmail.com	Ph.D. Hydrology	UPR-RP Environmental Sciences	Limnology, Hydrology
Luis R. Pericchi	luispericchi@yahoo.com	Ph.D. Statistics and applied mathematics	UPR-RP Mathematics	Statistics and mathematical modeling
María E. Pérez	maria.perez34@upr.edu	Ph.D. Mathematics	UPR-RP Mathematics	Bayesian Statistics, Biostatistics
Alonso Ramírez	aramirez@ramirezlab.net	Ph.D. Limnology	UPR-RP Environmental Sciences	Aquatic ecology

Carla Restrepo	crestre@hpcf.upr.edu	Ph.D. Landscape ecology	UPR-RP Biology	Landscape ecology, landslides
Rafael Ríos	rafaelrios00936@yahoo.com	Ph.D. Environmental health engineering	UPR-RP Environmental Sciences	Water Treatment and Pollution Control
Loretta Roberson	loretta.roberson@gmail.com	Ph.D. Marine ecology	UPR-RP Biology	Anthropogenic Impacts on Coastal Marine Communities
Osvaldo Rosario	rosario_o@msn.com	Ph.D. Organic chemistry	UPR-RP Chemistry	Methods in analysis of environmental pollutants, air pollution analysis, bioaccumulation of pollutants
Alberto Sabat	amsabat@gmail.com	Ph.D. Biology	UPR-RP Biology	Population and marine ecology
Arthur D. Tinoco	atinoco9278@gmail.com	Ph.D. Chemistry	UPR-RP Chemistry	Bioactivity of metals
Gary A. Toranzos	gatoranzos@uprrp.edu	Ph.D. Environmental virology	UPR-RP Biology	Environmental microbiology
Joseph Wunderle	jmwunderle@gmail.com	Ph.D. Ecology	UPR-RP Biology and ITTF	Avian ecology and management
Mei Yu	meiyupr@yahoo.com	Ph.D. Spatial analysis, modeling	UPR-RP Environmental Sciences	Environmental spatial analysis, GIS and remote sensing
Jess K. Zimmerman	jesskz@ites.upr.edu	Ph.D. Plant ecology	UPR-RP Environmental Sciences	Plant communities and response to disturbances
Xiaoming Zou	xzou2000@yahoo.com	Ph.D. Forest ecology	UPR-RP Environmental Sciences	Soil nutrients and biogeochemical cycles

The following are considered associated/EXTERNAL faculty to Environmental Sciences UPRRP

NAME	EMAIL ADDRESS	DEGREE AND SPECIALTY	AFFILIATION	RESEARCH AREA
Maritza Barreto	maritzabarretoorta@gmail.com	Ph.D. Oceanography	UPR-RP Geography	Coastal and beach geomorphology, and risk processes
Jorge Bauza	oceanus.bauza@gmail.com	Ph.D. Marine Sciences	Scientific Director The San Juan Bay Estuary Program	Water quality, Benthic mapping, aquatic ecosystem restoration
José A. Dumas-Rodríguez	jose_dumas@eea.uprm.edu	Ph.D. Analytical chemistry	UPR-RUM Experimental Sta. (Rio Piedras)	Organic, analytical, and environmental chemistry
Bruno Marie	brunomariemail@gmail.com	Ph.D. Biochemistry	Institute of Neurobiology, UPR	Cellular / molecular biology, biochemistry, neuroscience
Gustavo A. Martínez	tavomarti@hotmail.com	Ph.D. Soil chemistry	UPR-RUM Crop and Agro-environmental Science	Applied soil chemistry, limnology
William McDowell	bill.mcdowell@unh.edu	Ph.D. Aquatic ecology	University of New Hampshire	Limnology, watershed ecology

Mark W. Miller	mark.miller@upr.edu	Ph.D. Neurobiology	Institute of Neurobiology, UPR	Comparative neurobiology, environmental neurobiology
Ernesto Medina	medinage@gmail.com	Ph.D. Agronomy	Instituto Venezolano de Investigaciones Científicas	Tropical plant ecophysiology
Carlos E. Ramos Scharrón	cramos@irf.org	Ph.D. Geosciences	Geography and Environment University of Texas	Hydro-geomophology
Luis A. Ríos-Hernández	luis.rios5@upr.edu	Ph.D. Microbiology	UPR-RUM Biology	Biofilm communities, biodegradation, phylogenetics
Mario Rodriguez	mrodriquez@rcm.upr.edu	Ph. D. Ind.-Org. Psychology	UPR-RM Public Health	Organizational behavior, health services planning and evaluation, environmental health
Joshua J.C. Rosenthal	rosenthal.joshua@gmail.com	Ph.D. Biology	Institute of Neurobiology, UPR	Neurobiology, environmental neurobiology
Luis Santiago	luis.santiago47@upr.edu	Ph.D. Planning	UPR-RP Planning	Environmental Economy, Environmental Planning
Victor A. Snyder	victor.snyder@upr.edu	Ph.D. Soil physics	UPR-RUM Agronomy	Effects of soil physical environment on crop production, micro-irrigation
Steven N. Treistman	steven.treistman@upr.edu	Ph.D. Neurobiology	Institute of Neurobiology, UPR	Neurobiology, environmental neurobiology
Joseph H. Vogel	josephvogel@usa.net	Ph.D. Economics	UPR-RP Economics	Environmental economics
Guillermo A. Yudowski	gyudowski@gmail.com	Ph.D. Biochemistry	Institute of Neurobiology, UPR	Neurobiology, environmental neurobiology
Steven Zottoli	steven.j.zottoli@williams.edu	Ph.D. Physiology	Eugene Bell Center for Regenerative Biology, Woods Hole, MA	Marine Physiology

Appendix C:

Evaluation Table to be used in Exam B, Proposal and Thesis/Dissertation Defense

	Does not meet expectations	Meets expectations	Exceeds expectations
Research creation and original thought criteria:	□ Is unable to justify own perspective/opinion □ Arguments are simple or confusing.	□ Inconsistently presents and justifies own perspective □ Arguments are occasionally vague.	□ Presents and justifies own view while integrating contrary interpretations. □ Arguments are properly identified and incorporate experiences and information gathered.
	Does not meet expectations	**Meets expectations**	**Exceeds expectations**
Effective communication criteria	□ Language often difficult to follow and not appropriate to the discipline □ Grammatical mistakes are common and/or repetitive. □ Ideas are unorganized and lack focus. □ Vocabulary and style are not appropriate to the discipline □ Limited or no citations □ Shows absolutely no interest in topic presented. □ Tension and nervousness is obvious; has trouble recovering from mistakes.	□ Language does not interfere with communication most of the time. □ Occasional grammatical mistakes can cause style problems. □ Ideas are logically organized but lack specificity. □ Vocabulary and style are not entirely appropriate to the discipline □ Most sources are cited correctly □ Occasionally shows positive feelings about topic. □ Makes mistakes, but quickly recovers from them; displays little or no tension.	□ Language communicates ideas clearly and efficiently. □ Grammar and syntax is impeccable □ Ideas are clearly organized; transitions are smooth. □ Vocabulary and style are appropriate to the discipline. □ Sources are cited correctly. □ Demonstrates a strong, positive feeling about topic during entire presentation. □ Student displays relaxed, self-confident nature about self, with no mistakes.
	Does not meet expectations	**Meets expectations**	**Exceeds expectations**
Critical analysis criteria	□ Unable to effectively identify the challenge □ Does not identify the relationships between/among concepts. □ Evidence and/or sources of evidence, are simplistic, inadequate or not related to the challenge. □ Does not distinguish between facts and opinions. □ Does not distinguish between cause and correlation; presents disorganized ideas. □ Presents only one perspective of the challenge and avoids all the others without justification. □ Ideas are not integrated. The work seems disjointed or unfinished. Avoids challenging ideas.	□ Presents the challenge, but some aspects are incorrect or confusing. □ Identifies/explains relationships between/among concepts but lacks details □ Evidence/sources of evidence selected are adequate and selective. □ Differentiates fact from opinion, recognizes biases but may be mistaken in attributions. □ Differentiates cause from correlation though the argument may have flaws. □ Presents alternate points of view to support the analysis □ Grossly integrates and compares perspectives but lacks complexity. May exaggerate or underestimate the implications of the perspectives.	□ Clearly identifies the challenge and the intrinsic aspects of the subject. □ Identifies/explains essential relationships between and among concepts. □ Evidence and sources of evidence are examined carefully □ Demonstrates understanding of how the events lead to his/her opinion. Recognizes biases. □ Distinguishes the correlation between causal relations and demonstrates clear organization of ideas. □ Integrates perspectives from a variety of sources to justify the analysis. □ The analysis of other positions is accurate. Is immersed in a complex process of assessment and justification of challenging ideas.

FORM 1

UNIVERSITY OF PUERTO RICO
ENVIRONMENTAL SCIENCES GRADUATE PROGRAM
REQUEST FOR TRANSFER OF CREDITS

Student Name _____ Date _____

Student Number _____ □ MSc □ PhD

Official Transcripts: □ on file □ requested

INSTRUCTIONS: To apply for the acceptance of transfer credits the student should submit to the Graduate Program Coordinator an official copy of their academic record (if it is not already on file) and a copy of the form "Request for Transfer of Credits" (**Form 1**), as well as a description of the courses according to the University catalog where the graduate courses were taken. The student should also submit a letter from their advisor justifying the need to transfer credits for specific courses as part of the student's emphasis area. Upon approval by the Graduate Affairs Committee, a formal request will be sent to the Dean of Graduate Studies and Research (DEGI) in support of the course validation.

CURSOS REQUERIDOS		**CURSO SUSTITUIDO, CONVALIDADO**					**RECOMENDACIÓN**		
NUM Y TITULO CORTO DEL CURSO	CRS	NUM CURSO	TITULO CORTO	INSTITUCION	FECHA	NOTA	CRS	ELEC (x)	REQ (x)

Total Credits Requested _____ (10 max)

_____ _____
Student Signature Approval of Graduate Program Coordinator

_____
Date

FORM 2

UNIVERSITY OF PUERTO RICO
ENVIRONMENTAL SCIENCES GRADUATE PROGRAM

Application for Student Advisory Committee (SAC)

Student Name _____

Student Number_____

_____ Masters _____Doctorate

Date of Application _____

Area of interest / specialty :_____

Preliminary title of thesis / dissertation:

Proposed composition of Student Committee:

_____	_____	_____
Name of Advisor	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature

_____ _____

Signature of Student

Approval
Graduate Program Coordinator

FORM 3

UNIVERSITY OF PUERTO RICO
ENVIRONMENTAL SCIENCES GRADUATE PROGRAM

Change in the Constitution of Student Advisory Committee (SAC)

Student Name _____

Student Number_____

_____ Masters _____Doctorate

Date of Application _____

Area of interest / specialty :_____

Preliminary title of thesis / dissertation:

Proposed composition of Student Committee:

_____	_____	_____
Name of Advisor	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature

_____ _____

Signature of Student

Approval
Graduate Program Coordinator

FORM 4

UNIVERSITY OF PUERTO RICO
GRADUATE PROGRAM IN ENVIRONMENTAL SCIENCES

RESULTS OF QUALIFYING EXAMINATION PART B (PH.D)

Student Name _____ Date _____

Student Number _____

Decision:

□ Approved □ Action Requested for Approval □ Failed

Student Committee:

_____	_____	_____
Name of Advisor	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature

_____
Approval
Graduate Program Coordinator

Actions needed (continue on back as necessary):

FORM 5

UNIVERSITY OF PUERTO RICO
GRADUATE PROGRAM IN ENVIRONMENTAL SCIENCES

APPROVAL OF PROJECT PROPOSAL

____M.S. ____ PH.D

Student Name _____ Date _____

Student Number _____

Decision:

□ Approved □ Action Requested for Approval □ Failed

Title: _____

Student Committee:

_____	_____	_____
Name of Advisor	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature

_____
Approval
Graduate Program Coordinator

NOTE: This certification is a commitment between the student and their Committee. Any alteration or substantial change in the scope of the proposal must be done with the approval of the student's Committee.

Actions needed (continue on back as necessary):

FORM 6

UNIVERSITY OF PUERTO RICO
GRADUATE PROGRAM IN ENVIRONMENTAL SCIENCES

APPROVAL OF THESIS OR DISSERTATION DEFENSE

____M.S. ____ PH.D

Student Name _____ Date _____

Student Number _____

Decision:

□ Approved □ Action Requested for Approval □ Failed

Title: _____

Student Committee:

_____	_____	_____
Name of Advisor	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature

_____
Approval
Graduate Program Coordinator

Actions needed (continue on back as necessary):

FORM 7

UNIVERSITY OF PUERTO RICO
ENVIRONMENTAL SCIENCES GRADUATE PROGRAM

Annual Progress Report

Student Name:	
Student Number:	
Date entered into Graduate Program: Month _____ Year _____	
Date of meeting :	
Approval:	
Name of Advisor	Signature
Committee Member	Signature
Committee Member	Signature
Committee Member	Signature
Committee Member	Signature
Summary of Accomplishments (give date):	
Approval of Student Advisory Committee:	
Approval of Qualifying Examination (indicate Part A or B or both):	
Approval of Project Proposal:	
Teaching conducted (list by Semester and Year):	
Economic Aid Received (list by Semester and Year):	

Courses	Credit	Grade	Courses	Credit	Grade	Annual Evaluation

Thesis/dissertation Credits						
Publications (specify if in preparation, submitted, or in press): Presentations at Conferences						
Proposals submitted:						
Honors received:						
Comments from Committee:						

Notes:

FORM 8

UNIVERSITY OF PUERTO RICO
ENVIRONMENTAL SCIENCES GRADUATE PROGRAM

REQUEST FOR FORMAL EVALUATION DATE

Student Name _____ Date _____

Student Number _____ □ MSc □ PhD

The committee herby understands that the student is prepared to (select one)

□ Take exam B

□ Defend proposal

□ Defend thesis/dissertation

The student will be evaluated on the following date: _____

Student Committee:

_____	_____	_____
Name of Advisor	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature
_____	_____	_____
Committee Member	Department	Signature

_____
Approval
Graduate Program Coordinator

ENVIRONMENTAL SCIENCES GRADUATE PROGRAM
COLLEGE OF NATURAL SCIENCES
UNIVERSITY OF PUERTO RICO
RÍO PIEDRAS CAMPUS

Research Course Evaluation

Introduction:
The purpose of this evaluation is to encourage communication between graduate students and their research supervisor and evaluate the results of the research experience provided by each research course. During the period of course registration, the research supervisor and the student will discuss the research goals they are planning to achieve during the semester and will create a list that they will use as their guide to make sure that those goals are met by the end of the semester. The student and the research supervisor will also consider the student's achievements based on the Environmental Sciences Graduate Program goals for graduate student's success (Note: Description of these goals is included with this form). Both student and research supervisor will sign this document at the beginning and end of the course. Completing this document is mandatory for any research related course (including, but not limited to, CIAM 6910, CIAM 6999 and CIAM 8999).

I. Data about the Student and the Research Supervisor
II. Goals and Meetings
III. Evaluation of student's achievements at the end of the semester
IV. Evaluation of research course by student
V. Comments and Certification

I. Data about the Student and the Research Supervisor

Student's name: _____ (Name) _____ (Last name)

Student Number: _____

Degree sought ☐ Masters ☐ Ph.D.

Supervisor's name _____

Department _____

Supervisor's Extension _____ Research Supervisor's e-mail _____

Course number: _____ Course name: _____

Academic Year 20____ - 20____ _____ 1st semester _____ 2nd semester _____ summer

Research Goals and Meetings

a) **Main goals of research course: Before the course starts, the student and his/her supervisor will discuss their goals for the semester to help the student advance in his/her academic development.**

Overall Goals:	
Specific Goals	
1	
2	
3	
4	
5	

b) Meeting times:

Write here how often during the semester the student and research supervisor will meet to be able to achieve the goals mentioned above:

_____

During course registration, student and research supervisor should verify that the goals for the semester are clear and achievable. Departmental goals of critical thinking, original thought and effective communication (Description included at the end of this document) should also be discussed so that the student understands what will be the evaluation criteria considered at the end of the semester.

B – Comments and Certification Before Beginning of Research Course

Student's Comments:	Supervisor's Comment:
_____	_____
_____	_____
_____	_____

We certify that we have discussed the expected goals before the beginning of the course:

_____	_____
Student's name	Supervisor's name
_____	_____
Student's signature	Supervisor's signature
_____	_____
Date	Date

III. Evaluation of student's achievements at the end of the semester

At the end of the semester, the research supervisor will evaluate the students achievements in the goals agreed upon during course registration before the course started.

A - Research Goals

Specific goals agreed upon before the course started		Evaluation to complete at the end of the semester				
		EXCELENT	GOOD	AVERAGE	POOR	VERY POOR
1.						
2.						
3.						
4.						
5.						

B - Evaluation of student's achievement's based on Departmental Goals

Goals*	Evaluation Method	Evaluation to complete at the end of the semester				
		EXCELENT	GOOD	AVERAGE	POOR	VERY POOR
Critical Thinking						
Research creation and original thought						
Effective communication						

*Meaning of these goals can be found at the end of this document

C – Additional Comments on Students Performance

IV. Evaluation of research course by student

	Yes	No
1. Did you discuss your goals with your supervisor before the start of the semester?	☐	☐
2. How often did you meet with your supervisor? _____		
3. Did you receive appropriate and sufficient guidance during the course?	☐	☐
4. Was your work periodically evaluated regarding its quality?	☐	☐

5. Mention your most important achievements during this research course? (for example: training in X skill, advancement in scientific writing and oral communication, improvement in critical thinking, developing a theoretical framework, advancement in proposal writing, publications, development of creative ideas, etc)

_____

_____

_____

6. How did this course help you advance your goals as a graduate student in Environmental Sciences?

_____

_____

_____

7. Mention here any suggestions to improve the experience of future students in a research course like this.

_____

_____

_____

V. Comments and Certification

B – Comments and Certification at the End of Research Course

Student's Comments:	Supervisor's Comment:
_____	_____
_____	_____
_____	_____

We certify that we have discussed these goals at the end of the course:

_____	_____
Student's name	Supervisor's name
_____	_____
Student's signature	Supervisor's signature
_____	_____
Date	Date

---------- o ----------

Description of Environmental Sciences Graduate Program goals for graduate student's success

Critical Analysis Criteria

Identifies and appropriately formulates the problem, question, or topic: Clearly identifies the challenge and the intrinsic or implicit aspects of the subject. Identifies and explains essential relationships between and among concepts.

Presents, evaluates, analyzes, and uses data / evidence properly: Demonstrates that he/she has selected and evaluated the information. Examines the evidence and the sources from which it was obtained, questions the accuracy and relevance of the data or information gathered. Demonstrates clear organization of ideas according to the importance and impact that each entails.

Develops the argument using other perspectives and positions: Integrates perspectives from a variety of sources to justify the analysis. The analysis of other positions is accurate. Is immersed in a complex process of assessment and justification of challenging ideas.

Effective communication criteria

The language communicates ideas clearly and efficiently. Words are consistent and orderly so that the approach can be understood easily. Uses language appropriate to the discipline. Communication is rich and eloquent. The style is appropriate for the audience and the subject. The organization is clear, the transitions between ideas are smooth. Supports arguments with valid statements and sources. Sources are cited correctly, showing understanding of the concepts discussed.

Original thought criteria:

Develops, presents, and communicates own perspective, hypothesis or positions: Presents and justifies his own view or hypothesis while integrating contrary interpretations. Properly identifies own posture, applying experience and data/information gathered.

APPENDIX 4

Proposal to Create Graduate Programs

APPENDIX 4 **PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO**

APPENDICES

APPENDIX A: REPORTS AND GRAPHS ON ALUMNI

1. Summary of data obtained from a study of alumni concerning graduate studies.
2. Percent of Environmental Sciences Program graduates that replied to the alumni study.
3. Alumni that replied to the questionnaire who carried out studies subsequent to the Bachelors degree.
4. Graduate studies carried out by the Environmental Sciences Program alumni that replied to the questionnaire.
5. Institutions of higher education where Environmental Sciences Program alumni who replied to the questionnaire completed their graduate studies.
6. Environmental Sciences Program alumni who replied to the questionnaire and were interested in pursuing graduate studies.

APPENDIX B: DEGREE REQUIREMENTS FOR EACH OPTION OF THE MASTER'S AND DOCTORATE IN SCIENCES WITH A SPECIALIZATION IN ENVIRONMENTAL SCIENCES

1. Requirements for the MS in Sustainable Management of Islands and Tropical Regions
2. Requirements for the MS in Environmental Modeling and Spatial Analysis
3. Requirements for the MS in the Interdisciplinary Option
4. Requirements for the PhD in Sustainable Management of Islands and Tropical Regions
5. Requirements for the PhD in Environmental Modeling and Spatial Analysis
6. Requirements for the PhD in the Interdisciplinary Option

APPENDIX C: COURSES COMMON TO THE DIFFERENT OPTIONS

APPENDIX D: ORGANIZATION CHARTS FOR THE COLLEGE OF NATURAL SCIENCES AND THE ENVIRONMENTAL SCIENCES GRADUATE PROGRAM

1. Organization chart for the Administration of the College of Natural Sciences
2. Organization chart for the Environmental Sciences Graduate Program

APPENDIX E: PROPOSALS FOR NEW COURSES

APPENDIX E-1: SYLLABI OF RELEVANT EXISTING COURSES IN OTHER DEPARTMENTS

APPENDIX F: CURRICULUM VITAE OF AVAILABLE PROFESSORS

APPENDIX G: COPIES OF APPLICABLE PERMITS

APPENDIX H: STRATEGIC PLAN FOR STRENGTHENING THE MASTER'S AND DOCTORATE PROGRAMS IN ENVIRONMENTAL SCIENCES (2002-2008)

APPENDIX I: MODEL BROCHURE FOR PROGRAM PROMOTION
APPENDIX J:
APPENDIX K: STUDENT ASSESSMENT PLAN

PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

1. Introduction

1.1 Program title and proposed degrees

The Environmental Sciences Program at the College of Natural Sciences in the Río Piedras campus of the University of Puerto Rico proposes the creation of a Graduate Program in Environmental Science. The purpose is to offer Master's in Science (M.S.) with a specialty in Environmental Science and Doctor in Philosophy (Ph.D.) in science with a specialty in Environmental Science degrees. Both degrees would include emphasis options in Sustainable Management of Islands and Tropical Regions, Environmental Modeling and Spatial Analysis and an Interdisciplinary option.

The differences between the three available emphasis options are based on their technical content. Upon completion of the medullar courses, which establish the concentration's general basic knowledge and develop the desired attitudes and values, each option expands on the student's knowledge in the particular chosen area. For example, the Environmental Modeling and Spatial Analysis concentration requires specialized courses in spatial analyses, remote perception and environmental system modeling whereas the Island and Tropical Region Sustainable Management concentration emphasizes in more specific environmental components including hydrology, geology and environmental meteorology. Finally, the Interdisciplinary option allows the student to specialize in other areas including courses in chemistry, mathematics, among others, such as those related to the social sciences, architecture and planning.

1.2 Program duration

The Program has been designed so that a full time student can complete the Master's degree in a two or three year period and the Doctoral degree in a four to five year period. The experience with programs in other science areas indicates that the average Master's student completes the degree requirements in two and a half or three years: two years to complete the course work, comprehensive exam, seminar and research work and an additional semester or year for writing, presentation, and defense of the thesis. The average Doctoral student, on the other hand, usually takes five years in completing the degree: three to complete the course work, seminar and qualifying exams, and two additional years to complete the research proposal, carry out the research work, and writing, presentation, and defense of the Doctoral dissertation.

1.3 Brief Program description

An innovative program capable of responding to the accelerated environmental degradation in Puerto Rico, other islands and tropical regions is being proposed. The main focus is to offer the students a rigorous and comprehensive education with a strong emphasis in research, while also providing the scientific and ethical basis for advancing essential knowledge for the sustainable management of islands and tropical regions, mathematical modeling and environmental spatial analysis, or study of the environment from the perspective of different disciplines which integrate the natural sciences.

The Graduate Program in Environmental Science will be directed towards preparing scientists and researchers with a profound and integrated knowledge of the environment and environmental problems, including methods and techniques for environmental research. The Program will also provide the student with a solid scientific basis related to natural and anthropogenic processes which impact the environment and will also prepare them to define and analyze environmental problems, apply advanced methods and techniques in environmental analyses, create new knowledge and make decisions directed towards achieving a sustainable society.

This program includes diverse scientific disciplines combined to understand and manage natural environments and their various interactions with their physical, chemical and biological components. Environmental sciences provide an integrated, quantitative and interdisciplinary focus to the study of natural systems as opposed to studies of environmental issues, which are mainly targeted towards the social sciences and are related to the application of environmental sciences for understanding and improving social, environmental and economic processes in order to accomplish a common good.

1.4 Starting date

The Graduate Program in Environmental Science will begin during the first semester of the 2009-2010 academic year.

2. Justification

2.1 Relationship with the mission and objectives of the University and the Unit

The proposed Program responds to the mission of the University of Puerto Rico and the mission of the Río Piedras campus. The former establishes that the University must:

> *"transmit and increase knowledge in the sciences and arts, placing this knowledge at the service of the community through the action of its professors, researchers, other university personnel, and graduates."*

The latter stipulates that the Campus's mission is to develop programs that contribute:

> *"to the transformation and continuous progress of the Puerto Rican society, to the analysis and formulation of solutions to the country's socioeconomic and political problems and to improve the quality of life."*

Part of the mission of the Río Piedras campus is to serve the people of Puerto Rico by creating the necessary programs to solve the problems faced by the country. At this historical moment, where environmental problems increasingly affect the quality of life of Puerto Ricans, the Campus is called upon to prepare and qualify professionals to assume a leading role in developing scientific research directed towards the improved use and management of natural resources, as well as to find solutions that can harmonize economic development with environmental protection and improvement.

The scientific research carried out by our graduates, as well as their resulting data bases, can greatly benefit local and federal governmental agencies (such as the local board for environmental quality ["Junta de Calidad Ambiental"], the Department of Natural and Environmental Resources, the Solid Waste Administration, the Puerto Rico Agency for Emergency Management, the Planning Board, the Department of Agriculture, the United States Geological Survey, the Environmental Protection Agency and the US International Institute for Tropical Forestry, among others), and other governmental and private agencies, and communities within and outside of Puerto Rico. Through these entities, our graduates can measure, analyze, reach conclusions and propose adequate solutions to specific environmental problems that affect Puerto Rico and other countries on islands and in tropical regions. Their studies will prepare them to collaborate in establishing and implanting policies and regulations directed towards management and protection of the environment, serve as consultants in situations requiring environmental considerations and assume responsible positions in decision-making related to the optimal future use of natural resources.

In total harmony with both missions, the one from the University of Puerto Rico and the one for the Río Piedras campus, the proposed Graduate Program in Environmental Science will not only increase scientific knowledge related to the environment and on the impact of human activities, but will also prepare graduates to carry out research and critical analyses that allow formulation of solutions to the country's problems and improve the Puerto Rican's quality of life.

2.1.1 **Academic reasons for Program establishment**

There are many scientific and academic contributions that this Program can provide to the field of environmental sciences as a result of the research carried out by its professors and their graduate students. These contributions will mostly be directed to providing a comprehensive vision of the behavior of environmental systems on islands and in tropical regions, advancing knowledge related to these systems, and designing and improving mathematical models and experimental methods in order to facilitate the study and analysis of different environmental systems and matrixes. The proposed Program will depend on active researchers in the following indicated areas, and will be a vehicle for stimulating and increasing research efforts directed towards:

- Obtaining and analyzing data related to diverse systems, species, nutrients, and other environmental parameters in water, soil and air matrixes, and interpret the distribution and variability in these entities based on natural variations in environmental conditions or on anthropogenic changes.

- Design mathematical models and experimental procedures that recreate or simulate the behavior of environmental and anthropogenic processes and which aid in predicting the response of environmental systems in different scenarios.

- Study the recovery of plant communities and ecosystems after various natural events such as hurricanes and landslides, among others.

- Study the effects of land use on environmental quality and on different populations of endemic species in diverse tropical ecosystems and regions.

- Design new techniques for sampling, detection, analysis, and interpretation of different environmental parameters, and analyze contaminant levels and their dispersion patterns in different matrixes in natural environments and in urban microclimates in environmentally critical areas affected by pollution.

- Study the distribution, structure, and spatial dynamics of different systems, species, or environmental parameters and the factors necessary for their occurrence based on multidimensional analyses taking into account climatic, geological, hydrologic, and geomorphologic factors, among others.

- Specify the mechanisms through which the stability thresholds are exceeded for diverse processes of interaction between human activities and the natural environment such as those produced by erosion and sedimentation in watersheds and coastal zones, flooding and coastal waves, the elimination or displacement of endemic by exotic species, the displacement and progressive elimination of species related to the reduction in vegetative areas and habitat

elimination, destabilization of slopes due to cutting or excessive water infiltration, among others.

With the proposed graduate program, research in additional areas of environmental science will be directed towards studying:

- Impact of human activities on hydrologic balance as well as diffusion and transport of contaminants in superficial bodies of water and the development of strategies for remediation in contaminated sites.

- The magnitude and frequency of tropical meteorological events including drought, rain, tropical waves, depressions, hurricanes, convective and orographic rain, and the effects of global climate change on tropical meteorological systems, coastal microclimatology and the effect of heat islands, heat transfer mechanisms, and mathematical models for pollutant dispersion and severe meteorological events.

- Rehabilitation of contaminated sites; land stabilization, geologic risks induced by diverse environmental phenomena, hydrogeological erosion and sedimentation and karst topography; as well as the impact of human activities on hydrological balances, and diffusion of pollutants in subterranean waters and transfer processes.

- Design and application of spatial analysis and environmental mathematical modeling methods using the most advanced GIS, RS, and GPS technologies, and programs such as S-Plus and C++, the development of standards for data collection (metadata), and the integration and interpretation of spatial data from different sources and matrixes that constitute the terrestrial system.

- Changes in morphological patterns and environmental conditions in coastal zones (including estuary, intertidal, bays, mangroves, and other zones) caused by natural processes and by the impact of human activities on these regions, particularly the consequences of global climatic change on coastal areas.

- Puerto Rico's central position with respect to the Antillean arc and the American continent tropical region, in addition to agreements already established with islands and tropical regions in the Caribbean, South America, Spain and Portugal, increase the potential impact of this Program in the Atlantic region, and in academic and research exchange with other higher education institutions in this region.

- Another consideration is that our graduates from the Bachelors Degree Program in Environmental Science are presently forced to leave the island to continue graduate studies in their field of interest, pursue studies in areas related to the environmental sciences but focused towards other needs or are deterred from the idea of pursuing graduate studies in their area of specialization. The Environmental Sciences Graduate Program will provide these graduates with the opportunity to pursue advanced studies in a field of utmost importance and urgency, in order to help solve the environmental problems faced by the country without having to leave it. Analysis of the last study carried out of this alumni population demonstrates their interest in the proposed Program (See Appendix A).

Puerto Rico is an ideal site for studying the impact of human activities on island environments and tropical regions. Despite its limited size, the Island possesses a great variety of geological, hydrologic, coastal, climatic, ecological, and human environments which are representative of a great part of the prevailing environments on islands and in tropical regions in the world. This facilitates the systematic examination of the impact of human activities on diverse tropical ecosystems.

Puerto Rico also possesses a great diversity of anthropogenic environments (urban centers, suburbs, slums, agricultural activities, industrial centers, road networks, canalization, and other infrastructure projects) representative of the great diversity of conditions existing in other islands and tropical regions. Due to its high population density and inadequate practices for natural resource use and management, Puerto Rico is also an ideal site to study the impact of modernization and the introduction of development technologies imported from other latitudes on islands and tropical regions. With this background, the proposed Program will provide a mechanism that will allow development of a scientific knowledge base which will permit identifying alternatives to current problems and anticipation of future ones, not only in Puerto Rico but also for other islands and tropical regions.

2.1.2 **Need for the new Program**

There are various reasons why the creation of this Program is necessary. Among others, the main one is the accelerated degradation of the environment in Puerto Rico and other islands and tropical regions. The rapid economic growth experienced in the Island during the past fifty years, in addition to the concomitant urban and industrial sprawl which this growth has produced, has made Puerto Ricans confront problems of an unprecedented magnitude for the first time in their history. Global changes and their consequences on environmental and human systems have already shown repercussions in numerous regions of the planet, particularly on islands and coastal zones. Global warming is causing effects such as an increase in sea levels, coastal

erosion, coral bleaching, an increase in magnitude and frequency of hurricanes and droughts, and greater climatic variability. This represents a menace to coastal infrastructure, beaches and reefs and, therefore, tourism and sustained economic development.

In terms of water resources, we are confronting serious problems related to its availability and quality in rivers, creeks, lakes, aquifers, coasts, and bays. As for terrestrial resources, we are confronting erosion and sedimentation problems in watersheds, irreversible loss of habitats and biodiversity and the indiscriminate alteration of the island's topography. In relation to the atmosphere, we face problems related to pollution due to emissions from point sources and sources dispersed throughout the island. Each day that passes, islands and tropical regions are more vulnerable to the effects of diverse natural hazards such as floods, landslides, coastal waves, and various types of geologic and hydrological dangers.

Many of these problems occur because the decisions related to projects that develop the public and private sectors do not adequately take into account considerations of the natural environment. Cost-benefit analyses do not take into account factors external to the economy, nor is there an all-encompassing scientific base to serve as a framework for adequate decision- making which would minimize the adverse impact of human activities on the environment.

The current environmental sciences bachelor's degree program is committed to community services capable of transforming their environmental conditions. For example, an integral plan for solid waste management in Río Piedras in collaboration with the CAUCE community organization, and with partial funding from the Toyota Foundation, was developed. This project continues to carry out studies to improve the conditions of the *Quebrada Juan Domínguez* in Río Piedras. The Program is also working with the rural aqueduct systems in Puerto Rico in order to improve health in the communities in which those systems operate. The proposed graduate program will allow even more community involvement. The Environmental Sciences Program has received a donation of approximately $3 million from the National Science Foundation (NSF) for a project titled "Natural-Human Systems in the Urbanizing Tropics" which studies the interaction between human and natural systems in the tropics. This project promises to have extensive social and public policy applications.

Agencies in Puerto Rico's Commonwealth have traditionally employed consulting firms in order to carry out environmental research. An example of this is the research required for completing an Environmental Impact Statement. We have approached the island's Water Authority in order to establish an operation research center for potable and wastewater treatment. Our intention is to eventually be the preferred environmental consultants for the Commonwealth's agencies.

Another of the proposed program's collaborations would be with the Long Term Ecological Research (LTER) program from the College of Natural Sciences' Institute for Tropical Ecosystem Studies (ITES), which has been operating in the Luquillo Experimental Forest since 1988. This would be a collaborative agreement involving over 1,100 students and researchers studying large-scale time and space ecological processes.

The program would also engage in establishing collaborations with projects similar to the LTER such as the WATERS Network, the National Ecological Observatory Network (NEON) and the Stream Observatory Network (STREON). There are many of the College's current professors participating in these programs and, in addition, we were one of the first five sites to be approved for NEON by the NSF.

For these reasons, it is essential that the country, as well as other islands and tropical regions, can depend on scientists specializing in the study and management of environments characteristic of this region. In this manner, they will be able to apply their knowledge to the service of society and contribute in making decisions that promote sustainable development. The complexity and spatial and temporal variability of tropical systems also require scientists capable of analyzing environmental changes using the most advanced knowledge in spatial analyses available by means of deterministic and probabilistic mathematical models, remote sensing, and geographical information systems. It is important to point out that technological development in these areas has significantly increased scientists' capacity to define and analyze environmental problems and provide alternatives for their solution at local, region, and global scales.

2.1.3 Employment opportunities for Program graduates

a. Master of Science (M.S.) with a specialty in Environmental Sciences

Master's graduates will have employment opportunities as environmental managers in the manufacturing industry, in the permissions departments of consulting firms and in various local and federal governmental agencies.

Persons which are responsible for assuring a company's compliance with the applicable environmental laws and regulations need technical support. In many cases, these regulations require research pertaining to a professional with a master's degree. For example, an industry with wastewater discharge to the sea may be required to establish a mangrove area in order to mitigate other activities of environmental impact. Due to particular oceanographic conditions, this mangrove must be established using untested new and innovative techniques and whose efficiency must be investigated.

Practically all industries interested in establishing in Puerto Rico or carrying out construction activities must obtain the environmental permits which can be as simple as an emission permit for an emergency generator or as complex as an Environmental Impact Statement (EIS). These permits are the responsibility of the engineering consulting firms in charge of the project. Simple permits can be prepared by a person with a bachelor's degree but an EIS for a large project requires research of the flora and fauna, environmental analysis and modeling, and environmental and natural resource use and management. Many consulting firms are currently carrying out these tasks employing professionals with a master's degree in environmental health where a professional with a master's degree in environmental sciences would be more appropriate.

There are many federal agencies in Puerto Rico with jurisdiction on environmental issues; these include the United States Geological Survey, Engineer Corps, Fish and Wildlife Service and the Environmental Protection Agency (EPA), among others. At the EPA, the initial professional placement is at the GS-9 level. One of the requirements for qualification to this position is having a Master's degree. A recent hiring advertisement for a physical scientist required:

> "GS-9: Two years of progressively higher level graduate education leading to a master's degree or equivalent graduate degree in a related discipline or 52 weeks of specialized experience equivalent to the next lower level (ND-II/GS-7)."

The main local agencies providing employment opportunities are the Natural Resources Department, the Waste Management Authority, the Water Authority and the Environmental Quality Board. At the Board, the three technical (non-managerial) environmental positions are the I and II Permissions Officers, I and II Environmental Specialists and the I and II Environmental Quality Inspectors.

Description for the Permissions Officer I position is: "Professional and specialized position consisting in analyzing and evaluating permit applications and carry out research to determine compliance with the environmental laws and regulations". The academic requirements for this position are a Master's degree in Environmental Sciences or Environmental Manager specializing in Environmental Evaluation and Risk Management or Environmental Planning, a Master's in Management Engineering specialized as an Environmental Manager or a Master in Science specializing in Environmental Health from an accredited university.

Description for the Environmental Quality Inspector I position is: "Professional and specialized position in the environmental sciences field consisting in the analysis, study and scientific research related to conservation, protection and quality control of natural

resources and ecosystems." The academic requirements for this position are a Master's degree in Environmental Sciences or as an Environmental Manager specializing in Environmental Evaluation and Risk Management or a Master in Science specializing in Chemistry, Physics or Biology from an accredited university.

The Environmental Quality Inspector I position only requires a bachelor's degree.

b. Doctor in Philosophy (Ph.D.) in Sciences

Presently, more than half of the science doctoral degrees awarded on the island are graduates from the College of Natural Sciences. Since we have 28 environmental-related academic programs in Puerto Rico, both at the undergraduate and the graduate level, there would be enough demand for the doctoral program during the next five years. In addition, government agencies, such as the Natural Resources Department, which have active research programs (the Estuarine Research National Reserve in Jobos Bay, for example) would require personnel with doctoral degrees.

According to the Bureau of Labor Statistics at the Department of Federal Employment (http://www.bls.gov/oco/ocos050.htm, obtained on February 2, 2009):

> "A bachelor's degree in an earth science is adequate for a few entry-level positions, but environmental scientists increasingly need a master's degree in environmental science, hydrology or a related natural science. A master's degree is also the minimum educational requirement for most entry-level applied research positions in private industry, in State and Federal agencies and at State geological surveys. A doctoral degree generally is necessary for college teaching and most research positions."

This indicates a need for an advanced degree in order to achieve professional success in the discipline. The following table, obtained from the same reference, shows employment projections for the next 10 years, indicating a growth of approximately 25%. As a researcher, a Ph.D. in environmental sciences can also work in the private sector in environmental consulting firms, which carry out complex tasks, particularly those related to remediation at contaminated sites. The Federal government also needs these professional for their own research laboratories.

Employment projections
Projections data from the National Employment Matrix

Occupational title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16		Detailed statistics
				Number	Percent	

Environmental scientists and hydrologists	--	92,000	114,000	23,000	25	--	--
Environmental scientists and specialists, including health	19-2041	83,000	104,000	21,000	25	PDF	zipped XLS
Hydrologists	19-2043	8,300	10,000	2,000	24	PDF	zipped XLS

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

3. Relationship of the Program with the University's Strategic Plan and the Strategic Action Plan of the Campus

The proposed academic offerings of the Graduate Program in Environmental Science are in total harmony with the guidelines established in the University of Puerto Rico's Systemic Strategic Plan, particularly in those directed towards the following:

- Develop innovative, timely programs tailored to society's needs and the development of knowledge.
- Promote research and collaborative consultation in matters related to quality of life, education, health, public safety, environment, public service, and economic development of Puerto Rico to make us more competitive internationally.
- Stimulate the application of new knowledge generated through research and creative activities for the development of Puerto Rico.
- Promote the participation of students in the search for solutions and alternatives related to their environment.
- Identify specific areas of need in communities and promote the university's contribution to finding possible alternatives for their solution.
- Promote and facilitate inter- and intra- disciplinary research endeavors at the level of the UPR system, and with other universities inside and outside of Puerto Rico.

Similarly, the Program responds to the guidelines of the Río Piedras Campus Strategic Action Plan, particularly in what concerns its ability to:

- Promote and facilitate interdisciplinary research projects on the campus, in the system, and with other universities and research centers.

- Stimulate the participation of members of the university community in the discussion of subjects vital to the Puerto Rican society.

- Promote an interdisciplinary vision in programs, courses, conferences, and other activities sponsored by the university.

- Increase faculty and student exchange agreements with other programs and initiatives in collaboration with universities in the United States and other countries.

The proposed Program effectively responds to each of these guidelines. Not only will it prepare individuals fully conscious of their surrounding environment, but it will also prepare them to be capable of carrying out research on environmental subjects related to islands and tropical regions, as well as significantly contributing to the preservation and management of the environment from an integrative perspective. The proposed Program will also promote development of new knowledge in an interdisciplinary area directed towards the attention of society's needs and the sustainable economic development of Puerto Rico and other tropical regions. It will also prepare its graduates so that, by means of research and critical analyses, they will contribute to improving the quality of life for all Puerto Ricans.

Correlation of the individual degrees included in the proposed program and the University of Puerto Rico's Systemic Strategic Plan is as follows:

a. **Master of Science (M.S.) with a specialty in Environmental Sciences**

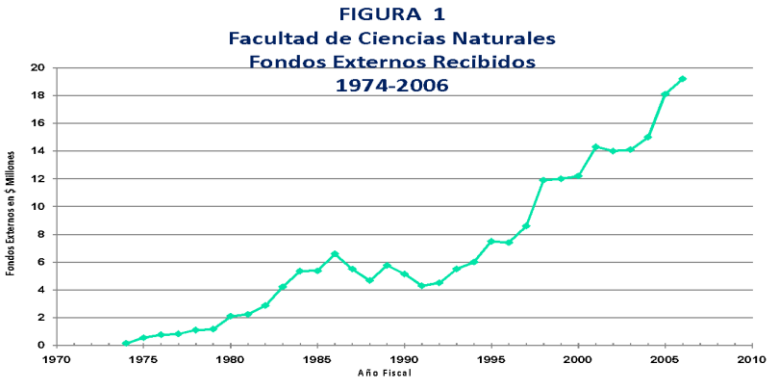
Among the purposes indicated for the institution's strategic plan, the third one is competitive research. The first objective established for this purpose is to "promote competitive research in all disciplines as a function of current international parameters." The current environmental sciences undergraduate program requires completion of a research project by the student and its presentation as a dissertation. Although some of these projects have been presented in professional technical conferences, the time available during undergraduate studies is insufficient for students to work in their projects and develop the competitive research skills required for this objective. Establishing a graduate program will allow to further continue development of students as researchers.

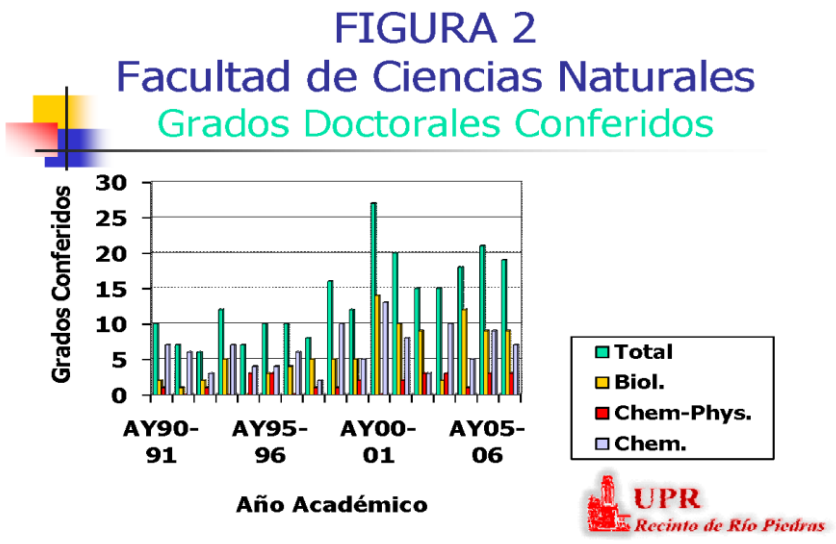
Another objective is to "strengthen publication levels, including peer reviewed journals." Accomplishment of this objective also requires a graduate program.

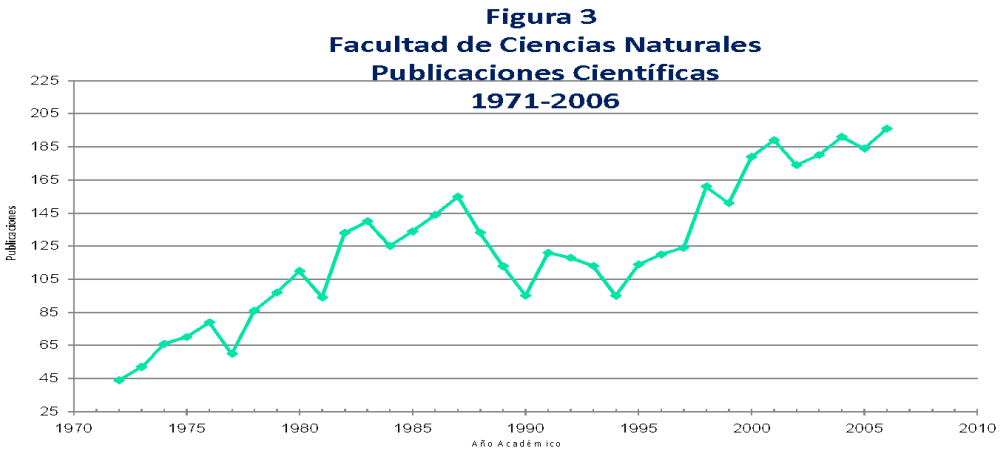
b. **Doctor in Philosophy (Ph.D.) in Sciences**

An additional objective in the strategic plan for competitive research development is to "encourage research in pivotal areas and disciplines susceptible to competitive funding and with the potential to result in social, industrial, technological and public policy applications."

The College of Natural Sciences, located in four distinct buildings, has a vast graduate study and research culture which will nourish the environmental sciences graduate program. The faculty includes 136 full time professors, 94% of which have doctoral degrees in their areas of specialization. In addition, approximately 2/3 of these personnel are actively involved in research. Each year, the College receives approximately $20 million in external funding for research activities. Figure 1 shows the historical tendency for received external funds, Figure 2 shows the conferred doctoral degrees at the College and Figure 3 shows the number of scientific publications. A Web of Science search for the College indicates 626 publications during the past five years.







The Environmental Sciences Program received a donation from the National Science Foundation (NSF) for approximately $3 million for the project titled "Natural-Human Systems in the Urbanizing Tropics" which studies the interaction between human and natural tropical systems. This is a pivotal research area for the NSF and has vast social

and public policy applications. In order to accomplish this project's goals, a doctoral program in environmental sciences is required.

Since research is an essential component of the proposed degrees, and due to the nature of the discipline, it is expected that the projects carried out by the students are oriented towards consideration of, and possible solutions for, the environmental problems faced by Puerto Rican society, as well as other societies on islands and in tropical regions. In this way, our students will be contributing towards the solution to society's urgent problems even before they are part of the work force.

4. Relationship between the new Program and other programs

4.1 In the same unit

The proposed Program is unique among the other departments and schools in the Río Piedras campus of the University of Puerto Rico. The College of Natural Sciences currently offers academic programs leading to the Master's in science in biology, physics, mathematics, computer science, and chemistry, as well as doctoral programs in chemistry, physical chemistry, mathematics, and biology. The latter is in collaboration with the Medical Sciences Campus. However there is no graduate program in environmental science.

In addition, the new proposed courses in Environmental Science are unique, and are not duplicated by any other course in any of these programs or other programs in the Río Piedras campus. These courses, however, could be of great use for students completing graduate studies in other disciplines and whose research is directed towards subjects related to the environment, such as ecology, environmental chemistry, environmental planning, environmental law, environmental education, tropical architecture, among others.

4.1.1 Projection of future collaborations with other programs in the unit

It is important to point out that the structure and courses to be offered by this Program, in particular those directed towards the interdisciplinary option, may serve as a basis for future offerings of joint degrees with graduate programs from other colleges at the campus. To this end, conversations have been already carried out with the Law School with the purpose of offering a joint degree (Juris Doctor- Master in Environmental Science) and approaches have been initiated to the College of Education for the possible creation of a Master's in Environmental Science Education, and with the School of Architecture for the creation of a Master's in Environmental Design for Tropical Islands.

In the future, collaboration could be established with the School of Public Communication to create a Master's in Public Communication with a specialization in Environmental Communication, with the Planning Graduate School to strengthen their Master's program in Environmental Planning, and with the Department of Economics to create a joint Master's in Economy and Environment. Therefore, the creation of this Graduate Program not only benefits students majoring in Environmental Science but also provides the opportunity for students in other programs to expand their knowledge in an area that will allow them to become better prepared professionals and be able to more effectively contribute to resolving the environmental problems of the country.

4.2 In the UPR system

Other graduate programs in the UPR system focusing on environmental issues are the master's and doctoral degrees in Environmental Health at the School of Social Biosciences and Public Health at the Medical Sciences campus. These programs differ from the proposed environmental sciences program. One of the goals of the Public Health Department's master's program mission is to develop health professionals capable of carrying out research related to the country's environmental issues from and inter and multidisciplinary perspective. The focus is clearly targeted to health related environmental issues and not a wider scope view of environmental sciences unifying various scientific disciplines in order to understand and manage the natural environment and the multiple interactions between its physical, chemical and biological components. Environmental sciences provide an integrated, quantitative and interdisciplinary focus to the study of environmental systems. Environmental health is but one of these disciplines.

The doctoral degree in Environmental Health offered at the Medical Sciences campus' School of Social Biosciences and Public Health is another degree in environmentally related issues. The degree offered in this program, a Doctorate in Public Health (Dr.P.H.) specializing in Environmental Health, is a professional degree which is opposite to the research degree proposed for the environmental sciences program. In addition, it is a degree in Public Health where half of the required courses are in public health and half in environmental health. The graduate's dissertations have mostly been in epidemiology with some aspects of environmental health.

4.3 With other institutions in Puerto Rico

Two of the graduate offerings in the area of the environment in Puerto Rico are programs offered by the Ana G. Méndez University System. The Metropolitan University offers a Master's degree in Environmental Administration directed towards the preparation of managers with familiarity with the environment. This degree does not require Bachelors in Science for admission. The University of Turabo offers a Master's degree in Environmental Science in two areas of specialization: Environmental Management and Environmental Analyses. According to the information provided by this institution, the emphasis in Environmental Management is directed towards providing *"knowledge and skills to apply established processes for waste management and disposal and the current regulations that direct these activities"* and the emphasis in Environmental Analysis is directed towards providing *"knowledge and skills for using existing technologies to identify and classify solid, liquid, and airborne wastes, as well as reducing their discharge".*

The San Germán campus of the Interamerican University offers a Master's degree in Environmental Science with specializations in Environmental Biology, Environmental Chemistry, Water Resources, and Unit Operations. Its focus is on disciplinary study (as indicated by course titles such as Environmental Biology, Environmental Chemistry, Environmental Ecology, Environmental Health, Environmental Instrumentation, Environmental Microbiology, etc.), not on integrated study as in this proposal.

The School of Management at the Polytechnic University of Puerto Rico offers a Master's in Management of Environmental Protection which, similarly to the programs at the Metropolitan University of the Ana G. Méndez System, is directed towards preparing professionals in management with knowledge of regulations and environmental problems.

The Pontifical Catholic University in Puerto Rico and the Turabo University offer Ph.D. degrees in Environmental Sciences with a specialty in Environmental Management, Biology and Chemistry. Forty eight percent of the professors at Turabo have a doctor's degree in their specialties. A Web of Science search for this university shows 21 publications in the last five years. The proposed program includes specialties in Island and Tropical Region Sustainable Management, Environmental Modeling and Spatial Analysis and an Interdisciplinary option. A comparison of the course requirements for the programs in these universities shows that they are completely different curriculums as can be seen by comparing the medullar courses at the Turabo University (PHIL 700 Environmental Ethics and Public Policy 3 cr, ECON 700 Environmental Economics 3 cr, ENSC 803 Water Treatment Systems 3 cr, ENSC 805 Solid Waste Management 3 cr, ENSC 806 Air Quality Management 3 cr, ENSC 801 Environmental Risk Assessment and Management 3 cr) with the medullar courses of the proposed Graduate Program

(CIAM 6115 The terrestrial environment 3 cr, CIAM 6116 Tropical Ecosystems 3 cr, CIAM 6117 The coastal environment 3 cr, CIAM 6118 The urban environment 3 cr, CIAM 6235 Remote Perception I 3 cr, CIAM 6256 Environmental System Statistical Analysis Methods 3 cr).

5. Program description

5.1 Philosophy, goals, and specific objectives of the Program

This Program has the mission to create and divulge environmental sciences scientific knowledge in order to promote the sustainable development of Puerto Rico, and other islands and tropical regions, so that current environmental necessities can be satisfied without compromising the capacity of future generations to satisfy their own needs.

The philosophy of the proposed program is:

The education offered by the Environmental Sciences Graduate Program is based on critical thinking, research and creative work in order to channel the practice, production and disclosure of knowledge. There will be an exam on disciplines related to the environmental sciences designed to stimulate and facilitate the participant's integral development. Education will be reciprocal and students will be responsible for their own knowledge acquisition as part of a complete, active and significant process facilitating transformation from a constructivist perspective.

The conceptual and value dimensions allow the students to generate and apply environmental practices for the common good and to search for short, medium and long-term well being without compromising the capacity of future generations to satisfy their own needs. In addition, reflection and respect towards diversity, dignity, solidarity and human liberty are promoted.

The development of knowledge as a process of continuous change and enrichment generated to be shared with others in order to promote progress as a service to humankind through the search for solutions to environmental problems in a social, humanistic and ethical focus is cultivated.

To accomplish this, the Program in Environmental Science proposes to create a graduate level Program through which the following goals will be achieved:

- A greater integration of academic endeavors with the current and future needs of Puerto Rican society in everything related to the environment and sustainable development.

- The search, carried out by students and faculty members, for alternatives that promote harmony among social, environmental, and economic processes for the common good.

- Integration and adequate use of the most advanced technologies in analyzing environmental problems.

- Active and responsible participation of the university community in the decision-making processes that affect the environment and the quality of life for Puerto Ricans.

- The development of a scientific community that does not limit itself to the creation and transmission of knowledge, but that also generates, develops, and supports the environmental transformation of the Island, and provides real solutions that help in solution of the problems that affect society.

- Establishment of an effective collaboration between the academic communities associated with the Program and governmental and federal agencies so that they may benefit from the pool of expertise in the Program in relation to management and interpretation of environmental data bases, and the search for solutions to problems confronted by the country.

The specific objectives of the Program are the following:

- Form scientists with strong critical and analytical abilities, and a solid knowledge in the field of environmental sciences, that are capable of attending to society's needs related to the use, management, and improvement of the environment within the context of islands and tropical regions.

- Develop rigor in our students' search of knowledge, a strong ethical sense, and social responsibility.

- Stimulate our students' application of knowledge acquired from study and research towards the goal of sustainable development in islands and tropical regions.

- Promote our students' participation in the search for solutions and alternatives to problems and issues related to the environment.

- Promote, in Puerto Rico and other islands and tropical regions, research in environmental science, particularly in what concerns problems and issues characteristic of islands and tropical regions.

- Establish effective communication with government and communities in order to direct research efforts towards the search for possible solutions to the problems confronted by islands and tropical regions, emphasizing aspects related to Puerto Rico.

- Facilitate interdisciplinary and collaborative research efforts with other graduate programs in the University of Puerto Rico and with universities and public and private institutions on other islands and tropical regions.

5.2 Graduate profile

Graduates from this Program will have a solid conceptual base pertaining to environmental processes and problems associated to with islands and tropical regions, as well as theoretical and practical command of the most modern methodologies for scientific analyses and research on the environment. The proposed Program will enable students to define and identify complex environmental problems composed of multiple variables, apply and develop research methodologies, use analytical instruments to obtain data, analyze critically the obtained data with an integrated vision of the environment, construct models that recreate the behavior of environmental systems and provide intelligent solutions that will ultimately attend to present and future environmental needs.

Ethics and social responsibility play a main role in environmental management and, therefore are fundamental in all environmental education processes. Throughout the courses and seminars, our program's graduates will achieve sensibility and consciousness towards their surroundings in such a way that their behavior generates new relationships with their particular and the global environment.

Interdisciplinary approaches will be achieved through the different seminars, elective courses and research thesis and dissertations required to all students. In addition, six courses have been developed as part of the interdisciplinary project titled "Natural-Human Systems in the Urbanizing Tropics", these are Human Dimensions of Environmental Change, Design and Expansion of the Urban Environment, Ecosystem services and Economic Ecology and Communication and the Environment. These courses will also promote an interdisciplinary culture in the students.

The attributes of being agents of change in their communities and in society, besides being effective communicators on environment related issues, will be developed in the

graduate seminars CIAM 8901 (Graduate seminar I) and CIAM 8902 (Graduate seminar II) which are required to all environmental sciences graduate students. In addition, the elective courses Public Policy and Environmental Ethics, Socio-ecologic models and Ecological Informatics and Communication and the Environment also contribute to this goal. Accomplishment of the graduate's role as "agents of change in their community and in society" will be achieved through the development of social conscience and ethics as a result of the activities previously described. Their role as "effective communicators on environmental-related issues" will be accomplished through presentations during the seminars, in their regular course work and in research proposal or dissertation defenses.

The courses/activities that will develop these ethical and social aspects are:

Graduate seminars (CIAM 8901 and 8902) which are required to all environmental sciences graduate students.

Alliances for Graduate Education and the Professoriate (AGEP), an NSF program, workshop which is required to all freshmen students at the College of Natural Sciences. These workshops discuss ethical and social responsibility issues. The topics in this seminar are further developed during the students training in the College.

Elective courses (required for IGERT students) titled Public Policy and Environmental Ethics, Socio-ecologic models and Ecological Informatics and Communication and the Environment.

Medullar courses with social components such as The terrestrial environment (CIAM 6115) which focuses on studying impact of human activities, environmental problems resulting from these activities and the strategies to promote their sustainable development. In the Urban Environment course (CIAM 6118), strategies to improve the quality of life in cities and promote their sustainable development are discussed while the Coastal Environment course (CIAM 6117) studies the impact of human interaction on the coastal environment, environmental problems resulting from these activities and the strategies to promote the sustainable development of these regions.

5.2.1 Profile for Master's graduates

Upon completion of the Master's degree, graduates of the Environmental Science Graduate Program will have obtained an advanced knowledge in their area of specialty, ethical values of respect for the environment and towards preservation of the moral principles that should direct a scientist's professional performance, and skills for

research, group collaboration, and communication necessary to be able to carry out the following functions:

- Apply the most modern methods and techniques related to the analyses of environmental parameters, sustainable management of natural resources, modeling environmental systems or spatial environmental analyses, depending on their area of specialty.

- Design and implement environmental evaluation and management plans, especially those concerning issues and problems characteristic of islands and tropical regions.

- Carry out environmental evaluations, critically prepare and analyze documents for environmental evaluation, write environmental impact statements, and effectively communicate the results of these evaluations, by writing or by oral depositions and public hearings.

- Plan and conduct field studies, and analyze studies carried out by others to verify the adequacy of the procedures and compliance with current regulations.

- Work in a team for field studies and research projects in environmental sciences and make a significant contribution to them.

- Contribute to the solution for problems of an environmental nature using knowledge acquired through study and research, and the most recent scientific knowledge published in an area.

- Critically analyze data and information related to the environment, and propose theoretical and practical solutions to the identified environmental problems.

- Be an agent of change in their community and in society in aspects pertaining to preservation of the environment and optimal use of natural resources.

- Be an effective communicator in environmental matters in public and private forums, in scientific and professional congresses, and for audiences of all levels of knowledge, both in written and oral form.

- Occupy technical and managerial positions in local and federal governmental agencies, as well as in private companies where the services of a specialist with solid knowledge in environmental sciences are required.

5.2.2 Profile for Doctoral graduates

Upon completion of the Doctoral degree, graduates of the Environmental Science Graduate Program will have obtained advanced knowledge in their area of specialty, ethical values of respect for the environment and towards preservation of the moral principles that should direct a scientist's professional performance, and skills for research, group collaboration, and communications necessary to carry out the following functions:

- Initiate, direct, and supervise research projects in the environmental sciences, write proposals to obtain funding for these projects, and establish collaborative relationships with other researchers.

- Advance theoretical and technical knowledge in environmental sciences by the development, application, and evaluation of protocols, sampling techniques, and quantitative analyses of environmental parameters; design of comprehensive plans for sustainable management of natural areas and environmental resources; or the development of mathematical models and spatial analysis techniques to solve complex environmental problems, according to their area of specialty.

- Integrate knowledge acquired by profound study and research, or by applying the most recent scientific knowledge published in the area, to analyze environmental problems and situations characteristic of islands and tropical regions, and to provide viable alternatives directed towards their sustainable development.

- Serve as an expert in court cases related to their area of specialty or in other situations that require assessment by a consultant with advanced knowledge in environmental sciences.

- Be an agent of change in their community and society in matters pertaining to environmental preservation and optimal use of natural resources.

- Be an effective communicator in environmental matters during public and private forums, in scientific and professional congresses, and for audiences of all levels of knowledge, both in written and oral form.

- Contribute significantly to their area of specialty in environmental sciences by means of publication of research results in professional journals of recognized excellence, the evaluation and critical analysis of work carried out by others, and by active and effective participation in local and international scientific meetings.

- Contribute to society's sustainable development by offering an integrative vision in the analysis of modern society's problems in light of anticipated social and environmental changes, promoting changes and bringing about the achievement of a better quality of life through optimal sustainable use of available natural and environmental resources, and assuming leadership positions in defense of the environment and natural resources.

- Undertake research and teaching in higher level academic institutions, or occupy leadership positions in research or administration in government or private industries.

5.2.3 Graduate profile differences

The fundamental difference between both graduates is that the master's graduate will carry out more applied functions while the doctoral graduate will work in a more creative setting.

The profile for a master's graduate are similar (particularly in attitude and value development) but not the same as for the doctoral degree. As presented above, it is expected that the master's graduate carries out more applied functions as described by phrases such as "apply modern methods and techniques", "design and implement plans" "carry out environmental evaluations" and "plan and conduct field studies".

The doctorate graduate must carry out functions of a higher level characterized by phrases such as "begin, direct and supervise research projects", "advance theoretical and technical knowledge", "integrate acquired knowledge through profound study and investigation" and "significantly contribute to their area of specialty".

5.3 Program components

5.3.1 Course distribution by area

5.3.1.1 Master's in Environmental Science

Environmental Science Master's students must complete a total of 38 credits. Of this total, 18 credits (47%) correspond to core courses, 6 credits (16%) in emphasis areas, 2 credits (5%) to a graduate seminar, 6 credits (16%) to elective courses, and 6 credits (16%) to graduate research leading towards a Master's thesis.

Distribution by area	Credits	Percent
Core courses	18	47%
Emphasis areas	6	16%
Graduate seminar	2	5%
Elective courses	6	16%
Graduate research	6	16%
	38	100%

Students must also approve Part A of the Environmental Sciences Graduate Program qualifying exam, present and defend their thesis proposal, and present and defend a Master's thesis. In order to follow up on students' academic and research progress, until the student selects a thesis supervisor, the Program Coordinator will serve as mentor and will meet with the students at least twice per semester.

5.3.1.2 Doctor in Environmental Science

Environmental Science Doctoral students must complete a total of 60 credits. Of this total, 18 credits (30%) correspond to core courses, 9 credits (15%) to emphasis areas, 2 credits (3%) to a graduate seminar, 4 credits (7%) in an emphasis seminar, 9 credits (15%) to elective courses, and 18 credits (30%) to graduate research leading towards a Doctoral thesis.

Distribution by area	Credits	Percent
Core courses	18	30%
Emphasis areas	9	15%
Graduate seminar	2	3%
Emphasis seminar	4	7%
Elective courses	9	15%
Graduate research	18	30%
	60	100%

Students must also present a graduate seminar, approve parts A and B of the Environmental Sciences Graduate Program qualifying exams, present and defend their thesis research proposal, present and defend an original research proposal in their emphasis area, and present and defend a Doctoral dissertation. In order to follow up on students' academic and research progress, until the student selects a thesis supervisor, the Program Coordinator will serve as mentor and will meet with the students at least twice per semester.

5.3.1.3 Courses to be offered by area

The courses to be offered, their suggested codes and the number of credits and contact hours are presented:

Core courses

The core courses will be taken both by Master's and Doctoral students specializing in Environmental Sciences.

Code	Title	Credits	Hours
CIAM 6115	The terrestrial environment	3	45
CIAM 6116*	Tropical ecosystems	3	45
CIAM 6117	The coastal environment	3	45
CIAM 6118	The urban environment	3	45
CIAM 6235*	Remote sensing I	3	45
CIAM 6256	Methods for statistical analysis of environmental systems	3	45

* These courses (CIAM 6116: Tropical ecosystems and CIAM 6235: Remote Sensing I) are required for those students interested in completing a degree in Environmental Modeling and Spatial Analysis and in Sustainable Management of Islands and Tropical Regions. Students that wish to pursue an interdisciplinary option can take one or more emphasis courses (or none of them) of the other separate emphasis areas (for example, one course in each area) or other courses of content level 5000 or 6000 offered in any graduate programs of the College of Natural[1] Science, with prior authorization of the Program Director or Environmental Science Program Coordinator. Among these courses are:

BIOL 6115	Communities and ecosystems
BIOL 6125	Microbial ecology
BIOL 6126	Population ecology
BIOL 6145	Bioconservation
BIOL 6190	Advanced ecology
BIOL 6367	Ecological genetics
BIOL 6999	Special topics in modern biology
FISI 6441	Nuclear physics

[1] Many of the core courses offered by other graduate programs of the College of Natural Sciences require, as a prerequisite, undergraduate level courses. If a student is interested in taking a core course which has an undergraduate prerequisite, the prerequisite must be taken without these undergraduate credits counting towards the Master's or Doctoral degree.

MATE 6601	Probability and statistics I
MATE 6602	Probability and statistics II
MATE 6700	Projects in applied mathematics
QUIM 6215	Theory of analytical chemistry
QUIM 6225	Theory of instrumental analysis

Emphasis area courses: Option in Environmental Modeling and Spatial Analysis
Master's students with the option in Environmental Modeling and Spatial Analysis must take at least two of the following three emphasis courses, while Doctoral students in this emphasis must take all three emphasis courses.

Code	Title	Credits	Hours
CIAM 8225	Methods in spatial analysis	3	45
CIAM 8236	Remote sensing II	3	45
CIAM 8257	Techniques for construction of environmental models	3	45

Emphasis area courses: Option in Sustainable Management of Islands and Tropical Regions
Master's students with the option in Sustainable Management of Islands and Tropical Regions must take at least two of the following three emphasis courses, while Doctoral students in this specialization must take all three emphasis courses.

Code	Title	Credits	Hours
CIAM 8425	Environmental geology	3	45
CIAM 8435	Environmental hydrology	3	45
CIAM 8445	Environmental meteorology	3	45

Emphasis area courses: Interdisciplinary option
Master's students in the interdisciplinary option, with prior authorization from the thesis committee, may take any two courses in the Environmental Modeling and Spatial Analysis emphasis or Sustainable Management of Islands and Tropical Regions emphasis or substitute these for an equal amount of credits in level 8000 courses offered by other graduate programs in the College of Natural Sciences of the campus. Doctoral students in the interdisciplinary option, with prior authorization from the thesis committee, may take any three courses in the Environmental Modeling and Spatial Analysis or Sustainable Management of Islands and Tropical Regions emphasis or substitute these for an equal amount of credits in level 8000 courses offered by other graduate programs in the College of Natural Sciences on campus. Among these courses are:

MATE 8990	Topics in applied mathematics I

MATE 8995	Topics in applied mathematics II
QUIM 8211	Advanced analytical chemistry I
QUIM 8212	Advanced analytical chemistry II
QUIM 8992	Special topics in analytical chemistry
QUIM 8996	Special topics in physical chemistry

Seminars

Code	Title	Credits	Hours
CIAM 8901	Graduate seminar I	1	30
CIAM 8902	Graduate seminar II	1	30
CIAM 8205	Seminar in environmental modeling and spatial analysis I	2	45
CIAM 8206	Seminar in environmental modeling and spatial analysis II	2	45
CIAM 8405	Seminar in sustainable management of tropical islands I	2	45
CIAM 8406	Seminar in sustainable management of tropical islands I	2	45

All Master's or Doctoral students will take the Graduate Seminar courses I and II during their first year. Doctoral students with an option in Sustainable Management of Islands and Tropical Regions and in Environmental Modeling and Spatial Analysis will take the topical seminars corresponding to their emphasis option. Doctoral students in the interdisciplinary option, with prior authorization from the thesis committee, can take any of these two seminar courses or substitute them for an equal amount of credits in advanced seminars offered by other graduate programs in the College of Natural Sciences of the campus. Among these are found:

BIOL 8368	Seminar in population biology
QUIM 8205	Seminar in analytical chemistry I
QUIM 8206	Seminar in analytical chemistry II

Graduate research

It is expected that all of the program's students participate as research assistants during their first year which would expose them to the research activities carried out at the different laboratories, as well as their exposition to various current research experiences presented throughout the graduate seminars. In addition, students will be encouraged to be interviewed by at least three other professors related to the student's emphasis in

order to get to know their interests. Research, as a general topic, will be included in the seminars (for example, seminars on how to write a proposal). It must be pointed out that students from the undergraduate environmental sciences program at the Río Piedras campus are required to complete a research project upon graduation and many of the students from the College of Natural Sciences have obtained some research experience.

The CIAM 6999 and CIAM 8999 courses have variable credits, this allows for greater flexibility to the student in terms of the required time dedicated to research and payment of those credits. Usually a master's student registered in CIAM 6999 for three credits in each of two semesters during the second year of study and completes the research work required can graduate in two years. The thesis continuation course encoded with 0 credits allows students that have completed the six credits in CIAM 6999 to be considered a full time student at the university and be able to complete the required research. The same goes for doctoral students.

Code	Title	Credits	Hours
CIAM 6896	Master's thesis continuation	0	-
CIAM 6999	Master's graduate research[2]	1-3	45-135

Code	Title	Credits	Hours
CIAM 8896	Doctoral thesis continuation	0	-
CIAM 8999	Doctoral graduate research[3]	3-6	135-270

Elective courses

Code	Title	Credits	Hours
CIAM 8345	Landscape ecology of islands and tropical	3	45

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[2] This is a variable credit course (1, 2 or 3 credits). The student may take any combination of credits during their stay in the Master's program, with prior authorization of the thesis supervisor, as long as a total of 6 credits in CIAM 6999 are completed before graduation. This arrangement is similar to that of the Graduate Program in Chemistry and allows greater flexibility in terms of the time dedicated to research and the payment of these credits.

[3] This is a variable credit course (3, 4 or 5 credits). The student may take any combination of credits during their stay in the Doctoral program, with prior authorization of the thesis supervisor, as long as a total of 18 credits in CIAM 8999 are completed before graduation. This arrangement is similar to that of the Graduate Program in Chemistry and allows greater flexibility in terms of the time dedicated to research and the payment of these credits.

	regions		
CIAM 8545	Environmental noise	3	45
CIAM 8765	Environmental impact evaluation	3	45
CIAM 8775	Residue management and disposal	3	45
CIAM 8785	Energy generation	3	45
CIAM 8845	Natural dangers in islands and tropical regions	3	45
CIAM 8990	Special topics in environmental sciences	1-3	15-45

Students in the Master's and Doctoral Environmental Sciences Program, with prior authorization of the thesis committee, may also take courses offered by other graduate programs on campus as elective courses. Among these possible courses are:

DERE 7676	Seminar: Topics in environmental law
ECON 6095	Economics of natural resources
ECON 6695	Economic aspects of regional urban development
PLAN 6597	Urban development and environmental change
PLAN 6598	Communities and environmental problems
PLAN 6618	Environmental design
PLAN 6621	Administration of environmental controls

5.3.2 Courses

5.3.2.1 Description of all Program courses

CIAM 6115. The terrestrial environment. *Three credits. Three hours of class per week. Requisites: None for students admitted to the Graduate Program.* Study of the geological, geomorphologic, hydrologic, and climatic processes in mountainous, alluvial, and karstic regions characteristic of islands and tropical regions. The focus is on the study of the impacts of human activity, environmental problems resulting from that activity, and strategies to promote a sustainable development of the studied regions. Topics are discussed and analyzed in the context of the general theory of systems using the watershed as the study unit.

CIAM 6116. Tropical ecosystems. *Three credits. Three hours of class per week. Requisites: None for students admitted to the Graduate Program.* Study of the

characteristic ecosystems of island and tropical regions and their spatial distribution. The interactions among different biotic and abiotic components within these ecosystems, as well as the impact of natural processes and human activities on them are examined in a systematic manner.

CIAM 6117. The coastal environment. *Three credits. Three hours of class per week. Requisites: None for students admitted to the Graduate Program.*
Study of the ecology and processes (geological, geomorphic, hydrologic and climatic) of the coastal region, including the intertidal zone, surge zone, littoral zone, estuaries, reefs and others. The focus is on the study of the impact of human interactions on this environment, environmental problems associated with these interactions, and strategies to promote sustainable development in these regions.

CIAM 6118. The urban environment. *Three credits. Three hours of class per week. Requisites: None for students admitted to the Graduate Program.* Study of cities from a systems perspective. Urban structure and function, city climate, urban ecology, the impact of transportation systems, energy generation, water distribution, disposal of used water and solid waste, and the impact human activities on environmental quality are examined. Issues in urban planning, green areas, natural risks, urban noise, distribution of poverty pockets, and aspects of environmental justice are considered. Strategies are discussed to improve the quality of life within cities and promote sustainable development. Characteristic contaminants of urban areas and their transport and diffusion mechanisms are examined.

CIAM 6235. Remote sensing I. *Three credits. Three hours of class per week. Requisites: None for students admitted to the Graduate Program.* Theoretical and practical study of methods of analysis of land cover and land use based on satellite images. The physical laws essential for studying teledetection, image capturing systems, image correction and classification, and interpretation of results are examined. A project is developed in which the student carries out an analysis to classify land cover and use using satellite images of islands and tropical regions. (Students that have taken the undergraduate Remote Sensing course cannot take this course; they must take CIAM 8236 in its place).

CIAM 6256. Methods for statistical analysis of environmental systems. *Three credits. Three hours of class per week. Requisites: None for students admitted to the Graduate Program.* Study of statistical methods for analyzing environmental data that include multiple variables. Models of multiple linear regression, principal component analysis, cluster analysis, multidimensional surface analysis, canonical analysis, discriminator analysis, and others are studied. Variables are analyzed to quantitatively understand the behavior of environmental processes. Different statistical software

programs are discussed and applied, and research projects using these techniques are discussed.

CIAM 6896. Continuation of the Master's thesis. *Zero credits. Requisite: Authorization of the Director.* In order to register in this course, the student should have completed all academic requirements and investigation credits necessary to obtain the Master's degree in Environmental Science, and have only remaining the completion, presentation, and defense of the thesis. A student enrolled in this course will be considered a full time student of the Environmental Science Master's Program and of the University of Puerto Rico, Río Piedras Campus.

CIAM 6999. Graduate research*. One to three credits. Three to nine research hours a week Requisites: Authorization of the Director.* Master's thesis research. This is a variable credit course (1, 2 or 3 credits). The student may take any combination of credits during their time in the Master's Program, with prior authorization of the thesis supervisor, as long as they complete a total of 6 credits in CIAM 6999 before they graduate. This arrangement is similar to that of the Graduate Program in Chemistry and allows greater flexibility in terms of the time dedicated to research and the payment of these credits.

CIAM 8205. Seminar in modeling and environmental spatial analysis I. *Two credits. Two hours of class per week. Requisites: Authorization of the Director.* Advanced seminar directed to analysis and discussion of literature and recent advances in the environmental spatial analysis with emphasis on islands and tropical regions.

CIAM 8206. Seminar in modeling and environmental spatial analysis II. *Two credits. Two hours of class per week. Requisites: Authorization of the Director.* Advanced seminar directed to analysis and discussion of literature and recent advances in environmental spatial analysis with emphasis on islands and tropical regions.

CIAM 8225. Methods in spatial analysis. *Three credits. Three hours of class per week. Requisites: CIAM 6235.* Operational study of advanced spatial analysis methodologies: geographic information systems (GIS), and global positioning systems, and the theoretical basis for these techniques. The emphasis is on the use and application of different programs (Idrisi, ArcView, ArcInfo and Spatial Analyst) for entry, processing, representation, and analysis of environmental data; and the use of global positioning systems to perform field measurements. Island and tropical regions environmental problems are analyzed spatially. The course concludes with a research project that could be presented at a regional scientific congress.

CIAM 8236. Remote sensing II. *Three credits. Three hours of class per week. Requisites: CIAM 6235.* Practical study of advanced methods for satellite image

analysis and the theory behind these techniques. Emphasis on the use and application of programs such as *Imagine*, *ENVI*, *and Idrisi* for the study and analysis of environmental processes and problems in islands and tropical regions. At the end of the course the student will have completed a research project that could be presented at a regional scientific congress.

CIAM 8257. Techniques in environmental model construction. *Three credits. Three hours of class per week. Requisites: CIAM 6256.* Fundamentals of mathematical modeling. The application of discrete and continuous variable models and Monte-Carlo methods are studied. Modeling of environmental processes including biogeochemical cycles, contaminant transport and destination, problems in ecotoxicology, natural and agricultural systems, atmospheric pollution, and climatic change are studied.

CIAM 8345. Ecology of island and tropical region landscapes. *Three credits. Three hours of class per week. Requisites: CIAM 6116 and CIAM 6235.* Study of the factors that determine the morphology, connectivity, interaction, structure, and function of the diverse elements that characterize the landscape ecology of islands and tropical regions. The emphasis is on patterns and variation of the mosaic of ecosystems and land uses characteristic of these regions, the sequence of events that give rise to changes in the patterns in this mosaic, and the connectivity and interactions among different regions and systems that make up the landscape. These are also emphasized in the analysis of satellite images and aerial photographs, the impact of human activities on landscape ecology, as well as strategies for management, conservation, and restoration.

CIAM 8405. Seminar in island and tropical region management I. *Two credits. Two hours of class per week. Requisites: Authorization of the Director.* Advanced seminar directed towards analysis and discussion of literature and recent developments in island and tropical region management.

CIAM 8406. Seminar in island and tropical region management II. *Two credits. Two hours of class per week. Requisites: Authorization of the Director.* Advanced seminar directed towards analysis and discussion of literature and recent developments in island and tropical region management.

CIAM 8425. Environmental geology. *Three credits. Three hours of class per week. Requisites: CIAM 6115, 6117, and 6118.* Study of the interaction between human activities and geologic processes. Problems related to slope stability, processes of erosion, transport, and sedimentation, and measurement of the physicochemical properties of geological materials are analyzed. Hydrogeology and transport and diffusion of pollutants through soil and aquifers, sampling techniques, strategies for rehabilitation of contaminated sites, geological dangers induced by natural phenomena,

geological problems arising from infrastructural development in mountainous, karsts, valley, and coastal regions.

CIAM 8435. Environmental hydrology. *Three credits. Three hours of class per week. Requisites: CIAM 6115, 6117, and 6118.* Study of hydrological processes and water pollution. Chemical equilibriums, transport mechanisms, and destination of pollutants characteristic of the water matrix are examined. Measurement of water budgets, determination of physical and chemical parameters for natural waters, techniques for sampling and analysis of pollutants, processes of diffusion and transport of pollutants in surface and groundwater, impact of diverse human activities on hydrologic balances and water quality are discussed, as well as strategies for prevention, remediation, and mitigation of surface and groundwater pollution.

CIAM 8445. Environmental meteorology. *Three credits. Three hours of class per week. Requisites: CIAM 6115, 6117, and 6118.* Study of atmospheric processes that determine the weather and climate characteristic of tropical regions. Atmospheric circulation patterns and mechanisms for energy transfer and distribution are discussed. Atmospheric processes causing rain, drought, tropical storms, depressions and hurricanes, effects of global climate change and their possible consequences for tropical meteorological systems; microclimatology; effects of heat islands; contaminant diffusion, transport and analysis; mathematical models for contaminant dispersion; and their relation to meteorological events and the impact of human activities on climatological processes are addressed. Chemical equilibriums and the transport mechanisms and destination of pollutants characteristics of the air matrix are examined.

CIAM 8545. Environmental noise. *Three credits. Three hours of class per week. Requisites: CIAM 8445.* Study of environmental noise and its impact on environmental quality and health. The focus is on natural and anthropogenic events that cause environmental noise, methods for measurement and analysis, the impact of noise on humans and other organisms, and strategies for noise management and control in different environments.

CIAM 8765. Environmental impact evaluation. *Three credits. Three hours of class per week. Requisites: CIAM 6115, 6117, and 6118.* Design, preparation, and analysis of environmental impact evaluations for real and potential scenarios. The steps and actions are discussed which ought to be taken in preparing an environmental impact statement that complies with existing regulations. Actual environmental impact statements from different private companies and government agencies are analyzed and discussed critically for particular cases of interest.

CIAM 8775. Residual management and disposition. *Three credits. Three hours of class per week. Requisites: CIAM 6115, 6117, and 6118.* Analysis of all types of waste

disposal problems for islands and tropical regions, with emphasis on Puerto Rico, and study of the different alternatives and technologies and technologies available. Strategies for reduction, reuse, recycling, and disposal in local and regional landfills, gasification plants, incineration, and other topics are examined. Environmental impacts are discussed for different alternatives to the waste management problem for island and tropical regions, with focus on solutions compatible with sustainable development.

CIAM 8785. Energy generation. *Three credits. Three hours of class per week. Requisites: CIAM 6115, 6117, and 6118.* Study of fundamental energy concepts, the laws of thermodynamics, and their practical applications. Analysis of demand for and sources of energy for islands and tropical regions, and of alternatives for energy generation within the context of sustainable development. The environmental impacts of different alternatives for energy generation are discussed focusing experience in Puerto Rico and other islands.

CIAM 8845. Natural dangers in islands and tropical regions. *Three credits. Three hours of class per week. Requisites: CIAM 6115, 6117, and 6118.* Study of natural geological, hydrological, and atmospheric hazards on islands and in tropical regions, including floods, landslides, volcanism, earthquakes, tidal waves, tsunamis, hurricanes, expansive soils, and others. The focus is on geological, hydrological, and atmospheric processes that promote each of these hazards; their environmental, social, and economic impacts; strategies to minimize the magnitude of damages and losses they cause; and the impact of global climatic change on the magnitude and frequency of certain events.

CIAM 8896. Continuation of the Doctoral dissertation. *Zero credits. Requisite: Authorization of the Director.* In order to register in this course, the student should have completed all academic requirements and investigation credits necessary to obtain the Doctoral degree in Environmental Science, and have only remaining the completion, presentation, and defense of the dissertation. A student enrolled in this course will be considered a full time student of the Environmental Science Ph D. Program and of the University of Puerto Rico, Río Piedras Campus.

CIAM 8901. Graduate seminar in environmental sciences I. *One credit. One hour of class per week. Requisites: None for students admitted to the Graduate Program.* Conference and discussion on special topics in environmental sciences, usually by invited speakers or based on recent literature in the area.

CIAM 8902. Graduate seminar in environmental sciences II. *One credit. One hour of class per week. Requisites: None for students admitted to the Graduate Program.* Conference and discussion on special topics in environmental sciences, usually by invited speakers or based on recent literature in the area.

CIAM 8990. Special topics in environmental sciences. *One to three credits. One to three hours of class per week. Requisites: Authorization of the Director*. Detailed study on one or more specific themes in environmental sciences, usually under the direction of visiting professors or specialists in one of the areas of environmental science.

CIAM 8999. Graduate research. *Three to six credits. Nine to eighteen research hours per week Requisites: Authorization of the Director.* Doctoral thesis research. This is a variable credit course (3, 4, 5 or 6 credits). The student may take any combination of credits during their time in the Doctoral Program, with prior authorization of the thesis supervisor, as long as they complete a total of 18 credits in CIAM 8999 before they graduate. This arrangement is similar to that of the Graduate Program in Chemistry and allows greater flexibility in terms of the time dedicated to research and the payment of these credits.

BIOL 6115 Communities and Ecosystems. *Three credits. Three hours of class per week. Requisites: None* An introduction to and broad study of the highest levels of ecological organization. Lectures will cover the structure and organizations of communities and ecosystem properties.

BIOL 6125 Microbial Ecology. *Three credits. Three hours of class per week. Requisites: None* The study of the factors which govern the interrelationships between micro-organisms and their environment. All groups of organisms identified as microbes will be characterized physiologically, behaviorally and energetically. The critical role of microbes in aquatic, terrestrial and animal environments will be studied with emphasis on population and community dynamics.

BIOL 6126 Population Ecology. *Three credits. Three hours of class per week. Requisites: None* Population dynamics including contrasts between plant and animal populations, effects of intraspecific and interspecific competition, survivorship and life tables, reproduction and pollination ecology, and life history evolution.

BIOL 6145 Bioconservation. *Three credits. Three hours of class per week. Requisites: None* Dynamics of natural ecosystems with emphasis on Puerto Rico's ecosystems and their contributions to the economic and social development of the island. Importance of our natural ecosystems and methods utilized in their conservation will be discussed.

BIOL 6190 Advanced Ecology. *Three credits. Three hours of class per week. Requisites: None* This course will offer the students the chance to explore a few central concepts of ecology in great depth. It will draw directly on the active research programs of staff ecologists and emphasize their areas of expertise. Outside experts will also be

invited to contribute whenever possible. The students will learn to examine the current literature critically and develop their own ideas about the relationship between organisms and the environment.

BIOL 6367 Ecological Genetics. *Three credits. Three hours of class per week. Requisites: None* Study of genetic variation and the agents that change genetic frequencies. Topics will include population subdivision, gene flow and colonization, types of selection, heritability, speciation, environmental heterogeneity and speciation.

BIOL 6999 Special Topics in Modern Biology. *Two to four credits. Two to four hours of class per week. Requisites: None* The course may be repeated up to a maximum of 8 credits. Readings, lectures, and laboratory work, taught by the staff and visiting professors who are specialists in the field.

BIOL 8368 Seminar on Population Biology. *Three credits. Three hours of class per week. Requisites: None* Discussion of topics selected from literature on population-based evolutionary and ecological processes.

FISI 6441 Nuclear Physics. *Three credits. Three hours of class per week. Requisites:* FISI 6452 Nuclear forces: nucleon-nucleon scattering and the deuteron. Phenomenological nuclear potential and elementary Yukawa Theory. Size and shape of nuclei: electron scattering and nuclear form factors, neutron scattering and the optical model. Nuclear masses and binding energy: the liquid drop model and the semi-empirical mass formula. Alfa and beta decay. Fission. Resonance and compound nuclear reactions, the shell and collective models, theory of nuclear matter, and the quark model of nucleons.

MATE 6601 Probability and Statistics I. *Three credits. Three hours of class per week. Requisites:* MATE 5001, 5002 Sample spaces. Random variables. Conditional probability and expectation. Moment generating functions. Markov chains. Poisson processes. Queuing theory. Renewal theory. Reliability. Martingales.

MATE 6602 Probability and Statistics II. *Three credits. Three hours of class per week. Requisites:* MATE 6601 Populations and samples. Chi-square, t and F distributions. Estimation. Confidence sets. Simple and compound hypotheses tests. Decision theory. Linear models. Non-parametric methods. Statistics of time series.

MATE 6700 Projects in Applied Mathematics. *Three credits.* Introduction to research in applied mathematics. Emphasis on the formulation and solution of problems from the real world in terms of mathematical models and the interpretation of those solutions in the context of the original problem.

MATE 8990 Topics in Applied Mathematics. *One to three credits. One to three hours of class per week. Requisites:* Permission of the professor. Topics will be chosen according to the interests and availability of faculty and students.

MATE 8995 Topics in Computational Mathematics. *One to three credits. One to three hours of class per week. Requisites:* Permission of the professor. Topics will be chosen according to the interests and availability of faculty and students.

QUIM 6215 Theory of Analytical Chemistry. *Three credits. Three hours of class per week. Requisites:* QUIM 3255, 4042 or the equivalent. Study of theories of chemical equilibriums, separations and electrochemical methods; statistics in experimental work.

QUIM 6225 Theory of Instrumental Analysis. *Three credits. Three hours of class per week. Requisites:* QUIM 3255, 4041 or the equivalent. Theory of analytical techniques, including ultraviolet, visible, infrared, atomic absorption, and nuclear magnetic resonance spectroscopy, mass spectrometry, gas chromatography, high performance liquid chromatography, potentiometry, polarography, coulometry, conductimetry, refractometry, polarimetry, surface analysis and automated analysis.

QUIM 8205 Seminar: Analytical Chemistry I. *Two credits. Two hours of class per week. Requisites: None* Discussion of recent advances in analytical chemistry.

QUIM 8206 Seminar: Analytical Chemistry II. *Two credits. Two hours of class per week. Requisites: None* Discussion of recent advances in analytical chemistry.

QUIM 8992 Special Topics in Analytical Chemistry. *One to four credits. One to four hours of class per week. Requisites: None* Advanced treatment of specialized topics in analytical chemistry such as signal processing, interfacing, environmental analyses, and electrode processes.

QUIM 8996 Special Topics in Physical Chemistry. *One to four credits. One to four hours of class per week. Requisites: None* Advanced treatment of specialized topics in physical chemistry such as photochemistry, nuclear magnetic resonance, and photo-physical processes.

DERE 7676 Seminar: Topics on Environmental Law. *Two credits. Two hours of class per week. Requisites: None* Study of relevant issues in environmental law: specialized legislation for environmental protection; economic development and environmental protection; methods, processes, and remedies in the protection of natural resources,

ecology, and the environments comparative environmental law; international environmental law; environmental law in general. The specific issue to be addressed will be announced in advance. Students will be required to write an extensive paper.

ECON 6095 Natural Resources Economics. *Three credits. Three hours of class per week. Requisites: None* Analysis of theoretical models applied to economic development problems and the management of natural resources; the importance of natural resources used in different economic sectors and their impact in economic development. Economic principles applied in the efficient use of resources, such as water, land, forest and oceans. The consideration of economic analysis in public policy related to the management and conservation of natural resources.

PLAN 6618 Environmental Design *Three credits. Three hours of class per week. Requisites: None.* The value of good design in human environments, urban, and rural, is constantly being affected by technological innovations and accelerated change. This course seeks to evaluate design from an environmental point of view to minimize the negative social, economic, and spatial effects of development and to stimulate the positive effects.

PLAN 6619 Environmental Studies for Planning (Coastal Systems in Puerto Rico) *Three credits.* The close links between planning and the environment and the implications for planning. The scientific factors that must be taken into account when dealing with the environment. An overview of ecology and methods of conservation. The focus of this course is on the study of coastal environments.

PLAN 6621 Environmental Control Administrations *Three credits. Three hours of class per week. Requisites:* PLAN 6076, 6077 Analysis of the environment from an administrative perspective. Evaluation of how environmental management has been conceived, structured, and practiced. Study of the major legal and administrative strategies developed for the protection of environmental resources.

5.3.2.2 Existent or proposed course outlines

All proposed courses are new. The proposals for each one are included in Appendix E.

5.3.3 Alignment of the program's goals, objectives, graduate profile and courses

Information on alignment of the master's degree goals, objectives, graduate profile and courses are presented in Table 2. Table 3 presents the same information for the doctoral degree. For course alignment, only medullar courses are considered since the remaining courses taken depend on the emphasis and particular interest of each student.

TABLE 2 Alignment of the master's degree goals, objectives, graduate profile and courses

Goals	Objetives	Graduate profile	Courses
1. A greater integration of academic tasks with the actual and future needs of the Puerto Rican society in relation to the environment and its sustainable development.	Train scientists with high critical and analytical sense and a solid knowledge in the environmental sciences field with a capability to attend to society's needs relating to the use, management and improvement of the environment within the island and tropical region context.	Design and implement environmental plans and management in areas related to issues and problems characteristic to islands and tropical regions.	CIAM 6115 The Terrestrial Environment CIAM 6117 The Coastal Environment CIAM 6118 The Urban Environment CIAM 6116 Tropical Ecosystems CIAM 8901 Graduate Seminar I CIAM 8902 Graduate Seminar II
		Be an agent of change in the community and in society in all that is related to environmental preservation and optimal use of natural resources.	

2. Student and faculty member search for alternatives that promote harmony between social, environmental and economic processes in order to accomplish a common good.	Develop students' rigor in the search for knowledge and a high sense of ethics and social responsibility.	Conduct environmental evaluations, prepare and critically analyze environmental evaluation documents, prepare environmental impact statements and effectively communicate the results of these evaluations in written form or during presentations or public hearings.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environmentCIAM 6118 The urban environment CIAM 6116 Tropical Ecosystems CIAM 8901 Graduate Seminar I CIAM8902 Graduate Seminar II
3. Integration and appropriate use of advanced technologies for analysis of environmental problems.	Train scientists with high critical and analytical sense and a solid knowledge in the environmental sciences field with a capability to attend to society's needs relating to the use, management and improvement of the environment within the island and tropical region context.	Apply modern methods and techniques to analysis of environmental parameters, sustainable management of natural resources, environmental system modeling or in environmental spatial analysis according to the area of emphasis.	CIAM 6235 Remote Perception I CIAM 6256 Methods in statistical analysis of environmental systems CIAM 6999 Master's graduate research
		Occupy technical and managerial positions in Local and Federal agencies as well as in private companies which require services from an environmental specialist with solid knowledge in the field.	

4. Active and responsible participation as a member of the university's community in decision making processes related to the environment and Puerto Rican quality of life.	Encourage student participation in the search for solutions and alternatives to environmental-related issues and problems.	Contribute to the solution of environmental problems using knowledge acquired throughout their studies and research and recent scientific knowledge published in the emphasis area.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environmentCIAM 6118 The urban environment CIAM 6116 Tropical Ecosystems CIAM 8901 Graduate Seminar I CIAM8902 Graduate Seminar II
	Facilitate efforts to carry out interdisciplinary research and collaboration with other graduate programs at the University of Puerto Rico, with other universities and with private or public institutions on other islands or tropical regions.	Critically analyze environmental-related data and information and propose theoretical and practical solutions to the identified problems.	
		Effectively communicate environmental issues in public and private forums, scientific and professional congresses as well as for all audiences in both oral and written form.	

5. Develop a scientific community not limited to driving creation and transmission of knowledge but also generates, develops and supports the country's environmental transformation and provide authentic solutions that will help solve the problems affecting society.	Train scientists with high critical and analytical sense and a solid knowledge in the environmental sciences field with a capability to attend to society's needs relating to the use, management and improvement of the environment within the island and tropical region context.	Plan and conduct field studies and analyze studies carried out by others in order to verify procedural adequacy and compliance with current regulations.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environmentCIAM 6118 The urban environment
		Be able to carry out team work in environmental sciences field studies and research projects and significantly contribute to them.	
	Stimulate the students to apply acquired knowledge obtained throughout their studies and research in order to accomplish sustainable development in islands and tropical regions.		
	Promote student participation in the search for solutions and alternatives in environmental-related issues and problems.		
6. Establish effective collaboration between the program's academic community and the Local and Federal government agencies so they may benefit from the program's pool of experts in relation to	Stimulate the students to apply acquired knowledge obtained throughout their studies and research in order to accomplish sustainable development in islands and tropical regions.	Contribute to the solution of environmental problems using knowledge acquired throughout their studies and research and recent scientific	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environment

management and interpretation of environmental data and the search for solutions to the country's problems.		knowledge published in the emphasis area.	CIAM 6118 The urban environment CIAM 6999 Master's graduate research
	Promote research in environmental sciences in Puerto Rico, other islands and tropical areas, particularly those concerning environmental problems and issues characteristic of islands and tropical regions.		
	Establish effective communication with the government and communities in order to direct research efforts towards the solution of problems confronted by islands and tropical regions, emphasizing in those aspects related to Puerto Rico.		

TABLE 3 Alignment of the master's degree goals, objectives, graduate profile and courses

Goals	Objetives	Graduate profile	Courses

1. A greater integration of academic tasks with the actual and future needs of the Puerto Rican society in relation to the environment and its sustainable development.	Train scientists with high critical and analytical sense and a solid knowledge in the environmental sciences field with a capability to attend to society's needs relating to the use, management and improvement of the environment within the island and tropical region context.	Initiate, direct and supervise environmental sciences research projects, write proposals to obtain research funding and establish professional collaborations with other researchers.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environment CIAM 6118 The urban environment CIAM 6116 Tropical ecosystems CIAM 8901 Graduate seminar I CIAM 8902 Graduate seminar II
2. Student and faculty member search for alternatives that promote harmony between social, environmental and economic processes in order to accomplish a common good.	Develop students' rigor in the search for knowledge and a high sense of ethics and social responsibility.	Integrate knowledge acquired throughout their studies and research and recent scientific knowledge published in the emphasis area in order to analyze environmental problems and issues characteristic of islands and tropical regions and to provide viable alternatives directed towards their sustainable development.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environment CIAM 6118 The urban environment CIAM 6116 Tropical ecosystems CIAM 8901 Graduate seminar I CIAM 8902 Graduate seminar II
3. Integration and appropriate use of advanced technologies for analysis of environmental problems.	Train scientists with high critical and analytical sense and a solid knowledge in the environmental sciences field with a capability to attend to society's needs relating to the use, management and improvement of the environment within the island and tropical region context.	Advance theoretical and technical knowledge in environmental sciences through the development, application and evaluation of protocols, sampling methods and quantitative analysis of environmental parameters, design of	CIAM 6235 Remote perception I CIAM 6256 Methods in environmental system statistical analysis CIAM 8999 Doctoral graduate research

		comprehensive plans for sustainable management of natural areas and resources or the development of mathematical models and spatial analysis techniques to solve complex environmental problems according to their area of emphasis.	
4. Active and responsible participation as a member of the university's community in decision making processes related to the environment and Puerto Rican quality of life.	Encourage student participation in the search for solutions and alternatives to environmental-related issues and problems.	Serve as an expert in their area of emphasis during legal cases or in other situations requiring a consultant with profound knowledge in environmental sciences.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environment CIAM 6118 The urban environment CIAM 6116 Tropical ecosystems CIAM 8901 Graduate seminar I CIAM 8902 Graduate seminar II
	Facilitate efforts to carry out interdisciplinary research and collaboration with other graduate programs at the University of Puerto Rico, with other universities and with private or public institutions on other islands or tropical regions.	Be an agent of change in the community and in society in all that is related to environmental preservation and optimal use of natural resources.	
		Effectively communicate environmental issues in public and private forums, scientific and professional congresses as well as	

		for all audiences in both oral and written form.	
		Contribute to society's sustainable development through an integrative vision of the analysis of modern society's problems considering the anticipated social and environmental changes, promoting changes and a better quality of life through the optimal sustainable use of natural and environmental resources and assuming leading positions defending the environment and natural resources.	
5. Develop a scientific community not limited to driving creation and transmission of knowledge but also generates, develops and supports the country's environmental transformation and provide authentic solutions that will help solve the problems affecting society.	Train scientists with high critical and analytical sense and a solid knowledge in the environmental sciences field with a capability to attend to society's needs relating to the use, management and improvement of the environment within the island and tropical region context.	Significantly contribute to their area of environmental sciences emphasis through publication of research results in professional journals of renowned excellence, evaluation and critical analysis of work carried out by peers and active and effective participation in local and international scientific meetings.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environment CIAM 6118 The urban environment
	Stimulate the students to apply acquired knowledge	Work as teaching and research staff in higher	

	obtained throughout their studies and research in order to accomplish sustainable development in islands and tropical regions.	level education institutions or occupy lead positions in research or administration in the government or the private industry.	
	Promote student participation in the search for solutions and alternatives in environmental-related issues and problems.		
6. Establish effective collaboration between the program's academic community and the Local and Federal government agencies so they may benefit from the program's pool of experts in relation to management and interpretation of environmental data and the search for solutions to the country's problems.	Stimulate the students to apply acquired knowledge obtained throughout their studies and research in order to accomplish sustainable development in islands and tropical regions.	Initiate, direct and supervise environmental sciences research projects, write proposals to obtain research funding and establish professional collaborations with other researchers.	CIAM 6115 The terrestrial environment CIAM 6117 The coastal environment CIAM 6118 The urban environment CIAM 8999 Doctoral graduate research
	Promote research in environmental sciences in Puerto Rico, other islands and tropical areas, particularly those concerning environmental problems and issues characteristic of islands and tropical regions.	Serve as an expert in their area of emphasis during legal cases or in other situations requiring a consultant with profound knowledge in environmental sciences.	
	Establish effective communication with the government and communities in order to direct research efforts	Work as teaching and research staff in higher level education institutions or occupy lead positions in	

	towards the solution of problems confronted by islands and tropical regions, emphasizing in those aspects related to Puerto Rico.	research or administration in the government or the private industry.	

5.3.4 Proposed Program model or design and curricular sequence

5.3.4.1 Master in Environmental Sciences

During their first year, full time students in the Master's Program will take 3 courses each semester, in addition to the graduate seminar. During their second year, they will take four courses; two courses in the emphasis area and two elective courses in addition to carrying out research. It is expected that the students regularly attend the graduate seminar (or a seminar in the emphasis area) during their time in the Graduate Program.

The following is a description of a possible curricular sequence for a student interested in completing a Master's in Environmental Sciences in the area of Sustainable Management of Islands and Tropical Regions is described as follows:

First year: First semester			**First year: Second Semester**		
CIAM 6115	The terrestrial environment	3	CIAM 6116	Tropical ecosystems	3
CIAM 6117	The coastal environment	3	CIAM 6118	The urban environment	3
CIAM 6235	Remote sensing I	3	CIAM 6256	Methods for statistical analysis	3
CIAM 8901	Graduate Seminar I	1	CIAM 8902	Graduate Seminar II	1
Second year: First semester			**Second year: Second Semester**		
CIAM 8425	Environmental geology	3	XXXX ------	Elective course	3
CIAM 8435	Environmental hydrology	3	XXXX ------	Elective course	3
CIAM 6999	Graduate Research	3	CIAM 6999	Graduate research	3

Other requirements
Approve a qualifying exam (Part A) during the summer of the first year.
Present thesis research proposal before beginning research work.
Present and defend the Master's thesis after completing the second year.

The following is a description of a possible curricular sequence for a student interested in completing a Master's in Environmental Sciences in the area of Environmental Modeling and Spatial Analysis:

First year: First semester			**First year: Second Semester**		
CIAM 6115	The terrestrial environment	3	CIAM 6116	Tropical ecosystems	3
CIAM 6117	The coastal environment	3	CIAM 6118	The urban environment	3

CIAM 6235	Remote sensing I	3	CIAM 6256	Methods for statistical analysis	3
CIAM 8901	Graduate seminar I	1	CIAM 8902	Graduate seminar II	1

Second year: First semester			**Second year: Second Semester**		
CIAM 8225	Spatial analysis methods	3	XXXX ------	Elective course	3
CIAM 8257	Model constructing techniques	3	XXXX ------	Elective course	3
CIAM 6999	Graduate research	3	CIAM 6999	Graduate research	3

Other requirements
Approve a qualifying exam (Part A) during their first year summer session.
Present a thesis research proposal before beginning research work.
Present and defend the Master's thesis after completing the second year.

The following is a description of a possible curricular sequence for a student interested in completing a Master in Environmental Sciences in the interdisciplinary option:

First year: First semester			**First year: Second Semester**		
CIAM 6115	The terrestrial environment	3	CIAM 6118	The urban environment	3
CIAM 6117	The coastal environment	3	CIAM 6256	Methods for statistical analysis	3
XXXX ------	Core course	3	XXXX ------	Core course	3
CIAM 8901	Graduate Seminar I	1	CIAM 8902	Graduate Seminar II	1

Second year: First semester			**Second year: Second Semester**		
XXXX ------	Specialty course	3	XXXX ------	Elective course	3
XXXX ------	Specialty course	3	XXXX ------	Elective course	3
CIAM 6999	Graduate Research	3	CIAM 6999	Graduate research	3

Other requirements
Approve a qualifying exam (Part A) during the summer of the first year.
Present thesis research proposal before beginning research work.
Present and defend the Master's thesis after completing the second year.

If thesis research, presentation, and defense are not completed during the second year, the student must register in CIAM 6896 (Master's thesis continuation), until the degree requirements are completed, in order to be considered a full time student.

5.3.4.2 Doctor in Environmental Sciences

During their first year, similar to students in the Master's Program, full time students in the Doctoral Program will take 3 courses each semester, in addition to the graduate seminar. During their second and third year, they will take one or two courses per semester in addition to the emphasis area seminar and carrying out research. It is expected that all Doctoral students regularly attend the graduate seminar or an emphasis area seminar for at least three years.

The following is a description of a possible curricular sequence is described for a student interested in completing a Doctor of Philosophy in Environmental Sciences in the area of Management of Environmental Systems:

First year: First semester			**First year: Second Semester**	
CIAM 6115	The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117	The coastal environment	3	CIAM 6118 The urban environment	3
CIAM 6235	Remote sensing I	3	CIAM 6256 Methods for statistical analysis	3
CIAM 8901	Graduate Seminar I	1	CIAM 8902 Graduate Seminar II	1
Second year: First semester			**Second year: Second Semester**	
CIAM 8425	Environmental geology	3	CIAM 8445 Environmental meteorology	3
CIAM 8435	Environmental hydrology	3	XXXX ------ Elective course	3
CIAM 8405	Sustainable management Seminar I	2	CIAM 8406 Sustainable management Seminar II	2
CIAM 8999	Graduate Research	3	CIAM 8999 Graduate research	3
Third year: First semester			**Third year: Second Semester**	
XXXX ------	Elective course	3	XXXX ------ Elective course	3
CIAM 8999	Graduate Research	3	CIAM 8999 Graduate research	3
Fourth year: First semester			**Fourth year: Second Semester**	
CIAM 8996	Thesis continuation	0	CIAM 8996 Thesis continuation	0

Other requirements
Give a presentation in the graduate seminar course during the second year.
Approve a qualifying exam (Part A) during the summer of the first year.
Approve a qualifying exam (Part B) during the summer of the second year.
Present dissertation research proposal before beginning research work.
Present an original research proposal during the third year.
Present and defend a Doctoral dissertation after completing the fourth year.

The following is a description of a possible curricular sequence is described for a student interested in completing a Doctor of Philosophy in Environmental Sciences in the area of Environmental Modeling and Spatial Analysis:

First year: First semester			**First year: Second Semester**	
CIAM 6115	The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117	The coastal environment	3	CIAM 6118 The urban environment	3
CIAM 6235	Remote sensing I	3	CIAM 6256 Methods for statistical analysis	3
CIAM 8901	Graduate Seminar I	1	CIAM 8902 Graduate Seminar II	1
Second year: First semester			**Second year: Second Semester**	
CIAM 8225	Methods of spatial analysis	3	CIAM 8236 Remote sensing II	3
CIAM 8257	Techniques in environmental model construction	3	XXXX ------ Elective course	3
			CIAM 8206 Spatial analysis seminar II	2

CIAM 8205	Spatial analysis seminar I	2	CIAM 8999	Graduate research	3
CIAM 8999	Graduate research	3			
Third year: First semester			**Third year: Second Semester**		
XXXX ------	Elective course	3	XXXX ------	Elective course	3
CIAM 8999	Graduate research	3	CIAM 8999	Graduate research	3
Fourth year: First semester			**Fourth year: Second Semester**		
CIAM 8996	Thesis continuation	0	CIAM 8996	Thesis continuation	0

Other requirements
Give a presentation in the graduate seminar course during the second year.
Approve a qualifying exam (Part A) during the summer of the first year.
Approve a qualifying exam (Part B) during the summer of the second year.
Present dissertation research proposal before beginning research work.
Present an original research proposal during the third year.
Present and defend a Doctoral dissertation after completing the fourth year.

The following is a description of a possible curricular sequence is described for a student interested in completing a Doctor of Philosophy in Environmental Sciences in the interdisciplinary option:

First year: First semester			**First year: Second Semester**		
CIAM 6115	The terrestrial environment	3	CIAM 6118	The urban environment	3
CIAM 6117	The coastal environment	3	CIAM 6256	Methods for statistical analysis	3
XXXX ------	Core course	3	XXXX ------	Core course	3
CIAM 8901	Graduate seminar I	1	CIAM 8902	Graduate seminar II	1
Second year: First semester			**Second year: Second Semester**		
XXXX ------	Specialty course	3	XXXX ------	Specialty course	3
XXXX ------	Specialty course	3	XXXX ------	Elective course	3
XXXX ------	Subject seminar	3	XXXX ------	Subject seminar	3
CIAM 8999	Graduate Research	3	CIAM 8999	Graduate research	3
Third year: First semester			**Third year: Second Semester**		
XXXX ------	Elective course	3	XXXX ------	Elective course	3
CIAM 8999	Graduate research	3	CIAM 8999	Graduate research	3
Fourth year: First semester			**Fourth year: Second Semester**		
CIAM 8996	Dissertation continuation	0	CIAM 8996	Dissertation continuation	0

Other requirements
Give a presentation in the graduate seminar course during the second year.
Approve a qualifying exam (Part A) during the summer of the first year.
Approve a qualifying exam (Part B) during the summer of the second year.
Present a dissertation research proposal before beginning research work.
Present an original research proposal during the third year.

Present and defend a Doctoral dissertation after completing the fourth year.

If thesis research, presentation, and dissertation are not completed during the fourth year, the student must register in CIAM 8896 (Doctoral thesis continuation), until the degree requirements are completed, in order to be considered a full time student.

5.3.5 Educational methodology and instructional strategies to accomplish the established objectives

The proposed master's and doctoral programs is set in an educational methodology designed to develop knowledge in environmental sciences and its issues in a context where students' individuality and interest are respected and promote collaboration, responsibility and equality among participants.

The course's main educational strategies include research, experimentation, special projects, presentations and publication discussions, among others. These strategies will be used to study environmental processes, generate knowledge and propose alternatives for solving environmental-related problems.

5.3.6 Catalog and promotion

Upon approval of the proposed academic programs by the corresponding authorities, they will be advertised in the press and the web page of the Campus's College of Natural Sciences, and included in the Graduate Program Catalog of the Río Piedras campus. Due to the interest that this Program ought to generate among scientists interested in the environment of islands and tropical region in diverse parts of the world, brochures and informative material about the Program will be sent out to the major universities in these geographical areas, as well as to the main institutions of higher education in Puerto Rico and the United States. The Program will also be advertised among the members of the ISA network, the consortium of universities on islands of the Atlantic that carry out studies on the environment and environmental problems of islands. When necessary, every so often recruitment visits will be made to universities of islands and tropical regions.

6. Admission and registration

6.1 Admission requirements

To be admitted to the Environmental Sciences Graduate Program, the applicant must fulfill requirements detailed below. Required documentation must be turned in at the Environmental Sciences Program Office on or before the deadline established by the Registrar's office for receipt of applications for admission to graduate programs, in order to be considered by the members of the Environmental Sciences Program Committee of Graduate Affairs. The requirements are:

- A Bachelor's in Science degree (or its equivalent) with a major in Environmental Sciences or majoring in Biology, Computational Science, General Science, Physics, Mathematics, or Chemistry from a renowned university. Students that do not have a Bachelor's degree in Environmental Sciences may be admitted conditionally until approval of the undergraduate Introduction to Environmental Sciences course with a minimum grade of B during their first semester. This does not apply to students who have taken the course a part of their Bachelor's degree.

  Students with a Bachelor's from a renowned university but not majoring in any of the previously mentioned disciplines, can apply for admission to the graduate program once they have approved the following requirements with a minimum 3.0 grade point average: one year of General Biology, one year of General Chemistry, the Calculus I course, one year of Physics with Calculus, the Statistics course for science majors and the Introduction to Environmental Sciences course. However, satisfactory approval of these courses does not guarantee admission to the program.

- A minimum general grade point average of 3.00 (on a scale of 0-4) and a minimum grade point average in science of 3.0 at the undergraduate level.

- Submit two official copies of their most recent academic transcript.

- Submit three letters of recommendation from professors with whom they have taken science courses.

- Submit the results from the Graduate Record Examination (GRE) or the Exam for Graduate Study Admission (PAEG) or evidence of having taken these exams.

- Have adequate knowledge of English and Spanish in both written and oral form.

- Submit the results from the TOEFL exam (foreign students only).

- Attend an interview, if required by the Admissions Committee.

In special situations, the Program's Graduate Affairs Committee may award **conditional admission** to students with a Bachelor in Science (or its equivalent) from a recognized university, but who for some reason do not fulfill one of the admission requirements, including the required grade point average. Conditionally admitted students must fulfill all of the requirements of the Program's retention index (and any other imposed by the Committee depending on the case) and their continuation in the Program will be evaluated at the end of the second semester of their conditional admission.

All applicants that fulfill all the admission requirements to the Environmental Sciences Graduate Program will be admitted directly into the Master's Program, and admission of candidates to the Doctoral Program will not occur until the student will have completed the qualifying exam requirements detailed in section 7.2. Upon approval of the Doctoral Qualifying Exam during the summer after the second year in the Graduate Program, the student will proceed directly to the Doctoral Program without presenting a Master's thesis. If the exam is not approved, the student will remain in the Master's program and must present the thesis for the degree before reapplying to the Doctoral program.

Students that have completed the Master's degree in Environmental Sciences approve the Doctoral Qualifying Exam during the summer immediately after the first year of post-master studies.

In relation to the validation of graduate courses taken elsewhere, in the case of those students who have a Master's in Science and who are interested in pursuing a Doctoral degree, the course validation will not be automatic. This will require having passed the course or its equivalent with a grade of A or B, and could require passing a written test in the area of the course to be validated. In the case of students with a Master's degree conferred by the Environmental Science Graduate Program of the University of Puerto Rico at Río Piedras, approved core and emphasis courses will be validated as long as they has been passed within a five year period prior to the validation date. Validation requests for courses approved in a time period greater than five years will be considered individually.

6.2 Registration projections for the first five years

It has been estimated that the initial program registration would be between 20 and 55 students for the first year (2009-2010). An increase in registration is expected upon promotion of the Program in and outside of Puerto Rico. Based on the study of the Bachelor's graduates (Appendix A), problems in achieving this level of registration is not anticipated.

In the following Registration Projection table, it is assumed that 21 students will enter the Program each year; 12 in the Doctoral and 9 in the Masters programs. A 20% withdrawal is estimated for the first year of study. Average duration in the Master's program is two years while duration in the Doctoral program would be five years.

TABLE 4 Registration Projections

Year	New Enrollments	Total Program Enrollment
1	21	21
2	21	38
3	21	48
4	21	68
5	21	78

7. Academic requirements for degree award

7.1 Environmental Sciences Master's degree

Requirements for degree candidacy

Candidacy of any student interested in obtaining an advanced degree must first be recommended by the Program's Graduate Affairs Committee. Acceptance of the request for candidacy implies that the student has demonstrated capability to satisfy the degree's requirements and has sufficient preparation to be able to carry out an independent research project.

Master in Sciences:

1. Courses: The student must complete a minimum of 20 graduate credits. The graduate course requirement can be fulfilled as follows:

   Eighteen (18) credits in medullar courses (6000 level)
   Two (2) seminar credits (8000 level)

2. Qualifying exam (Part A): After the first year as a graduate student, approval of Part A of the written qualifying exam integrating knowledge acquired in the CIAM 6115, 6117, 6118 and 6256 courses is required. The exam will be offered during the summer of the first year, upon completion of the first two semesters of graduate studies. The student will have two opportunities (June and July) to pass the exam (based on a "Pass" or "Fail" criterion). Failure to approve the exam entails dismissal from the Graduate Program.
3. Proposal: Students must present a satisfactory research time table to the Thesis Committee.

4. Teaching or Research Assistantships: A minimum of one year as a Teaching or Research Assistant is required.

5. Candidacy promotion: In order to be promoted as a Master's degree candidate, academic performance, first year Qualifying Exam, research time table, counselor's recommendation and the Graduate Affairs Committee's decision are taken into consideration. Evaluation of candidacy promotion will be carried out after the first year of graduate studies.

Requirements for degree award

Master in Sciences:

Approval of a total of 32 graduate credits with a grade point average of 3.00 or higher; required credit breakdown is as follows: 18 credits in medullar courses, 6 credits in emphasis courses, 2 credits in graduate seminars and 6 credits in elective courses.

Satisfactory completion of degree candidacy requirements.

Approval of 6 graduate research credits and successful presentation and defense of a master's thesis based on the research carried out.

7.2 Environmental Sciences Doctoral degree

1. Courses: Approval of a minimum of 42 graduate credits with a grade point average of 3.00 or higher; required credit breakdown is as follows: 18 credits in medullar courses, 9 credits in emphasis courses, 2 credits in graduate seminars , 4 credits in emphasis seminars and 9 credits in elective courses. Students should consult with their research advisors prior to course registration. The research advisor may recommend the student's registration in courses from other fields such as Biology, Chemistry, Physics or Mathematics, according to the student's need for development as a researcher.

2. Qualifying exam (Part A): After the first year as a graduate student, approval of Part A of a written qualifying exam integrating knowledge acquired in the CIAM 6115, 6117, 6118 and 6256 courses is required. The exam will be offered during the summer of the first year, upon completion of the first two semesters of graduate studies. The student will have two opportunities (June and July) to pass the exam (based on a "Pass" or "Fail" criterion). Failure to approve the exam implies dismissal from the Graduate Program.

3. Qualifying exam (Part B): After the second year as a graduate student, approval of Part B of a written qualifying exam integrating knowledge acquired throughout the medullar courses (18 credits), the required emphasis courses (9 credits), the graduate seminars (2 credits) and the emphasis seminars (4 credits) is required. The exam will be offered during the summer of the second year, upon completion of the first two years of graduate studies. The student will have two opportunities (June and July) to pass the exam (based on a "Pass" or "Fail" criterion). Failure to approve the exam after a second opportunity entails dismissal from the Graduate Program.

4. Seminars: At least two graduate seminars must be satisfactorily presented to the Program's faculty and students. One of these seminars must be an oral presentation on the student's proposed dissertation research.

5. Proposal: Students must present a satisfactory research time table to the Dissertation Committee.

6. Teaching or Research Assistantships: A minimum of one year as a Teaching or Research Assistant is required.

7. Candidacy promotion: In order to be promoted as a Doctoral degree candidate, academic performance, first and second year Qualifying Exams, graduate seminars, counselor's recommendation and the Graduate Affairs Committee's decision are taken into consideration. Evaluation of candidacy promotion will be carried out within three years of having been admitted to the Program.

Requirements for the Doctoral degree award

Approval of a minimum of 42 graduate credits with a grade point average of 3.00 or higher; required credit breakdown is as follows: 18 credits in medullar courses, 9 credits in emphasis courses, 2 credits in graduate seminars , 4 credits in emphasis seminars and 9 credits in elective courses.

Satisfactory completion of degree candidacy requirements.

Approval of 18 graduate research credits and successful presentation and defense of a doctoral dissertation based on the research carried out.

Seminar presentation of the student's final dissertation research results.

8. Faculty

8.1 Distribution of necessary faculty for offering the Program

8.1.1 Faculty in charge of courses

The faculty currently available to the Environmental Sciences Graduate Program, as well as those expected to be hired, to offer the proposed courses are as follows.

8.1.1.1 Available personnel

Except for Dr. Rafael A. Ríos and personnel to be recruited, the only faculty members affiliated to the Environmental Sciences Graduate Program, personnel indicated in Table 1 would be adjunct faculty of the Environmental Sciences Graduate Program during the academic years when these courses are offered or would collaborate in team teaching courses for the Program. Based on their preparation and experience, these professors could offer some of the graduate courses under the CIAM classification or some of the topics within these courses, or teach some of the specialty or elective courses in other departments of the College of Natural Sciences, as part of the requirements for a Master's or Ph.D. in Environmental Sciences under the interdisciplinary option. Table 1 contains information on available faculty, their academic preparation, affiliation, years of service, academic duties, and courses taught per semester.

During the period of appointment as adjunct faculty, these professors will participate in the meetings of the Graduate Faculty of Environmental Sciences and in the development of regulations and policies that will govern the Graduate Program. They may belong to the Graduate Affairs Committee in representation of the option corresponding to their specialty. They may refer themselves as members of the Adjunct Faculty of the Environmental Sciences Graduate Program, will make recommendations and advise the Environmental Program Director in matters related to faculty recruitment and evaluation in their specialty areas, and may serve on thesis and proposal committees of the Program's students.

TABLE 4. AVAILABLE FACULTY, PREPARATION, AFFILIATION, YEARS OF SERVICE AND COURSES PER SEMESTER

NAME	DEGREE AND SPECIALTY	INSTITUTION AND YEAR	AFFILIATION	YEARS OF SERVICE	DUTIES	COURSES TAUGHT PER SEMESTER

Rafael Ríos Dávila	Ph.D. Environmental Health Engineer	University of Texas, Austin, 1975	UPR-RCM Environmental Sciences	26	C	• Fresh and wastewater treatment • Solid waste management
James Ackerman*	Ph.D. Taxonomy, Plant ecology	Florida State University, 1981	UPR-RP Biology	26	C	• Plant reproduction • Plant taxonomy • Plant organismal biology
T. Mitchell Aide	Ph.D. Community Ecology	University of Utah, 1989	UPR-RP Biology	15	C	• Communities and ecosystems • Zoology seminar • Advanced ecology: critical thinking on condition of conservation and the environment
Paul Bayman*	Ph.D. Mycology	University of California-Berkeley, 1987	UPR-RP Biology	14	C	• Plant organismal biology
Elvira Cuevas*	Ph.D. Ecosystem ecology	Venezuelan Institute of Scientific Research, 1983	UPR-RP Biology	7	C	• Tropical biology: structure and function of tropical ecosystems • Introduction to ecology
María Gloria Domínguez Bello*	Ph.D. Microbial ecology	University of Aberdeen, 1990	UPR-RP Biology	4	C	• Zoology seminar: human microbial ecology
Edwin Hernández*	Ph.D. Marine ecology	University of Puerto Rico, Río Piedras, 2000	UPR-RP Biology	3	C	• Topics in Biology: Marine biology

Rafael L. Joglar	Ph.D. Ecology, herpetology	Kansas State University, 1986	UPR-RP Biology	14	C	• Ecología de Puerto Rico • Animal Organismal Biology
Carla Restrepo*	Ph.D. Landscape ecology	University of Florida, 1995	UPR-RP Biology	6	C	• Ecology • Large scale ecology •Zoology seminar: Complex Adaptive Systems • Topics in Biology: Darwinian medicine
Loretta Roberson*	Ph.D. Marine ecology	Stanford University, 2001	UPR-RP Biology	4	P	• Marine biology and ecology
Gary Toranzos*	Ph.D. Environmental microbiology	University of Arizona, 1985	UPR-RP Biology	19	C	• Microbiology
Rafael Arce	Ph.D. Physical chemistry	University of Wisconsin-Madison, 1971	UPR-RP Chemistry	30	C	• Physical chemistry
Osvaldo Rosario	Ph.D. Analytical chemistry	University of Puerto Rico, Río Piedras, 1978	UPR-RP Chemistry	21	C	• Environmental chemistry • Instrumentation analysis •Chromatographic separation • Capillary electrophoresis • Environmental sampling

						• Organic contaminant analysis in water and air
Mariano Marcano	Ph.D. Applied mathematics and modeling	State University of New York-Stony Brook, 1998	UPR-RP Computer Sciences	4	C	• Computational analysis
Gabriel Moreno	Ph.D. Sustainable urban systems	State University of New York-Stony Brook, 1990	UPR-RP General Sciences	3	C	• Urban environment • Sustainable urbanism • Environmental quality and urban forms • Sustainable development • The environment: integration of social and scientific aspects
Nicholas Brokaw*	Ph.D. Tropical forest ecology	University of Chicago, 1980	UPR-RP Institute for Tropical Ecosystems	7	C	• Ecology • Advanced ecology: Tropical forest ecology
Olga Mayol	Ph.D. Analytical chemistry	University of Puerto Rico-Río Piedras, 1998	UPR-RP Institute for Tropical Ecosystems	5	C	• Analytical chemistry seminar • Special topics in chemistry
Elvia Meléndez-Ackerman*	Ph.D. Plant ecology	University of California, Irvine, 1995	UPR-RP Institute for Tropical Ecosystems	11	C	• Ecology • Plant reproduction ecology (grad) •Bioconservation (grad)

Jorge Ortiz*	Ph.D. Hydrology	University of Colorado-Boulder, 1998	UPR-RP Institute for Tropical Ecosystems	4	C	• Limnology • Environmental sciences seminar • Aquatic resources
Alonso Ramírez*	Ph.D. Limnology	University of Georgia-Athens, 2001	UPR-RP Institute for Tropical Ecosystems	6	C	• Limnology • Aquatic entomology
Mei Yu*	Ph.D. Spatial analysis, modeling	Chinese Academy of Sciences, 1998	UPR-RP Institute for Tropical Ecosystems	0.5	C	New Faculty member
Jess K. Zimmerman	Ph.D. Plant ecology	University of Utah, 1989	UPR-RP Institute for Tropical Ecosystems	10	C	• Biometrics • Ecology
Xiaoming Zou	Ph.D. Forest ecology	Colorado State University, 1992	UPR-RP Institute for Tropical Ecosystems	9	C	• Ecology • Ecology laboratory •Biogeochemistry
Heeralal Janwa*	Ph.D. Applied mathematics	Syracuse University, 1986	UPR-RP Mathematics	10	C	• Graduate linear algebra • Advanced cryptography • Algebraic combinations • Information theory • Statistics with Computers • Introduction to code theory
María Eglée Pérez*	Ph.D. Statistics and applied mathematics	Venezuela Central University, 1994	UPR-RP Mathematics	2	C	• Linear modeling • Experimental design and

						advanced data analysis • Bayesian methods in clinical assays
Luis R. Pericchi	Ph.D. Statistics and applied mathematics	University of London (Imperial College), 1981	UPR-RP Mathematics	6	C	• Probability and Statistics
Gerardo Morell*	Ph.D. Physical chemistry	University of Puerto Rico-Río Piedras, 1995	UPR-RP Physics	12	C	• Introduction to meteorology • Meteorological microsatellites I and II • Energy production, its technology and the environment •Thermodynamics • Nuclear physics
Edgardo Resto*	Ph.D. Biochemistry	University of Puerto Rico-Rio Piedras, 1988	UPR-RP Physical sciences	7	C	• Applied and industrial chemistry • Environmental analysis techniques • Environmental quality indicators • Science, technology and society
Indira Luciano*	Ph. D. Regional economics	Universidad Nacional Autónoma de México, 2005	UPR-RP Economy	1	C	• Statistics for social sciences • Economic and social development in PR • Urban economy

Joseph Vogel*	Ph.D. Ecological economy	Rutgers University, 1987	UPR-RP Economy	5	C	• Seminar on environmental economy • Amazonia in the Arts • Applied ecological economy analysis • History of economic thought • Principles of economy
Maritza Barreto*	Ph.D. Marine geology	University of Puerto Rico-Mayagüez, 1997	UPR-RP Geography	10	C	• Geology • Marine geology • Coastal processes • Natural risks • Remote perception • Environmental geology • Aerial photography • Photogrammetry
Angel David Cruz Báez*	Ph.D. Demography, agricultural geography	University of Wisconsin, Madison, 1977	UPR-RP Geography	27	C	• Cartography and quantitative methods • Geographic information systems • Remote perception • Population geography • Land use • Demography

Carlos J. Guilbe	Ph.D. Urban geography	University of Wisconsin, Milwaukee, 1999	UPR-RP Geography	8	C	• Urban geography • Quantitative methods in geography
Camilo Gomides*	Ph. D. Eco-critics	Tulane University, 2003	UPR-RP Foreign languages	3	C	• Brazilian Cinema, Culture and Society • Amazonia in the Arts
Humberto Cavallín	Ph. D. Architecture	University of California-Berkeley, 2006	UPR-RP Architecture	3	C	• Architectural design • Architectural theory and critic
David Román*	J. D. Environmental law	Tulane Law School, 1994	UPR-RP DECEP	6	P	• Environmental impact evaluation • Environmental regulations • Environmental laws • Environmental management
Mario Rodríguez	Ph. D. Industrial psychology	Carlos Albizu University, 2002	UPR-RCM Public health	12	C	• Organization behavior • Planning and evaluation of health services • Special projects in organizations and health service offers • Medullar course in public health
Cecilio Ortiz*	Ph.D. Urban systems	Arizona State University, 1999	UPR-RUM Social sciences	1	C	• Research methods • Decision analysis

						• Administration development
Marla Pérez*	Ph. D. Environmental sociology	Rutgers University, 2003	UPR-RUM Social sciences	5	C	• Research methods • Environmental sociology • Natural disaster sociology
Vance Vicente	Ph.D. Marine sciences	University of Puerto Rico-Mayagüez, 1987	Consultant	na	na	• Tropical island marine resources
Ariel Lugo	Ph.D. Tropical ecology	University of North Carolina, 1969	International Institute for Tropical Forestry (USDA)	na	na	na

na = non applicable
C = Full time; P = Part time

* Faculty members added to the list after the 2003 approval by the Academic Senate of the Environmental Sciences Graduate Program. All faculty members that were not on the original list approved by the Academic Senate of the UPR-RP will be evaluated by the Environmental Sciences Graduate Affairs Committee in order to be included in the Graduate Program (section 12.2). Personnel to me appointed as Adjunct Professors in the Graduate Program will be evaluated in accordance to the Board of Trustees' Certification 024 1996-1997 in order to be included in the program.

8.1.1.2 Personnel to be hired

The Program proposes recruitment of three professors with doctoral degrees in environmental sciences and specializing in air quality (meteorology, contaminant modeling and transport), hydrology (groundwater hydrology and contaminant transport) and marine sciences (coastal geological, geomorphological, hydrological and climatological processes) during the first semester of the 2009-10 academic year. Incorporation of the Institute for Tropical Ecosystem Studies (ITES) to the Environmental Sciences Program is also expected to occur during that same year, thereby providing sufficient teaching staff to sustain the program during the next 10 years.

8.1.1.3 Possible course assignment for professors

Based on their areas of expertise, the following courses could be offered individually or by means of team teaching by currently available professors or by those to be recruited:

CODE	TITLE	PROFESSOR
CIAM 6115	The Terrestrial Environment	Dr. Jorge Ortiz*
CIAM 6116	Tropical Ecosystems	Dr. T. Mitchell Aide or Dr. Jess Zimmerman
CIAM 6117	The Coastal Environment	Dr. Vance Vicente
CIAM 6118	The Urban Environment	Dr. Gabriel Moreno*
CIAM 6235	Remote Sensing I	Dr. Mei Yu
CIAM 6256	Methods for Statistical Analysis of Environmental Systems	Dr. Alonso Ramírez* and Dr. María Egleé Pérez* or Dr. Luis Pericchi
CIAM 8205-6	Seminar on Topics in Environmental Modeling and Spatial Analysis s I	Dr. Carla Restrepo*
CIAM 8225	Methods in Spatial Analysis	Dr. Mei Yu*
CIAM 8236	Remote Perception II	Dr. Maritza Barreto*
CIAM 8257	Environmental Model Construction Techniques	Dr. Mariano Marcano and Dr. María Egleé Pérez* or Dr. Luis Pericchi*
CIAM 8345	Island and Tropical Region Landscape Ecology	Dr. Carla Restrepo*
CIAM 8405-6	Topics Seminar in Sustainable Management of Islands and Tropical Regions I	Dr. Jorge Ortiz* or Dr. Gabriel Moreno
CIAM 8425	Environmental Geology	PhD Environmental Hydrogeology
CIAM 8435	Environmental Hydrology	PhD Environmental Hydrology
CIAM 8445	Environmental Meteorology	PhD Environmental Meteorology
CIAM 8545	Environmental Noise	This course may be substituted by the graduate Environmental Acoustics

		course offered by the UPR-RP School of Architecture
CIAM 8765	Environmental Impact Evaluation	David Román, JD
CIAM 8775	Waste Management and Disposal	Dr. Rafael Ríos Dávila
CIAM 8785	Energy Generation	Dr. Edgard Resto*
CIAM 8845	Natural Dangers in Tropical Regions	Team teaching: Dr. Jorge Ortiz*, Dr. Rafael Ríos Dávila, PhD Environmental Meteorology, PhD Environmental Hydrology
CIAM 8901-2	Graduate Seminar I and II	Any of the Graduate Program professors (Table 4)
CIAM 8990	Special topics in Environmental Sciences	Visiting professors or Any of the Graduate Program professors (Table 4), depending on the topic.

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8.1.2 Research Faculty

Research currently under way at the College of Natural Sciences which will serve as the basis for research projects leading to Master's theses and Doctoral dissertations. The faculty members are indicated below, as well as their respective research areas, which are presently doing research in areas related to the environment in different departments, programs, and institutes of the College. Besides serving as suitable thesis supervisors for students in the Environmental Sciences Graduate Program, these professors will advise these students on specialty and elective courses that ought to be taken in order to be better prepared in their area. The Curriculum Vitae of the professors in this following list are included in Appendix F.

The College of Natural Sciences has 136 full time faculty members, 94% of which have a doctoral degree, and approximately 2/3 are actively involved in research activities. The College receives approximately $20 million a year in external funding for research. The Environmental Sciences Program currently has an external funding assignment of

$4.5 million, mainly for research related to the IGERT project. This projected should support 25-30 doctoral students provide an annual of aid of $30,000 including course registration, office space, computers and programs. Students can also access local governmental funding through teaching and research assistantships.

Environmental Sciences Program

Dr. Rafael Rios *	Water contamination, solid waste

Institute for the Study of Tropical Ecosystems

Dr. Nicholas Brokaw*	Forest ecology
Dra. Olga Mayol-Bracero	Tropical atmospheric chemical contaminants
Dra. Elvia Meléndez-Ackerman*	Population ecology and biodiversity
Dr. Jorge Ortiz*	Hydrology
Dr. Alonso Ramírez*	Aquatic ecology
Dra. Mei Yu*	Environmental spatial analysis, GIS and teledetection
Dr. Jess Zimmerman	Plant communities and disturbance response
Dr. Xiaoming Zou	Soil nutrients and biogeochemical cycles

Biology Department

Dr. James Ackerman*	Plant ecology and taxonomy
Dr. T. Mitchell Aide	Tropical plant ecology, restoration ecology
Dr. Paul Bayman*	Mycology
Dra. Elvira Cuevas*	Plant/soil relations, terrestrial system functions
Dra. María Gloria Domínguez Bello*	Microbial ecology
Dr. Edwin Hernández*	Coral and reef ecosystems
Dr. Rafael L. Joglar	Antillean herpetofauna ecology and biogeography
Dra. Carla Restrepo*	Landscape ecology, landslides
Dra. Loretta Roberson*	Marine plant ecophysiology
Dr. Gary Toranzos*	Environmental microbiology
Dr. Ariel Lugo (adjunct)	Tropical forest ecology

Computer Science Department

Dr. Mariano Marcano	Numerical systems, optimization of linear and non-linear systems, mathematical modeling

Physics Department	
Dr. Gerardo Morell*	Nanotechnology, energy and human system impact
Mathematics Department	
Dr. Heeralal Janwa*	Information theory, combinatorial
Dra. María Eglée Pérez*	Statistics and mathematical modeling
Dr. Luis R. Pericchi	Statistics and mathematical modeling
Chemistry Department	
Dr. Rafael Arce	Photochemistry of atmospheric contaminants
Dr. Osvaldo Rosario	environmental contaminant analysis methods, air pollution analysis, contaminant bioaccumulation
General Sciences Program	
Dr. Gabriel Moreno	Urban systems

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8.2 Faculty projections for the first five years and recruitment plan

Beginning in the next academia year 2009-2010, and according to budget availability, three professors with a Doctoral degree specializing in air quality (meteorology, contaminant modeling and transport), hydrology (groundwater hydrology and contaminant transport) and marine sciences (coastal geological, geomorphological, hydrological and climatological processes) will be hired.

In addition, it is projected that visiting professors will be brought in who may offer specialized courses and collaborate in research projects with faculty and graduate students in the Program.

Since recruitment is difficult for these areas, the available faculty positions will be advertised in the most widely circulated professional journals corresponding to each

area, as well as the local press. Candidates will be selected from the applicants by evaluation of their academic credentials, their professional trajectory, research interests, and recommendation letters submitted by each candidate. The selected candidates will be invited to present a seminar to which all of the College's faculty members will be invited, and will be interviewed by a faculty committee named by the Environmental Sciences Director. Once the faculty of Program form a stable unit, they will be responsible for carrying out the functions assigned to this committee.

8.3 Preparation of currently available professors

All professors available for teaching courses have a Doctoral degree in their area of specialty. Their names, degree, institution and year have been previously indicated in Table 1.

8.4 Plan for faculty development according to Program needs

The currently available personnel, as well as those to be recruited, will keep up to date on the most recent advances in their field by attending and participating in workshops, congresses, courses offered by visiting professors, and other professional improvement activities. New professors must also attend faculty training workshops offered by the Center for Academic Excellence (CAE). Participation of all professors will be promoted in professional development activities such as the "Fridays for Teaching" and other workshops sponsored by the CAE, as well as short courses and workshops offered by other educational and professional dependencies and entities.

8.5 Faculty evaluation

The faculty members of the Environmental Sciences Program will be evaluated by a group of professors designated by the College of Natural Science's Personnel Committee, based on criteria of faculty excellence (as defined by the Committee) in teaching, research, and service to the institution and the community. This evaluation mechanism has been used in the past to evaluate the only professor affiliated to the Program, as well as faculty personnel affiliated with the Institute of Tropical Ecosystems of the College of Natural Sciences. Once the faculty of Program form a stable unit, they will be responsible for carrying out the functions assigned to the group named by the College's Personnel Committee.

8.6 Collaborative linkages with other institutions and centers

Collaboration between the Environmental Sciences Program collaborates and the Public Health Graduate School (PHGS) at the Medical Sciences campus is carried out through the exchange of teaching staff (such as the PHGS' Aquatic Environment course-SAAM 6531-, for example) and in common service projects (such as providing assistance to aqueducts in small communities). Collaboration with the Mayagüez campus is carried out through faculty members participating in the IGERT project. There is also a project shared with the Miami Dade Community College which will bring students and faculty members to the Program. In addition, a collaboration with the University of the West Indies is being negotiated which would allow exchange of teaching and research faculty. There are also collaborations with the private sector established through the hiring of professors teaching undergraduate courses (such as Dr. Vance Vicente, a consultant in marine affairs) and with governmental agencies through the program's graduates (such as the President of the Board for Environmental Quality and the Vice president of the Water Authority). There are also research collaborations with centers associated with the Long Term Ecological Research (LTER) web as part of the Institute for Tropical Research Studies, which is expected to become part of the Environmental Sciences Program.

9. Learning resources

9.1 Inventory of existing resources

9.1.1 Library resources

The Natural Sciences library has 2,800 book titles catalogued in environmental sciences that include subjects related to environmental pollution, environmental problems, environmental engineering, environmental toxicology, conservation, biodiversity, ecology, earth sciences, hydrology, geology, geographic information systems and climate change. It also has hundreds of other educational and reference books on environmental subjects catalogued in the areas of biology, chemistry, physics, and mathematics.

The library also has various data bases which allow access to information on the environmental sciences. These are:

BIOSIS – Biological Abstracts
Biological and Agricultural Index
Chemical Abstracts
General Science Full Text
Applied Science Full Text
Web of Science

There are also 81 journals in environmental science related areas. Some of the active journal titles catalogued under environmental sciences, as well as the available years, are indicated below:

Ambio 1983-
Applied Geography 1983-84, 1995-
Bulletin of the Polish Academy of Sciences: Earth Science 1983-
12. Catena 1994-
Chemical Geology, Chemical Geology-Isotope, Geosciences 1983-
Coastal Management 1995-
Conservation Biology 1994-
Coral Reefs 1983-
Disasters 1995-
Dynamics of Atmospheres and Oceans 1982-
Ecological Applications 1995-
Ecology 1920-
Environment 1969-
Environment Business 1995-
Environmental Conservation 1982-
Environmental Geology 1975-1984, 1993-
Environmental Impact Assessment Review 1993-
Environmental Management 1976-82, 1986-
Environmental Monitoring and Assessment 1981-
Environmental Pollution 1970-
Environmental Science and Technology 1967-
Environmentalist, The 1982-
EOS Transactions of the American Geophysical Union 1969-
Evolutionary Ecology 1994-
Geological Magazine 1924-
Geological Society of America (Bulletin) 1994-
Geophysics 1936-
Geotimes 1995-
Global Environmental Change 1995-
Global and Planetary Change 1989-
Ground Water 1995-
Helictite 1995-
Hydrogeology Journal 1995-
International Journal of Geographical Information Science 1998-
International Research in Geographic and Environmental Education 1993-
Journal of Atmospheric and Oceanic Technology 1984-
Journal of Atmospheric and Solar-Terrestrial Physics 1997-

Journal of Contaminant Hydrology 1994-
Journal of Environmental Economics and Management 1974-
Journal of Environmental Management 1995-
Journal of Environmental Planning and Management 1994-
Journal of Geology 1950-
Journal of Geophysical Research 1959-
Journal of Geoscience Education 1996-
Journal of Hazardous Materials 1975-84, 1991-
Journal of Hydrology 1983-
Journal of Physical Oceanography 1983-
Journal of Soil Contamination 1995-
Journal of the Air and Waste Management Association 1989-
Journal of the Institute of Environmental Sciences 1995-
Journal of Wildlife Diseases (and supplement) 1982-
Journal of Wildlife Management (and supplement) 1946-
Land Degradation and Development 1995-
Landscape Ecology 1995-
Limnology and Oceanography 1956-
Malaysian Journal of Tropical Geography 1995-
Marine Policy 1983-
Marine Pollution Bulletin 1970-
Molecular Ecology 1994-
Mountain Research and Development 1995-
North American Journal of Fisheries Management 1981-
Ocean and Coastal Management 1995-
Oceanus 1995-
Oikos 1949-
Palaeogeography, Palaeoclimatology, Palaeoecology 1965-
Physical Geography 1995-
Progress in Oceanography 1984-
Remote Sensing of Environment 1994-
Resources Conservation and Recycling 1995-
Restoration Ecology 1994-
Singapur Journal of Tropical Geography 1995-
Smithsonian Contributions to the Earth Sciences 1969-
Surveys in Geophysics 1986-
Tellus, Serie A 1984-
Terranova 1994-
Water, Air and Soil Pollution 1971-
Water Environment and Technology 1989-
Water Environment Research 1992-
Water Research 1971-

Water Science and Technology 1981-
Wildlife Monographs 1969-

Due to its interdisciplinary nature, a lot of the research carried out in the environmental sciences field is published in scientific journals catalogued under other disciplines. These journals are cited in the *Environmental Abstracts*. The College of Natural Science library has 49 of these journals cited in the *Environmental Abstracts,* which are not included in the previous list. The titles of the most relevant of these journals are:

Accounts of Chemical Research
Agricultural and Forest Meteorology
American Journal of Science
Analytical Chemistry
Annals of Nuclear Energy
Annual Review of Energy and Environment
Applied and Environmental Microbiology
Archives of Biochemistry and Biophysics
Australian Journal of Zoology
BioScience
Bioscience, Biotechnology & Biochemistry
Biotechnology Progress
Bulletin of Marine Sciences
Bulletin of the American Meteorological Society
California Agriculture
Canadian Journal of Microbiology
Chemical Research in Toxicology
Chemistry & Ecology
Chemistry & Industry (UK)
Chemosphere
Climatic Change
Critical Reviews in Environmental Science and Technology
Economic Botany
Energy Sources
Environmental Entomology
Environmental Geology and Water Sciences
FEMS Microbiology and Ecology
FEMS Microbiology Reviews
Fisheries
Fishery Bulletin
Ibis (UK)
Industry Week
Issues in Science and Technology

Journal of Agricultural and Food Chemistry
Journal of Aquatic Animal Health
Journal of Arid Environments
Journal of Atmospheric Chemistry
Journal of Ecology
Journal of Environmental Education
Journal of Power Sources
Journal of the Acoustical Society of America
Nature
New Scientist
Science News
Scientific American
Soil Science Society of America Journal
Solar Energy Materials and Solar Cells
Trends in Analytical Chemistry
Trends in Ecology and Evolution

Through the University of Puerto Rico's Library System, the Environmental Sciences Program also has access to books and journals at other colleges, schools, and University of Puerto Rico dependencies. Among these are the library in the School of Law which has all environmental regulations in addition to journals and books on related subjects; the library at the Graduate School of Planning; the library at the School of Architecture, the José M. Lázaro General Library, where the Puerto Rican Collection as well as the Caribbean Regional Collection contain works on topics related to environmental studies on islands; and the libraries at the different campuses such as the Medical Sciences campus, Mayagüez, and others whose collections are available by interlibrary loans. The libraries at the US International Institute of Tropical Forestry as well as the Agricultural Experimental Station will also be available to students and researchers.

9.1.2 Other primary sources

Undergraduate research projects in the past have required information, data, or access to public domain data bases produced by local and federal government agencies. If this information is required for graduate research, it will be requested through the same channels. The primary sources for these available data bases include the following, among many others:

- *USGS Water Resources Data for Puerto Rico and the Virgin Islands*
  Contains water flow registries for 85 gauging stations, sediment transport registries at 26 stations, partial registries at 21 stations, lake level fluctuations for 18 dams, water quality registries at 16 gauging stations, and information for

about 42 additional riverside locations. It also contains water quality data from eleven lakes, two lagoons, and a bay, and water level registries for 108 observation wells.

- *Photogrammetrical and Topographical Maps Division of the Puerto Rico Highway Authority*
  Possesses aerial photos of all of Puerto Rico in 1:15,000 y 1:20,000 scales from the years 1936-1937, 1950, 1960, 1962, 1979, 1980, 1985 and 1997, as well as photos from different years that cover specific areas of the island.

- *Satellite Pour L'Observation de la Terre (SPOT) Satellite Images, Multi-spectral Scanner (MSS) and Thematic Mapper*
  SPOT produces digital images with the greatest resolution currently available. Panchromatic images can be obtained with a resolution of 10 x 10 meters. Because of this, it is used for map making, detecting changes and identifying natural and cultural features. Multispectral images are available in both visible and infrared light spectra with a resolution of 20 x 20 meters, which permits their use in making land use maps, land surface cover, monitoring of the environment and flooded lands, as well as for study of ecological systems, forests, environmental change, land formations, natural resources and environmental pollution. **MMS** is obtained at a low resolution (80 x 60) in order to cover greater areas. It is used in regional planning, large scale cartography and environmental monitoring. The data captured in the **THEMATIC MAPPER** platform have a 30 x 30 meter resolution and is used worldwide for regional planning, environmental monitoring, conservation, mining exploration, and many other uses.

- *US Census (International and USA Data Bases)*
  Provides statistical information on population by census blocks, neighborhoods, towns, municipalities, states, regions, and countries. The available data include mortality and birth rates, natural growth, emigration and immigration, life expectancy, demographic structure, income, number of persons per family, head of family, number of children, age, location, and origin, among others.

- *National Climatic Data Center*
  Primary source of information for time series data on daily and hourly precipitation, maximum and minimum temperatures, wind speed and direction, atmospheric pressure, cloud coverage, relative humidity, visibility, solar radiation, and other local, regional, and global meteorological parameters.

- *USGS WATSTORE Database*
  Contains point information as well as statistical summaries on all observed values, seasonal registries for the years when data was collected, and a physical

description of each unit of hydrological measure. Each database station has values for diverse observed parameters including flow, water volume in reservoirs, elevation over the base level, water temperature, pH, and total dissolved solids.

- *EPA STORET*
  Contains water quality data for the 10 EPA regions. These include diverse parameters such as dissolved oxygen, nitrogen, sodium, phosphorus, salinity, electric conductivity, total suspended solids, turbidity, bacteria, organic and inorganic matter, metals, pesticides and descriptive statistics.

- *EPA Toxic Release Inventory (TRI*)
  This data base includes all reports submitted to the EPA by facility owners and operators that manufacture, process, or import toxic substances in excess of 25,000 pounds annually, as required by SARA, Title III, Section 313. This data base, which includes Puerto Rico, contains information on more than 20,000 different sites.

- *Soil Conservation Service Map Unit Information Record (MUIR): SCS PEDON and SCS Soils 5*
  These data bases contain detailed information on laboratory analyses done on more than 16,000 soil series, including the 256 series and different soil types in Puerto Rico. These data include detailed descriptions of soil profiles, including granulometric analysis, organic material content, permeability, Atterberg limits, acidity, structure, chroma, depth, expansiveness, corrosiveness, length, slope, agrological capacity, and water table depth, among others.

- *Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)*
  This database contains more than 32,000 different sites that have been identified by the EPA as dangerous places that could potentially require cleaning using funding from the *Superfund* program.

- *EPA Leaking Underground Storage Tanks (LUST)*
  Provides information on the location of underground tanks from which all type of liquids have escaped into the subsoil causing a significant contamination problem in soil and subterranean waters.

- *National Environmental Data Information Systems (NEDIS)*
  Identifies all contaminated sites that could be close to commercial, industrial, or residential locations, and that could impact property value or affect the owner. Includes all *Superfund* sites, places with dangerous wastes, registered

underground tanks, places where polychlorinated biphenyls (*PCB's)* are handled, sites where spills of dangerous materials have been reported, places where dangerous chemical substances are handled, among others.

- *National Resource Recovery Act (RCRA)*
  Provides select information on sites whose facilities are registered with the RCRA division of the EPA, with the purpose of legal treatment, storage and disposal of toxic residues.

- *USGS DIGITAL ELEVATION MODEL (DEM)*
  This model consists of a surface of points that provide digital elevation values (z) for any specific location (x,y). Data are available at a scale of 1:250,000 where every degree in the quadrangle contains more than 22,000 elevation values. Those that contain the 7.5 minute series have more than 140,000 elevation values.

- *National Earthquake Information Center (NEIC*)
  Provides real time information on global seismic activity. Produces summaries of seismic magnitudes and frequencies at the local, regional and global scales. Establishes the magnitude, intensity, hypocenter, epicenter, P, S, L, and R wave arrival times, shadow zone, and diagrams of fault orientation and directions of compression and tensional forces.

9.1.3 Equipment resources and teaching and research materials

The Environmental Sciences Program presently has a GIS and Teledetection research laboratory equipped with:

eighteen (18) Dell Precision 370
one (1) Gateway 2000 486 MHz computer
one (1) Gateway 2000 486 P5-120 computer
four (4) Dell Optiplex GX 260 computers
two (2) Dell Precision 450
one (1) Dell PowerEdge SC 1420 server
two (2) portable Dell M70 workstations
one (1) portable Compaq Evo W 8000 workstation
one (1) ipaq pocket PC H5500

one (1) Dell Power Vault 122T backup
one (1) Dell Power Vault 725N storage unit
one (1) HP 755CM Color Plotter map printer
two (2) CalComp digitation tables
one (1) Roll Up III digitizer
licenses for programs such as ArcView, ArcInfo, IDRISI and others

It also has various equipment for field measurements, which include:

two (2) Bausch & Lomb Zoom Transfer Scopes
one (1) elevation measuring stereoscope (Cartographic Engineering Heightening Stereoscope)
one (1) mirror stereoscope (Cartographic Engineering SB-190 Mirror Stereoscope)
one (1) Wild ST-4 stereoscope
one (1) HydroLab Datasonde 4A probe for measuring multiple water parameters
one (1) SUTRON meteorological station (pinanometer, barometer, pluviometer, nanometer and thermometer)
four (4) Onset rain gauge pluviometers
water sampling equipment (bailers, pump sampler, dippers)
one (1) probe for determining soil humidity
various planimeters (Ushikata and others)
one (1) Zeiss level with tripod
one (1) instrument for granulometric analysis, including sieves
one (1) conductivity meter
four (4) GPS XR Surveyor systems
two (2) GPS GeoExplorer II
two (2) GPS GeoExplorer III
one (1) laser rangefinder
one (1) ORION Model 290ª portable pH meter
one (1) YSI Model 85 dissolved oxygen, conductivity, salinity, and temperature portable meter
one (1) HF Scientific Model DRT-15CE portable turbidity meter
one (1) digital current instrument for water flow measurements
one (1) YSI-52 dissolved oxygen meter

The Program also has an wide collection of topographic, geological, and hydrological maps of the Island, aerial photos, rock collections, and other material that can be used in the Program's courses and research projects.

Due to the Program's interdisciplinary nature, Environmental Sciences graduate students will have access to research equipment available in laboratories and departmental facilities assigned to researchers that will be supervising students' thesis and dissertation research. This allows our graduate students to have access to various facilities and instruments of the Biology Department and the Institute for Tropical Ecosystem Studies, such as: ecology and environmental microbiology laboratories, the facilities at the El Verde Field Station, stereoscopes, computers, digitations table, fluorescence microscopes, electrophoresis equipment, and scintillation counters, among others.

They will also have access to various instruments in the Chemistry Department, among which are spectrophotometers and fluorimeters, gas chromatography and mass spectrometer (GC/MS) systems, high pressure liquid chromatography (HPLC) systems, photolysis systems, infrared and nuclear magnetic resonance spectrophotometers for using the Fourier transformed technique (FT-IR y FT-NMR) with different resolutions and spin electron resonance spectrometers (ESR), among others.

9.2 Improvement plan

9.2.1 Improvement of library resources

The Program's interdisciplinary nature impacts resources located in the José M. Lázaro library's document and map collection, and the Graduate School of Planning, Medical Sciences campus and Mayagüez libraries.

Throughout the past years, the library at the College of Natural Sciences has increased the collection of basic environmental sciences references in response to the requirements of the current undergraduate degree. However, recent evaluation of the available references shows a need for an update of these sources.

In order to support the curriculum and research carried out in the new Environmental Sciences Graduate Program, an in-depth development of the available collections responding to the Program's needs is necessary. The collection must also respond to the master's and doctoral students' needs. A strategic plan for development, expansion and updating of the current printed matter and electronic collections related to the proposed curricular areas is recommended. This requires purchase of books,

professional journals and databases which implies the need for recurrent funds which would allow for this continuous purchase and updating.

Collection development requires consideration of the following aspects:

Expansion of the collection's subject areas based on the new curriculum and research emphasizing areas such as spatial analysis, sustainable development and management, environmental models, tropical regions and environmental chemistry and ecology.

A 300% increase in monographic resources in order to enrich the available resource collections and contribute to their updating.

Strengthen the professional journal collection thereby providing the necessary resources for carrying out research in the new graduate program. Titles currently unavailable and which are considered necessary for the graduate curriculum include: *Acta Aecológica, Acta Oecologica: International Journal of Ecology, Aquatic Botany, Biochemical Systematics and Ecology, Biological Conservation, Ecological Entomology, Ecological Modeling, Ecological Research, Ecotoxicology and Environmental Safety, Ecoscience, Environmental Biology Fishes, Environmental & Ecology Statistics, Environmental Entomology, Forest Science, International Journal of Geographical Information Science, Journal of Freshwater Ecology, Marine Environmental Research, Tropical Ecology,* and *Tropics*.

Update, expansion and subscription maintenance in response to the proposed graduate program's needs requires purchase of books, professional journals and databases emphasizing in environmental spatial analysis, pollution, sustainable development and management, environmental system modeling and subjects related to islands and tropical regions. Electronic access to environmental databases such as Environmental Sciences and Pollution Management is also required.

9.2.2 Improvement of equipment and materials for teaching and research

The projected budget in this proposal includes funding for purchase of additional equipment for common use, as well as startup funds for initiation and strengthening of research the areas in air (meteorology and contaminant modeling and transport), hydrology(groundwater hydrology and contaminant transport) and marine sciences (coastal and marine geologic, geomorphologic, hydrologic and climatologic processes.

9.3 Other resource sources

The University of Puerto Rico, Mayagüez campus, has research facilities that could be used by the Program's graduate students and researchers. These include the Marine Sciences Department facilities on Magueyes Island for studying coastal, mangrove, and reef systems.

10. Physical facilities and equipment

10.1 Inventory of available facilities

The Environmental Sciences Program currently has a geology laboratory (C-229), a map laboratory (C-221), an earth sciences laboratory (C-234), and geographic information systems and teledetection laboratory (C-233). This laboratory has also been used for teaching the methods in spatial analysis courses. The College of Natural Sciences also has 27 classrooms and 2 amphitheaters in the New Natural Sciences building (Phases I and II). The numbering and capacity for each classroom is presented:

Room	Capacity	Use	Room	Capacity	Use
A-207	50	classroom	C-210	40	classroom
A-209	50	classroom	C-211	40	classroom
A-211	120	amphitheater	C-212	40	classroom
A-224	32	classroom	C-235	40	classroom
A-225	32	classroom	C-236	50	classroom
A-226	32	classroom	C-311	36	classroom
A-227	50	classroom	C-312	36	classroom
A-229	60	classroom	NCN-142	340	amphitheater
A-231	60	classroom	NCN-338	60	classroom
A-233	60	classroom	NCN-339	60	classroom
C-202	50	classroom	NCN-340	80	classroom
C-204	60	classroom	NCN-354	40	classroom
C-206	60	classroom	NCN-355	40	classroom
C-208	24	tutoring room	NCN-356	40	classroom
C-209	28	classroom	NCN-357	40	classroom

Table 5 Research facilities

Facilities	Laboratories
Animal House	Advanced Materials Research Lab (SPECLAB)
Botanical Garden	Agricultural Experimental Station
Center for Educational Production Services	Botanical Garden
Computing Center	Center for Applied Tropical Ecology and Conservation (CREST-CATEC)
Electronics Workshop	High Performance Computing Facility (HPCF)
Field House at El Yunque	Institute for Tropical Ecosystem Studies (ITES)
Greenhouse	El Verde Field Station
Herbarium	Laboratory for the Design of Sequences and Codes
Instrumentation Workshop	Luquillo Experimental Forest
Machining Workshop	Materials Characterization Center
Natural Sciences Library	Tropical Community Ecology Laboratory

Zoology Museum	
Glass Blowing Workshop	

10.2 Impact of the new Program on existing physical facilities

10.2.1 Space for offering courses

The proposed Program entails the creation of 29 new courses. Four of them do not require assignment to a particular classroom (CIAM 6999-Master's research, CIAM 6896-Master's Thesis Continuation, CIAM 8999-Doctoral Research and CIAM 8896-Doctoral Thesis Continuation), and another (CIAM 8225 –Methods in Spatial Analysis) will be offered for the moment in the Geographic Information Systems Research Laboratory. The remaining courses will be offered in the existing facilities on alternate semesters. The semester programming for the courses (after the first year) is projected as follows:

First semester

CIAM 6115 The Terrestrial Environment
CIAM 6117 The Coastal Environment
CIAM 6235 Remote Sensing I
CIAM 8205 Seminar on Topics in Environmental Modeling and Spatial Analysis I
CIAM 8225 Methods in Spatial Analysis
CIAM 8257 Techniques for Construction of Environmental Models
CIAM 8405 Seminar on Topics in Sustainable Management of Islands and Tropical Regions I
CIAM 8425 Environmental Geology
CIAM 8435 Environmental Hydrology
CIAM 8545 Environmental Noise
CIAM 8765 Environmental Impact Evaluation
CIAM 8845 Natural Dangers in Tropical Regions
CIAM 8901 Graduate Seminar I

Second semester

CIAM 6116 Tropical Ecosystems
CIAM 6118 The Urban Environment
CIAM 6256 Methods for Statistical Analysis of Environmental Systems
CIAM 8206 Seminar on Topics in Environmental Modeling and Spatial Analysis II

CIAM 8236	Remote Sensing II
CIAM 8345	Ecology of Island and Tropical Region Landscapes
CIAM 8406	Seminar on Topics in Sustainable Management of Islands and Tropical Regions II
CIAM 8445	Environmental Meteorology
CIAM 8775	Waste Management and Disposal
CIAM 8785	Energy Generation
CIAM 8902	Graduate Seminar II
CIAM 8990	Special Topics in Environmental Sciences

Based on the previous program, 13 periods of 1.5 hours offered twice a week will be the required use of classrooms for the first semester and 12 periods of 1.5 hours twice a week will be required for the second semester. Based on current space availability, we understand that this will not represent a major problem in the College of Natural Sciences.

Table 7 shows the projected course registration for the Program's first five years based on the revised expected annual registration of nine master's degree students and twelve doctoral students divided equally within the emphasis areas. These revised numbers reflect the experiences of the existing chemistry and biology graduate programs. As shown below, the required funding for these course sections has already been assigned.

TABLE 7 Projected course registration

	Academic year				
Admitted students	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
MS Sustainable management	3	3	3	3	3
MS Modeling	3	3	3	3	3
MS Interdisciplinary	3	3	3	3	3
PhD Sustainable management	4	4	4	4	4
PhD Modeling	4	4	4	4	4
PhD Interdisciplinary	4	4	4	4	4

		COURSE		2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
1st year	1st sem	CIAM6115	Terrestrial Environment	21	21	21	21	21
		CIAM6117	Coastal environment	21	21	21	21	21
		CIAM6235	Remote Perception I	14	21	21	21	21
		CIAM8901	Graduate Seminar I	21	21	21	21	21
	2nd sem	CIAM6116	Tropical Ecosystems	14	21	21	21	21
		CIAM6118	Urban Environment	21	21	21	21	21
		CIAM6256	Statistical Analysis	21	21	21	21	21
		CIAM8902	Graduate Seminar II	21	21	21	21	21
2nd year	1st sem	CIAM8425	Environmental Geology	0	7	7	7	7
		CIAM8435	Environmental Hydrology	0	7	7	7	7
		CIAM8225	Spatial Analysis Methods	0	7	7	7	7
		CIAM8257	Model Construction	0	7	7	7	7
		CIAM8405	Sustainable Management Seminar I	0	4	4	4	4
		CIAM8205	Spatial Analysis Seminar I	0	4	4	4	4
	2nd sem	CIAM8445	Meteorology	0	4	4	4	4
		CIAM8406	Sustainable Management Seminar II	0	4	4	4	4
		CIAM8236	Remote Perception II	0	4	4	4	4
		CIAM8206	Spatial Analysis Seminar II	0	4	4	4	4

10.2.2 Space for offices and research laboratories

The Environmental Sciences Program has an administrative office, where the Program's administrative assistant and secretary work, and a professor's office assigned to Dr. Ríos. In order to have the necessary space for the recruited professors, as well as those

working part time, a total of five new offices are required. Three of these will be assigned to newly recruited professors, one to those professors offering part time services and an additional one for visiting professors.

Adequate laboratory space for each of the recruited professors is also required. An essential part of the academic tasks of these professors with specialties in the areas of air quality (meteorology and contaminant modeling and transport), hydrology (groundwater hydrology and contaminant transport) and marine sciences (coastal and marine geologic, geomorphologic, hydrologic and climatologic processes (refer to section 8.2) will be to conduct research in their areas, therefore, space availability is extremely necessary and urgent.

Assignment of these office and research spaces is important for the recruitment of full time researchers who will be part of the permanent Environmental Sciences Program faculty members.

In addition, the various department directors at the College of Natural Sciences, in a letter addressed to the College's Dean, agreed to allow environmental sciences graduate student's equal access to the research laboratory facilities available to their program's graduate students.

10.3 Need for and availability of computer services for the new Program

10.3.1 Available computer services and facilities

As was mentioned in Section 9.1.2, the Environmental Sciences Program currently has a Geographic Information and Teledetection Systems Research Laboratory with the computer equipment detailed in that section.

10.3.2 Needs for computer service and facilities

The Program currently has the necessary equipment for teaching and supervision of graduate research by Dr. Ríos. As the need increases on the part of newly recruited professors, additional equipment would be purchased with the projected funds for initiating research and for purchase of common use equipment (refer to Section 14.1.1 and those following).

10.4 Other available facilities, equipment, and services

Graduate students and researchers in the Environmental Sciences Graduate Program will also have access to the Computer Center of the College of Natural Sciences. This Center has computers, and electronic and distance education classrooms that can be used for conferences and workshops.

10.5 Copies of required permits for use of physical facilities

The Río Piedras campus has permits for the physical installations that would be used by the Program. Copies of these permits are in Appendix G.

11. Program accreditation and licensing

According to the regulations of the University of Puerto Rico's, proposed programs must have the approval of the Río Piedras campus and the University of Puerto Rico's Central Administration academic authorities before beginning. None of the Programs require accreditation by professional associations for the graduates to carry out the functions related to their corresponding degrees once conferred.

12. Administration of the new Program

The Environmental Sciences Graduate Program will be affiliated with the Environmental Sciences Program of the College of Natural Sciences at the Río Piedras campus. As such, its director will be the Graduate Program's director. The Program will also have a Graduate Program Coordinator and a Graduate Affairs Committee.

12.1 Functions of the Graduate Program Coordinator

The Graduate Program Coordinator will be in charge of keeping student files up to date, advising students on the registration process, apply the current regulations and current policies in cases when they can be directly applied, coordinate the dates for the qualifying exams and defense of students' theses, dissertations, and proposals, and other tasks inherent to the position. Because of the time needed for these tasks, the Coordinator will have three credits of academic release time or a three credit compensation.

12.2 Functions of the Graduate Affairs Committee

The Graduate Affairs Committee will be in charge of evaluating the admission applications and recommending students for admission to the Graduate Program, evaluating each semester the performance of the students in the Program, and

considering special situations and requests that may occur. This Committee, whose Director will be an *ex-officio* member, will be composed of the Program Coordinator and by three members of the Program's graduate faculty (refer to Section 8.1.1) representing the three subspecialty options, so that each is represented in the Committee. The Graduate Affairs Committee will establish a uniform evaluation procedure for the participation of faculty members which were not included in the list approved by the UPR-RP Academic Senate. Evaluations will also be carried out by the Committee. Professors to be named as Adjunct Faculty members in the graduate program will be evaluated according to the Board of Trustees' 1996-1997 Certification 024.

13. Graduate students

13.1 Student participation

Student participation in institutional processes is essential to guarantee effective communication between the components of the university's community. Similar to what already occurs with the Environmental Sciences undergraduates, graduate students will have representation in the Natural Sciences Student Council, as well as at Natural Sciences Faculty meetings, and those of the Environmental Sciences Program.

13.2 Student Financial Aid

Similarly to what occurs in graduate programs in other departments, the Environmental Sciences Graduate Program will apply for PAS funds from the Graduate Affairs and Research Dean's Office to cover stipends for some students to provide services as teaching assistants in laboratories and undergraduate courses in the Environmental Sciences Program or in other programs in the College of Natural Sciences of the campus. In addition, the Graduate Program's researchers will be required to submit proposals requesting external and institutional research funds which include funds for graduate student stipends.

In this way, students registered full time in the Environmental Sciences Master's program will be eligible to receive financial aid from:

- Teaching assistantships equivalent to 18 hours (6 contact hours) of academic tasks.

- Research assistantships from funds available from PAS, FIPI, and other institutional research programs.

- Research assistantships from federal governmental agencies (NASA, EPA and others), or other research projects subsidized by external sources.

- Federal, state, or private scholarships for graduate studies

The IGERT project was mentioned previously for 25-30 doctoral student aids. These student aids include a 30,000 annual stipend, money for tuition and research as well as office facilities and materials.
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14. Fiscal Resources: Budget

14.1 Detailed budget for the first year of operation

During the proposed Program's first year of operation, funding will be required to cover payment of faculty salaries and other services affiliated with the Program; compensations to personnel affiliated with other departments, programs, and institutes that will be responsible for teaching some of the graduate courses; purchase of library resources; funds to begin research projects; faculty trips; purchase of research equipment and materials, and to strengthen graduate teaching. The projected budget, based on these items, is detailed as follows:

14.1.1 Actual and projected budget for the first year

The detailed budget presented summarizes the needs for the first year of Program operation. The current budget includes recurrent assigned funds from the General Fund in addition to the expected yearly salary increases. The budget for the first year is broken down as follows:

14.1.1 Current and first year projected budget

	Current	**Year 1**
Current faculty personnel:		
Director (R. Rios))	$101,616	$106,697
Bonus $700/month	$700	$1,000
Full professor	$74,184	$77,893
Faculty personnel to be hired:		
3 Auxiliary professors with Ph.D.	$0	$187,110
Current Administrative personnel:		

Admin. Assistant	$34,980	$36,729
Adm. Secretary III	$32,880	$34,524
Non-faculty technical personnel:		
Spatial Analysis Center coordinator	$43,620	$45,801
Salary Total	**$287,980**	**$489,754**
Fringe Benefits	$130,455	$221,859
This sum includes employer's contribution to Social Security, Medicare, "Fondo del Seguro del Estado", Unemployment Insurance and Retirement (for an estimated total of 24.20% of the total salaries). It also includes the Christmas bonus and employer's contribution to the Medical Insurance Plan. It also includes 9.2% of compensations.		
Academic compensations		
Six compensations per semester at $1,968/compensation/ semester or 12 compensations a year	$23,616	$24,797
Graduate Program Coordinator Compensation		
(six 3 credit compensations)	$0	$11,808
Teaching and Research Assistantships (6 for year 1,		
10 after year 2 and beyond)	$0	$72,000
10 students x $1,000/month/12 months		
Funds for invited speakers (6 x $1,750)	$0	$10,500
Library resources	$0	$100,000
Materials	$10,205	$30,000
Equipment maintenance	$0	$0
TOTAL	**$452,256**	**$960,717**

14.1.2 **First year budget justification**

Salaries. The projected budget for the first year represents an $ 111,446 increase over the current budget. A major portion of this increase is due to the hiring of one new faculty member and the projected salary rises for regular personnel. It has been projected that the recruited professors would receive a salary corresponding to an Associate Professor with a Ph.D. ($62,168/year).This professor will work actively in both research and teaching in the areas of meteorology or hydrogeology, depending on the program's current recruiting. The recruitment process could begin during the 2007-2008 academic year.

Fringe benefits. Included fringe benefits are those required by law and by agreements obtained for both faculty and administrative personnel. These are the employer's contribution to Social Security, Medicare, "Fondo del Seguro del Estado",

Unemployment Insurance, and Retirement (for an estimated total of 24.20% of the total salaries for permanent positions, 9.2% of contract services and compensations and 1.55% for student's payment). It also includes the Christmas bonus and the employer's contribution to the Medical Insurance for regular personnel. The projected budget represents a $32,886 increase corresponding to salary rises for the program's personnel.

Academic compensations. The projected budget includes a portion destined to cover the costs of additional academic compensations required for payment of professors from other departments, programs or institutes. Currently the undergraduate program hires six professors not affiliated to the program each semester for some of the program's offered courses. Each professor receives a $ 1,968 compensation for each 3 credit course. Since 12 undergraduate courses are offered in this manner, this item of expenditure represents a total of $23,616 a year. the undergraduate program's academic compensation budget remains the same. Newly recruited professors will be teaching at the graduate level, therefore no additional compensations are required.

Coordination compensation. The projected budget includes a compensation for Graduate Program Coordination calculated based on a nine credit release, which is equivalent to three-3 credit compensations each semester ($1,198/3 credit compensation/semester) or $11,808 each year.

Assistantships. The creation of the Graduate Program also requires the assignment of funds for teaching assistantships. A total of 6 assistantships have been projected during the first year and 10 for subsequent years. These students will work as assistants in the laboratories for environmental sciences undergraduate courses, as well as for physical geology, land use and management, geographic information systems, remote sensing, techniques for environmental management and conservation, among others. Since students admitted to the Program are expected to have specialized in different natural sciences areas, we consider that many of them would be eligible for teaching assistantships in departments of their undergraduate major. This would also alleviate the lack of teaching assistants in some departments at the College of Natural Sciences.

Funds for invited speakers and visiting professors. The Graduate Seminar course requires funding for the travel and lodging expenses of approximately 6 visiting speakers per year.

Library resources. The projected budget includes funds for acquiring additional library resources with an assigned $100,000 during the first year which would allow access to the ENVIRONMENTAL SCIENCE AND POLLUTION MANAGEMENT database, purchase of new books and subscription to new journals in order to increase the collection and services in the environmental sciences area at the College of Natural

Sciences library. Distribution of funding for journals and books will vary according to the increases in annual journal subscription rates, which tend to annually increase by approximately 5%.

Materials. The current assignment for materials ($10,205) covers office and undergraduate teaching materials cost. In order to strengthen graduate teaching and research, as well as cover the initial needs generated by the new Program, an assignment of an additional $19,795 in funds during the first year has been projected for the purchase of educational and research materials (programs, maps, satellite images, etc.) for the graduate program.

Equipment maintenance. The assignment corresponds to $5,000 upon the third year in order to maintain and replace equipment. Maintenance assignments are project to annually increase by approximately 5%.

14.2 Budget for operational costs during the second and third years

The projected budget to cover operation costs of the Program's second and third year are presented below. As can be seen, it is assumed that the recruited professors have been hired, and that there are mostly recurrent costs. Projected faculty and administrative personnel salaries include a 5% increase over the previous year's base salary. The number of teaching assistants increases from 6 to 10 therefore increasing costs for this item. Justification of the projected expenses is the same as for the previous year.

	Year 2	**Year 3**
Personnel salaries:		
Current faculty personnel:		
Director R Rios	$112,032	$117,633
Bonus $1000/month	$1,000	$1,000
Current faculty personnel:		
Full professor	$81,788	$85,877
Faculty personnel to be hired:		
3 Auxiliary Professors with Ph.D.	$196,466	$206,289
Current administrative personnel:		
Admin. Assistant	$38,565	$40,494
Adm. Secretary III	$36,250	$38,063
Non-faculty technical personnel to be hired:		
Spatial Analysis Center Coordinator	$45,801	$48,091
Salary Total	$514,192	$539,901
Fringe benefits		

This sum includes employer's contribution to Social Security, Medicare, "Fondo del Seguro del Estado", Unemployment Insurance and Retirement (for an estimated total of 24.20% of the total salaries) for 7 employees. It also includes the Christmas bonus, employer's contribution to the Medical Insurance Plan and 9.2% of compensations.	$233,929	$244,575
Academic compensations Six compensations per semester at $1,968/compensation/ semester or 12 compensations a year	$26,037	$27,338
Compensation for Graduate Program Coordination *(six 3 credit compensations)*	$12,398	$13,018
Teaching and Research Assistantships (10 students at $1,000/ Month/student x 12 months)	$120,000	$120,000
Funds for invited speakers (6 x $1,750)	$10,500	$10,500
Library resources	$100,000	$100,000
Materials	$30,000	$30,000
Equipment maintenance	$5,000	$5,250
TOTAL	$1,051,056	$1,090,583

14.3 Projected five year budget

Budget Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Salaries	$489,754	$514,192	$539,901	$566,896	$595,241	$2,705,985
Fringe benefits	$221,859	$232,929	$244,575	$256,804	$269,644	$1,225,811
Academic compensations	$24,797	$26,037	$27,338	$28,705	$30,141	$137,018
Graduate Program Coordination	$11,808	$12,398	$13,018	$13,669	$14,353	$65,247
Teaching Assistantships	$72,000	$120,000	$120,000	$120,000	$120,000	$552,000
Materials	$30,000	$30,000	$30,000	$30,000	$30,000	$150,000
Equipment and Maintenance	$0	$5,000	$5,250	$5,513	$5,788	$21,551
Invited Speakers	$10,500	$10,500	$10,500	$10,500	$10,500	$52,500

Library Resources	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
Total	**$960,717**	**$1,051,056**	**$1,090,583**	**$1,132,088**	**$1,175,667**	**$5,410,511**

This budget would be totally provided by institutional funds. Recruitment of three professors during the first year is required. Once the Program is in operation, it is expected that these professors submit proposals for external funding agencies to subsidize their research projects.

It is important to point out that the cost to only establish a Master's program would be practically the same as establishing both Master's and Doctoral programs, since a substantial portion of the budget is associated with salaries for both faculty and non-faculty personnel to be recruited, and expenses related to initiating research. The nature of this graduate program is interdisciplinary. Therefore, all personnel are indispensable even for the Master's Program.

In addition, the cost per student for the proposed Program is approximately half the cost calculated for graduate students in the Chemistry and Biology programs. This difference responds to the fact that some of the proposed Program's courses would be covered by academic compensations to faculty members affiliated with other departments.

The determination of cost per student was done taking into account the salaries of affiliated faculty and non-faculty personnel and the total of students affiliated with these programs. In the case of the Environmental Sciences Graduate Program, a stable registration of 100 students was projected after five years of having established the Program. A comparative table of these numbers is presented here:

COST PER STUDENT IN NATURAL SCIENCES GRADUATE PROGRAMS			
GRADUATE PROGRAM	**BIOLOGY***	**CHEMISTRY***	**ENVIRONMENTAL SCIENCES**
FACULTY PERSONNEL AFFILIATED WITH THE GRADUATE PROGRAM	23 professors	19 professors	7 professors + compensations
NON-FACULTY PERSONNEL AFFILIATED WITH THE GRADUATE PROGRAM	4	7	3
TOTAL YEARLY SALARIES	$1,295,268	$1,225,284	$625,382 (including compensations)
TOTAL GRADUATE STUDENTS	115	124	100** (estimated)
COST PER GRADUATE STUDENT	**$11,263**	**$9,881**	**$6,254**

* Information provided by the Biology and Chemistry Departments.
** It is estimated that after five years (after the first Doctoral graduating class) registration will stabilize at approximately 100 graduate students.

15. Income

Besides income related to registration, program faculty members or those affiliated to other departments, programs and institutes mentioned in this proposal also have research funds from external funding agencies. These include the *Environmental Protection Agency (EPA)*, the *National Science Foundation (NSF)*, the *National Aeronautics and Space Administration (NASA)*, the *National Institutes of Health (NIH)*, the Department of Natural and Environmental Resources (locally, the DRNA) and others. In addition, many newly recruited professors bring research funds with them. Also, after the second year after being hired, these new professors will be required, to the extent possible, to sustain their research projects by proposals submitted to external funding agencies.

16. Evaluation

16.1 Program evaluation

In compliance with the guidelines from the Vice presidency of Academic Affairs and Research, a five year plan has been elaborated to guarantee development and strengthening of the proposed new Programs. This plan, called the Strategic Plan for Strengthening the Master's and Doctoral Programs in Environmental Sciences, is included as part of the appendixes.

As established in this plan, and according to the requirements of Certification 72 (1991-92) of the Academic Senate of the Río Piedras campus, after five years of beginning the Graduate Program, it will be extensively evaluated with participation of external evaluators. This evaluation will include formative and summative components. By means of the formative component, it will be determined if:

- The Program's promotion has been effective and successful.
- Personnel recruitment in the Program's required areas was achieved.
- Interested students were able to complete the procedures for admission on time.
- The courses are being offered as projected in the proposal.
- Students consider that orientation received is adequate.
- Recruited professors have achieved the steps necessary to establish research programs.

These points will be evaluated through questionnaires, through an analysis of the state of the Program after the first year of course offerings, and by interviews with professors and students.

By means of the summative component, after five years of creating the Program, in other words, once the first Master's and Doctoral classes have graduated, its effectiveness will be evaluated and the accomplishment of some of the specific objectives detailed in section 5.1 of this proposal will be evaluated. This component will have the purpose to determine:

- The academic progress of the Program's students.
- The retention percent of the first class, and the reasons why some could not have complete their studies.
- The time it took the students to complete their degrees**.**
- The effectiveness of professors in developing and strengthening research areas and obtaining external funding to subsidize their research.
- Student's contributions, through their thesis work, to the solution of the Island's problems.
- The number of scientific publications in peer reviewed journals
- The number of scientific presentations by student and Program faculty members.
- The collaboration agreements that have been established between the Program and government or communities, with other departments or Programs on campus, or with other universities or research centers.

After ten years of having creating the Program, the following will also be evaluated:

- Placement of the Program's graduates once they have completed their studies and entered the work force.
- The adequacy of the Program's courses based on evaluation by graduates and their employers.
- The retention percentage of the first five classes, and the possible relation between student retention and general grade point average at admission, grade point average in science at admission, grades on qualifying exams, the institutions of origin, majors for the Bachelors degree, employment status while a student (an employee studying part time or full time, teaching assistant, research assistant and others), area of research, among others.

16.2 Student assessment plan

A preliminary version of the Student Assessment Plan is presented in Annex K.

APPENDICES

APPENDIX A: REPORTS AND GRAPHS ON ALUMNI

4. Summary of data obtained from a study of alumni concerning graduate studies.
5. Percent of Environmental Sciences Program graduates that replied to the alumni study.
6. Alumni that replied to the questionnaire who carried out studies subsequent to the Bachelors degree.
4. Graduate studies carried out by the Environmental Sciences Program alumni that replied to the questionnaire.
5. Institutions of higher education where Environmental Sciences Program alumni who replied to the questionnaire completed their graduate studies.
6. Environmental Sciences Program alumni who replied to the questionnaire and were interested in pursuing graduate studies.

APPENDIX B: DEGREE REQUIREMENTS FOR EACH OPTION OF THE MASTER'S AND DOCTORATE IN SCIENCES WITH A SPECIALIZATION IN ENVIRONMENTAL SCIENCES

APPENDIX A: REPORT AND GRAPHS ON ALUMNI

APPENDIX B: DEGREE REQUIREMENTS FOR EACH OPTION OF THE MASTER'S AND DOCTORATE IN SCIENCE WITH SPECIALIZATION IN ENVIRONMENTAL SCIENCES

APPENDIX C: COURSES COMMON TO THE DIFFERENT OPTIONS

APPENDIX D: ORGANIZATION CHART FOR THE COLLEGE OF NATURAL SCIENCES AND GRADUATE PROGRAM IN ENVIRONMENTAL SCIENCES

APPENDIX E: PROPOSALS FOR NEW COURSES

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "The terrestrial environment"

2. **Suggested codification:** "CIAM 6115"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Admission to the Environmental Science Graduate Program. Field trips on Saturdays or Sundays.

5. **Course description:** Study of the geological, geomorphological, hydrological, and climatic processes in mountainous, alluvial, and karst regions characteristic of islands and tropical regions. The focus is on the study of the impacts of human activity, environmental problems resulting from that activity, and strategies to promote a sustainable development of the studied regions. Topics are discussed and analyzed in the context of the general theory of systems using the watershed as the study unit.

   Descripción del curso: Estudio de los procesos geológicos, geomorfológicos, hidrológicos y climatológicos de la regiones montañosas, aluviales y cársticas características de islas y regiones tropicales. Se focaliza en el estudio del impacto de las actividades humanas, los problemas ambientales producto de dichas acciones, y las estrategias para promover un desarrollo sostenible de las mismas. Los temas se discuten y analizan dentro del contexto de la teoría general de sistemas usando la cuenca hidrográfica como unidad de estudio.

6. **Course objectives:**

   Upon passing the course the student will be able to:

   1. Identify, describe, analyze and predict changes in the different components of the terrestrial environment in tropical systems using the watershed as the study unit.

2. Analyze interrelations between the diverse geologic and hydrologic subsystems, and their importance in regulating biogeochemical cycles.
3. Analyze patterns of environmental changes and their effect on different components of the watershed, as well as the effects of changes in energy and matter fluxes as the result of human activities.
4. Identify, describe, and analyze the environmental consequences of different human activities in diverse physiographic regions, including tropical mountain systems, karst regions, and areas with plains and of low relief.
5. Analyze, discuss, and propose strategies for sustainable development of natural and environmental resources in different tropical terrestrial environments.

- *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I Introduction to the tropical terrestrial environment	1.5 hours
II Watershed as a unit for the environmental analysis	3.0 hours
III Environmental components of the watershed a. Mountain or slope system b. Fluvial system c. Hydrogeological system d. Biological system	6.0 hours
IV Mountain or slope system a. Form, formation processes, and function b. Quantitative analysis of physical processes of the mountain region c. Process of environmental change d. Impacts of human activities on the mountain system e. Sustainable management strategies for mountain systems	6.0 hours
V Fluvial system a. Form, formation processes, and function b. Quantitative analysis of physical processes of the fluvial region c. Processes of environmental change d. Impacts of human activities on the fluvial system e. Sustainable management strategies for fluvial systems	6.0 hours
VI Karst system a. Form, formation processes, and function b. Quantitative analysis of physical processes of the karts region c. Processes of environmental change d. Human activity impacts on the karst system e. Sustainable management strategies for karst systems	6.0 hours
VII Low relief system a. Form, formation processes, and function b. Quantitative analysis of physical processes of the low relief region c. Processes of environmental change d. Impacts of human activities on the low relief system e. Sustainable management strategies for low relief systems	6.0 hours

VIII	Integrative analysis of terrestrial systems	7.5 hours
IX	Research paper presentation	3.0 hours
Total Hours		**45 – equivalent to 3 credits per semester**

8. Instructional strategies: Conferences, field trips and research project.

1. *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. Minimal resources available or required: Field trip transportation

10. Strategies for evaluation:

Partial exams (3)	45%
Final exam	15%
Research project	40%

Attendance at field trips is essential for passing the course.
**Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: DeBarry, P. A. 2004. Watersheds: Processes, Assessment and Management. Wiley.

13. Bibliography:

1. Ford, D. C. and P. Williams. 2007. Karst Hydrogeology and Geomorphology. Wiley.
2. France, R. L. 2005. Introduction to watershed development: Understanding and managing the impacts of sprawl. Rowman and Littlefield Publishers.
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1. Brown, A.G. and T. Quine. 1999. Fluvial Processes and Environmental Change. John Wiley & Sons.
2. Lal, R. 1999. Integrated Watershed Management in the Global Environment. Soil and Water Conservation Society. CRC Press.
3. Reimold, R. J. 1998. Watershed Management: Practice, Policies and Coordination. McGraw Hill.
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3. www.mountainecology.org/
4. http://www.enviroliteracy.org/
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6. www.cwp.org/
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10. http://www.karstconservancy.org/

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Tropical ecosystems"

2. **Suggested codification:** "CIAM 6116"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, corequisites and other requirements:** Admission to the Environmental Science Graduate Program. Field trips on Saturdays or Sundays.

5. **Course description:** Study of the characteristic ecosystems of island and tropical regions and their spatial distribution. The interactions among different biotic and abiotic components within these ecosystems, as well as the impact of natural processes and human activities on them are examined in a systematic manner.

Descripción del curso: Estudio y distribución espacial de los ecosistemas característicos de islas y regiones tropicales. Se examina de forma sistemática la interacción entre los distintos componentes bióticos y abióticos de dichos ecosistemas, así como el impacto de los procesos naturales y de las actividades humanas sobre los mismos.

6. **Course objectives:**

Upon completing the course the student will be able to:

1. Explain the natural processes that promote the formation of the ecosystems of islands and tropical regions.
2. Explain the factors that determine the spatial distribution of ecosystems of islands and tropical regions ecosystems.
3. Analyze the function of each of the biotic and abiotic components within these ecosystems and the interactions among these components.
4. Predict the potential impact of climatic changes, and of changes in composition, and relative proportion of components of these ecosystems.

5. Analyze the impacts of diverse natural and anthropogenic processes on tropical ecosystems.

* *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I Principles of tropical ecology	1.5 hours
II Tropical ecosystems: components, structure, and dynamics	7.5 hours
III Soil, nutrients, and biogeochemical cycles	3.0 hours
IV Ecological succession and evolutionary patterns	3.0 hours
V Components of and threats to biodiversity	3.0 hours
VI Island biogeography	3.0 hours
VII Biological interactions	1.5 hours
VIII Population conservation	1.5 hours
IX Ecological communities, biological populations, and demographic patterns	3.0 hours
X Ecology of disturbed sites: effects of major and minor disturbances on species succession and regeneration	3.0 hours
XI Carrying capacity, population size, and management	1.5 hours
XII Application of quantitative methods for systems analysis	3.0 hours
XIII *Ex-situ* and *in-situ* strategies for species conservation and their applications	3.0 hours
XIV Rehabilitation of species and habitats	3.0 hours
XV Resource management and sustainable development	3.0 hours
XVI Political and economic aspects of conservation	1.5 hours
XVII Research project	-
Total hours	**45 – Eqivalent to 3 credits per semester**

8. Instructional strategies: Lectures, field trips and field measurements.

- *Arrangements will be done to provide accommodation for disabled students upon request.*

9. Minimal resources available or required: Transportation for field trips.

10. Strategies for evaluation:

Partial exams (3)	60%
Final exam	20%
Research project	20%

Assistance to field trips is essential for passing the course.

** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: Osborne, P. L. 2000. Tropical Ecosystems and Ecological Concepts. Cambridge University Press. (Suggested by Dr. Nick Brokaw).

13. Bibliography:

1. Park, C. 2007. A Dictionary of Environment and Conservation. Oxford University Press.
2. De Jong, W., D. Donovan, and K. Abe. 2007. Extreme Conflict and Tropical Forests. Springer-Verlag.
3. NInan, K. N., and C. Perring. 2007. The Economics of Biodiversity Conservation. Earthscan.
4. Borgerhoff Mulder, M., and P. Coppolillo. 2005. Conservation: Linking Ecology, Economics, and Culture. Princeton University Press.
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7. Montagnini, F., and C. F. Jordan. 2005. Tropical Forest Ecology: The Basis for Conservation and Management. Springer-Verlag.
8. Lonholdt , J. 2003. Environmental Management in the Tropics. IWA Publishing.
9. Pound, B., A. Braun, C. McDougall, and S. Snapp. 2003. Managing Natural Resources for Sustainable Livelihoods: Uniting Science and Participation. Earthscan.
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3. http://www.jstor.org/journals/02664674.html
4. http://www.ecologyandsociety.org/vol1/iss1/art3/
5. http://www.enviroliteracy.org/
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8. http://www.ctfs.si.edu

9. http://www.ots.ac.cr/es/
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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "The coastal environment"

2. **Suggested codification:** "CIAM 6117"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Admission to the Environmental Science Graduate Program. Field trips on Saturdays or Sundays.

5. **Course description:** Study of the ecology and processes (geological, geomorphic, hydrologic and climatic) of the coastal region, including the intertidal zone, surge zone, littoral zone, estuaries, reefs and others. The focus is on the study of the impact of human interactions on this environment, environmental problems associated with these interactions, and strategies to promote sustainable development in these regions.

   Descripción del curso: Estudio de la ecología y los procesos geológicos, geomorfológicos, hidrológicos y climatológicos de la región costera, incluyendo la zona marítimo-terrestre, la zona de la marejada, la zona litoral, estuarios, arrecifes y otros. Se focaliza en el estudio del impacto de las interacciones humanas sobre dicho ambiente, los problemas ambientales producto de dichas interacciones, y las estrategias para promover un desarrollo sostenible de dichas regiones.

6. **Course objectives:**

   Upon passing the course the student will be able to:

   1. Understand and explain the factors that determine the morphology and geomorphology of the coastal region. Analyze the factors that determine the processes of accretion and erosion in these zones.
   2. Explain the variation in particle size found at the coast, in beach sediments, and

in other littoral zone sediments.

3. Understand and analyze how short and long term processes produce sea-level fluctuations, and the effect of human on these processes and fluctuations.
4. Explain the factors that cause the coastal surface waves, and its effect on morphology and profile of the coastline.
5. Understand the differences in properties, composition, function, and ecosystems of the coastal, estuarine and oceanic zones, and analyze the impact of human activities on the quality of each of these systems.
6. Design planning strategies for the protection of coastal ecosystems and environments in tropical zones.

∗ *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I Coast structure a. Morphology b. Geomorphology c. Sedimentology d. Coastal profile	4.5 hours
II Coastal processes a. Coastal accretion processes b. Coastal erosion processes c. Impact of human activities on these those processes d. Sand budget	6.0 hours
III Global processes a. Sea level and tides b. Effects of global warming on sea level c. Changes in coastal equilibrium due to increases in sea level	4.5 hours
IV Processes associated with ocean waves a. Waves generation and propagation b. Wave analysis and prediction methods c. The effect of wave breakers on coastal processes	4.5 hours
V Coastal environments and ecosystems a. Beach ecosystem: Structure, flora, fauna, and function. b. Estuarine ecosystem: Structure, flora, fauna, and function. c. Reef ecosystem: Structure, flora, fauna, and function. d. Mangrove ecosystem: Structure, flora, fauna, and	12.0 hours

function.	
VI Impact of human activities on coastal environments a. Effects associated with tourism on the sea and coast. b. Effects associated with fishing. c. Effects associated with inadequate waste disposition.	4.5 hours
VII Strategies for management and planning for coastal zones.	9.0 hours
Total hours	**45 – equivalent to 3 credits per semester**

8. **Instructional strategies:** Conferences, field trips and field measurements.
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Transportation and measurement equipment.

10. **Strategies for evaluation:**

Partial exams (3)	75%
Final exam	25%

Attendance at field trips is essential for passing the course.
** Modified evaluation for students with special needs.*

11. **Grading:** A, B, C, D, F

12. **Suggested textbook:** Masselink, G. and M. Hughes. 2003. An Introduction to Coastal Processes and Geomorphology. Hodder Arnold.

13. **Bibliography:**

1. Hoanh, C. T., T. P. Tuong, J. W. Gowing, and B. Hardy. 2006. Environment and Livelihoods in Tropical Coastal Zones. CABI Publishing
2. Sindermann, C. J. 2005. Coastal Pollution: Effects on Living Resources and Humans (Marine Science Series.). CRC.
3. Pugh, P. 2004. Changing sea levels. Cambridge University Press.
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1. Mann, K. H. 2002.
2. Ecology of Coastal Waters with Implications for Management. Blackwell Science, Inc.
3. Kay, R. and J. Alder. 1999. Coastal Planning and Management. E & F N.
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5. http://www.onr.navy.mil/focus/ocean/regions/default.htm
6. http://www.epa.nsw.gov.au/beach/causes.htm
7. http://www.oceansatlas.org/index.jsp
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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Tittle:** **"**The Urban Environment"

2. **Suggested codification:** "CIAM 6118"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Admission to the Environmental Science Graduate Program. Field trips on Saturdays or Sundays.

5. **Course description** Study of cities from a systems perspective. Urban structure and function, city climate, urban ecology, the impact of the transportation system, energy generation, water distribution, disposal of used water and solid waste, and the impact human activities on environmental quality are examined. Issues in urban planning, green areas, natural risks, urban noise, distribution of poverty pockets, and aspects of environmental justice are considered. Strategies are discussed to improve the quality of life within cities and promote sustainable development.

   Descripción del curso: Estudio de la ciudad desde una perspectiva de sistema. Se examina su estructura y función, la climatología de ciudades y ecología urbana; el impacto ambiental de sistemas de transportación, generación de energía, distribución de agua, disposición de aguas usadas y desperdicios sólidos, y el impacto de las actividades humanas sobre la calidad del ambiente. Se consideran problemas de planificación urbana, áreas verdes, riesgos naturales, ruido urbano, distribución de bolsillos de pobreza, y aspectos de justicia ambiental. Se discuten estrategias para mejorar la calidad de vida en las ciudades y promover un desarrollo sostenible.

6. **Course objectives:**

   Upon completing the course the student will be able to:

6. Understand and analyze city structure and the patterns of population distribution within cities.
7. Analyze the spatial structure of the built environment over time, as well as the environmental, economic, and social implications of urban sprawl and other misteken planning decisions.
8. Analyze the spatial distribution and connectivity among components of the natural environment, its importance for the life quality for human inhabitants, and the preservation of wildlife characteristic of the urban environment.

9. Analyze the consequences of urban life in cities in terms of health, transportation, distribution of utilities and services, waste disposal, and other factors.
10. Design planning strategies for adequate management of the city and the urban environment, and for fair distribution of services and benefits to citizens.

* *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I The city a. Structure and function b. Population distribution patterns	4.5 hours
II The built environment a. Urban centers b. Suburban areas c. Urban sprawl d. Distribution of facilities and services	6.0 hours
III The natural environment a. Urban ecology b. Green areas c. Ecological corridors d. The natural environment in cities and its effect on quality of life e. City climatology	9.0 hours
IV Topics that should be attended to within the urban environment a. Distribution of potable water b. Electricity generation and distribution c. Used water disposal and treatment d. Rainfall drainage	12.0 hours

e. Cleaning of public areas f. Waste management and disposal g. Emissions generated by cars and other human activities h. Transportation systems i. Health problems related to high population densities j. Urban noise k. Exposure to natural hazards	
V Elements of social justice a. Access to services and facilities b. Pockets of poverty c. Uneven exposure to natural hazards d. Environmental justice	4.5 hours
VI Urban planning and sustainable development of cities	9.0 hours
Total hours	**45 – equivalent to 3 credits per semester**

8. **Instructional strategies:** Conferences and field trips.
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Transportation for field trips.

10. **Strategies for evaluation:**

Partial exams (3)	60%
Final exam	20%
Individual project	20%

Assistance to field trips is essential for passing the course.
** Modified evaluation for students with special needs.*

11. **Grading:** A, B, C, D, F

12. **Suggested textbook:** Wheeler, S. 2004. The Sustainable Urban Development Reader. Routledge (suggested by Dr. Gabriel Moreno).

13. **Bibliography:**

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2. Benfield, F. K., D. T. T. Chen, and M.D. Raimi. 1999. Once There Were Greenfields: How Urban Sprawl is Undermining America's Environment, Economy and Social Fabric. Natural Resources Defense Council .
3. Inoguchi, T., E. Newman, and G. Paoletto. 1999. Cities and the Environment: New Approaches for Eco-Societies United Nations Publications.
4. Leitmann, J. 1999. Sustaining Cities: Environmental Planning and Management in Urban Design. McGraw-Hill.

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7. http://www.epa.gov/urban/
8. http://www.iadb.org/
9. http://www.itdp.org/
10. http://www.unchs.org/
11. http://www.makingcitieswork.org/

15. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Remote Sensing I"

2. **Suggested codification:** "CIAM 6235"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Admission to the Environmental Science Graduate Program.

5. **Course description:** Theoretical and practical study of methods of analysis of land cover and land use based on satellite images. The physical laws necessary for studying teledetection, image capturing systems, image correction and classification, and interpretation of results are examined. A project is developed in which the student carries out an analysis to classify land cover and use satellite images of islands and tropical regions.

   Descripción del curso: Estudio teórico y práctico de metodologías de análisis de la cobertura terrestre y el uso de la tierra mediante imágenes de satélite. Se examinan las leyes físicas esenciales para el estudio de la teledetección, sistemas para la obtención de imágenes, corrección y clasificación de imágenes, e interpretación de resultados. Se desarrolla un proyecto donde el estudiante realiza un análisis para clasificar la cobertura y uso de la tierra usando imágenes de satélite de islas y regiones tropicales.

6. **Course objectives:**

   Upon passing the course the student will be able to:

   1. Understand the implications of the dual nature of electromagnetic radiation for systems of terrestrial observation.
   2. Understand the process of image capture using satellite and aerial sensors, and

explain the differences between them.
3. Apply geometric and radiometric corrections to images.
4. Modify images in order to optimize their information content.
5. Analyze an image to be able to obtain information on land cover or land use.
6. Calculate the error for classified images, and interpret results already published by other investigators.

∗ *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	Introduction to teledetection	1.5 hours
II	Laws and principles of radiation	4.5 hours
III	Imaging systems a. Terrestrial observation satellites b. Image sensors c. Image capture procedures d. Applications of different wavelengths	6.0 hours
IV	Images types a. Digital images b. Thermal images	3.0 hours
V	Image correction a. Geometric correction b. Radiometric correction	3.0 hours
VI	Images classification a. Supervised classification b. Non-supervised classification	4.5 hours
VII	Post-classification procedures a. Field data b. Changes in detection c. Accuracy determination	6.0 hours
VIII	Uses and applications	6.0 hours
IX	Research project	10.5 hours
	Total hours	**45 - equivalent to 3 credits per semester)**

8. Instructional strategies: Part of every week will be dedicated to lectures and part to work in the computer lab, except for the first week which will be only for lectures, and the last two weeks which will be spent in the laboratory. At the middle of the

semester, students will develop a research project to classify land use for a segment of a satellite image.

* *Arrangements will be made to provide reasonable accommodation for disabled students who require it*

9. Minimal resources available or required: Laboratory facilities and teledetection software.

10. Evaluation strategies:

Daily progress	10%
Midterm exam	15%
Final exam	20%
Homework	15%
Research project	40%

** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: Schowengerdt, R. A. 2006. Remote Sensing: Models and Methods for Image Processing. Academic Press.

13. Bibliography:

1. Jensen J. R. 2007. Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall.
2. Adams, J. B., and A. R. Gillespie. 2006. Remote Sensing of Landscapes with Spectral Images. Cambridge University Press.
3. Campbell, J. B. 2006. Introduction to Remote Sensing. The Guilford Press.
4. Canty, M. J. 2006. Image Analysis, Classification and Change Detection in Remote Sensing With Algorithms for ENVI/IDL. CRC Press.
5. Richards, J. A., and X. Jia. 2005. Remote Sensing Digital Image Analysis: An Introduction. Springer.
6. Ustin, S. 2004. Manual of Remote Sensing, Remote Sensing for Natural Resource Management and Environmental Monitoring. Wiley.
7. Wulder, M. A., and S. E. Franklin 2003. Remote Sensing of Forest Environments: Concepts and Case Studies. Springer.

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1. Jia, X., J.A., Ricahrds, W. Gessner, D.E. Ricken. 1999. Remote Sensing Digital Image Analysis. Springer-Verlag.
2. Sabins, F. F. 1996. Remote Sensing: Principles and Interpretation. Freeman.

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12. http://www.ldeo.columbia.edu/res/fac/rsvlab/glossary.html
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14. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Methods of statistical analysis for environmental systems"

2. **Suggested codification:** "CIAM 6256"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Admission to the Environmental Science Graduate Program

5. **Course description:** Study of statistical methods for analyzing environmental data that include multiple variables. Models of multiple linear regression, principal component analysis, cluster analysis, multidimensional surface analysis, canonical analysis, discriminant analysis, and others are studied. Variables are analyzed to quantitatively understand the behavior of environmental processes. Different statistical software programs are discussed and applied, and research projects using these techniques are discussed.

   Descripción del curso: Estudio de los métodos estadísticos para el análisis de datos ambientales que comprenden variables múltiples. Se estudian los modelos de regresión lineal múltiple, análisis de componentes principales, análisis de agrupamientos, análisis multidimensional de superficies, análisis canónico, análisis discriminante y otros. Se analizan las variables con el fin de comprender cuantitativamente el comportamiento de los procesos ambientales. Se discuten y aplican distintos programas de estadísticas para computadoras y se discuten trabajos de investigación científica donde se han usado los mismos.

6. **Course objectives:**

   Upon passing the course the student will be able to understand different statistical analysis methods and will be able to apply them to environmental systems studies.

   * *Students should make the necessary arrangements to include disabled students*

when working in groups.

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	Introduction to statistical analysis for environmental systems	1.5 hours
II	Sampling of environmental data: populations, types of samples, sources of variability, and independence	3.0 hours

III Continuous and discrete data structure, probability distribution, probability density function, accumulative distribution function, probability distribution for one or multiple variables, analysis of parameters of distribution (precision, skewness, errors, variability, confidence intervals, etc.)	6.0 hours
IV Tolerance and prediction intervals, hypothesis testing	4.5 hours
V Design of sampling plans based on confidence intervals, prediction and tolerance, and hypothesis testing; optimization of sampling design	3.0 hours
VI Analysis of variance and correlations, linear and multiple regression	4.5 hours
VII Limits of detection and censored data	1.5 hours
VIII Principal component analysis: analysis and factor extraction, combining variables in one factor	3.0 hours
IX Cluster analysis: grouping algorithms (Joining, Two-way joining and K-means)	3.0 hours
X Canonical correlation analysis: relation among sets of variables, eigenvalues, canonical weight, canonical variants	3.0 hours
XI Analysis of spacial patterns: Poisson, binomial functions, non-graphic methods	4.5 hours
XII Kriging and analysis of surface tendencies: geostatistical estimation using semivariance and semivariograms	3.0 hours
XIII Ripley K function for spatial dependence	1.5 hours
XIV Time series analysis	3.0 hours
Total hours	**45 - equivalent to 3 credits per semester**

8. **Instructional strategies:** Lectures, assignments, use of computer programs.
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Computer facilities and statistics software

10. **Evaluation strategies:**

Homework	20%
Partial exams (3)	60%
Final exam	20%

** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: Millard, S. P., and Neerchal, N. K. 2000. Environmental Statistics with S-Plus. CRC Press. (Suggested by Dr. Pericchi, lThe University requires a S-Plus license)

13. Bibliography:

1. Shaefer, S. J. and L. Theodore. 2007. Probability and Statistics Applications for Environmental Science. CRC.
2. Hair, J. F., B. Black, B. Babin, R. E. Anderson, and R. L. Tatham. 2005. Multivariate Data Analysis. Prentice Hall.
3. Kaufman, L., and P. J. Rousseeuw. 2005. Finding Groups in Data: An Introduction to Cluster Analysis. Wiley-Interscience.
4. Barnett, V. 2004. Environmental Statistics: Methods and Applications. Wiley.
5. Green, R. H. 2004. Sampling Design and Statistical Methods for Environmental Biologists Wiley-Interscience.
6. Kanevski, M., and M. Maignan. 2004. Analysis and Modelling of Spatial Environmental Data. EFPL Press.
7. Ginevan, M. E., and Splitstone, D. E. 2003. Statistical Tools for Environmental Quality Measurement (Applied Environmental Statistics). Chapman & Hall/CRC.
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10. Shaw, P. J. A. 2003. Multivariate Statistics for the Environmental Sciences. Hodder Arnold Publication.
11. Berthouex, P. M. 2002. Statistics for Environmental Engineers. Lewis Publishers.
12. Townend, J. 2002. Practical Statistics for Environmental and Biological Scientists.
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1. Manly, B. F. J. 2000. Statistics for Environmental Science and Management. CRC Press .
2. Ott, W. R. 1995. Environmental Statistics and Data Analysis. Lewis Publishers.
3. Cressie, N.A.C. 1993. Statistics for Spatial Data. John Wiley & Sons.
4. Jobson, J. D. 1992. Applied Multivariate Data Analysis. Vol. II: Categorical and Multivariate Methods. Springer.
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4. http://www.statsoft.com/textbook/stcluan.html
5. http://www.statsoft.com/textbook/stcanan.html
6. http://www.probability.net/
7. http://www.amstat.org/
8. http://www.graphpad.com/www/book/Choose.htm
9. http://www.stat.sc.edu/rsrch/gasp/
10. http://biostatistics.oxfordjournals.org/

14. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** **"**Masters thesis continuation"

2. **Suggested codification:** "CIAM 6896"

3. **Nu. hours/credit:** 0 contact hours per week (equivalent to 0 hours/0 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Have completed course and investigation credits that are required to obtain the Masters degree in Environmental Science.

5. **Course description:** In order to register in this course, the student should have completed all academic requirements and investigation credits necessary to obtain the Masters degree in Environmental Science, and have only remaining the completion, presentation, and defense of the thesis. A student enrolled in this course will be considered a full time student of the Environmental Science Masters Program and of the University of Puerto Rico, Río Piedras Campus.

   Descripción del curso: Para poder matricularse en este curso el estudiante debe haber aprobado todos los requisitos académicos y créditos de investigación para la obtención del grado de Maestría en Ciencias Ambientales, y tan solo le debe restar la fase de completar, presentar y defender la tesis de maestría. Un estudiante matriculado en este curso será considerado como estudiante a tiempo completo del Programa de Maestría en Ciencias Ambientales y del Recinto de Río Piedras de la Universidad de Puerto Rico.

6. **Instructional strategies:** Not applicable

7. **Minimal resources available or required:** Not applicable

8. **Evaluation strategies:** Not applicable

9. Grading: Not applicable

10. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

11. Title: **"**Graduate research for the Masters degree in Environmental Sciences"

12. Suggested codification: "CIAM 6999"

13. Nu. hours/credit: 1 - 3 contact hours per week (equivalent to 15 - 45 hours/1 - 3 credits per semester)

14. Prerequisites, co-requisites and other requirements: Authorization of the Director of the Environmental Science program.

15. Course description: Thesis research leading to the Master degree in Environmental Sciences.

Descripción del curso: Investigación de tesis conducente al grado de Maestría en Ciencias Ambientales.

16. Instructional strategies: Field and laboratory investigation.
- *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

17. Minimal resources available or required: Laboratory facilities**.**

18. Evaluation strategies: Progress will be evaluated by the thesis advisor.

19. Grading: PS, PN, PB, NP

20. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with

the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Environmental topics spatial analysis seminar"

2. **Suggested codification:** "CIAM 8205"

3. **No. hours/credit:** 2 contact hours per week (equivalent to 30 hours/2 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Authorization from the Environmental Science Program Director

5. **Course description:** Advanced seminar directed to analysis and discussion of literature and recent advances in environmental spatial analysis with emphasis on islands and tropical regions.

   Descripción del curso: Seminario avanzado dirigido al análisis y discusión de la literatura y los desarrollos recientes en el área de análisis espacial del ambiente, sobre todo en lo que concierne a islas y regiones tropicales.

6. **Instructional strategies:** Seminars, conferences and group discussion.
   * *Students should make the necessary arrangements to include disabled students when working in groups.*

   * *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

7. **Minimal resources available or required:** Projection facilities.

8. **Evaluation strategies:** Evaluation by the professor responsible of the course.
   * *Modified evaluation for students with special needs.*

9. **Grading:** PS, PN, PB, NP

10. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Environmental topics special analysis seminar II"

2. **Suggested codification:** "CIAM 8206"

3. **Nu. hours/credit:** 2 contact hours per week/credit (equivalent to 30 hours/2 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Authorization from the Environmental Science Program Director.

5. **Course description:** Advanced seminar directed to analysis and discussion of literature and recent advances in environmental spatial analysis with emphasis on islands and tropical regions.

   Descripción del curso: Seminario avanzado dirigido al análisis y discusión de la literatura y los desarrollos recientes en el área de análisis espacial del ambiente, sobre todo en lo que concierne a islas y regiones tropicales.

6. **Instructional strategies:** Seminars, conferences and group discussion.
   * *Students should make the necessary arrangements to include disabled students when working in groups.*

   * *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

7. **Minimal resources available or required:** Projection facilities.

8. **Evaluation strategies:** Evaluation by the professor responsible of the course.
   * *Modified evaluation for students with special needs.*

9. **Grading:** PS, PN, PB, NP

10. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Methods for spatial environmental analysis"

2. **Suggested codification:** "CIAM 8225"

3. **No. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** CIAM 6235

5. **Course description:** Operational study of advanced spatial analysis methodologies: geographic information systems (GIS), and global positioning systems, and the theoretical basis for these techniques. The emphasis is on the use and application of different programs (Idrisi, ArcView, ArcInfo and Spatial Analyst) for entry, processing, representation, and analysis of environmental data; and the use of global positioning systems to perform field measurements. Island and tropical regions environmental problems are analyzed spatially. The course concludes with a research project that could be presented in a regional scientific congress.

   Descripción del curso: Estudio operacional de metodologías avanzadas de análisis espacial: sistemas de información geográfica (GIS) y de posicionamiento global, y de la teoría que fundamenta estas técnicas. Se enfatiza en el uso y aplicación de programas (Idrisi, ArcView, ArcInfo y Spatial Analyst) para la entrada, procesamiento, representación y análisis de datos ambientales; y en el uso de sistemas de posicionamiento global (GPS) para mediciones de campo. Se analizan espacialmente problemas ambientales de islas y regiones tropicales. El curso concluye con un trabajo de investigación que podría ser presentado en un congreso científico regional.

6. **Course objectives:**

   Upon passing the course the student will be able to use the technologies for geographic information systems and global positioning systems technology to carry out integrated spatial analysis of environmental systems. In addition the student will be able to:

11. Define an environmental problem in spatial terms.
12. Apply the methodology of spatial analysis methodology to build environmental databases.
13. Analyze environmental systems in an integrated manner by interpreting spatial data obtained using global positioning systems and advanced geographic information systems.
14. Evaluate independently a portion of a given environment by using spatial analysis methods.

- *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I Introduction to spatial analysis methods	1.5 hours
II Geographic Information Systems: technical aspects	3.0 hours
III Data sources	3.0 hours
IV Spatial database design	3.0 hours
V Data transformation in geographic information systems	3.0 hours
VI Spatial relations (Spatial Analyst™) a. Map superposition b. Relationships among polygons	4.5 hours
VII Hydrologic and watershed analysis (3D Analyst™)	4.5 hours
VIII Visualization (3D Analyst™ and Image Analysis™) a. Image topographic data b. Visualization for dissemination	4.5 hours
IX Study of environmental case from a spatial perspective	3.0 hours
X Research project	15.0 hours
Total hours	**45 – equivalent to 3 credits per semester**

8. Instructional strategies: Lectures, laboratory work, and independent research.
- *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. Minimal resources available or required: Laboratory facilities and GIS and GPS equipment.

10. Strategies for evaluation:

Partial exams (2)	40% (15% y 25%)
Homework	25%
Final project	35%

** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F,

12. Suggested textbook: Longley, P. A., M. F. Goodchild, D. J. Maguire and D. W. Rhind. 2005. Geographic Information Systems and Science. Wiley.

13. Bibliography:

1. Campagna, M. 2006. GIS for Sustainable Development. CRC Press.
2. Maantay, J., and J. Ziegler. 2006. GIS for the Urban Environment. ESRI Press.
3. Wang, F. 2006. Quantitative Methods and Applications in GIS. CRC Press.
4. Maguire, D., M. Batty, and M. Goodchild. 2005. GIS, Spatial Analysis, and Modeling. ESRI Press.
5. LeGates, R. T. 2005. Think globally, act regionally: GIS and data visualization for social science and public policy research. ESRI Press.
6. Clarke, G., and J. Stillwell. 2003. Applied GIS and Spatial Analysis. John Wiley & Sons.

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1. Ormsby, T., and J. Alvi. 1999. Extending ArcView GIS. ESRI Press.
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3. http://link.springer.de/link/service/journals/10109/index.htm
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5. http://www.esri.com/
6. http://www.epa.gov/enviro/
7. http://www.fws.gov/data/
8. http://gislounge.com/
9. http://www.lib.berkeley.edu/EART/abbrev.html
10. http://www.pmel.noaa.gov/vents/coax/gis_www.html

16. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
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Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Remote sensing II"

2. **Suggested codification:** "CIAM 8236"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, corequsites and other requirements:** CIAM 6235

5. **Course description:** Study of the theory and practice of advanced methods for analysis of satellite images. The use and application of such programs as *Imagine, ENVI*, and *Idrisi* for study and analysis of environmental processes and problems on islands and in tropical regions are emphasized, as well as the use of RADAR for teledetection in tropical regions since it can be used to analyze cloud-covered areas. Advanced techniques for analysis of images with shadows caused by clouds and mountains are discussed. At the end of the course the student will have completed a research project that could be presented at a regional scientific congress.

Descripción del curso: Estudio práctico de metodologías avanzadas de análisis de imágenes de satélite y de la teoría que fundamenta estas técnicas. Se enfatiza el uso y aplicación de programas tales como *Imagine*, *ENVI*, *e Idrisi* para el estudio y análisis de procesos y problemas ambientales de islas y regiones tropicales; así como en el uso de RADAR para teledetección en regiones tropicales por su capacidad para el análisis de áreas cubiertas por nubes. Se discuten técnicas avanzadas para el análisis de imágenes con sombras causadas por nubes y montañas. Al final del curso el estudiante habrá completado un trabajo de investigación que podría ser presentado en un congreso científico regional.

6. **Course objectives:**

Upon passing the course the student will be able to use programs such as *Imagine, ENVI and Idrisi* to analyze and classify satellite images. In addition the student will

be able to use these technologies to study the environmental issues of island and tropical. In addition, the student will be able to:

1. Apply advanced image analysis techniques
2. Evaluate satellite images to identify natural and environmental hazards.
3. Independently research an environmental problem or situation by using image analysis.

* *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	Review of spectral teledetection	1.5 hours
II	Applications a. Preparation of vegetation maps. b. Analysis of geology and hydrology	3.0 hours
III	Application of *Hyperspectral* y *RADAR*	4.5 hours
IV	Transformations	4.5 hours
V	Filters and matching for images	3.0 hours
VI	Classification a. Differences between methods currently used b. Fuzzy logic c. Artificial neural network	4.5 hours
VII	Images texture a. Fractal dimensions b. Other measurement of texture	4.5 hours
VIII	Advanced method for accuracy evaluation	4.5 hours
IX	Research project	15.0 hours
	Total hours	**45 (Equivalent of 3 credits per semester)**

8. Instructional strategies: At the beginning of the semester there will be lectures and computer work. At the middle of the semester, students will develop a research project to apply the theoretical concepts and technologies learned in the first part of the course.

* *Arrangements will be made to provide reasonable accommodation for disabled students who require it*

9. Minimal resources available or required: Teledetection laboratory facilities

10. Evaluation strategies:

Midterm exam	40% (15% + 25%)
Final exam	35%
Laboratory project	25%

** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F.

12. Suggested textbook: Schowengerdt, R. A. 2006. Remote Sensing: Models and Methods for Image Processing. Academic Press.

13. Bibliography:

1. Jensen, J. R. 2007. Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
2. Campbell, J. B. 2006. Introduction to Remote Sensing. The Guilford Press.
3. Canty, M. J. 2006. Image Analysis, Classification and Change Detection in Remote Sensing With Algorithms for ENVI/IDL. CRC Press.
4. Kampes, B. M. 2006. Radar Interferometry: Persistent Scatter Technique. Springer-Verlag.
5. Richards, J. A., and X. Jia. 2005. Remote Sensing Digital Image Analysis: An Introduction. Springer.
6. Shepard, R. B. 2005. Quantifying Environmental Impact Assessments Using Fuzzy Logic (Springer Series on Environmental Management) . Springer.
7. Varshney, P. K., and A. M. K. 2004. Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data. Springer-Verlag.
8. Sandham, W., M. Leggett, and F. Aminzadeh. 2003. Geophysical Applications of Artificial Neural Networks and Fuzzy Logic. Kluwer Academic Publishers.

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1. Mather, P., and B. Tso. 2001. Remote Sensing Imagery Analysis and Classification: An Advanced Course. Springer Verlag.
2. Jia, X., J.A. Ricahrds, W. Gessner, D.E. Ricken. 1999. Remote Sensing Digital Image Analysis. Springer-Verlag..
3. Congalton, R. A., and K. Green. 1998. Assessing the Accuracy of Remotely Sensed Data. Lewis Publishers.

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12. http://www.ldeo.columbia.edu/res/fac/rsvlab/glossary.html
13. http://www.nps.gov/gis/remote_sensing/

14. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Techniques for construction of environmental models"

2. **Suggested codification:** "CIAM 8257"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** CIAM 6256

5. **Course description:** Fundamentals of mathematical modeling. The application of discrete and continuous variable models, and Monte-Carlo methods are studied. Modeling of environmental processes including biogeochemical cycles, contaminant transport and destination, problems in ecotoxicology, natural and agricultural systems, atmospheric pollution, and climatic change are studied.

   Descripción del curso: Fundamentos de modelaje matemático. Se estudia la aplicación de modelos de variables discretas y contínuas, y los métodos Monte-Carlo. Se estudia el modelaje de procesos ambientales incluyendo ciclos biogeoquímicos, transporte y destino de contaminantes, problemas de ecotoxicología, sistemas biosféricos y agrícolas, contaminación atmosférica, y cambio climático.

6. **Course objectives:**

   Upon passing the course the student will be able to understand and apply the diverse modeling techniques to environmental systems, and use them to design new models.

   Students should make the necessary arrangements to include disabled students when working in groups.

7. **Course Outline and time distribution:**

	Topic	Time assigned (hours)
I	Instruction to modeling and mathematical simulation	1.5 hours
II	Modeling techniques: linear models, exponential dynamic, first-order kinetic processes, non-linear models, logistic dynamic, Michaelis-Menten-Monod, natural and anthropogenic perturbations, sensitivity analysis, Monte Carlo method	7.5 hours
III	Spatial modeling techniques: landscape dynamics, succession dynamics, land use, habitat alterations	6.0 hours

IV Modeling cyclic and flow systems and processes: biogeochemical cycles, productivity, photosynthesis, diffusion, eutrophication, water and nutrient flux , groundwater flux, equilibrium diagrams	6.0 hours
V Modeling biological processes: ecotoxicology, bioavailability, bioconcentration, uptake kinetics	4.5 hours
VI Modeling of terrestrial ecosystems: forests, interaction among species and communities, food webs	4.5 hours
VII Modeling of processes and perturbations caused by human activities: agriculture and crop models, soil erosion, urban sprawl	3.0 hours
VIII Pollution modeling: atmospheric pollution, dispersion plumes, deposition, non-point source pollution models, dispersion of pesticides in runoff, models of contaminant transport and destination, modeling water quality parameters	6.0 hours
IX Climatic change modeling: El Niño, cooling and warming patterns, global warming modeling	6.0 hours
Total hours	**45 – equivalent to 3 credits per semester**

8. **Instructional strategies:** Lectures, assignments, use of computer programs
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Computer facilities and modeling software.

10. **Evaluation strategies:**

Homework	25%
Partial exams (2)	50%
Final exam	25%

* Modified evaluation for students with special needs.

11. **Grading:** A, B, C, D, F

12. **Suggested textbook:** Smith, J. and P. Smith. 2007. Introduction to Environmental Modelling. Oxford University Press.

13. **Bibliography:**

1. Clark, J. S., and A. Gelfand. 2006. Hierarchical Modelling for the Environmental Sciences: Statistical methods and applications. Oxford University Press.
2. Manly, B. F. J. 2006. Randomization, Bootstrap and Monte Carlo Methods in Biology. Chapman & Hall (CRC Press).
3. Hersh, M., and. I Hamburg. 2005. Mathematical Models for Sustainable Development. Springer-Verlag.
4. Washington, W. M., and C. L. Parkinson. 2005. Introduction To Three-dimensional Climate Modeling. University Science Books.

5. Canham, C. D., J. J. Cole, and W. K. Lauenroth. 2004. Models in Ecosystem Science. Charles Princeton University Press.
6. Kanevski, M., and M. Maignan. 2004. Analysis and Modelling of Spatial Environmental Data. Marcel Dekker.
7. Allman, E. S., and J. A. Rhodes. 2003. Mathematical Models in Biology, An Introduction. Cambridge University Press.
8. Guhathakurta, S. 2003. Integrated Land Use and Environmental Models: A Survey of Current Applications and Research. Springer.
9. Kelly, R. 2004. Spatial Modelling of the Terrestrial Environment. John Wiley & Sons.
10. Ruth M., and B. Hannon. 2003. Landscape Simulation Modelling: A Spatially Explicit, Dynamic Approach. Springer-Verlag.
11. Vohnout, K. 2003. Mathematical Modeling for System Analysis in Agricultural Research. Elsevier.
12. Wainwright, J., and M. Mulligan. 2003. Environmental Modelling: *Finding Simplicity in Complexit.* John Wiley & Sons.
13. Roman, S. 2002. Writing Excel Macros: Automating Excel to Work for You. 2002. O'Reilly R. & Associates.

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1. Deaton, M.L., and J.J. Winebrake. 1999. Dynamic Modeling of Environmental Systems. Springer-Verlag.
2. Manly, B. F. J. 1991. Randomization and Monte Carlo Methods in Biology. Chapman and Hall, New York.
3. Capper, D. M. 1994. Introducing C++ for Scientists, Engineers and Mathematicians. Springer-Verlag.
4. Melli, P., and P. Zannetti. 1992. Environmental Modeling. Elsevier.
5. Marchuk, G.I. 1986. Mathematical Models in Environmental Problems. Elsevier.
6. Jakeman, A. J. 1995. Modeling Change in Environmental Systems. John Wiley & Sons.
7. Ford, A. 1999. Modeling the Environment. Island Press.
8. Mooney D. and R. Swift. 1999. A Course in Mathematical Modeling", The Mathematical Association of America.

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2. http://www.rti.org/page.cfm?nav=583
3. http://www.emc.ncep.noaa.gov/modelinfo/
4. http://www.ecopath.org/
5. http://www.climateprediction.net/science/model-intro.php
6. http://stommel.tamu.edu/~baum/climate_modeling.html

7. http://www-eosdis.ornl.gov/model_intro.shtml
8. http://smig.usgs.gov/SMIG/model_archives.html

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Landscape ecology of island and tropical regions"

2. **Suggested codification:** "CIAM 8345"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** CIAM 6116 and 6235

5. **Course description:** Study of the factors that determine the morphology, connectivity, interaction, structure, and function of the different elements that characterize the landscape ecology of islands and tropical regions. The emphasis is on patterns and variation of the mosaic of ecosystems and land uses characteristic of these regions, the sequence of events that give rise to changes in the patterns in this mosaic, and the connectivity and interactions among different regions and systems that make up the landscape. These are also emphasized in the analysis of satellite images, the impact of human activities on landscape ecology, as well as strategies for conservation, restoration and sustainable management.

   Descripción del curso: Estudio de los factores que determinan la morfología, conectividad, interacción, estructura y función de los diversos elementos que caracterizan la ecología del paisaje en islas y regiones tropicales. Se enfatizan los patrones y variaciones que presenta el mosaico de ecosistemas y usos de la tierra característicos de dichas regiones, la secuencia de eventos que dan lugar a cambios en los patrones de dicho mosaico, y la conectividad e interacciones que ocurren entre las distintas regiones y sistemas que lo componen. Se enfatiza también en el estudio de los mismos mediante el análisis de imágenes de satélite, el impacto de las actividades humanas sobre la ecología del paisaje, así como las estrategias para su conservación, restauración y manejo sustentable.

6. **Course objectives:**

   Upon completing the course the student will be able to:

15. Distinguish the different patterns that make up the mosaic of ecosystems and regions in islands and tropical areas.
16. Analyze the morphology for each region and the factors that determine it.
17. Analyze current connectivity and future possible connecting corridors among distinct regions using satellite images and aerial photographs.
18. Analyze the effect of different human activities on islands and tropical regions landscape patterns.

19. Predict, based on the function of each region and past changes in its morphology, possible future changes, and propose different strategies for sustainable management..

* *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I Introduction to landscape ecology	1.5 hours
II Regions and lands that make up the landscape mosaic a. Frequency and size b. Morphology	3.0 hours
III Corridors a. Ecological corridors: forests and rivers b. Built corridors: roads and electric lines c. Function and effects of corridors on ecosystems	7.5 hours
IV The landscape mosaic a. Natural regions b. Land use c. Interaction and connectivity among different regions and ecosystems d. Interchanges among regions e. Ecosystem fragmentation and its effects	9.0 hours
V Changes in the ecology of the landscape a. Natural changes thorough time b. Changes associated with land use c. Effects of these changes on ecosystems	7.5 hours
VI Techniques for analysis of satellite and aerial photos	7.5 hours
VII Management and planning strategies for achieving sustainable development of natural landscapes for islands and tropical regions	9.0 hours
Total hours	**45 – equivalent to 3 credits per semester**

8. Instructional strategies: Lectures and analysis of satellite images and aerial photographs.

∗ *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. Minimal resources available or required: Laboratory facilities, and equipment for analysis of satellite images and aerial photographs.

10. Strategies for evaluation:

Midterm exam	25%
Final exam	25%
Individual project	25%
Homework	25%

**Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: Bissonette, J. and I. Storch. 2003. Landscape Ecology and Resource Management: Linking Theory with Practice. Island Press.

13. Bibliography:

1. Bissonette, J. A., and I. Storch. 2007. Temporal Dimensions of Landscape Ecology: Wildlife Responses to Variable Resources. Springer-Verlag.
2. Green, D. G., N. Klomp, G. Rimmington and S. Sadedin. 2006. Complexity in Landscape Ecology. Springer-Verlag.
3. Hilty, J. A., W. Z. Lidicker, and A. M. Merenlender. 2006. Corridor Ecology: The Science and Practice of Linking Landscapes for Biodiversity Conservation. Island Press.
4. Perera, A. H., L. Buse, and T. Crow. 2006. Forest Landscape Ecology: Transferring Knowledge to Practice. Springer-Verlag.
5. Adams, J. B., and A. R. Gillespie. 2006. Remote Sensing of Landscapes with Spectral Images. Cambridge University Press.
6. Wiens, J., and M. Moss. 2005. Issues and Perspectives in Landscape Ecology. Cambridge University Press.

Bibliography (previous syllabus)

1. Turner, M. G., R.V. O'Neill, and R.H. Gardner. 2001. Landscape Ecology in Theory and Practice: Pattern and Process. Springer-Verlag.
2. Klopatek, J. M., and R. H, Gardner. 1999. Landscape Ecological Analysis: Issues and Applications. Springer-Verlag.
3. Frohn, R. C. 1997. Remote Sensing for Landscape Ecology: New Metric Indicators for Monitoring, Modeling, and Assessment of Ecosystems. Lewis Publishers.
4. Forman, R. T. T. 1995. Land Mosaics: The Ecology of Landscapes and Regions. Cambridge University Press.
5. Sample, V. A. 1994. Remote Sensing and GIS in Ecosystem Management. Island Press.

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3. www.cof.orst.edu/org/usiale/lejlinks.htm
4. http://www.epa.gov/esd/land-sci/default.htm

5. http://www.landscape-ecology.org/
6. http://ncrs.fs.fed.us/4153/
7. http://www.landscape-ecology.info/
8. http://edc.usgs.gov/
9. http://geography.wr.usgs.gov/science/ilm.html
10. http://www.lib.upm.edu.my/iislm.html

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Seminar on topics in sustainable management on islands and tropical regions I"

2. **Suggested codification:** "CIAM 8405"

3. **No. hours/credit:** 2 contact hours per week/credit (equivalent to 30 hours/2 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Authorization from the Environmental Science Program Director

5. **Course description:** Advanced seminar directed towards analysis and discussion of literature and recent developments in island and tropical region management.

   Descripción del curso: Seminario avanzado dirigido al análisis y discusión de la literatura y los desarrollos recientes en el área de manejo ambiental sostenible de islas y regiones tropicales.

6. **Instructional strategies:** Seminars, conferences and group discussion.
   * *Students should make the necessary arrangements to include disabled students when working in groups.*

   * *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

7. **Minimal resources available or required:** Projection facilities.

8. **Evaluation strategies:** Evaluation by the professor responsible of the course.
   * *Modified evaluation for students with special needs.*

9. Grading: PS, PN, PB, NP

10. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

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Description of a New Course

11. Title: "Seminar on topics in sustainable management on islands and tropical regions II"

12. Suggested codification: "CIAM 8406"

13. Nu. hors/credit: 2 contact hours per week/credit (equivalent to 30 hours/2 credits per semester)

14. Prerequisites, co-requisites and other requirements: Authorization from the Environmental Science Program Director

15. Course description: Advanced seminar directed towards analysis and discussion of literature and recent developments in island and tropical region management.

Descripción del curso: Seminario avanzado dirigido al análisis y discusión de la literatura y los desarrollos recientes en el área de manejo ambiental sostenible de islas y regiones tropicales.

16. Instructional strategies: Seminars, conferences and group discussion.

* *Students should make the necessary arrangements to include disabled students when working in groups.*

* *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

17. Minimal resources available or required: Projection facilities.

18. Evaluation strategies: Evaluation by the professor responsible of the course.

* *Modified evaluation for students with special needs.*

19. Grading: PS, PN, PB, NP

20. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
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Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Environmental geology"

2. **Codificación sugerida:** "CIAM 8425"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, corequisites and other requirements:** CIAM 6115, 6117 and 6118. Field trips on Saturdays or Sundays.

5. **Course description:** Study of the interaction between human activities and geological processes. Problems related to slope stability, processes of erosion, transport, and sedimentation, and measurement of the physicochemical properties of geological materials are analyzed. Chemical equilibria, transport mechanisms, and destination of characteristic contaminants of the soil matrix are examined. Hydrogeology, diffusion and transport of pollutants through the soil and aquifers, sampling techniques, rehabilitation strategies for contaminated sites, geological hazards induced by natural phenomena, and geological problems resulting from infrastructural development in mountains, karst, plains and coastal regions.

   Descripción del curso: Estudio de la interacción entre las actividades humanas y los procesos geológicos. Se analizan problemas de estabilidad de laderas, procesos de erosión, transporte y sedimentación y la medición de las propiedades fisicoquímicas de los materiales geológicos. Se examinan los equilibrios químicos y los mecanismos de transporte y destino de contaminantes característicos de la matriz suelo. Hidrogeología y difusión y transporte de contaminantes a través de los suelos y acuíferos, técnicas de muestreo, estrategias de rehabilitación de lugares contaminados, peligros geológicos inducidos por fenómenos naturales, problemas geológicos que surgen con el desarrollo de infraestructura en regiones montañosas, cársticas, llanos y costas.

6. **Course objectives:**

   Upon passing the course the student will be able to:

1. Analyze thematic maps of different types and data obtained from geographical information systems to derive relevant information for the analysis of the geology and geological processes at a given site.
2. Understand and analyze natural and induced geologic processes that occur on islands and in tropical regions.
3. Design stabilization strategies, risk control, and remediation for different geological problems and situations.

4. Analyze, formulate solutions, and recommend policies directed at eliminating or reducing the adverse impacts of different human activities on geological resources.

∗ *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	Rocks a. Tectonic plates and rocks cycles b. Origin, identification, and classification of rocks and minerals c. Structural geology d. Reading and interpretation of geological maps e. Interpretation of aerial photographs and satellite images	4.5 hours
II	Soils a. Origin, identification and classification of soils b. Soil properties and their measurement: pedological, edaphological, and engineering aspects c. Reading and interpretation of soil maps d. Soil pollution, causes, sampling methods and analysis e. Remediation of polluted soil	9.0 hours
III	Underground water systems a. Hydrogeology b. Underground water contamination: sources, causes, sampling and analysis c. Characterization of contaminated aquifers d. Contaminated aquifer cleanup	9.0 hours
IV	Solid, toxic and radioactive waste disposal a. Landfill location b. Design of facilities c. Contaminant monitoring d. Remediation	3.0 hours
V	Pluvial systems a. Reading and interpretation of hydrological and flood maps b. Floods c. Changes in rivers d. Construction of dams and reservoirs: environmental aspects e. Flood control and environmental impact	
VI	Coastal erosion problems	3.0 hours

a. The coastal system b. Changes and their causes c. Coastal contamination d. Structural and non-structural remediation measures	
VII Extraction of earthen materials a. Types, location and extraction methods b. Environmental impacts c. Management and mitigation strategies	3.0 hours
VIII Fossil fuel extraction and alternative energy sources a. Types, location, and extraction methods b. Environmental impacts	3.0 hours
IX Engineering aspects of environmental geology a. Roads, bridges, and tunnel construction b. Open excavations, fills, and dredging c. Water supplies, distribution networks, and collection	3.0 hours
X Analysis of data obtained by using geographic information systems	3.0 horas
XI Research project	-
Total hours	**45 – equivalent to 3 credits per semester**

8. Instructional strategies: lectures and field trips.
- ∗ *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. Minimal resources available or required: Transportation for field trips.

10. Strategies for evaluation:

Partial exams (2)	50%
Final exam	25%
Research project	25%

Assistance to field trips is essential for passing the course.
** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: McGeary , D., C. C. Plummer, and D. H. Carlson. 2003. Physical Geology: Earth Revealed. McGraw Hill.

13. Bibliography:

1. Keller, E. A. 2007. Introduction to Environmental Geology. Prentice Hall.
2. Marshak, S. 2006. Essentials of Geology. W. W. Norton.
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7. Rose, C. W. 2004. An Introduction to the Environmental Physics of Soil, Water and Watersheds. Cambridge University Press.
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9. Montgomery, C.W. 2002. Environmental Geology. McGraw Hill.

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1. Bell, F.G. 1998. Environmental Geology: Principles and Practice. Blackwell Science.
2. Lundgren, L. W. 1998. Environmental Geology. Prentice Hall.
3. Sharma, P. V. 1997. Environmental and Engineering Geophysics. Cambridge University Press.
4. Schlesinger, W. H, and A. C. Beer. 1997. Biogeochemistry: An Analysis of Global Change. Academic Press.
5. Lamoreaux, P. E., and M. M. Soliman. 1997. Environmental Hydrogeology. Lewis Publishers.

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12. www.energy.gov/energysources/index.htm
13. http://www.geology.er.usgs.gov/eastern/plates.html
14. http://www.soil.gsfc.nasa.gov/

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** **"**Environmental hydrology"

2. **Suggested codification:** "CIAM 8435"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, corequisites and other requirements:** CIAM 6115, 6117 and 6118. Field trips on Saturdays or Sundays.

5. **Course description:** Study of hydrological processes and water pollution. Chemical equilibria, transport mechanisms, and destination of contaminants characteristic of the water matrix are examined. Measurement of water budgets, determination of physical and chemical parameters for natural waters, techniques for sampling and analysis of contaminants, processes of diffusion and transport of contaminants in surface and groundwater, impact of diverse human activities on hydrologic balances and water quality are discussed, as well as strategies for prevention, remediation, and mitigation of surface and groundwater contamination.

   Descripción del curso: Estudio de los procesos hidrológicos y de la contaminación de agua. Se examinan los equilibrios químicos y los mecanismos de transporte y destino de contaminantes características de la matriz agua. Se discute la medición de presupuestos de agua, la determinación de parámetros físicos y químicos para agua naturales, las técnicas de muestreo y de análisis de contaminantes, los procesos de difusión y transporte de contaminantes en aguas superficiales y subterráneas, el impacto de diversas actividades humanas en los balances hidrológicos y la calidad de las aguas, así como las estrategias de prevención, remediación y mitigación de contaminación de aguas superficiales y subterráneas.

6. **Course objectives:**

   Upon passing the course the student will be able to:

1. Understand the processes associated with the hydrologic cycle, and determine in a quantitative manner the extent and magnitude of each process under different conditions.
2. Apply mathematical models to simulate and determine the response of a hydrologic system in different environmental scenarios.
3. Analyze water quality by using appropriate field methodologies, sampling, sample preservation, and analysis of physical, chemical and microbiological parameters.

4. Analyze the impact of human activities on water quality and on hydrologic processes.
5. Formulate strategies for the prevention, remediation, and mitigation of water pollution.

∗ *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	Hydrologic cycle and its processes a. Precipitation b. Evaporation c. Transpiration d. Evapotranspiration e. Infiltration and percolation f. Runoff: surface flow g. Vadose zone flow h. Underwater flow i. Quantitative models of the hydrologic cycle	1.5 hours
II	Precipitation and infiltration processes a. Precipitation: measurements and statistical analysis b. Soil-water relations c. Factors affecting water movement through the soil d. Soil and subsoil chemical and physical characteristics e. Quantitative methods for determining infiltration speed and magnitude f. Soil particle characteristics and their effects on infiltration	4.5 hours
III	Process of evapotranspiration a. Fick laws of diffusion b. Evapotranspiration processes for surface water, soil, and plants c. Transpiration rates d. Quantitative methods for measuring evapotranspiration	1.5 hours
IV	Runoff a. Methods for measuring superficial runoff b. Methods for measuring subsuperficial runoff	3.0 hours
V	Groundwater a. Water table level and causes of variation b. Groundwater flow processes c. Aquifer types and characteristics	3.0 hours

VI Surface water a. River flow: volume and velocity of flow b. Hydrogram analysis c. Relationship between precipitation and runoff d. Response of rivers to rain e. Quantitative models	6.0 hours
VII Water quality a. Water quality parameters b. Surface and groundwater common contaminants c. Surface and groundwater pollution sources d. Contaminant dispersion e. Sampling and preservation methods f. Water pollution analysis methods	18.0 hours
VIII Strategies for prevention, remediation, and mitigation of surface and groundwater pollution	7.5 hours
Total hours	**45 - Equivalent to 3 credits per semester**

8. **Instructional strategies:** lectures, field trips, and field measurements.
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*
9. **Minimal resources available or required:** Transportation to field, and equipment for measuring parameters.

10. **Strategies for evaluation:**

Partial exams (3)	75%
Final exam	25%

Assistance to field trips is essential for passing the course.
** Modified evaluation for students with special needs.*

11. **Grading:** A, B, C, D, F

12. **Suggested textbook:** Gordon, N. D., T. A. McMahon, B. L. Finlayson, C. J. Gippel, and R. J. Nathan. 2004. Stream Hydrology: An Introduction for Ecologists. Wiley. (suggested by Dr.Jorge Ortiz and Dr. Alonso Ramírez).

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1. LaMoreaux, J. W. 2008. Environmental Hydrogeology. CRC.
2. Pharino, C. 2007. Sustainable Water Quality Management Policy: The Role of Trading: The U.S. Experience, C. Springer-Verlag.

3. Ghosh,S. N, and V. R. Desai. 2006. Environmental Hydrology and Hydraulics: Eco-technological Practices for Sustainable Development. Science Publishers.
4. Scholz, M. 2006. Wetland Systems to Control Urban Runoff. Elsevier.
5. Appelo, C. A. J., and D. Postma. 2005. Geochemistry, Groundwater and Pollution. A. A. Balkema.
6. Ward, A. D., and S. W. 2004. Trimble Environmental Hydrology. CRC.
7. Todd, D. K. 2004. Ground Water Hydrology. John Wiley & Sons.
8. Hudak, P. F. 2004. Principles of Hydrogeology. CRC Press.
9. Weltzin, J. F., and G. R McPherson. 2003. Changing Precipitation Regimes and Terrestrial Ecosystems: A North American Perspective. University of Arizona Press.
10. Viessman, W., and G. L. Lewis. 2002. Introduction to Hydrology. Prentice Hall.
11. Novotny, V. 2002. Water Quality: Diffuse Pollution and Watershed Management. Wiley.

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1. Chow, V. T., D. R. Maidment, and L. W. Mays. 1988. Applied Hydrology. McGraw Hill.
2. Elliot, W. J., and A .D. Ward. 1995. Environmental Hydrology. Lewis Publishers.
3. Heisel, D. R., and R.M. Hirch. 1995. Statistical Methods in Water Resources. Elsevier.
4. Watson, I., and A. D. Burnett. 1994. Hydrology: An Environmental Approach. Lewis
5. Publishers.

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1. www.elsevier.com/locate/jhydrol
2. www.tandf.co.uk/journals/titles/07900627.asp
3. www.spatialhydrology.com/journal/
4. http://www.ucowr.siu.edu/hydro/
5. http://www.dlwc.nsw.gov.au/care/water/
6. http://www.ghcc.msfc.nasa.gov/Model/model_diagnostic.html
7. http://www.epa.vic.gov.au/Water/
8. http://usinfo.state.gov/journals/itgic/0399/ijge/gj-07b.htm
9. http://water.usgs.gov/
10. http://www.epa.gov/water/laws.html
11. http://www.internationalwaterlaw.org/
12. http://www.enviroliteracy.org/

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Environmental meteorology"

2. **Sugegsted codification:** "CIAM 8445"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** CIAM 6115, 6117 and 6118 Field trips on Saturdays or Sundays.

5. **Course description:** Study of atmospheric processes that determine the weather and climate characteristic of tropical regions. Atmospheric circulation patterns, and mechanisms for energy transfer and distribution are discussed. Atmospheric processes causing rain, droughts, tropical waves, depressions, and hurricanes; effects of global climatic change and the possible consequences for tropical meteorological systems; microclimatology; heat island effects; diffusion, transport, sampling, and analysis of pollutants and their relation to meteorological events; and the impact of human activities impact on climatic processes are addressed. Chemical equilibria and the transport mechanisms and destination of pollutants characteristic of the air matrix are examined.

   Descripción del curso: Estudio de procesos atmosféricos que determinan el estado del tiempo y el clima característicos de la región tropical. Se discuten los patrones de circulación atmosférica, mecanismos de transferencia y distribución de energía. Procesos atmosféricos que causan lluvia, sequías, ondas tropicales, depresiones, y huracanes; efectos del cambio climático global y sus posibles consecuencias en los sistemas meteorológicos tropicales; microclimatología; efecto de la isla de calor; difusión, transporte, muestreo y análisis de contaminantes; modelos matemáticos de dispersión de contaminantes y su relación con eventos meteorológicos, y el impacto de las actividades humanas sobre los procesos climáticos. Se examinan los equilibrios químicos y los mecanismos de transporte y destino de contaminantes característicos de la matriz aire.

6. Course objectives:

Upon passing the course the student will be able to:

1. Explain the composition, vertical structure, global atmospheric circulation patterns, and the mechanisms of energy transfer and distribution in the atmosphere, and factors that determine them.
2. Explain atmospheric phenomena and climatic patterns characteristic of tropical regions.
3. Predict the effects of global climatic change on tropical meteorological systems.

4. Explain microclimatic phenomena such as heat island effects and others.
5. Explain the mechanisms of atmospheric stability and their impacts on the diffusion of pollutants. Analyze these mechanisms by using mathematical models to study dispersion patterns.
6. Analyze the impacts of human activity on tropical weather.

∗ *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	The atmosphere a. Composition b. Global circulation patterns c. Heat transfer mechanisms d. Duration of atmospheric components	4.5 hours
II	Atmospheric chemical processes a. Photochemical processes b. Kinetics of these processes c. Processes in different layers	4.5 hours
III	Aerosols a. Aerosol properties in the atmosphere b. Aerosol particle dynamics c. Thermodynamics of aerosol particles	3.0 hours
IV	Atmospheric physical processes a. Nucleation b. Rain formation c. Cloud formation d. Movement of air masses	3.0 hours
V	Typical tropical atmospheric phenomena a. Rain and drought patterns b. Tropical waves c. Hurricanes and tropical depressions	6.0 hours
VI	Microclimatology	3.0 hours
VII	Atmospheric pollution a. Air quality standards b. Primary and secondary pollutants c. Pollution sources d. Atmospheric stability e. Theories of atmospheric diffusion	13.5 hours

	f. Gaussian plume models of contaminant dispersion g. Deposition processes h. Models of chemical transport in the atmosphere i. Sampling and analysis of atmospheric pollutants	
VIII	Tropical weather	3.0 hours
IX	Impact of human activities impact on climate and atmosphere	4.5 hours

Total hours	**45 - Equivalent to 3 credits per semester**

8. **Instructional strategies:** Lectures and field measurements.
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Measurement equipment for the field.

10. **Evaluation strategies:**

Partial exams (3)	75%
Final exam	25%

** Modified evaluation for students with special needs.*

11. **Grading:** A, B, C, D, F

12. **Suggested textbook:** Hewitt, C. N., and A. Jackson. 2003. Handbook of Atmospheric Science. Blackwell.

13. **Bibliography:**

1. Seinfeld, J. H., and S. N. Pandis. 2006. Atmospheric Chemistry and Physics: From Air Pollution to Climate Change. Wiley-Interscience.
2. Kondratyev, K., L. S. Ivlev, V.F. Krapivin, and C.A. Varostos. 2005. Atmospheric Aerosol Properties, Formation Processes and Impacts. Springer-Verlag.
3. Metcalfe, S. 2005. Atmospheric Pollution and Environmental Change. Hodder Arnold.
4. Jacobsen, M. Z. 2005. Fundamentals of Atmospheric Modeling. Cambridge University Press.
5. U. N. 2005. Air pollution and citizen awareness U. N.
6. Tsonis, A. A. 2004. An Introduction to Atmospheric Thermodynamics. Cambridge University Press.
7. Elsom, D. M., and J. W. S. Longhurst. 2004. Regional and Local Aspects of Air Quality Management: Advance in Air Pollution. WIT Press.
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9. Greenland, D., D. G. Goodin, and R. C. Smith. 2003. Climate Variability and Ecosystem Response in Longterm Ecological Research Sites. Oxford University Press.
10. Jacobson, M. Z. 2002. Atmospheric Pollution. Cambridge University Press.
11. Barry , R. G., and R. J. Chorley. 2003. Atmosphere, Weather and Climate.

Routledge.

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1. Finlayson-Pitts, B. J., and J. N. Pitt. 1999. Chemistry of the Upper and Lower Atmosphere: Theory Experiments and Applications. Academic Press.
2. Bohren, C. F., and B. A. Albrecht 1998. Atmospheric Thermodynamics. Oxford University Press.
3. Jacobson, M. Z. 1998. Fundamentals of Atmospheric Modeling. Cambridge University Press.

4. Singh, M. P., and S. Raman. 1998. Dynamics of Atmospheric Flows: Atmospheric Transport and Diffusion Processes. Computational Mechanics.
5. Thompson, R. D. 1998. Atmospheric Processes and Systems. Routledge.
6. Seinfeld, J. H., and S. Pandis. 1997. Atmospheric Chemistry and Physics: Air Pollution to Climate. John Wiley & Sons.

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3. http://ams.allenpress.com/perlserv/?request=index-html
4. www.rmets.org/publication/QJ/
5. http://www.epa.gov/
6. http://www.enn.com/
7. http://www.geo.umass.edu/climate/climate.html
8. http://www.ace.mmu.ac.uk/eae/index.html
9. http://liftoff.msfc.nasa.gov/academy/space/atmosphere.html
10. http://www.nhc.noaa.gov/
11. http://www.ucar.edu/
12. http://oea.larc.nasa.gov/PAIS/Aerosols.html

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Environmental noise"

2. **Suggested codification:** "CIAM 8545"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** CIAM 8445

5. **Course description:** Study of environmental noise and its impact on environmental quality and health. The focus is on natural and anthropogenic events that cause environmental noise, methods for measurement and analysis, the impact of noise on humans and other organisms, and strategies for noise management and control in different environments.

   Descripción del curso: Estudio del ruido ambiental y de su impacto sobre la calidad del ambiente y la salud. Se focaliza en las actividades naturales y antropogénicas que generan ruido ambiental, los métodos de medición y análisis del mismo, el impacto del ruido sobre los seres humanos y otros organismos, y las estrategias de manejo y control de contaminación por ruido en distintos ambientes.

6. **Course objectives:**

   Upon passing the course the student will be able to:

   1. Explain the properties of sound, and methods to determine frequency, intensity, and directionality.
   2. Explain impact of the human activities on environmental quality in terms of environmental noise.
   3. Explain the effects of environmental noise on the health of humans and other species, and how to analyze them.
   4. Formulate different strategies for control of environmental noise taking into

account the origin of the noise.

5. Apply methods and instruments to measure noise, and analyze and interpret experimental data.

∗ *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	Sound and waves a. Physical properties of sound and waves b. Scales of Intensity and frequency	6.0 hours
II	The theory of acoustic signals	3.0 hours
III	Sonometry and sound levels (scale/decibels)	4.5 hours
IV	Acoustic physiology: Effects of noise on the organism a. Types of effects on the health of humans and other organisms b. Processes that produce those effects c. Effects on sleep patterns d. Studies on diseases caused by environmental noise	4.5 hours
V	Responses to environmental noise responses and psychoacoustics a. Relationship between exposure levels and discomfort b. Community reactions to environmental noise	1.5 hours
VI	Measurement of environmental noise a. Noise potency and directionality in relation to the source location b. Noise propagation in open areas c. Urban noise sources and characterization d. Strategies to reduce noise	10.5 hours
VII	Environmental noise control a. Noise generated by motor vehicles and other terrestrial transport b. Airplane noise c. Acoustic insulation in buildings d. Noise control laws and regulations e. Noise control techniques	9.0 hours
VIII	Research project	6.0 hours
	Total hours	**45 - equivalent to 3 credits per semester**

8. Instructional strategies: lectures and sonometric measurements.
- ∗ *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. Minimal resources available or required: Sonometric measurement equipment.

10. Strategies for evaluation:

Partial exams (2)	60%
Final exam	20%
Final project	20%

** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: Singal, S. P. 2005. Noise Pollution and Control Strategy. Alpha Science International, Ltd.

13. Bibliography:

1. Crocker, M. J. 2007. Handbook of Noise and Vibration Control. Wiley.
2. Hansen, C. 2005. Noise control from concept to application. Taylor & Francis.
3. Vér, I. L., and L. L. Beranek. 2005. Noise and Vibration Control Engineering: Principles and Applications. Wiley.
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6. Norton, M. P., and D. G. Karczub. 2003. Fundamentals of Noise and Vibration Analysis for Engineers. Cambridge University Press.
7. Walker, J. and I. Flindell. 2003. Noise Pollution. John Wiley & Sons.

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1. García, A. 2001. Environmental Urban Noise. WIT Press.
2. Smith, B. J., R. J. Peters, and S. Owens. 1996. Acoustics and Noise Control. Addison Wesley Publishing Co.
3. Foreman, J. E. K. 1990. Sound Analysis and Noise Control. Van Nostrand Reinhold.
4. Beranek, L. L., and I.L.. Ver. 1992. Noise and Vibration Control Engineering: Principles and Applications. John Wiley and Sons (1992).

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2. http://www.defra.gov.uk/environment/noise/index.htm
3. http://ec.europa.eu/environment/noise/greenpap.htm

4. http://www.epa.sa.gov.au/noise.html
5. http://www.sepa.org.uk/noise/index.htm
6. http://www.acousticecology.org/urban.html
7. http://www.kineticsnoise.com/
8. http://www.hearingconservation.org/
9. http://www.environment.nsw.gov.au/noise/index.htm
10. http://www.who.int/topics/noise/en/
11. http://www.eionet.europa.eu/gemet/concept?langcode=en&cp=10092

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Environmental impact evaluation"

2. **Suggested codification:** "CIAM 8765"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** CIAM 6115, 6116, 6117 and
6118. Field trips on Saturdays or Sundays.

5. **Course description:** Design, preparation and analysis of environmental impact evaluations for real and potential scenarios. The steps and actions are discussed which ought to be taken in preparing an environmental impact statement that complies with existing regulations. Actual environmental impact statements from different private companies and government agencies are analyzed and discussed critically for particular cases of interest.

   Descripción del curso: Diseño, preparación y análisis de evaluación de impacto ambiental para una serie de escenarios reales y potenciales. Se discuten los pasos y acciones que se deben tomar para preparar una declaración de impacto ambiental que cumpla con la reglamentación vigente. Se analizan y discuten críticamente declaraciones de impacto ambiental radicadas por diferentes compañías privadas y agencias de gobierno para algunos casos de interés.

6. **Course objectives:**

   Upon completing the course the student will be able to:

   1. Design and implement an environmental impact evaluation plan following actual laws.
   2. Prepare an environmental impact statement, based on an evaluation plan for any given environmental scenario.

3. Analyze critically any environmental impact declaration to determine its validity and compliance with existing regulations.

∗ *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I Introduction to environmental impact evaluations	1.5 hours
II Environmental impact evaluations a. Applicable federal legislation and regulations b. Terminology c. Components of an environmental impact evaluation	1.5 hours
III Evaluation plan for Environmental impact a. Proposal development b. Determination of variables and controls c. Needed personal d. Design of observation and sampling plan e. Selection of methodology and indicators for air quality analysis f. Selection of methodology and indicators for water quality analysis g. Selection of methodology and indicators for soil quality analysis h. Selection of methodology and indicators for ecosystem quality analysis i. Selection of methodology and indicators for environmental noise analysis j. Selection of indicators for impact on archeological resources k. Selection of indicators for impact on aesthetic quality of location	6.0 hours
IV Evaluation process in the field a. Visits to study area b. Observation and data to be measured in the field c. Selection of sampling points d. Evaluation of air quality e. Evaluation of superficial and underground water quality f. Evaluation of soil quality g. Evaluation of ecosystem quality h. Evaluation of environmental noise	9.0 hours

i. Evaluation of impact on archeological resources j. Evaluation of impact on aesthetic quality k. Evaluation of management practices l. Determination of possible past, present and future sources of pollution m. Evaluation of possible mitigation strategies n. Special considerations depending on the environmental system under study	
V Qualitative and quantitative models for determining environmental impact a. Habitat-based model b. Physical models c. Quantitative models based on particular parameters	3.0 hours
VI Critical analysis of actual environmental impact statements	9.0 hours
VII Environmental evaluation project	15.0 hours
Total hours	**45 – equivalent to 3 credits per semester**

8. **Instructional strategies:** Conferences, case studies and field trips.
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Transportation for field trips.

10. **Evaluation strategies:**

Partial exams (3)	60%
Final project	40%

** Modified evaluation for students with special needs.*

11. **Grading:** A, B, C, D, F

12. **Suggested textbook:** Lawrence, D. P. 2003. Environmental Impact Assessment: Practical Solutions to Recurrent Problems. Wiley.

13. **Bibliography:**

1. Pharino, C. 2007. Sustainable Water Quality Management Policy: The Role of Trading: The U.S. Experience. Springer-Verlag.
2. Griffin, R. D. 2006. Principles of Air Quality Management. CRC Press.
3. Quevauviller, P., and K. C. Thompson. 2005. Analytical Methods for Drinking Water: Advances in Sampling and Analysis (Water Quality Measurements). Wiley.
4. Lerche, I., and W. Glaesser. 2005. Environmental Risk Assessment; Quantitative Measures, Anthropogenic Influences, Human Impact. Springer-Verlag.
5. Glasson, J., R. Therivel and A. Chadwick. 2005. Introduction to Environmental Impact Assessment: Principles and Procedures, Process, Practice and Prospects. University College London Press.
6. Pierzynski, G.M., J.T. Sims, and G.F. Vance. 2005. Soils and Environmental Quality. Lewis Publishers.
7. Young, R. A., and R. L. Giese. 2002. Introduction to Forest Ecosystem Science and Management. Wiley.

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1. Jain, R. K., G. S. Stacy, L. V. Urban, and H. Balbach. 2001. Environmental Assessment. McGraw Hill Professional
2. Marriott, B. B. 1997. Environmental Impact Assessment: A Practical Guide. McGraw Hill Professional

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2. www.environmental-center.com/magazine/elsevier/eiar/
3. http://www.taugroup.com/
4. http://www.envirolink.org/
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6. http://sedac.ciesin.org/entri/
7. http://www.epa.gov/
8. http://www.hsrd.ornl.gov/ecorisk/ecorisk.html
9. http://www.erin.gov.au/life/general_info/biodiv_assess_intro.html

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University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Waste management and disposal"

2. **Suggested codification:** "CIAM 8775"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** CIAM 6115, 6117, and 6118. Field trips on Saturdays or Sundays.

5. **Course description:** Analysis of all types of waste disposal problems for islands and tropical regions, with emphasis on Puerto Rico, and study of the different alternatives and technologies and technologies available. Strategies for reduction, reuse, recycling, disposal in local and regional landfills, gasification plants, incineration, and other topics are examined. Environmental impacts are discussed for different alternatives to the waste management problem for island and tropical regions, with focus on solutions compatible with sustainable development.

   Descripción del curso: Análisis del problema de disposición de residuos de todo tipo en islas y regiones tropicales, focalizando en Puerto Rico, y estudio de las diferentes alternativas y tecnologías disponibles. Se examinan las estrategias de reducción, reutilización, reciclaje, disposición en rellenos sanitarios locales y regionales, plantas de gasificación, incineración y otros. Se discute el impacto ambiental de las distintas alternativas al problema manejo de residuos en islas y regiones tropicales focalizando en soluciones cónsonas con el desarrollo sostenible.

6. **Course objectives:**

   Upon completing the course the student will be able to:

   20. Understand and analyze the magnitude and factors that have caused waste management and waste disposal problems in Puerto Rico and other tropical

islands.

21. Explain the sources, composition, and properties of wastes.
22. Explain the process of management, transportation, and disposal of wastes from the source to the final destination, and the alternatives and technologies available for its transformation.
23. Analyze the environmental impact of each available technology for waste transformation and disposal.
24. Design a management plan that includes different strategies for controlling wastes directed to reducing the adverse impact of wastes on environmental quality.

- *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

Topic	Time assigned (hours)
I Introduction to the problem of waste management and disposal	1.5 hours
II Waste management and disposal legislation	3.0 hours
III Magnitude of the waste disposal problem in Puerto Rico, other islands and tropical regions	3.0 hours
IV Wastes a. Waste sources b. Waste composition produced in a municipality c. Physical, chemical and biological properties of wastes d. Hazardous substances in municipal domestic wastes e. Toxicological aspects of waste management and disposal	7.5 hours
V Waste management a. Waste collection and transport b. Methods of separation according to waste composition c. Classification and processing d. Storage and disposal e. Development of adequate facilities for waste storage f. Site selection for the placement of landfills	7.5 hours
VI Waste transformation and recycling a. Thermal conversion: gasification and incineration plants b. Chemical and microbiological conversion c. Stabilization and solidification methods d. Waste recycling	7.5 hours
VII Remediation of sites contaminated by hazardous wastes a. Quantitative evaluation of risk b. Characterization of the affected area c. Methods for containing dispersion and mitigating damages d. Analysis of alternatives for remediation	7.5 hours
VIII Alternatives for reducing the environmental impact of wastes. a. Reduction of waste generation b. Reuse c. Recycling	7.5 hours
Total hours	**45 – (equivalent to 3 credits per semester)**

8. **Instructional strategies:** Conferences and field measurements.
   - *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Transportation for field trips.

10. Strategies for evaluation:

Partial exams(3)	75%
Final exam	25%

Assistance to field trips is essential for passing the course.
** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: Williams, P. T. 2005. Waste Treatment and Disposal. John Wiley & Sons.

13. Bibliography:

1. Atlas, R. M., T. Hazen and J. Philp. 2005. Bioremediation. Blackwell.
2. Berkey, E. and T. Zachry. 2005. Subsurface Contamination Remediation: Accomplishments of the Environmental Management Science Program. Oxford University Press.
3. Pichtel, P. 2005. Waste Management Practices: Municipal, Hazardous, and Industrial. CRC.
4. UNEP. 2005. Solid Waste Management. United Nations Environment Programme.
5. Bagchi, A. 2004. Design of Landfills and Integrated Solid Waste Management. Wiley.
6. Glaser, J. A., and P. Baveye. 2003. The Utilization of Bioremediation to Reduce Soil Contamination: Problems and Solutions. Springer-Verlag.
7. Almorza, D., C. A. Brebbia, D. Sales, and V. Popov. 2002. Waste Management and the Environment. WIT Press.

Bibliography (previous syllabus)

1. Hickman, H.L. 1999. Principles of Integrated Municipal Solid Waste Management. American Academy of Environmental Engineers.
2. Lagrega, M. D., P. L. Buckingham, and J. C. Evans. 1994. Hazardous Waste Management. McGraw Hill.
3. Tchobanoglous,G., H. Theisen, S. A. Vigil. 1993. Integrated Solid Waste Management: Engineering Principles and Management Issues. McGraw Hill.

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1. http://www.environmental-center.com/magazine/elsevier/eiar/

2. www.elsevier.com/locate/wasman
3. wmr.sagepub.com/
4. http://www.wastedisposal.com/
5. http://www.epa.gov/msw/disposal.htm
6. http://www.gdrc.org/uem/waste/waste.html
7. http://water.usgs.gov/wid/html/bioremed.html
8. http://www.epa.gov/msw/recycle.htm
9. http://www.webdirectory.com/Recycling/

14. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Energy generation"

2. **Suggested codification:** "CIAM 8785"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Pre-requisites, co-requisites and other requirements:** CIAM 6115, 6117 and 6118

5. **Course description:** Study of fundamental energy concepts, the laws of thermodynamics, and their practical applications. Analysis of demand for and sources of energy for islands and tropical regions, and of alternatives for energy generation within the context of sustainable development. The environmental impacts of different alternatives for energy generation are discussed focusing experience in Puerto Rico and other islands.

   Descripción del curso: Estudio de los conceptos fundamentales de energía, las leyes de termodinámica y sus aplicaciones prácticas. Análisis de la demanda y las fuentes de energía en islas y regiones tropicales, y de las alternativas para su generación dentro del contexto del desarrollo sostenible. Se discute el impacto ambiental de las distintas alternativas de generación de energía focalizando en la experiencia de Puerto Rico y otras islas.

6. **Course objectives:**

   Upon completing the course the student will be able to:

   1. Explain the utility of different energy sources, and the process of development of different technologies for energy generation that are presently used.
   2. Discuss and analyze the energetic advantages and disadvantages of energy generation technologies that are in use or in development.
   3. Analyze the environmental, social, and economic impact of these technologies.
   4. Analyze the impact of human activities on some renewable and non-renewable

energy sources.

5. Design planning strategies directed at the achievement of sustainable economical development based on energy alternatives that will not adversely affect the environment.

* *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	General vision of different energy generation methods	1.5 hours
II	Thermodynamic laws and their application to energy generation problems	3.0 hours
III	The sources, availability, and costs for energy, and the technological advances required and available to facilitate their use a. Solar energy b. Hydraulic energy c. Wind energy d. Fossil fuel e. Nuclear energy f. Geothermic energy g. Biomass h. Other potential sources	7.5 hours
IV	Energetic advantages and disadvantages of the technologies available and in development for energy generation	4.5 hours
V	Risks and hazards associated with the use of each of these technologies	4.5 hours
VI	Environmental, social, and economic impact of each technology a. Air, water, and soil contamination b. Effects on population health c. Effects on habitats and ecosystems d. Greenhouse effect e. Cost-benefit analysis f. Externalities	6.0 hours
VII	Human activities impact on some renewable and non-renewable energy sources a. Excessive consumption of fossil fuel and other non-renewable resources b. Use of renewable resources in excess to their renewable capacity c. Deforestation d. Others	7.5 hours
VIII	Local, federal, and international public policies related to the use of diverse technologies for energy generation	3.0 hours
IX	Planning strategies for achieving sustainable development on islands and in tropical regions based on the use of available	7.5 hours

resources and technologies that do not adversely affect the environment	
Total hours	**45 – 3 credits per semester**

8. **Instructional strategies:** Lectures, literature review.
   - *Arrangements will be done to provide accommodation for disabled students upon request.*

9. **Minimal resources available or required:** Library resources

10. **Strategies for evaluation:** Partial exams (3) 75%
    Final exam 25%
    * *Modified evaluation for students with special needs.*

11. **Grading:** A, B, C, D, F

12. **Suggested textbook:** Boyle, G., B. Everett, and J. Ramage. 2003. Energy Systems and Sustainability. Oxford University Press.

13. **Bibliography:**

1. Sovacool, B. K., and M. A. Brown. 2007. Energy and American Society: Thirteen Myths. Springer-Verlag.
2. Odum, H. T. 2007. Environment, Power, and Society for the Twenty-first Century: The Hierarchy of Energy. Columbia University Press.
3. Manwell, J. F., J. G. McGowan, and A. L. Rogers. 2007. Wind Energy Explained: Theory, Design and Application. John Wiley & Sons.
4. Gupta, H., and S. Roy. 2006. Geothermal Energy: An Alternative Resource for the 21st Century. Elsevier.
5. Bradford, T. 2006. Solar Revolution: The Economic Transformation of the Global Energy Industry. MIT Press.
6. Loulou, R.,J. Waaub, and G. Zaccour. 2005. Energy and Environment. Springer.
7. Tester, J. W., E. M. Drake, M. J. Driscoll, and M. W. Golay. 2005. Sustainable Energy: Choosing Among Options. MIT Press.
8. Elliott, D. 2003. Energy, Society and Environment. Routledge.
9. Harrison, R. M., and R.E. Heste. 2003. Sustainability and Environmental Impact of Renewable Energy Sources. Royal Society of Chemistry.

Bibliography (previous syllabus)

1. Borbely, A. M., and J.F. Kreider. 2000. Distributed Generation: The Power Paradigm for the New Millenium. CRC Press.
2. Bejan, A., P. Vadbasz, and D. G. Krhoger. 1999. Energy and the Environment.

Kluwer Academic Publishers.
3. Hinrichs, R. 1997. Energy. Harcourt Brace.
4. Kreith, F. 1996. CRC Handbook of Energy Efficiency. CRC Press.

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1. http://www.iaee.org/en/publications/journal.aspx
2. http://www.netl.doe.gov/publications/journals/jeer_toc.html
3. www.elsevier.com/locate/energy
4. http://www.nrel.gov/
5. http://www.fe.doe.gov/education/
6. http://www.eere.energy.gov/
7. http://www.greenhouse.gov.au/renewable/recp/solar/index.html
8. www.energy.gov/
9. http://www.eere.energy.gov/afdc/altfuel/altfuels.html
10. http://www.fueleconomy.gov/feg/
11. http://www.rri.org/index.php
12. http://www.ren21.net/

14. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Natural hazards on islands and in tropical regions"

2. **Suggested codification:** "CIAM 8845"

3. **Nu. hours/credit:** 3 contact hours per week (equivalent to 45 hours/3 credits per semester)

4. **Prerequisites, corequisites and other requirements:** CIAM 6115, 6117 and 6118. Field trips on Saturdays or Sundays.

5. **Course description:** Study of natural geological, hydrological, and atmospheric hazards on islands and in tropical regions, including floods, landslides, volcanism, earthquakes, tidal waves, tsunamis, hurricanes, expansive soils, and others. The focus is on geological, hydrological, and atmospheric processes that promote these hazards, their environmental, social, and economic impacts, strategies to minimize the magnitude of damages and losses they cause, and the impact of global climatic change on the magnitude and frequency of certain events.

   Descripción del curso: Estudio de los peligros naturales: geológicos, hidrológicos y atmosféricos característicos de islas y regiones tropicales, incluyendo inundaciones, deslizamientos de tierra, volcanismo, terremotos, maremotos, huracanes, suelos expansivos y otros. Se focaliza en los procesos geológicos, hidrológicos y atmosféricos que dan lugar a cada uno de estos peligros, su impacto ambiental, social y económico, las estrategias para minimizar la magnitud de daños y pérdidas ocasionados por los mismos y el impacto del cambio climático global en la magnitud y frecuencia de algunos eventos.

6. **Course objectives:**

   Upon passing the course the student will be able to:

   1. Explain geological, hydrological, and atmospheric processes that produce

different natural disasters on islands and in tropical regions.

2. Analyze the environmental, social and economic impact of each of the natural disasters.
3. Design or formulate planning and mitigation strategies directed at eliminating or reducing the adverse effects of different types of risks on human populations and the environment.
4. Analyze impact of global climatic change on the magnitude and frequency of natural disasters on islands and in tropical regions.
5. Apply mathematical models to predict natural risks and disasters.

- *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:

	Topic	Time assigned (hours)
I	Introduction to natural disasters on islands and tropical regions	1.5 hours
II	Geologic disasters; causes, effects, magnitude, frequency, and impact a. Volcanoes b. High temperature volcanic gases c. Lahars d. Earthquakes e. Tidal waves and tsunamis f. Avalanches g. Landslides h. Falling rocks i. Mudflow	12.0 hours
III	Hydrologic and atmospheric dangers: causes, effects, magnitude, frequency, and impact a. Hurricanes and tropical storms b. Storm surge c. Floods d. Droughts	7.5 hours
IV	Effects of climatic change on magnitude and frequency natural disasters	4.5 hours
V	Impact of human activities on magnitude, frequency, and potential risks of natural disasters	6.0 hours
VI	Strategies for the elimination or reduction of natural disasters	6.0 hours
VII	Quantitative models for the prediction of natural dangers and risks	7.5 hours
	Total hours	**45 - equivalent to 3 credits per semester**

8. Instructional strategies: Lectures, field trips and field measurements.

- *Arrangements will be done to provide accommodation for disabled students upon request.*

9. Minimal resources available or required: Field trip transportation.

10. Strategies for evaluation:

Partial exams (3)	75%
Final exam	25%

** Modified evaluation for students with special needs.*

11. Grading: A, B, C, D, F

12. Suggested textbook: Bryant, E. 2005. Natural Hazards: Threat, Disaster, Effect, Response. Cambridge University Press.

13. Bibliography:

1. Cotton, W. R., and R. A. Pielke, Sr. 2007. Human Impacts on Weather and Climate. Cambridge University Press.
2. Arnold, M., R. S., Chen, U. Deichmann, and M. Dilley. 2006. Natural Disaster Hotspots Case Studies. World Bank.
3. Bhatti, J., R. Lal, M. A. Price, and M. J. Apps. 2006. Climate Change and Managed Ecosystems. CRC Press.
4. Nott, N. 2006. Extreme Events. Cambridge University Press.
5. Hyndman, D., and D. Hyndman. 2005. Natural Hazards and Disasters .Brooks Cole.
6. Marti, J., and G. G. J. Ernst. 2005. Volcanoes and the Environment. Cambridge University Press.
7. Bell, F. 2003. Geological Hazards: Their Assessment, Avoidance and Mitigation". Spon Press (Routledge).
8. Schneider, S. H., and T. L. Root. 2002. Wildlife Responses to Climate Change: North American Case Studies. Island Press.
9. Hebenstreit, G. T. 2002. Tsunami Research at the End of a Critical Decade. Academic Publishers (2002).

Bibliography (previous syllabus)

1. Burby, R. J. 1998. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities. National Academy Press.
2. Bras, R. L. 1992. The World at Risk: Natural Hazards and Climate Change. American Institute of Physics).

Electronic references:

1. http://www.pubs.asce.org/journals/nh.html
2. http://www.springer.com/east/home/environment?SGWID=5-198-70-18981265-0
3. http://www.enviroliteracy.org/
4. http://www.sciencecourseware.org/eec/Earthquake/
5. http://pubs.usgs.gov/gip/dynamic/tectonics.html
6. http://pubs.usgs.gov/gip/monitor/contents.html
7. http://volcanoes.usgs.gov/Hazards/What/hazards.html
8. http://walrus.wr.usgs.gov/hazards/offquake.html
9. http://hvo.wr.usgs.gov/volcanowatch/
10. http://vulcan.wr.usgs.gov/Glossary/PlateTectonics/
11. http://www.noaa.gov/
12. http://nthmp-history.pmel.noaa.gov/index.html
13. http://www.tsunamiwave.org/

14. http://geohazards.cr.usgs.gov/

14. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Doctoral thesis continuation"

2. **Suggested codification:** "CIAM 8896"

3. **Nu. hours/credit:** 0 contact hours per week (equivalent to 0 hours/0 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Have completed course and investigation credits that are required to obtain the Ph.D. degree in Environmental Science.

5. **Course description:** In order to register in this course, the student should have completed all academic requirements and investigation credits necessary to obtain the Doctoral degree in Environmental Science, and have only remaining the completion, presentation, and defense of the dissertation. A student enrolled in this course will be considered a full time student of the Environmental Science Ph D. Program and of the University of Puerto Rico, Río Piedras Campus.

   Descripción del curso: Para poder matricularse en este curso el estudiante debe haber aprobado todos los requisitos académicos y créditos de investigación para la obtención del grado doctoral en Ciencias Ambientales, y tan solo le debe restar la fase de completar, presentar y defender la disertación doctoral. Un estudiante matriculado en este curso será considerado como estudiante a tiempo completo del Programa Doctoral en Ciencias Ambientales y del Recinto de Río Piedras de la Universidad de Puerto Rico.

6. **Instructional strategies:** Not applicable

7. **Minimal resources available or required:** Not applicable

8. **Evaluation strategies:** Not applicable

9. **Grading:** Not applicable

21. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** "Environmental science graduate seminar I"

2. **Suggested codification:** "CIAM 8901"

3. **No. hours/credit:** 1 contact hour per week/credit (equivalent to 15 hours/1 credit per semester)

4. **Prerequisites, co-requisites and other requirements:** Admission to the Environmental Science graduate program.

5. **Course description:** Conference and discussion on special topics in environmental science, usually by invited speakers or based on research by professors within the environmental science program or on recently published literature in the area.

   Descripción del curso: Conferencia y discusión sobre tópicos especiales en el área de ciencias ambientales, usualmente a cargo de conferenciantes invitados o basado en resultados de investigación de profesores del Programa o trabajos publicados en la literatura reciente en el área.

6. **Instructional strategies:** Seminars, conferences and group discussion.
   * *Students should make the necessary arrangements to include disabled students when working in groups.*
   * *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

7. **Minimal resources available or required:** Projection facilities.

8. **Evaluation strategies:** Evaluation by the professor responsible of the course.
   * *Modified evaluation for students with special needs.*

9. **Grading:** PS, PN, PB, NP

10. **Disability Statement**: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

11. Title: "Environmental Science Graduate Seminar II"

12. Suggested codification: "CIAM 8902"

13. Nu. hours/credit: 1 contact hour per week/credit (equivalent to 15 hours/1 credits per semester)

14. Prerequisites, co-requisites and other requirements: Admission to the Environmental Science graduate program

15. Course description: Conference and discussion of special topics in environmental science, usually by invited speakers or based on research by professors within the environmental science program or on recently published literature in the area.

Descripción del curso: Conferencia y discusión sobre tópicos especiales en el área de ciencias ambientales, usualmente a cargo de conferenciantes invitados o basado en resultados de investigación de profesores del Programa o trabajos publicados en la literatura reciente en el área.

16. Instructional strategies: Seminars, conferences and group discussion.
* *Students should make the necessary arrangements to include disabled students when working in groups.*
* *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

17. Minimal resources available or required: Projection facilities.

18. Evaluation strategies: Evaluation by the professor responsible of the course.
* *Modified evaluation for students with special needs.*

19. Grading: PS, PN, PB, NP

20. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
College of Natural Sciences
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Título:** "Special topics in environmental sciences"

2. **Suggested Coding:** "CIAM 8990"

3. **Credit-hours:** 1-3 contact hours per week (equivalent to 15-45 hours/1-3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Authorization from the Environmental Sciences Graduate Program Director.

5. **Course description:** Detailed study on one or more specific topics in environmental sciences, usually under the direction of visiting professors or specialists in one of the areas of environmental science. The course is designed to offer a practical and theoretical experience on one or more specific topics of current interest in the environmental sciences. The topics will vary each year. The format of the course facilitates invited experts in the selected topics to dedicate a week or more to lectures and laboratory or empirical experiences.

   Descripción del curso: Estudio detallado sobre uno o más temas específicos en el área de ciencias ambientales, usualmente a cargo de profesores visitantes o de especialistas en alguna de las áreas de las ciencias ambientales. El curso está diseñado para ofrecer una experiencia práctica y teórica sobre temas específicos y de actualidad en ciencias ambientales. Los temas varían cada año. El formato del curso propicia el que invitados expertos en el tema seleccionado dediquen una semana o más a sus conferencias y experiencias empíricas.

6. **Course Objectives:**

   This course has various purposes:

   1. Expose the student to current topics in the environmental sciences.
   2. Provide practical experiences related to the topics presented by visiting professors.

3. Have the students develop a critical analysis of the content to which he/she has been exposed in the course and apply his/her knowledge in an empirical manner.
4. Develop in the students skills for exchanging information and technical transfer which will facilitate the application of what they have learned to their research project.

* *Students should make the necessary arrangements to include disabled students when working in groups.*

7. Course Outline and time distribution:
The course outline and time distribution will depend on the specific topic under discussion and the professor in charge. In general terms:

Topic	Time assigned (hours)
Lecture (5-15 sessions)	5-15 hours
Laboratory/Field trips (5-15 sessions)	20-50 hours (equivalent to 7-20 hours of lecture)
Oral presentations of research projects	3 hours
Total hours	**15-45 – equivalent to 1-3 credits per semester**

8. Instructional Strategies: Lectures, group discussion, laboratories, field trips, and a research project. Lectures and laboratory/field trips will be presented by visiting professors specializing in each topic.

∗ *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. Minimal resources available or required: Projection facilities, transportation for field trips, and laboratory facilities. The resources required for learning could change depending on the topics and laboratory requirements included in the course in each semester. If a laboratory is needed, this will require space, equipment, and appropriate materials for the students to carry out the practical exercises. If there are field trips, transportation and field sampling equipment will be required.

10. Evaluation Strategies: Evaluations will be carried out by the professors in charge of the course. Students will be evaluated based on their participation in the laboratories or field trips, class discussions, and on the oral presentations. In addition, students can be evaluated with partial and/or a final exam.

* *Modified evaluation for students with special needs.*

11. Grading: A,B,C,D,F

12. Suggested Textbook: The selection of the text will change depending on the topic(s) selected during the semester in which the course is offered.

13. Bibliography: The bibliographic selection will change depending on the topics selected during the semester in which the course is offered**.**

17. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

21. Title: **"**Graduate research for the Doctorate degree in Environmental Sciences"

22. Suggested codification: "CIAM 8999"

23. No. hours/credit: 1 - 6 hours per week (equivalent to 15 – 90 hours/1 - 6 credits per semester)

24. Prerequisites, co-requisites and other requirements: Authorization of the Director of the Environmental Science program.

25. Course description: Dissertation research leading to the Doctorate degree in Environmental Sciences.

Descripción del curso: Investigación de tesis conducente al grado doctoral en Ciencias Ambientales.

26. Instructional strategies: Field and laboratory investigation.
- *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

27. Minimal resources available or required: Laboratory facilities.

28. Evaluation strategies: Progress evaluation by the advisor.

29. Grading: PS, PN, PB, NP

30. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that

receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

APPENDIX E-1: SYLLABI OF RELEVANT EXISTING COURSES IN OTHER DEPARTMENTS

APPENDIX F: CURRICULUM VITAE OF AVAILABLE PROFESSORS

BIOGRAPHICAL SKETCH - **ALONSO RAMIREZ**

Institute for Tropical Ecosystem Studies, University of Puerto Rico, Rio Piedras
PO Box 21910, San Juan PR 00931-1910, Tel 787-764-0000 x7781, Fax: (787) 772-1481
Email: alonso_ites@yahoo.com

PROFESSIONAL PREPARATION

Universidad Nacional, Costa Rica	Tropical Biology	B.S., 1994
University of Georgia	Conservation Ecology	MS, 1997
University of Georgia	Ecology	Ph.D. 2001

APPOINTMENTS

Associate Professor, University of Puerto Rico, Rio Piedras Campus	2001 - present
Scientific Director, El Verde Field Station, University of Puerto Rico	2001 - present

PUBLICATIONS (Total = 27; * indicates students)

Five relevant to the proposed project

Cross, W.F., A. Ramírez, A. Santana*, L. Silvestrini*. 2008. Toward Separating the Relative Importance of Invertebrate Consumption and Bioturbation in Puerto Rican Streams. Biotropica 00:00-00.

Ramírez, A., C.M. Pringle, & K.M. Wantzen. 2008. Tropical river conservation. In D. Dudgeon and C. Cressa (eds.), Tropical Stream Ecology. Academic Press.

Bobeldyk*, A. & A. Ramírez. In Press. Redundancy between shrimps and invertebrates in leaf LITTER DECOMPOSITION. JOURNAL OF FRESHWATER ECOLOGY 00:00-00.

TRISKA, F.J., C.M. PRINGLE, J.H. DUFF, R.J. AVANZINO, A. RAMÍREZ, M. ARDON & A.P. JACKMAN. 2006. Soluble Reactive Phosphorus transport and retention in tropical, rainforest streams draining a volcanic and geothermally active landscape in Costa Rica. 1: Long-term concentration patterns, pore water environment and response to ENSO events. Biogeochemistry DOI 10.1007/s10533-006-9026-

Wantzen, K. M., A. Ramírez, & K. Winemiller. 2006. New Vistas in Neotropical Stream Ecology: Introduction. Journal of North American Benthological Soc. 25:61-65.

Ramírez, A., C.M. Pringle, & M. Douglas. 2006. Physico-chemical variables and the structure of stream insect assemblages in a tropical landscape. Journal of North American Benthological Society 25:108-123.

Five other publications

Ramírez, A., & C.M. Pringle. 2006. Fast growth and turnover of chironomid assemblages in response to stream phosphorus levels in a tropical lowland landscape. Limnology and Oceanography 51: 189-196.

Ramírez, A., & C.M. Pringle. 2004. Do macroconsumers affect insect responses to a natural stream phosphorus gradient? Hydrobiologia 515:235-246. Ramírez, A., & L.R. Hernández-Cruz*. 2004. Aquatic insect assemblages in shrimp-dominated tropical streams, Puerto Rico. Biotropica 36:259-266.

Ramírez, A., C.M. Pringle, & L. Molina*. 2003. Effects of stream phosphorus levels on microbial respiration. Freshwater Biology 48: 88-97.

Ramírez, A. & C.M. Pringle. 2001. Spatial and temporal patterns of invertebrate drift in streams draining a Neotropical landscape. Freshwater Biology. 46: 47-62.

Ramírez, A., D.R. Paulson & C. Esquivel. 2000. Odonata of Costa Rica: Diversity and checklist of species. Revista de Biología Tropical 48(1): 245-252.

SYNERGISTIC ACTIVITIES

Scientific Director of El Verde Field Station. The field station facilitates research in tropical ecology and serves as a location in cross-site comparisons with other field station.

Director of the summer internship program at El Verde Field Station. This program trains undergraduate students in ecology at El Verde Field Station with the participation of faculty mentors.

Director of the Undergraduate Mentoring in Environmental Biology (UMEB) program at UPR. This program trains undergraduate students in ecology by immersing them in a major research laboratory with the participation of ITES faculty mentors.

With R. Novelo-Gutiérrez, international collaboration on dragonfly (Odonata) systematics, resulted in a series of papers in on systematics of the immature stages of the order in Central America.

COLLABORATORS & OTHER AFFILIATIONS

Collaborators and Co-Editors.

Alan Covich, University of Georgia
Todd Crowl, Utah State University
Wyatt Cross, University of Montana
William McDowell, Univ. New Hampshire
Elvia Melendez, University of Puerto Rico
Rodolfo Novelo, Inst. Ecologia, Mexico
Catherine Pringle, University of Georgia
Fred Scatena, University of Pennsylvania

Kirk Winemiller, Texas A&M
Xiaoming Zou, University of Puerto Rico

Graduate and Postdoctoral Advisors.
Catherine Pringle, University of Georgia

Thesis Advisor and Postgraduate-Scholar Sponsor.
Brynne Bryan, University of Puerto Rico
Rebeca De Jesus, University of Puerto Rico
Sofia Burgos Caraballo, University of Puerto Rico
Diana Martino, University of Puerto Rico
Pablo Hernandez, University of Puerto Rico
Noraida Martinez, University of Puerto Rico

BIOGRAPHICAL SKETCH - **ÁNGEL DAVID CRUZ BÁEZ**

Department of Geography, University of Puerto Rico-Rio Piedras, San Juan PR 00931
Tel. (787) 764-0000, ext. 4295 – Email: angeldavid.cruz@gmail.com

PROFESSIONAL PREPARATION

University of Puerto Rico	Social Science	B.A. 1969
University Wisconsin-Madison	Geography	M.S. 1971
University Wisconsin-Madison	Geography	Ph.D. 1977

APPOINTMENTS

Instructor, Department of Geography, University of Puerto Rico-RP, 1972-74
Assistant Professor, Department of Social Sciences, Interamerican University, San Germán, Puerto Rico, 1975-1979
Associate Professor, Department of Social Sciences, Interamerican University, San Germán, Puerto Rico, 1979-1980.
Associate Professor of Geography, University of Puerto Rico-Río Piedras, Puerto Rico, 1980-1986.
Chairman, Department of Geography, University of Puerto Rico-Río Piedras, Puerto Rico, 1983-1986.
Professor of Geography, University of Puerto Rico-Río Piedras, Puerto Rico, 1986 to present.
Chairman, Department of Geography, University of Puerto Rico, Río Piedras, Puerto Rico, 2003 to present.

Areas of Academic and Professional Interests: Computer Cartography, Geographic Information Systems, Remote Sensing, Economic Geography, Medical Geography, Computers in Geography, Geography of Puerto Rico.

FIVE RELEVANT PUBLICATIONS

Cruz Báez, A.D. 2006. *Introducción a la Estadística Elemental para Estudiantes de Geografía*. Ediciones Situm, San Juan, ISBN-59608-229-1.

Cruz Báez, A.D., Guilbe, C. J., López, A. 2002. *Vive la Geografía de Nuestro Puerto Rico*. Editorial Cordillera, San Juan.

Cruz Báez, A.D. 2003. *El potencial de mercado para techos naturados en residencias unifamiliares en Puerto Rico: Un Estudio Preliminar*. PP17-28 in (J. Briz and I. de Felipe, eds.) *Temas de Actualidad, Serie Técnica*, (Arquitectura Bioclimática y Naturación Urbana), Colegio Oficial de Ingenieros Agrónomos de Centro y Canarias, Editorial Agrícola Española, S.A, Madrid

Boswell, T.D. Cruz Báez, A.D., Zijlstra, P. 1998. *Housing Preferences and Attitudes of Blacks Toward Housing Discrimination in Metropolitan Mia*mi. Urban Geography 19(3):189-210.

Cruz Báez, A.D., Boswell, T.D. 1997. *Atlas of Puerto Rico*, with (Univ. Miami), Cuban American Nacional Council, Miami.

OTHER PUBLICATIONS

Boswell, T.D., Cruz Báez, A.D., 1997. *Residential Segregation by Socioeconomic Class in Metropolitan Miami: 1990*. Urban Geography 18(6):474-496.

Cruz Báez, A.D.. 1997. *¿Está la Agricultura de Puerto Rico lista para la Globalización?*, 1996, in (J. Seguinot Barbosa, ed.), *La Globalización en América*, Institute of Caribbean Studies, University of Puerto Rico Puerto Rico. (Joint Project between University of Puerto Rico and Laval University, Quebec.)

SYNERGETIC ACTIVITIES

Summer Faculty Fellowship, NASA (Aerospace Research, summer 1988 and summer 1989), Training and Research in Geographic Information Systems and Satellite Imagery Remote Sensing at the Stennis Space Center, Mississippi.

Transformed the Department of Geography from its traditional descriptive focus to a more modern scientific undergraduate department focusing on computer cartography, digital remote sensing and geographic information systems. This new approach made Geography more interesting to the students and thus significantly increased our enrollment. A computer laboratory with 16 computers with software for Computer Cartography, Geographic Information Systems, and Remote Sensing was eventually developed as a result of my $60,000 proposal submitted to the University Administration.

Research for the Puerto Rico Planning Board and Federal Emergency Management Agency, 2003-2004.

Member (2004 - present) of Roswell Park Cancer Institute-University of Puerto Rico Research Initiative that just obtained a $506,275 Minority Institution /Cancer Center Partnership Grant from National Cancer Institute to focus on Breast Cancer Research in Puerto Rico.

COLLABORATORS

Carlos Guilbe, University of Puerto Rico—Río Piedras
Thomas Boswell, University of Miami
Maritza Barreto, University of Puerto Rico—Río Piedras
Cruz María Nazario, School of Epidemiology, University of Puerto Rico—Medical Campus

Graduate Mentoring (3 MS)

M.S. Batista Camacho, Migdalia, Demography, University of Puerto Rico, Medical Campus, School of Public Health, 2006.

M.S. Valeiras Miní, Evelio, Metropolitan University, School of Environmental Sciences, 2003

M. Planning, Nelson Prieto**,** Graduate School of Planning, University of Puerto Rico—Río Piedras.

Undergraduate mentoring Honors theses:
Cielomar Rodríguez, coastal processes, University of Puerto Rico-Río Piedras ,2006
José David Colón-Alejandro, climatology, University of Puerto Rico, Río Piedras, 2005

BIOGRAPHICAL SKETCH – ARIEL E. LUGO

US Forest Service, International Institute of Tropical Forestry
1201 Calle Ceiba, Río Piedras, Puerto Rico 00926-1115
Tel: 787-766-5335 – Email: alugo@fs.fed.us

PROFESSIONAL PREPARATION

University of Puerto Rico	Biology	B.S. 1963
University of Puerto Rico	Biology	M.S. 1965
University of Carolina	Ecology	Ph.D. 1969

APPOINTMENTS

- Director, International Institute of Tropical Forestry, USDA Forest Service (1995-present)
- Acting Deputy Chief of International Forestry, USDA Forest Service, Washington, D.C., February-March, 1995
- Project Leader (1979-1992), Director (1986-1992), and Supervisory Research Ecologist (1979-1992), Institute of Tropical Forestry.
- Division Head, Center for Energy and Environment Research, University of Puerto Rico (1980-1988)
- Staff Member, Council on Environmental Quality, Executive Office of the President (1978-1979)
- Acting Director, Center for Wetlands, University of Florida at Gainesville (July 1977-January 1978)
- Assistant Secretary for Science and Technology, Puerto Rico Department of Natural Resources (1974-1975)
- Assistant Secretary for Planning and Resource Analysis, Puerto Rico Department of Natural Resources (1973-1974)

PUBLICATIONS

- Frangi, J.L., M.D. Barrera, L.L. Richter and A.E. Lugo. 2005. Nutrient cycling in *Nothofagus pumilio* forests along an altitudinal gradient in Tierra del Fuego, Argentina. Forest Ecology and Management 217:80-94.
- Silver, W.L., L.M. Kueppers, A.E. Lugo, R. Ostertag, and V. Matzek. 2004. Carbon sequestration and plant community dynamics following reforestation of tropical pasture. Ecological Applications 14(4):1115-1127.
- Lugo, A.E., W.L. Silver and S. Molina Colón. 2004. Biomass and nutrient dynamics of restored neotropical forests. Water, Air and Soil Pollution: Focus 4:731-746.
- Lugo, A.E. and J.L. Frangi. 2003. Changes in necro mass and nutrients on the forest floor of a palm floodplain forest in the Luquillo Mountains of Puerto Rico. Caribbean Journal of Science 39(3):265-272.
- Lugo, A.E., and S. Fu. 2003. Structure and dynamics of mahogany plantations in Puerto Rico. Pages 288-328 *in* Lugo, A.E., J.C. Figueroa Colón, and M. Alayón, editors. Big-leaf mahogany: genetics, ecology, and management. Springer, New York. 433 p.

- Medina, E., H.H. Wang, A.E. Lugo, and N. Popper. 2003. Growth, water-, and nutrient-related plasticity in hybrid mahogany leaf development under contrasting light regimes. Pages 146-168 *in* Lugo, A.E., J.C. Figueroa Colón, and M. Alayón, editors. Big-leaf mahogany: genetics, ecology, and management. Springer, New York. 433 p.
- Silver, W.L., A.E. Lugo, and D. Farmer. 2003. Soil organic carbon in the tropical forests of the United States of America. Pages 363-382 *in* Kimble, J.M., L.S. Heath, R.A. Birdsey, and R. Lal, editors. The potential of U.S. forest soils to sequester carbon and mitigate the greenhouse effect. CRC Press, Boca Raton, FL.

GRANTS

- National Science Foundation Long-Term Ecological Research grant for the Luquillo Experimental Forest IV, December 1, 2006-2012 ($4, 920,000) with N. Brokaw.
- National Science Foundation Long-Term Ecological Research grant for the Luquillo Experimental Forest III, December 1, 2002-2006 ($700,000) with N. Brokaw, J. Zimmerman, W. Silver, and W. McDowell.
- National Aeronautics and Space Administration Institutional Research Award for Land Management in The Tropics and its Effects on the Global Environment, 1999, ($112,000) with E. Helmer.
- National Science Foundation Long-Term Ecological Research grant for the Luquillo Experimental Forest III, March 18, 1999-2001 ($235,122) with J. Zimmerman and F. Scatena.
- National Science foundation Long-Term Ecological Research grant for the Luquillo Experimental Forest II, 1994-1997 ($4,080,000) with R. Waide, F.N. Scatena, and J.K. Zimmerman. (DEB-9411973).

RECOGNITIONS

- Environmental Quality Award, US Environmental Protection Agency, April 2005.
- Honorary Doctorate in the Humanities, University of Puerto Rico at Cayey, October 2004.
- Distinguished Scientific Career Award, University of Puerto Rico, Cayey Campus, March, 2004.
- Meritorious Executive Rank Award from President George W. Bush, October, 2004.
- Original Member, Highly Cited Researchers Database ISI Thomson Scientific, 2002.
- Distinguished Scientist Award for 1992, InterAmerican University, San Juan.

SYNERGISTIC ACTIVITIES

Innovations in Teaching and Training

- Through the AlACiMa program (Alianza para el Aprendizaje de Ciencias y Matemáticas – Alliance for Learning Science and Mathematics) have developed three two-week summer research camps for High School students (45 students) that have led to three peer reviewed publications co-authored by my students.

Development of Databases to Support Research and Education

- Developed with Institute staff a chemistry handbook with chemical data for tropical plants and soils (approximately 1 million data points).

Broadening the Participation of Groups Under-represented in Science

- Developed science participation programs for high school students in Puerto Rico and the U.S. Virgin Islands.

Service to the Scientific Community

- Through editorial boards of journals, handle or review about 36 manuscripts per year.

RESEARCH COLLABORATORS

COLLABORATORS
Nicholas Brokaw, University of Puerto Rico; Elvira Cuevas, University of Puerto Rico; Richard J. Hobbs, Murdoch University, Australia; William McDowell, University of New Hampshire; Ernesto Medina, Instituto Venezolano de Investigaciones Científicas; Sandra Molina Colón, Pontifical Catholic University of Puerto Rico; Whendee L. Silver, University of California; Skip van Bloem, University of Puerto Rico.

THESIS ADVISOR AND POSTGRADUATE-SCHOLAR SPONSOR
Oscar Abelleira, University of Puerto Rico (M.S.); Migdalia Alvarez, University of Puerto Rico (Ph.D.)
Tamara Heartsill-Scalley, University of Pennsylvania (Sponsor: Post-Doc)

BIOGRAPHICAL SKETCH – **CAMILO GOMIDES**

Department of Foreign Languages, University of Puerto Rico-Rio Piedras, San Juan PR 00931
Tel. (787) 764-0000, ext. 3688 – Email: camilogomides@yahoo.com

PROFESSIONAL PREPARATION

Universidade Federal de Viçosa, Brazil	Dairy Science	*Bacharel* (US equivalent B.S.; UK equivalent Honours) 1992
Tulane University	Spanish and Portuguese	MA 2000
Tulane University	Spanish	PhD 2003

APPOINTMENTS

2004- *University of Puerto Rico*, Rio Piedras, PR. Department of Foreign Language. Associate Professor of Portuguese.

2003-2004 *Western Illinois University*, Macomb, IL. Department of Foreign Languages and Literatures. Assistant Professor of Spanish.

1998-2003 *Tulane University*, New Orleans, LA. Department of Spanish and Portuguese. Teaching Assistant. Instruction of lower and upper division Portuguese and Spanish courses [4.99 average teaching evaluation out of a possible 5.00].

1995-1998 *Instituto Brasileiro Equatoriano de Cultura*, Quito, Ecuador. Instructor of Portuguese language and culture (levels 1-5), approximately 20 hours contact/week and free-lance translator. Representative of Brazilian Embassy for sponsored events (Diplomatic Visa in Ecuador).

1994-1995 *Facultad Latinoamericana de Ciencias Sociales*. Quito, Ecuador. Research assistant to Prof. Joseph Vogel, Economics/Amazonian Studies.

PUBLICATIONS (FIVE MOST RELEVANT)

"Putting a New Definition of Ecocriticism to the Test: The Case of The Burning Season, a film (mal)Adaptation". *Interdisciplinary Studies of Literature and Environment* Vol. 13.1 Winter 2006 13-23.

"An Ecocritical Analysis of The Old Man who Read Love Stories by Luis Sepulveda" (first author) with Joseph Henry Vogel, *OMETECA*, forthcoming, 2006, *OMETECA Science and Humanities*, vol X, 2006, 182-201.

"Ecological Debt and the Existence Value of Biodiversity: The Evidence begins with the *Diario* of Columbus' First Voyage to America, 1492-1493," first author, Joseph Henry Vogel, second author, Camilo Gomides, *OMETECA Sciences and Humanities*, 2005.

A*mazonia in the Arts: Ecocriticism versus the Economics of Deforestation*, (first author) with Joseph Henry Vogel (second author), under negotiation with the International Union for the Conservation of Nature for simultaneous print and WEB release. Advance praise available from top scholars and pilot project participants, expected publication 2007.

"Consilience of Human Evolution and a *Seemingly* Trivial Detail in the 'The Story of the Captive' by Cervantes," *OMETEC*A: Science and Humanities, 2005.

PUBLICATIONS (FIVE OTHER SIGNIFICANT)

"Histeria, Afeminamiento y *La Amiga Intima* de María del Pilar Sinués*" OMETECA Sciences and Humanities*, Forthcoming, 2007.

"The Nameless Interloper in the Museum of Bioprospecting, Intellectual Property, and the Public Domain," by Valentina Delich, translation into English, Chapter 8 of *The Museum of Bioprospecting, Intellectual Property, and the Public Domain: A Place, A Process, A Philosophy*, anthology of the panel chosen as semi-finalist for "The School for Advanced Research Prize on Nature, Science, and Religion in Latin America" and presented at the 2007 Meeting of the Latin American Studies Association, Montreal, Canada September 5-8, 2007. Available at http://economia.uprrp.edu/PDF%20files/museum.pdf

"*Bye-Bye Brasil*: una alegoría ecocrítica", Proceedings of The Latin American Studies Association for delivery at the 2006 Meeting, San Juan, Puerto Rico.

La consiliencia de la evolución humana y un pormenor aparentemente trivial en "La historia del cautivo de Miguel de Cervantes," Revista académica de pares *OMETECA*: Ciencias y Humanidades Vol. IX 2005 pp. 81-90.

"Como Obter Êxito ao usar Instrumentos Econômicos para Promover o Uso Sustentável da Biodiversidade: Seis Estudos de Caso da América Latina e Caribe," translation into Portuguese of "White Paper: The Successful Use of Economic Instruments to Promote the Sustainable Use of Biodiversity," by Joseph Henry Vogel, (Biodiversity Support Program) *Biopolicy Journal*, 50 pp. http://www.bioline.org.br/request?py97205

SYNERGISTIC ACTIVITIES

Panel Organizer of presentations from five scholars who have taught/are teaching *Amazonia in the Arts: Ecocriticism versus the Economics of Deforestation* as well as a former student of the course, "Student Reception to the textbook *Amazonia in the Arts: Ecocriticism versus the Economics of Deforestation* (Education Track) Latin American Studies Association Conference, 7 September 2007, Montreal, Canada.

"*Un Viejo que leía novelas de amor* con un análisis ecocrítico", a screening of the film for the members of the Sierra Club de Puerto Rico, 26 October 2005, prefaced by an ecocritical analysis. Q&A continued through the email lists and much interest has been generated in ecocriticism among members of the Sierra Club.

Organizer of an International Conference/Working Session of the Ometeca Institute of Literature and Science, held at the University of Puerto Rico, 23-25 October 2005.

Coordination and presentations with the School of Continuing Education at UPR regarding overseas educational excursions to the "Galapagos: a laboratory of evolution" and "The Upper Amazon of Ecuador," 2006-2007.

Innovative Learning Center, Tulane University. Creation of interactive CDROM companion to teach Spanish Cinema, 2002-2003

COLLABORATORS AND OTHER AFFILIATIONS

Co-Director with Joseph Henry Vogel, Department of Economics, UPR-RP (1) "Amazonia in the Arts: Ecocriticism versus the Economics of Deforestation", (50K) FIPI of DEGI July 2004-June

2006, (2) "Web Platforms for Project Proposals: ´The Museum of Bioprospecting, Intellectual Property, and the Public Domain´ and ´The Center for Ecocriticism´" (25K) FIPI of DEGI, July 2006-June 2007.

Own Graduate Advisor
Ana Lopez, Ph.D., Vice-Provost, Tulane University.

Thesis Advisor
MA Thesis Committee (reader), University of Puerto Rico: Jara Rios "Lo animal y lo humano en "Contos do nascer da terra de Mia Coto"" August 2006.

BIOGRAPHICAL SKETCH -**CARLA RESTREPO**

Department of Biology, University of Puerto Rico, Rio Piedras
PO Box 23360, San Juan PR 00931-3360, Tel 787-764-0000 x 4879
crestre@cnnet.clu.edu

PROFESSIONAL PREPARATION

Position, Institution	Major/area	Degree, dates
Undergraduate, Universidad del Valle, Colombia	Biology	B. Sc., January 1984
Graduate, University of Florida	Zoology	M. Sc., May, 1990
Graduate, University of Florida	Zoology	Ph. D., December, 1995

Postdoctoral Institution(s)		
University of Florida	Landscape Ecology	Jan 1996-May 1996
Stanford University	Ecosystem Ecology	May 1996-Sep. 1997
University of New Mexico	Landscape Ecology	Sep. 1997-Dec. 1998

APPOINTMENTS

Assistant Professor, Department of Biology, University of Puerto Rico-RP, 2001 - present
Research Assistant Professor, Department of Biology, University of New Mexico, 2000 – 2001
Postdoctoral fellow, Department of Biology, University of New Mexico, 1999
NSF Minority Postdoctoral Fellow, University of Florida, Stanford University, and University of New Mexico, 1996-1998
Research Associate, OSSO, Universidad del Valle, Colombia, 1996-present
Graduate Teaching Assistant, University of Florida, 1990-1995
Graduate Research Assistant, University of Florida, 1988
Research Coordinator, Reserva Natural La Planada-FES, Colombia, 1992-1993
Ecologist, Heritage Program-Centro de Datos para la Conservación-CVC, Colombia, 1984-1986

PUBLICATIONS

Restrepo, C. and N. Alvarez. 2006. Landslides and their impact on land-cover in the mountains of Mexico and Central America. Biotropica 38:446-457.

Restrepo, C., P. Vitousek, and P. Neville. 2003. Landslides significantly alter land cover and the distribution of biomass: An example from the Ninole ridges of Hawai'i. Plant Ecology 166:131-143

Brown, J. H., V. K. Gupta, B-L. Li, B. T. Milne, C. Restrepo, and G. B. West. 2002. The fractal nature of nature: Powe laws, ecological complexity, and biodiversity. Philosophical Transactions of the Royal Society of London Series B-Biological Sciences 357:619-629.

Milne, B. T., V. K. Gupta, and C. Restrepo. 2002. A scale invariant infiltration law that couples

plants, water, and energy. EcoScience 9:191-199.

Restrepo, C. and P. Vitousek. 2001. Landslides, alien species, and the diversity of a Hawaiian montane mesic ecosystem. Biotropica 33:409-420.

OTHER PUBLICATIONS

Cuervo, A. and C. Restrepo. 2007. Assemblage and population-level consequences of forest fragmentation on bilateral asymmetry in tropical montane birds. Biological Journal of the Linnean Society 92:119-123.

Allen, C. R., A. S. Garmestani, T. D. Havlicek, P. A. Marquet, G. D. Peterson, C. Restrepo, C. A. Store, B. Weeks. 2006. Keystone processes and ecological organization: Evaluating alternative explanations for patterns n body size distribution. Ecological Letters 6:630-643

Restrepo, C. and A. Vargas. 1999. The influence of treefall gaps and anthropogenic edges on seed germination and seedling growth of two understory neotropical shrubs. Oecologia 119:419-426.

Restrepo, C., N. Gómez, and S. Heredia. 1999. Anthropogenic edges, treefall gaps, and fruit-frugivore interactions in a Neotropical montane forest. Ecology 80:668-685.

Restrepo, C. and N. Gómez. 1998. Responses of understory birds to anthropogenic edges in a neotropical cloud forest. Ecological Applications 8:170-183.

SYNERGISTIC ACTIVITIES

Symposia organized: Symposium-workshop on Landslide Ecology – A Perspective from Tropical Mountainscapes, Association for Tropical Biology and Conservation Annual Meeting, Kunming, China, July 2006. (1-day session of oral presentations, 18 speakers from 9 countries, 40 participants; 2-afternoon workhops examining the geologic and hydrologic factors underlying the formation of landslides and discussing major avenues for future research and a concept paper). Symposium on Multimodality in Ecological Variables: A Theoretical Puzzle and a Statistical Challenge, University of Puerto Rico-Rio Piedras, San Juan, PR, March 2004 (3-day symposium, 10 speakers and 20 participants)

Councilor, Association for Tropical Biology, 2002-2003

Mentor, Women in Science and Engineering Program, University of New Mexico, NM, 1998

Development of new lab exercises for Introductory Biology (Majors), University of Florida, 1994

Development of environmental education activities for rural elementary and high school students at the Reserva Natural La Planada, Colombia. 1992-1993

COLLABORATORS

Rafael Bras, MIT
Jim Brown, University of New Mexico
Edward Bedrick, University of New Mexico

Timothy Hanson, University of New Mexico
Colin Stark, LDEO-Columbia University
Peter Vitousek, Standord University
Graduate and Postdoctoral advisors
Jim Brown, Postdoctoral mentor, University of New Mexico
Peter Feinsinger, M.Sc. advisor, Arizona State University
Crawford. S. Holling, Postdoctoral mentor, University of Florida
Douglas Levey, Ph.D. advisor, University of Florida
Bruce T. Milne, Postdoctoral mentor, University of New Mexico
Peter Vitousek, Postdoctoral mentor, Stanford University

Mentor

Zoraida Calle, M.Sc., Universidad del Valle, Colombia.
Andres Cuervo, M.Sc., University of Puerto Rico-Rio Piedras
Johanna Delgado-Acevedo, M.Sc., University of Puerto Rico-Rio Piedras
Dr. Humberto Perotto-Baldiviezo, post-doc
I am currently mentoring 4 B.Sc., 2-M.Sc. and 1-Ph.D. students, and 1-Postdoc at the University of Puerto Rico-RP.

BIOGRAPHICAL SKETCH - **CARLOS JORGE GUILBE-LÓPEZ**

Department of Geography, University of Puerto Rico, Rio Piedras
PO Box 23345, San Juan PR 00931-3345, Tel 787-764-0000 x4337,
Email: cjguilbe@uprrp.edu; http://uprgeografia.tripod.com/carlosjguilbe

PROFESSIONAL PREPARATION

University of Puerto Rico-Rio Piedras	Social Sciences	B.A., 1978
University of Puerto Rico-Rio Piedras	Urban and Environmental Planning	M. P., 1987
Government of Puerto Rico	Professional Certified Planner	PPC, Lic. 441, 1990
University of Wisconsin-Milwaukee	Urban and Economic Geography	Ph.D. 1998

APPOINTMENTS

1998-present: Professor, Department of Geography, College of Social Sciences, University of Puerto Rico-Rio Piedras
2000-2003: Chair, Department of Geography, UPR-RP

1995-2000: Consultant, Erwin Rodríguez and Associates, Engineers, Planners, and Architects, Santurce, Puerto Rico
1993-1997: Planner, Estudios para Negocios Inc., Río Piedras, Puerto Rico
1991-1993: Assessor, Comission on Planning and Socioeconomic Development, Cámara de Representantes, San Juan, Puerto Rico
1988-1991: Planner for Urban Transport Systems, Techni-Management Services Inc., Planners and Assessors, Santurce, Puerto Rico
1987: Director, Office of Planning and Budget, Municipal Government of

PUBLICATIONS

Guilbe-López, C.G. 2008 (in progress). *Plaza Puerto Rico Shopping Center; Historia y Geografía de los Centros Comerciales en Puerto Rico.* Editorial Universidad de Puerto Rico, San Juan, Puerto Rico,
Guilbe-López, C.G. 2007. *La Arquitectura en Sociedades de Consumo. Entorno.* Colegio de Arquitectos de Puerto Rico, in press.
Guilbe-López, C.G, ed. 2006. Historia y Geografía de Puerto Rico. La Enciclopedia del Estudiante. Volume 20. Grupo Santillana, Spain
Ortiz, L., Guilbe-López, C.G. 2005. *Arcadas de las estaciones 20 - 21; Visiones de los centros comerciales en Puerto Rico.* DVD, Center for Social Research, University of Puerto Rico-Rio Piedras.

Guilbe-López, C.G., Cruz Báez, A.D*. 2005. Repetitive Flood Losses in Puerto Rico*. Study for the PR Planning Board and the US Federal Emergency Management Agency.

Cruz Báez, A.D., Guilbe, C. J., López, A. 2002. *Vive la Geografía de Nuestro Puerto Rico*, Editorial Cordillera, San Juan.
Guilbe-López, C.G. 2002. *Chapters 1-4*, in (P. San Miguel, ed.) *Historia de los Estados Unidos* Editorial Norma. Libro de texto editado por.
Guilbe-López, C.G. 2001. *La Geografía de los Amores de Emergencia; Prostitución Juvenil en San Juan, Puerto Rico entre 1993 y 2000*. Revista de Ciencias Sociales 11:1-28.
Guilbe-López, C.G. 2000. *La Evolución de los Centros Comerciales y los Servicios en Puerto Rico*. Volume 3. Unidad de Investigaciones Económicas, Departamento de Economía y la Administración de Fomento Comercial, Puerto Rico
Guilbe-López, C.G. 1998. *The Globalization of Retail Activities; The North American Chain Stores in San Juan, Puerto Rico (1950-1998),* Doctoral Dissertation, University of Wisconsin-Milwaukee.

SYNERGISTIC ACTIVITIES

Service: 2005- Present: External Assessor for Land Use Plan for Puerto Rico, 2006-Present: Academic Senator, University of Puerto Rico-Rio Piedras; 2002- Presente: Writing Group- Exams for Social Science Teachers, College Board of Puerto Rico, San Juan, Puerto Rico; 2000-2002: External Evaluator, PR Solid Waste Administration, San Juan, Puerto Rico

Memberships: Puerto Rico Planning Society (SPP), Association of American Geographers (AAG), National Geographic Society (NGS), University of Wisconsin-Milwaukee Alummni Association, American Planning Association (APA), Geographic Allliance of Puerto Rico, Cogial Geographers of Puerto Rico (SGPR)

Studies completed individually or in a group as a private consultant: 2007: Delimitation of traditional urban centers, PR Department of Transportation and Public Works; 2006: Viability study for the Catalinas Office Park (Caguas), Edwin Rodríguez & Asociados, Río Piedras, PR; 2005: Mitigation Plan for the Municipality of Comerío, Robert de La Cruz & Associates, San Juan, Puerto Rico; 2002: Inventory of slums in Puerto Rico, Office of Special Communities, PR, Taller Social de Planificación; 1995: Regional Plans for the Municipalities of Orocovis, Barranquitas, Corozal, Villalba, Isabela, Nelson Soto and Associates; 1989-1993: Location Studies for Transportation Terminals in Naranjito, Salinas, Cayey, and Municipality of Florida, various companies; 1992: Plans for Economic Development of Arecibo and Barranquitas, Estudios para Negocios Inc.

Media Communications: Isla Chatarra: Dependency of urban planning on the Automobile, Program for TV Global, Brazil and TV Channel 6, Puerto Rico.

COLLABORATORS

Laura Ortiz, UPR-Rio Piedras, Angel David Cruz Baez, UPR-Rio Piedras, Adolfo Lopez, Puerto Rico.

Advisor and committee member for 11 Masters theses in Planning and History.

BIOGRAPHICAL SKETCH – **CECILIO ORTIZ GARCÍA**
Department of Social Sciences, University of Puerto Rico-Mayagüez, Mayagüez, PR 00681
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PROFESSIONAL PREPARATION

Park College	Management	B.Sc. 1988
Governors State University	Public Administration	M.P.A. 1996
Arizona State University	Public Admin/Policy	Ph.D. 1999
Smithsonian Institute	Environmental Leadership Training	May – August 2002

APPOINTMENTS

Assistant Professor, Department of Social Sciences, University of Puerto Rico at Mayaguez, 2007 - present

Assistant Professor, Roberto Sanchez Vilella Graduate School of Public Administration, University of Puerto Rico-RP, 2006 - present

Assistant Professor, Department of Social and Behavioral Sciences, University of Texas of the Permian Basin, 2003– present (on Leave of Absence)

Assistant Professor, Graduate Program in Public Administration, University of Texas of the Permian Basin, 2004- present (on Leave of Absence)

Research Fellow, Smithsonian Institute Monitoring and Assessing Biodiversity Program, Environmental Leadership Certificate, 2002

Visiting Assistant Professor, Chicano Studies Program, University of Texas at El Paso, 2001- 2003

Research Associate, Southwest Center for Environmental Research & Policy, University of Texas at El Paso, 2000

Economic Development Coordinator, Rio Grande Council of Governments, El Paso, TX, 1999

Graduate Teaching Assistant, School of Architecture and Environmental Design, Arizona State University, 1998-1999

Graduate Research Assistant, Western Alliance for Engineering and Science Opportunities, Arizona State University, 1996- 1998

PUBLICATIONS

Ortiz García (2006) "Administración y Medio Ambiente: Un acercamiento interdisciplinario" *Revista de Administración Publica; Volumen 39, Numero 2*, Escuela Graduada de Administración Publica, Universidad de Puerto Rico, Río Piedras (in press).

Ortiz-García (2006) "Managing the Environment on the Caribbean: A Baseline Assessment of State Environmental Capacity in Puerto Rico," *Revista de Administración Publica; Volumen 39, Numero 2*, Escuela Graduada de Administración Publica, Universidad de Puerto Rico, Río Piedras (in press).

Ortiz Garcia (2004) in Bassford, Ledford and Lemus, et. al. "US/Mexico Border Air Quality." Air of Injustice: How Air Pollution Affects the Health of Hispanics and Latinos. League of United Latin American Citizens, Washington, DC

Ortiz Garcia (2004) in Bassford, Ledford and Lemus, et. al. "Our Shifting Borders: Changes in Hispanic/Latino Demographic Patterns and its Environmental Justice Implications." Air of Injustice: How Air Pollution Affects the Health of Hispanics and Latinos. League of United Latin American Citizens; Washington D.C.

Ortiz Garcia (2004) in Bassford, Ledford and Lemus, et. al. "The Urban Forest of the New Millennium: Hispanics Preserving the Lungs of San Juan." Air of Injustice: How Air Pollution Affects the Health of Hispanics and Latinos. League of United Latin American Citizens; Washington D.C.

OTHER PUBLICATIONS

Ortiz Garcia (2003) "Promoting Bi-National Cooperation for Water Management in the Paso del Norte Region" Environmental Defense, New York

Ortiz Garcia C., Ashur S. and Mushkatel, A. (2002) "Development of a Risk Management System for the Transportation of Hazardous Wastes across the U.S./Mexico Border: The Case of El Paso-Ciudad Juarez." The Southwest Center for Environmental Research and Policy, University of San Diego

SYNERGISTIC ACTIVITIES

Symposia organized: Symposium-Workshop on Collaborative Partnerships for Water Management in the Paso del Norte Region, Environmental Defense/Paso del Norte Water Task Force Collaboration, El Paso Texas, October 2003 (2-day session investigating the complex nature of water conflicts in the Paso del Norte Region, and to design a model for collaborative partnerships among the several stakeholders involved.) Assisted in the organization of the 2nd. International Annual Conference *Interdisciplinary Approaches to Sustainability*, International Center for Environmental and Sustainable Development Studies, Turabo University, Gurabo, Puerto Rico November 3rd - 5th 2006 (brought scientists and officials from three Islands in the Caribbean Basin, Dominican Republic, Haiti and Puerto Rico to discuss issues related to protection and management of the Environment and the Sustainable Development of the Islands of the Caribbean Basin through educational and scientific activities related to environmental affairs).

Guest Editor for a special edition of the University of Puerto Rico Journal of Public Administration on Public Administration and the Environment, Volume 39, Number 2, (in press)

Board Member, National Hispanic Environmental Council, 2000-present

Technical Advisory Committee member, Paso del Norte Water Task Force, 2003- present

Development of new environmental justice course work for Chicano Studies (Majors), University of Texas at El Paso, 2002

COLLABORATORS

Dr. Efrain O'Neill Carrillo, University of Puerto Rico-Mayagüez
Dr. Marla Pérez Lugo, University of Puerto Rico-Mayagüez
Dr. Carlos Rincón, Environmental Protection Agency
Dr Eddie Laboy Nieves, Turabo University
Dr, Suleiman Ashur, University of Texas at El Paso
Dr. Christopher Brown, New Mexico State University
Roger Rivera, Esq., National Hispanic Environmental Council

Graduate and Postdoctoral advisors

Dr David K. Pijawka, Doctoral advisor, Arizona State University
Dr. Alvin Mushkatel, Doctoral advisor, Arizona State University
Dr. Michael Mitchell, Doctoral advisor, Arizona State University
Dr. Efraim Gil, MPA Advisor, Governors State University
Dr. Francisco Dallmeier, Mentor, Smithsonian Institution/MAB Biodiversity

Program Mentor: I am currently thesis advisor to 2 MPA students at the Graduate School of Public Administration, University of Puerto Rico-RP. I also serve as member of a PhD dissertation committee at UPRM Civil Engineering Dept.

BIOGRAPHICAL SKETCH - **DAVID W. RÓMAN-VARGAS**

5347 Isla Verde Avenue, Suite 1814, Carolina, Puerto Rico 00979
Tel.: (787) 268-0252 – Email: dwroman@uprrp.edu

PROFESSIONAL PREPARATION

Tulane Law School	Energy and Environment	LL.M., 1994
InterAmerican Law School	Law	J.D., 1991
The University of the South	Third World Studies	B. A., 1988

APPOINTMENTS

2001- Present – University of Puerto Rico, Río Piedras Campus, Coordinator / Professor of the Certificate in Environmental Regulations and Permits program at the UPR-RP, Division of Continuing Education and Professional Studies. University liaison with the U.S. EPA for academic matters.

1994-2000 – O'NEILL & BORGES**,** San Juan, Puerto Rico Attorney
1993-1994 – The Office of the Public Defender**,** New Orleans, Louisiana, Law Clerk.

1992-1993 – The Department of Justice of Puerto Rico**,** San Juan, Puerto Rico, Staff Attorney

PUBLICATIONS

"Valuing Natural Resources: The Puerto Rico Oil Spill Litigation", Wildlife Law Seminar, Tulane Law School, (1994).

"Police Brutality in Puerto Rico: Alternatives for our Penal Code and for our Mechanism of Administering Complaints Against the Police." 25 Rev. Jur. UIA 733 (1991).

SYNERGISTIC ACTIVITIES

- Originator of the Environmental Regulations and Permits Program at the University of Puerto Rico-Rio Piedras—the first academic program in Puerto Rico and in the continental United States in environmental permit management.

- Professional Affiliations: Environmental Law Society, International Law Society, La Alianza del Derecho; The Bar Association of Puerto Rico, Environmental and Natural Resources Committee, The American Bar Association, Section of Environment, Energy, and Resources, Tulane Institute for Environmental Law and Policy, Puerto Rico Association of Continuing Education.
- Service: Coordinate the Certificate in Environmental Regulations and Permits program at the university. Teach courses in environmental law and regulatory compliance. Organize seminars and workshops on environmental regulatory compliance in Puerto Rico and abroad. Conduct evaluations on environmental regulatory compliance. Provide legal advice on environmental matters to ensure compliance with federal and state laws and regulations. Research and prepare of legal memoranda and opinion letters on environmental compliance matters and on the constitutional and legal implications of a wide variety of public policy proposals, including environmental proposals. Litigate environmental matters in federal and state courts and before federal and state agencies. Represent indigent clients accused of federal offenses. Draft environmental law and regulations. Legislative research on environmental public policy proposals.

GRADUATE AND POST-DOCTORAL ADVISORS

Oliver Houck, Tulane Law School

THESIS ADVISOR AND POST-GRADUATE SCHOLAR SPONSOR

M.S. (Environmental Heath): 2 students.

BIOGRAPHICAL SKETCH - **EDGARD RESTO-RODRÍGUEZ**

Department of Physical Science, University of Puerto Rico, San Juan PR 00931
Tel. (787) 764-0000, ext. 2209 – Email: **restoe@gmail.com**

PROFESSIONAL PREPARATION (EDUCATION/TRAINING)

University of Puerto Rico, Río Piedras, PR	Chemistry	B.S.	1982
University of Puerto Rico, Río Piedras, PR	Chemistry (Biochemistry)	M.S.	1985
University of Puerto Rico, Río Piedras, PR	Chemistry (Biochemistry) & minor in Analytical)	Ph.D.	1988
University of Virginia , Charlottesville, VA	Molecular Biology	Postdoctoral	1988-90

APPOINTMENTS

Academic Sector

Associate Professor- Department of Physical Science , University of Puerto Rico, July 2003-present.

Executive Director of "Materials Characterization Center, Inc." (MCC). University of Puerto Rico (February 2002-present). The center offer specialized analytical, method development and applied research to academic and private sector using microscopy and spectroscopic methodology.

Assistant Professor- Department of Physical Science and/or Environmental Science at University of Puerto Rico, Rio Piedras Campus (July 2000-June 2003).

Assistant Professor- Science and Technology Department, Universidad del Turabo, Gurabo, PR (August 1990- May 1997)

Project Director of the *"Bioremediation Education, Science and Technology Center"* (BEST) project at the Ana G. Mendez University System (AGMUS) and member of its Board of Directors. This Project was a collaboration between the University of California Berkeley (UCB), Lawrence Berkeley National Laboratory (LBL), Jackson State University & AGMUS (1992-1997).

Faculty Leader responsible for the development of a "*Graduate Program in Environmental Science*" (1995-97)

Research Associate, University of Virginia, Charlottesville, Virginia (with Dr. Hecht, 1988-1990).

Instructor, Chemistry & Biochemistry Courses at University of Puerto Rico, R.P. (1986-1988). At Inter-American University (UIA) & Universidad Metropolitana (UMET) (1984-1986).

Research Assistant, Biochemistry Lab at University of Puerto Rico, R.P. (1980-1988).

Private/Industrial Sector

Senior Scientist Consultant- for several environmental and technical projects for lawyer or industrial firms (2000-07).

Managing and Quality Assurance- partner and co-founder of the *High Technology Laboratory, Inc*., the second largest contract laboratory dedicate to providing chemical analyses, method validation, analytical, pharmaceutical, microbiological and environmental services to industry and governmental agencies in PR and the Caribbean region, (from 1990 to April 2000).

RELEVANT PUBLICATIONS:

Resto, Edgard (2007) "*Reducción, Reuso y Reciclaje, Mito o Realidad"*, Ecoambiente, November, 2007 ed., In Press.

Resto, Edgard (2007) "*Alternativas para la Crisis en el Manejo de los Desperdicios Sólidos"* Revista Cientifica Crisol, Colegio de Químicos de Puerto Rico, September, 2007.

Garbisu, C., Carlson, D., Yee, B.C., Wong, J.H., Resto, E. Leighton, T. & Buchanan, B.B. (1999) "Morphological and Biochemical Responses of Bacillus subtilis to Selenite Stress" , BioFactor Volume 10, pp 311-319.

Resto, Edgard (1997) "Reglamento Ambiental: Programa Mandatorios vs. Voluntarios", Sin Fronteras (APPR) Volume VI, pp 7-8.

Dávila, R.F., Resto, E. , Pagán, E., & Sánchez, F. (1997) "Bioconversión de Desechos de Empresas Agropecuarias para la Producción de Energía", Panorama Ambiental (AIDIS), Vol. 2, nóm. 1 pp 60-68.

Lasalde, J.A., Colom, A., Resto, E., & C. Zuazága (1995) Heterogeneous distribution of acetylcholine channel induced by cholesterol enrichment. *Biophysical & Biochemical Acta* 1235: 427-438.

Resto, E., Lida, A., Van Cleve, M.D. and Hecht, S.M., (1992) "Amplification of Protein Expression in a Cell free System", Nucleic Acids Research 20, 5979.

Medina, C.A., Resto, E.R., Rivera, M. and Morales, R.W., (1983) "Phospholipases A_2 as Probes of Phospholipid Organization in Cell Surfaces", Fed. Proc.42, 320

AWARD AND OTHER PROFESSIONAL ACTIVITIES:

Member of Puerto Rico Chemist Examination Board, nominated by the Governor of Puerto Rico. November, (2002 to present) and selected as Vice-President since October 2003.

IUPAC Delegate, selected to be member of Board of Delegate of Puerto Rico to *International Union of Pure and Applied Chemistry* (**IUPAC**); (March 2001-present).

Regional Representative to the IUPAC Division of Chemical and Environment (DCE) since 2002.

Certification by Environmental Assessment Association as *Certified Environmental Specialist* (CES), 2000.

"*Dr. Osvaldo Ramirez Torres Award"*. conferred by the Colegio de Químicos de PR, 1999

President of Puerto Rico College of Chemist (1996-97)

"***National Research Service Award*"** by the National Institute of General Medical Sci. (NIH-GMS), (1989-90)

Member of Minority Biomedical Research Training program, University of Puerto Rico, Rio Piedras, P.R., (1986-1988).

RESEARCH COLLABORATION OR PROJECTS ONGOING DURING LAST 3 YEARS:

Principal Investigator: Applied science project, "Method Development for Characterization of Pharmaceutical or Biopharmaceutical Materials by Spectroscopy and Microscopy Techniques*"*

Collaboration with the the Principal Investigator: Jose A. Lasalde Dominicci, Ph.D. Our collaboration in this research group was to explore specific, novel aspects of the interaction of these allosteric sites with the membrane bilayer using nonsense suppressor methods to deliver unnatural amino acids to novel allosteric positions in transmembrane segments Agency National Institute of General Medical Sciences (NIGMS); Type: R01 (2RO1GM56371-05,Years 2002-2005)

ACTUAL SUPPORT

PR's Industrial Sector Private Funds: Approximately amount of ~ $600,000 per Fiscal Year for the management and operational expenses of the Materials Characterization Center, Inc., a non profit corporation (but self-supporting corporation) affiliate to UPR system offering specialized analyses and the corresponding technical and scientific expertise, on a fee basis, to clients in industry and government, from 2002 to present.

Institutional UPR Funds: Time release for the project of "Method Development for Characterization of Pharmaceutical/Biopharma Materials by Spectroscopy/Microscopy Techniques*", (2006-2008).*

OTHER CREDENTIALS:

Environmental or Chemical Analyses Experience: Analysis of environmental samples for organic pollutants using the **EPA** or **USP** approved methodology by Gas Chromatography (GC) and Mass Spectrometry (GC/MS) such as petroleum derivatives, pesticides, PCB's, volatiles, aromatics and halogenated solvents & others. Directly involved in the sampling, coordination and analysis of several projects for Hazardous Waste Characterization, according to the Resource Conservation and Recovery Act (RCRA).

Selected to participate as advisor to the Solid Waste Management Administration (**SWMA,** 1999-2000) and to Municipality of Caguas (2006-07) in the "Evaluation Committee" respectively, for the PR Resource Recovery Facility a ~$500MM *waste-to-energy* projects. In addition he has prepared, submitted and presented several opinions and pronouncement to proposed new legislation or regulation of environmental or chemistry concern at PR's Legislative Chambers or Regulatory Agencies during the last Six years.

BIOGRAPHICAL SKETCH -**ELVIA J. MELÉNDEZ-ACKERMAN**

Institute for Tropical Ecosystem Studies, University of Puerto Rico, Rio Piedras
PO Box 21910, San Juan PR 00931-1910, Tel 787-764-0000 x2842
Email: ejmelendez@uprrp.edu

PROFESSIONAL PREPARATION

University of Puerto Rico, Río Piedras.	Biology	B. S. 1984-1987
University of Puerto Rico, Río Piedras	Biology	M. S. 1987-1990
University of California, Irvine	Ecology	Ph.D. 1990-1995

APPOINTMENTS

1) Interim Director, Institute for Tropical Ecosystem Studies, University of Puerto Rico, Río Piedras Campus (January 2006 – Present); 2) -Full professor - Institute for Tropical Ecosystem Studies, University of Puerto Rico, Río Piedras Campus (July, 2006 – Present); 3) Special Appointment – Department of Terrestrial and Atmospheric Sciences – Purdue University (2005-2009); 4) -June 2002-Present Director Species and Population Management Cluster (Subgroup II) – Center for Applied Tropical Ecology and Conservation, 5) -Associate Professor, Institute for Tropical Ecosystem Studies, University of Puerto Rico- Río Piedras; 6) (June 2000- Present); 7) -Director El Verde Field Station, Institute for Tropical Ecosystem Studies, University of Puerto Rico- Río Piedras (June 1996 – June 2000), 8) -Assistant Professor, Institute for Tropical Ecosystem Studies, University of Puerto Rico- Río Piedras (June 1996 – June 2000), 9) Assistant Professor Department of Biology, University of Puerto Rico-Humacao –(Jan 1996-June 1996)

5 SIGNIFICANT PUBLICATIONS

Fumero-Cabán J. and E J. Meléndez-Ackerman. 2007. Behavior and Pollination effciency of flowers visitors of Pitcairnia angustiflia (Bromeliaceae). American Journal of Botany: 94(3): 419–424.

Rivera, N*., R. Tremblay, E. Meléndez-Ackerman. 2006. Density dependent effects in a lithophytic and epiphytic orchid. Folia Geobotanica 41:107-120

Raymond L. Tremblay, Elvia Meléndez-Ackerman and Durrell Kapan. 2006. Do epiphytic orchids behave as a metapopulation? Evidence from colonization, extinction rates and asynchronous population dynamics" Biological Conservation, 129:70-81

Meléndez-Ackerman, E., Speranza, P, Kress W. J., Rohena, L*., Toledo E*., Cortés C*, D. Treece*, Gitzendanner M, Soltis, P, Soltis, D. 2005. Micro-evolutionary processes inferred from AFLP and morphological variation in Heliconia bihai (Heliconiaceae). International Journal of Plant Sciences. 166:781-74

Meléndez-Ackerman, EJ, S. Aragón , M Morales-Vargas,, J. Sustache , F Axelrod,, Chamary Fuentes*, J D. Ackerman, M Garcia, D S.Fernández. 2005. Monitoring Efforts Yield New Plant Records For Mona Island, Puerto Rico, A Tropical Dry Forest Wonderland. Caribbean Journal of Science 41:150-152

FIVE OTHER SIGNIFICANT PUBLICATIONS

Melendez-Ackerman, E. J., C. Calisto-Pérez,*, M. López-Vargas*, J. Fumero-Cabán*. 2003. Patterns of damage and hurricane recovery of the understorey herb Heliconia caribaea. Journal of Tropical Ecology 19:677-684

Melendez-Ackerman, E. J. and J. D. Ackerman. 2001. Density-dependent variation in breeding system and reproductive success in a terrestrial orchid. Plant Systematics and Evolution 227:27-36.

Meléndez-Ackerman E.J., J.D. Ackerman and J.A. Rodríguez. 2000. Resource vs. pollen limitation in a nectar-producing orchid. Biotropica 32:282-290

Meléndez-Ackerman E. J., D. R. Campbell. 1998. Adaptive significance of flower color and inter-trait correlations in an Ipomopsis hybrid zone. Evolution 52:1293-1303.

Ackerman, J. D., E. J. Meléndez-Ackerman and J. Salguero-Faría. 1997. Variation in pollinator abundance and selection on floral phenotypes in an epiphytic orchid. American Journal of Botany 84: 1383-1390.

SYNERGISTIC ACTIVITIES

-Directed REU Site: "REU in Tropical Ecology ad Evolution at the El Verde Field Station (2000-2002).

-Several positions within the Organization for Tropical Studies including member of OTS.

National Fellowship Advisory Committee (NFAC- 2001-Present; functions include developing and implementing a comprehensive plan to increase diversity at the undergraduate, graduate, professional and organizational levels, UPR Delegate to OTS (Organization for Tropical Studies 2004-present, duties include disseminating OTS research and educational opportunity and serve as advisor to OTS applicants and recently elected Vice Chair of NFAC (a member of OTS Board of Directors).

-Collaborator in Program - Conservation GIS for Puerto Rico with CRC-NSP-Smithsonian.

-Development and implementation short-term course in GIS tools in Spanish with applications to Conservation with data relevant to Puerto Rico.

- served as NSF panelist for UMEB and Population Biology (2003, 2004).

Collaborators and other affiliations

Collaborators and Co-editors

University of Puerto Rico-Río Piedras: Alonso Ramirez , Elvira Cuevas , Jorge Ortiz, Patricia Burrowes, Eugenio Santiago, Tugrul Giray, Owen Mc Millan, Carla Restrepo, Edwin Hernandez, Paul Bayman. **Silvia Planas, Alberto Galindo, Alberto Puente, Carolina Monmany, Jessica Castro**; Maria Jose Andrade; University of, Puerto Rico-Humacao: Raymond Tremblay, Denny Fernandez, Ariel Diaz; University of Hawaii: Durell Kappan; Department of Natural Resources and the Environment: Department of Natural Resources and the Environment: Miguel García, José Sustache; CRC-NZP Smithsonian Peter Leimgruber, Catherine Christen; NMNH-Smithsonia: John Kress.

Thesis Advisors:
James D. Ackerman University of Puerto Rico-Río Piedras; University of Puerto Rico-Río Piedras

Graduate and Undergraduate Mentoring* (Undergraduate 31; Graduate 6: 3 MSc, 3 PhD). *Undergraduate*: *UPR.Rio Piedras:* Jose Fumero, Mariely Morales, Esther Toledo, Pablo Hernandez, Gabriel Agosto, Jesus Vazquez, Ernesto Beltrán , Colibrí Sanfiorenzo, Katherine Svenson, Carla Cortes,Vanesa Rodríguez, Paulina Calle, Sara Rivera; Ana Maria Noriega; Alma Martinez, Christopher Cheleueite; Sullian Sánchez, Edgard Hernández, Luz M. Báez, Roxana Morillo, Chamary Fuente, *UPR-Humacao*: Vilmaliz Guzman, Angel Torres, Juliana Rodriguez, Carolyn Cabrera; *UPR-Ponce*: Melanie Pagán; *UPR-Carolina*: Hagmel A. Vega, Ana S. Rosado, Ana L. Rosado*; Oberlin College*: Devon Treece, UPR-*Arecibo*: Rigoberto Gonzalez, Ivonne Figueroa *Graduate; UPR.Rio Piedras*:: Charito Orengo (MSc), Jose Fumero (MSc, Ph.D), Julissa Rojas (Ph.D), Paola Olaya (MS), Hana Lopez (MSc), Nadia Paola Flores (Ph.D-Co Advisor).
*Does not include research training courses

BIOGRAPHICAL SKETCH - **ELVIRA CUEVAS**

Department of Biology, University of Puerto Rico, San Juan PR 00931
Tel. (787) 764-0000, ext. 4713 – Email: ecuevas@uprrp.edu

PROFESSIONAL PREPARATION

University of Puerto Rico	Biology	B.S. 1971
University of Puerto Rico	Biology	M.S. 1975
Instituto Venezolano de Investigaciones Científicas	Ecology	Ph.D. 1983
USDAFS International Institute of Tropical Forestry	Nutrient cycling	Postdoctorate 1986-1988

APPOINTMENTS

- Director – CREST Center for Tropical Applied Ecology and Conservation, University of Puerto Rico, Río Piedras Campus (September 1st, 2002 – present).
- Full Professor – Department of Biology, University of Puerto Rico, Río Piedras campus (September 4, 2001 - present)
- Associate Investigator II & III (September 1988 – April 1999) – Plant eco-physiology laboratory, Ecology Center, Instituto Venezolano de Investigaciones Científicas, Caracas, Venezuela (IVIC)
- Scientific Collaborator - USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, Puerto Rico (1988 – present)
- Adjunct Professor - Department of Biology, University of Puerto Rico, Río Piedras campus (August 2000 – July 2001)
- Visiting Associate Professor - Department of Botany, University of Florida, Gainesville, Florida, USA (December 30 1994 - May 11, 1995).
- Visiting Professor – School of Biological Sciences, Stanford University (September 1993 – July 1994).
- Ecologist (post-doctoral appointment), International Institute of Tropical Forestry, USDA Forest Service, Río Piedras, Puerto Rico (August 1986 - February 1988)
- Visiting professional – Plant eco-physiology laboratory, Centro de Ecología y Ciencias Ambientales, Instituto Venezolano de Investigaciones Científicas (IVIC) (August 1983 - July -1986)

PUBLICATIONS

- Barger, N., D'Antonio, C.D., Ghneim, T., Brink, T. & Cuevas, E. 2002. Nutrient limitation to primary productivity in a secondary savanna in Venezuela. Biotropica 34(4): 493-501.

- Barger, N., D'Antonio, C.D., Ghneim, T. & Cuevas, E. 2003. Constraints to colonization and growth of the African grass (Melinis minutiflora), in a Venezuelan savanna. Plant Ecology 167: 31-43

- Tremont, O. & Cuevas, E. 2004. Organic carbon, nutrients and seasonal changes in the soil microbial biomass of the dominant tree species on two types of tropical forests. Multiciencias 4(2): 96-103.

- Ortiz-Zayas, J.R., Cuevas, E., Mayol-Bracero, O.L., Donoso, L., Trebs, I., Figueroa-Nieves, D., McDowell, W.H. 2006. Urban influences on the nitrogen cycle in Puerto Rico. Biogeochemistry 79: 109-133.
- Martinelli, L.A., Howarth, R.W., Cuevas, E., Filoso, S., Austin, A.T., Donoso, L., Huszar, V., Keeney, D., Lara, L.L., Llerena, C., McIssac, G., Medina, E., Ortiz-Zayas, J.R., Scavia, D., Schindler, D.W., Soto, D. & Townsend, A. 2006. Sources of reactive nitrogen affecting ecosystems in Latin America and the Caribbean: current trends and future perspectives, Biogeochemistry 79: 3-24

OTHER SIGNIFICANT PUBLICATIONS

- Cuevas, E. & Lugo A.E. 1998. Dynamics of organic matter and nutrient return from litter fall in stands of ten tropical plantation species. Forest Ecology and Management 112: 263-279.
- H. Tiessen, Cuevas, E. & Salcedo, I.H. 1998. Organic matter stability and nutrient availability under temperate and tropical conditions. In: Towards Sustainable Land Use. Advances in GeoEcology 31, Catena Verlag, 415-422.
- Martinelli, L.A., Piccolo, M.C., Townsend, A.R., Vitousek, P.M. & Cuevas, E., McDowell, W.M., Robertson, G.P., Santos, O.C. & Treseder, K. 1999. Nitrogen stable isotopic composition of leaves and soil: Tropical versus temperate forests. Biogeochemistry 46: 45-65.
- Cuevas, E. 2001. Soil versus biological controls on nutrient cycling in Terra Firme forests. In: (McClain, E.M, Victoria, R.L. & Richey, J.E., Eds.) The Biogeochemistry of the Amazon Basin and its Role in a Changing World. Oxford University Press. pp 41-67.
- Medina, E. & Cuevas, E. 2002. Comparative analysis of the nutritional status of mahogany plantations in Puerto Rico. In: (Lugo, A.E., Figueroa, J.C & Alayón, M., Eds.) Big-Leaf Mahogany: Genetics, Ecology, and Management. Ecological Studies, Vol. 159. Springer-Verlag,. New York. Pp. 129-145.

SYNERGISTIC ACTIVITIES

Thrust Area Co-leader - EPSCoR V, Resource Center for Science and Engineering, University of Puerto Rico (2002 - present); Board of Directors, Caribbean Division, American Association for the Advancement of Science (2003 - present); Scientific Advisory Committee - Jobos Bay Natural Reserve, Puerto Rico (2005 - present); Co-Developed a multidisciplinary research and teaching network funded by Interamerican Institute for Global Climate Change research (IAI), on biogeochemical determinants and land use in the semi-arid Americas; Co-developed an IAI/NSF funded research and teaching network on effects of species and functional diversity on ecosystem function: a comparison between Arctic tundra and a temperate grassland/shrubland system in Alaska and Argentina.

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators and Co-editors

Owen McMillan, University of Puerto Rico, Elvia Meléndez-Ackerman, University of Puerto Rico, Carla Restrepo, University of Puerto Rico; Ernesto Medina, IVIC; Ariel E. Lugo, USDA Forest Service International Institute of Tropical Forestry; Carla D'Antonio, University of California Santa Barabara;

Luiz Martinelli, CENA Universidad de Sao Paulo; Jorge Ortiz, University of Puerto Rico, Olga Mayol-Bracero, University of Puerto Rico; Robert Howarth, Cornell University; Amy Austin, Universidad de Buenos Aires; Allan Townsend, University of Colorado at Boulder, William M. McDowell, University of New Hampshire, Ghneim, T, Instituto Venezolano de Investigaciones Científicas (IVIC), Tremont, O. Universidad de Coro;

Graduate and Post-doctoral Advisors

Ariel A. Lugo, Postdoctoral Advisor, USDA Forest Service International Institute of Tropical Forestry

Ernesto Medina, Ph.D. Advisor, Centro de Ecología, Instituto Venezolano de Investigaciones Científicas

Richard Clements, M.S. Advisor, Environmental Protection Agency

Thesis Advisor and Post-Graduate Scholar Sponsor (Undergraduate 25, 4 at present, M.S.: 3 students; Ph.D: 2; Post-doctorate: 1) Mothes, Michel. 1997. M.S. Universidad de los Andes, Mérida, Venezuela, Businessman at Venezuela; Herrera, Francisco. 1997, M.S. IVIC, Posdoctorate (2000-2001) IVIC, Caracas, Venezuela. At present Associate IVIC, Caracas, Venezuela, at present Associate Investigator at IVIC, Caracas, Venezuela, Marulanda, Luis O. 1997. PH.D. IVIC, Caracas, Venezuela. Went into natural products business in Venezuela and Colombia, Tremont, Omar. 2002. IVIC, Caracas, Venezuela. Currently an assistant professor at Universidad de Coro, Venezuela; Barberena-Arias, María Fernanda. PhD University of Puerto Rico, Rio Piedras campus. In progress: Herrera, Francisco.

BIOGEOGRAPHICAL SKETCH - GABRIEL MORENO VIQUEIRA

College of Natural Sciences, University of Puerto Rico – Rio Piedras, San Juan, Puerto Rico
email: gmviqueira@onelinkpr.net

EDUCATION:

Princeton University	Biology	B.A. 1984
State University of New York at Stony Brook	Ecology and Evolution	Ph. D. 1990
University of Cambridge	Ecology and Evolution, History and Philosophy of Science	Postdoctorate 1991-1992
Harvard University	Urban Planning and Design, Social Studies of Science	Postdoctorate 1994-1998
Massachusetts Institute of Technology - University of Puerto Rico	Professional Development Program in Transportation and Urbanism	Professional training 1998-2003

APPOINTMENTS

2007-present	Associate Professor, *University of Puerto Rico at Río Piedras*
1993-2007	Assistant Professor, *University of Puerto Rico at Río Piedras*

FIVE MOST RELEVANT PUBLICATIONS:

Moreno Viqueira, G. 2007. Relating Urbanism and Transportation to Global Warming. *In* Gaia and Climate Change: An International Conference Proceedings. San Juan, Puerto Rico.

Moreno Viqueira, G. 2007. The Integration of Urban and Environmental Concerns: Urbanism as a Key Element in Current Environmental Practice. *In* City and Ecology: Toward a more Sustainable Future*:* Proceedings of the XII Ibero-American Urbanism Congress. Salamanca, Spain.

Moreno Viqueira, G. 2006. *The relationship among urbanism, transportation and the environment.* In: Report of the Advisory Board on Urbanism of the Governor of Puerto Rico.

Moreno Viqueira, G. 2005. Se hace ciudad al andar: Experiencias internacionales.(International Experiences in Sustainable Urbanism). Entorno, *Journal of the Puerto Rico College of Architects.*

Moreno Viqueira, G. 2005. University for a Sustainable and Livable City: The State University as a Laboratory, Pilot Project and Center for Education in Sustainable Transportation and Urbanism. *Proceedings of the EPA-SCUP Smart and Sustainable Campus Conference, 2005.*

OTHER PUBLICATIONS

Moreno Viqueira, G. 2005. An analysis of the intersection of the ecological and the aesthetic in environmental issues; A case study. *In:* Las Dos Culturas: Ciencias y Humanidades (*The Two Cultures: Science and the Humanities*) . *Publicaciones Fundación Nilita Vientós Gastón.*

Moreno Viqueira, G. 2004. The University as an example of sustainable urbanism and transportation: Results of a study at the University of Puerto Rico. In: Universidad

Centenaria ¿Y ahora qué? Proceedings on the Second Congress of University Research, University Professors Association, University of Puerto Rico, 2004.

Moreno Viqueira, G 2004. The intersection of environmental, urban and transportation issues: The case of the new metro of San Juan. In Recycling the City: Proceedings of the XI Iberean American Urbanism Congress.

Moreno Viqueira, G. 2003. *Modernist aesthetics in biology and architecture*. *Teknokultura* vol 3.

FELLOWSHIPS AND AWARDS:

2005 - EPA-SCUP Smart and Sustainable Campus Conference Selected Project (One of six projects selected by the EPA across the US)
2005 - EPA Environmental Quality Award for UPR Río Piedras Sustainable Campus Project
1994-2004 - Harvard University Graduate Prize Fellowship

CURRENT GRANTS:

As Principal Investigator:

1. Environmental Protection Agency-University of Puerto Rico Conservation Challenge Grant: University for a Sustainable Urbanism: Sustainability in Urban Systems as a key environmental issue in Puerto Rico.
2. ATI-UPR Río Piedras: Research and Professional Training Program in Sustainable Urbanism and Transportation (Puerto Rico Department of Transportation).

As Co-Principal Investigator:

1. NSF-IGERT Ecological and Human Tropical Systems (Pending approval).

SYNERGISTIC ACTIVITIES

2006-2008 P.I., EPA Grant R2DEPP-FO-05-04 ($50,928). University for a Sustainable and Livable City:
Sustainable Urbanism as a Key Environmental Issue in Puerto Rico. Collaboration between EPA and UPR Río Piedras to establish campus as a center for education, research and outreach in urban sustainability.

2004-2009 P.I., UPR Río Piedras Component of the ATI-UPR-PUPR Research and Professional Development Program ($550,000): Sustainable Transportation and Urbanism. Interdisciplinary professional training program funded by the Puerto Rico Highway and Transportation Authority.

2006 Advisory Board on Urbanism for the Governor of Puerto Rico.

2001-present Sustainable Campus Project. Research and Development in Sustainable Urbanism and Mobility for the UPR Río Piedras Campus with the Office of the Chancellor and consultant architects Field Operations. Member of the Steering Committee for the Master Plan of the UPR Río Piedras campus. Project selected by the EPA in a US national competition as model project for the Smart and Sustainable Campus Conference, 2005.

2000-2001 Río Piedras Urban Renewal Project. Proposal: *Integrating Sustainability Concepts in Río Piedras Urban Center Revitalization Project*. Interdisciplinary curricular development

and teaching among Natural Sciences, the Graduate School of Planning and the School of Architecture:

COLLABORATORS:
Criseida Navarro (Planning, UPR-RP), Sonia Miranda (Architecture, UPR-RP), Javier Isado (Architecture, UPR-RP), Aníbal Sepúlveda (Urban Planning, UPR-RP) Carmen Concepción, (Environmental Planning, UPR-RP) Javier de Jesús (Architecture, UPR-RP), Bejamín Colucci (Civil Engineering, UPR Mayaguez), Peter Rowe, (Urban Planning and Design Harvard), Larry Vale, (Urban Planning, MIT), Fred Salvucci (Transportation, MIT), Mikel Murga, (Transportation and Urban Planning, MIT), Ken Krukemeyer (Architecture, Urban Planning, Transportation, MIT) Nigel Wilson (Transportation MIT), Kevin Nelson (EPA-Smart Growth), Matthew Dalbey (EPA-Smart Growth)

Previous advisors/ graduate committees:
Ph. D: Douglas Futuyma, SUNY Stony Brook. Post Ph. D: Michael Ashburner (Cambridge, UK), Harmke Kamminga (Cambridge, UK), Everett Mendelson (Harvard), Rossana Vaccarino (Harvard), Hugh Gusterson (MIT)
Graduate Thesis Committees:
PhD Student: Ana Arteaga (May 2007)
Master's students: UPRRP: Sofía Solé (present), Javier Valentín (present), Hugo Colón (present), Idania Rodríguez (2006) Vanessa Rivera (2005), Lizbeth Dávila (2004), Yahaira Graxirena (2004), Annette de León (2003), Florida International University: Ana Leyda Román, (2002)
Note: The low number of Ph.D. students is due to the lack of Ph.D. programs in the areas I work on, namely, planning, social science and architecture students who work on issues of environmental sustainability. The only exception is the psychology department, from which I obtained one student. This situation will change once we have a Ph.D. environmental sciences program.

BIOGRAPHICAL SKETCH – **GARY A. TORANZOS**

Department of Biology, University of Puerto Rico, P.O. BOX 23360, San Juan, PR 00931-3360
Tel. (787) 773-1743 – email: gatoranzos@uprrp.edu

PROFESSIONAL PREPARATION

University of Arizona	B.S. Microbiology and Chemistry	1981
University of Arizona	M.S. Environmental Microbiology	1983
University of Arizona	Ph.D. Environmental Virology	1985
University of Florida	Post-Doc Environmental Virology	1986
University of Puerto Rico	Post-Doc Microbial Ecology	1986-88

APPOINTMENTS

- Professor, Dept. Biology, University of Puerto Rico, San Juan, PR. (1997-present).
-Associate Professor, Biology, University of Puerto Rico (1993-1997),
-Assistant Professor, Biology, University of Puerto Rico (1988-1992)
-Visiting Professor, Universidad Mayor de San Simon, Bolivia (1989-Present)
-Program Director, National Science Foundation, Molecular and Cell Biology (2002-2003)

HONORS:

Latin American Professorship Program Fellow. American Society for Microbiology. 1991
Elected Fellow of the American Association for the Advancement of Science (AAAS) 1995
1996 Award for Scientific and Academic Productivity, University of Puerto Rico
1996 EPSCoR Scholarly Productivity Award Central Administration, University of Puerto Rico
Elected Member, National Science Advisory Board, U.S. Environmental Protection Agency, 1997-2004.
Elected Fellow of the American Academy of Microbiology, American Society for Microbiology, 1997.
Elected Member, Water Environment Research Foundation Research Council, 2001-present.
Elected Member, National Research Council Committee on the Microbiological Quality of Water Distribution Systems National Academy of Sciences 2004-2006.

FIVE MOST RELEVANT PUBLICATIONS:

Alvarez, A.J., M. Khanna, G.A. Toranzos and G. Stotzky. 1998. Amplification of DNA bound on clay minerals: Implications for transfer and persistence of genes in the environment. Molecular Ecology. 7:775-778.

Santamaria, J., and G.A. Toranzos. 2003. Enteric pathogens and soil: a short review. Int. Microbiol. 6:5-9.

Rodriguez, R.A., and G.A. Toranzos. 2003. Stability of bacterial populations in tropical soil upon exposure to Lindane. Int. Microb. 6:253-258.

Cook, M.I. S.R. Beissinger, G.A. Toranzos and W.J. Arendt. 2005. Incubation reduces microbial growth on eggshells and the opportunity for trans-shell infection. Ecology Letters. 8:532-537.

Heinemann, J. A., H. Rosén, M. Savill, S. Burgos-Caraballo, and G. A. Toranzos. 2006. Environment Arrays: A Possible Approach for Predicting Changes in Waterborne Bacterial Disease Potential. Environ. Sci. Technol.40(23):7150 - 7156; (Critical Review)

OTHER PERTINENT PUBLICATIONS

Lasalde, C. R. Rodriguez, and G.A. Toranzos. 2005. Bacterial diversity and statistical programs: possible reasons for faulty source tracking efforts. Applied Environmental Microbiology. 71:4690-4695.

Toranzos, G.A. (ed.). 1997. **Environmental Applications of Nucleic Acid Amplification Techniques**. Technomic Publishing Co., Inc.

Jaykus, LA, R. DeLeon, and G.A. Toranzos. 2002. Detection of bacteria, viruses and parasitic protozoa in shellfish. In: **Manual of Environmental Microbiology: Second Edition.** C.J. Hurst (Ed. In-Chief). ASM Press.

Toranzos, G.A., and A. Toro. 2006. *Vibrio cholerae*. **American Water Works Association Waterborne Pathogens Manual**. AWWA Press.

Toranzos, G.A., G.A. McFeters, J.J. Borrego and M. Savill. 2007. Detection of microorganisms inenvironmental freshwaters and drinking waters. In: **Manual of Environmental Microbiology: Third Edition.** C.J. Hurst Ed. In-Chief). ASM Press. In Press.

SYNERGISTIC ACTIVITIES

-Editorial Board Service: International Microbiology, Journal of Water and Health, Manual of Environmental Microbiology, ASM Press. (1997-present)
-National agency service: Environmental Protection Agency Science Advisory Board 1997-2003;
-National Science Foundation CEOSE Advisory Committee Member (2000-2002); EPA STAA Award Committee Member (2002-2005); NSF Panelist (Ecology of Infectious Diseases, IGERT, Microbial Observatories, 2001-Present)
-Advisor and Reviewer: California State Polytechnic University at Pomona (Grant Review Advisor: 2007); Israel (International Proposal Reviewer)
-American Society for Microbiology, Member, Various Committees (ASM Foundation Lecturers Committee, International Committee, Diversity Committee, etc 2003-Present)
-International Water Association, Health Related Water Microbiology Steering Committee Member (2000-Present)

COLLABORATORS AND THEIR AFFILIATIONS

Gerba, Charles P., University of Arizona

Cook,Marc, South Florida Water Management District

Beissinger, Steve, University of California, Berkeley

Heineman, Jack, University of Canterbury, NZ

Borrego, J. Jose, University of Malaga, Spain

Savill, Marion, ESR, Inc., New Zealand

Smith, Henry, University of the U.S. Virgin Islands

Calderon, Rebecca, U.S.E.P.A.

Hurst, Christon, U.S.E.P.A.

Figueras, Ma. Jose, University of Barcelona, Spain

Graduate and Post-Doctoral Advisors

Charles P.Gerba, M.S. and Ph.D. Advisor, University of Arizona (1985)

Samuel Farrah, Post-Doc Advisor, University of Florida (1986)

Terry Hazen, Post-Doc Advison, Lawrence Berkeley National Laboratories (1988)

Thesis Advisor M.S. Students (Present Position):

Susan Rivera 1988 (Coadvisor, Industry)

Jose Marcos Soto 1989 (Coadvisor PR-EPA)

Edwin Hernandez 1991 (Assistant Professor, UPR)

Rafael Tosado 1992 (Associate Professor, UCC)

Vicente Gomez, 2000 (Ph.D. Candidate, Umass)

Ma. Ivelisse Rodriguez, 1997 (Engineering, MSU)

Maria Sierra, 1995 (Industry)

Roberto Rodriguez, 2003 (Post Doc)

Clarivel Lasalde 2005 (Ph.D. Candidate, UPR)

Gisella Hernandez 2007 (Industry)

In Bolivia:

Miguel Delgado 1993 (Teaching)

Patricia Rodriguez (1994, (Teaching)

Paola Bustillos 2001, (Industry)

Fernando Bascope 2004 (Teaching)

Thesis Advisor Ph.D. Students:

Abdiel Alvarez 1993 (Industry)

Rossana Marcos, 1997 (Professor, UPR)

Arlin Toro, 2000 (Professor, Interamerican University)

Elizabeth Dvorsky, 2000 (Professor, UPR)

Esther Vega, 2000, (Professor, UPR-Humacao)

Elia Sanchez 2006 (Industry)

Iraida Robledo, 2002 (Professor, Medical Sciences Campus, UPR)

Carmen Vazquez, 2002 (Assistant Professor, Colegio Universitario del Este)

Maristella Resto, 2000 (Professor, Metropolitan University)

Post Docs

Francisco Calderon, 2002 (USDA Research Scientist)

Undergraduates

Over 150 supervised in research

GERARDO MORELL

Department of Physics
University of Puerto Rico, San Juan, PR 00931, USA
Tel.: (787) 763-6108
Email: gerardo@adam.uprr.pr
Webpage: nanodiamond.org

Professional Preparation

University of Puerto Rico	Physics	B.S. 1989
University of Puerto Rico	Solid State Physics	M.S. 1994
University of Puerto Rico	Chemical Physics	Ph.D. 1995

Appointments

Aug 2006 – present : Director of the Department of Physics - University of Puerto Rico, Rio Piedras Campus
Jan 2004-present : Director of the Puerto Rico NASA Space Grant and the Puerto Rico NASA EPSCoR programs
July 2004-present : Professor - University of Puerto Rico, Rio Piedras
July 1999-Jun 2004 : Associate Professor - University of Puerto Rico, Rio Piedras
July 1995-June 1999 : Assistant Professor - University of Puerto Rico, Rio Piedras

Most Relevant Publications

- *Synthesis, structure, and field emission properties of sulfur-doped nanocrystalline diamond*, G. Morell, A. Gonzalez-Berrios, B.R. Weiner, and S. Gupta, Journal of Material Science 17, 443 (2006).
- *Diamond film synthesis at low temperature*, F. Piazza, J.A. González, R. Velázquez, J. De Jesús, S.A. Rosario, G. Morell, Int. Journal of Refractory Metals & Hard Materials 24, 24 (2006).
- *Electronic structure of sulfur-modified nanocrystalline carbon films*, S. Gupta, B. R. Weiner, and G. Morell, Journal of Applied Physics 97, 94307 (2005).
- *Spatial distribution of electron emission sites for sulfur doped and intrinsic nanocrystalline diamond films*, F. A. M. Köck, J. M. Garguilo, R. J. Nemanich, S. Gupta, B. R. Weiner and G. Morell, Diamond and Related Materials 12, 474 (2003).
- *Role of sp^2 C Cluster Size on the Field Emission Properties of Sulfur-incorporated Nanocomposite Carbon Thin Films Grown by Chemical Vapor Deposition*, S. Gupta, B. R. Weiner, and G. Morell, Applied Physics Letters 80, 1471 (2002).

Most Significant Publications

- *Room temperature electrical conductivity studies of sulfur modified microcrystalline diamond thin films*, S. Gupta, B.R. Weiner, G. Morell, Applied Physics Letters 83, 491 (2003).

- *Investigations of the Electron Field Emission Properties and Microstructure Correlation in Sulfur-Incorporated Nanocrystalline Carbon Thin Films*, S. Gupta, B.R. Weiner, G. Morell, Journal of Applied Physics 91, 10088 (2002).
- *Electrical conductivity studies of chemical vapor deposited sulfur incorporated nanocomposite carbon thin films*, S. Gupta, A. Martínez, B. R. Weiner, and G. Morell, Applied Physics Letters 81, 283 (2002).
- *The Effect of Hydrogen on the Network Disorder in Hydrogenated Amorphous Silicon*, S. Gupta, R.S, Katiyar, G. Morell, S.Z. Weisz, I. Balberg, Applied Physics Letters 75, 2803 (1999).
- *Anharmonic Interactions in Beryllium Oxide*, G. Morell, W. Pérez, E. ChingPrado, and R.S. Katiyar, Physical Review B, 53 (9), 5388 (1996).

Synergistic Activities

Development and/or Refinement of Research Tools:

Design and manufacture of a chemical vapor deposition (CVD) system especially suited for *in situ* studies of the growing film (spectroscopic phase-modulated real-time ellipsometry) and the gas phase dynamics (cavity-ring down spectroscopy and plasma galvanic effects) during diamond film growth.

Mentoring of Graduate Students:

a. Three MS Physics students graduated: Mr. Juan A. González (May 2000), Mr. Adolfo González (Dec 2004), Ms. Iris M. Vargas (Aug 2006).
b. One PhD Chemical Physics graduated: Dr. Sanju Gupta (June 2002), then became a postdoctoral fellow in J. Robertson's group, Cambridge University, UK
c. Currently Mentoring 3 MS students and 4 PhD students

Other Mentoring Activities:

a. Collaboration with the National Science Foundation Alliance for Minority Participation, directed by Dr. Ana Piñero in UPRRío Piedras. A total of ten undergraduate students (Summers of 1998-2006) have been supervised through this summer program.
b. Currently mentoring 2 undergraduate students during the academic year. A total of eleven have been mentored during the academic years in the laboratory

Honors and Awards

- Research Productivity Award, Resource Center for Science & Engineering, University of Puerto Rico, Fall 2001
- Outstanding Researcher Award, University of Puerto Rico, President's Office, Fall 2000

Collaborators & Other Affiliations

Collaborators:

Brad R. Weiner, UPR-Río Piedras
Ram S. Katiyar, UPR-Río Piedras
Luis F. Fonseca, UPR-Río Piedras
Eduardo Rosa-Molinar, UPR-Río Piedras
Felix Miranda, NASA Glenn Research Center
Michael Meador, NASA Glenn Research Center
Brock L. Weiss, Penn State University at Altoona
Robert Nemanich, University of North Carolina
Orlando Auciello, Argonne National Laboratory
Scott Wolter, Duke University
Patricia Bianconi, University of Massachusetts, Amherst, MA

Graduate and Postdoctoral Advisors:

Ram S. Katiyar, University of Puerto Rico, thesis advisor

Total number of postdoctoral scholars sponsored: four

Brock L. Weiss (1999-2201) – Pennsylvania State University, PA
Fabrice Piazza (2004-2006) – University of Strasbourg, France
Vladimir Makarov (2004-present) – Russian Academy of Sciences, Russia
Sri Lakshmi Katar (2006-present) – Institute of Science and Technology, India

BIOGRAPHICAL SKETCH - **HUMBERTO CAVALLIN**

School of Architecture, University of Puerto Rico – Rio Piedras, San Juan PR 00931-1909
Tel. (787) 764-0000, ext. 2110 – Fax: 787-763-5377 - Email: hcavallin@uprrp.edu

EDUCATION

Universidad Nacional Experimental del Táchira, Venezuela	Architecture	BA 1990
Universidad Central de Venezuela	Social Psychology	MS 1997
University of California Berkeley	Architecture	PhD 2006

EMPLOYMENT

2005-2006 Head of the Graduate Program in Architecture, University of Puerto Rico, Rio Piedras, PR
2004-Present Assistant Professor, University of Puerto Rico, Río Piedras, PR (Tenure Track 2006)
2003-2004 Lecturer, UC Berkeley-Extension, San Francisco, CA
2001-2002 Lecturer, University of California, Berkeley, CA
1992-2002 Associate Professor, Universidad Central de Venezuela, Caracas, Venezuela
1990-1992 Lecturer, Universidad Experimental del Táchira, San Cristobal, Venezuela

MOST CLOSELY RELATED PUBLICATIONS

Ann Heylighen, W.Mike Martin & Humberto Cavallin (2006). Building Stories Revisited / Unlocking the knowledge capital of architectural practice, Architecture Engineering and Design Management.
Developing methods to understand discourse and workspace in distributed computer mediated interaction Renate Fruchter and Humberto Cavallin Published in AI & Society (2006)20:169-188
Ann Heylighen, W.Mike Martin & Humberto Cavallin (2006). Knowledge exchange in the wild / Building Stories' attempt to unlock the knowledge capital of architectural practice, Proceedings of the CIB W096 Architectural Management. .
Ann Heylighen, W.Mike Martin & Humberto Cavallin (2005). Accidental Resource / A Fable of Design Research through Storytelling. En JS Gero and N Bonnardel (Editor), Studying Designers'05
Ann Heylighen, W. Mike Martin & H. Cavallin (June 23, 2005). How to Teach and Archive Tacit Design Knowledge, Design Intelligence. 11(6).

FIVE OTHER REPRESENTATIVE PUBLICATIONS

Ann Heylighen, Humberto Cavallin & W. Mike Martin (2004). The student, the architect, his intern and her knowledge, Between Research and Practice, Proceedings of the EAAE ARCC Conference. (pp. 111- 119). Dublin School of Architecture DIT, Ireland: EAAE Transactions on Architectural Education.

Mind-ing the task The role of context in usability research. Humberto Cavallin, W. Mike Martin & Ann Heylighen SID 2005, Proceedings of the 4th Social Intelligence Design Workshop, Stanford, CA (March 2005)

The right story at the right time Towards a tacit knowledge support for (student) designers W. Mike Martin, Ann Heylighen & Humberto Cavallin Accepted for publication in AI & Society (January 2005).

This is not a Caucus-Race Or why upgrades in software GUIs will (not necessarily) make (all) users (instantly) more productive Humberto Cavallin, W. Mike Martin & Ann Heylighen SID 2005, Proceedings of the 4th Social Intelligence Design Workshop, Stanford (Ca), March 2005

Developing Methods to understand Discourse and Workspace in Distributed Computer Mediated Interaction (2004) Fruchter Renate and H. Cavallin, in Nijholt and Nishida (Eds.) Proceedings of the 3rd Workshop on Social Intelligence Design, Enschede, Netherlands.

SYNERGISTIC ACTIVITIES

Experience on collaboration technologies research and the impact of technology on behavior and processes in global teamwork.

Experience in the planning and assessment of integrated research and education program on Computer Integrated Architecture, Engineering, and Construction (AEC) Global Teamwork Extensive

Active participant of the Colegio de Arquitectos de Puerto Rico.

COLLABORATORS WITHIN PAST 48 MONTHS

University of Puerto Rico: Enrique Vivoni (AACUPR), M. Asim Qayyum (EGCTI/School of Information Sciences & Technology).

Outside the University of Puerto Rico: Renate Fruchter (Stanford University), W. Mike Martin (University of California Berkeley), Ann Heylighen (Leuven Catholic University), Matteo Bianchin (University of Milano–Bicocca), Elena Fadeeva (Autodesk

Inc.).

Master students (In progress): Alejandro Castro, Katia Gonzalez, Desiree Guzman

BIOGRAPHICAL SKETCH - **INDIRA LUCIANO MONTALVO**

Department of Economics, University of Puerto Rico-Río Piedras, San Juan, Puerto Rico
Telephone (787) 721-5846, Cel. (787) 539-8740
inlumo@yahoo.com or iluciano@vmailuprrp.edu

PROFESSIONAL PREPARATION

University of Puerto Rico, Río Piedras.	Economics	B.A. 1995
University of Puerto Rico, Río Piedras	Economics	M.A. 1997
Universidad Nacional Autónoma de México (UNAM), Mexico City	Economics	Ph.D. 2005

APPOINTMENTS

2007 University of Puerto Rico-Río Piedras Campus. Department of Economics. Assistant Professor.

2006-2007 University of Puerto Rico-Humacao Campus. Department of Social Sciences. Lecturer

2005-2006 La Fortaleza, Office of the Governor of Puerto Rico. Economic Development Auxiliary Advisor.

2004 University of Puerto Rico-Arecibo Campus. Department of Social Sciences. Lecturer

2002-2004 Estudios Técnicos, Inc., Hato Rey, Puerto Rico. Economist

FIVE RELEVANT PUBLICATIONS

Luciano, I. y C. Rodríguez. "Un modelo de consumo con externalidad para estudiar los costos y las medidas de política asociadas a la huella ecológica." Sometido para publicación a la Revista Económica. (2007).

Luciano, I. y C. Rodríguez. (2005) "Del ejercicio de optimización del consumidor a la huella ecológica." Ensayos y Monografías, Unidad de Investigaciones Económicas, Departamento de Economía, Facultad de Ciencias Sociales, Universidad de Puerto Rico, Recinto de Río Piedras.

Luciano, I. (abril 2003) "Un panorama general de la productividad en Puerto Rico". Año X, núm. 4. Perspectivas. Publicación de Estudios Técnicos, Inc. y Triple S, Inc.

Luciano, I. (noviembre/diciembre 2002) "Insumo-producto cualitativo: nuevas posibilidades de análisis interindustrial en Puerto Rico". Año IX, núm. 10. Perspectivas. Publicación de Estudios Técnicos, Inc. y Triple S, Inc.

Luciano, I. (junio/julio 2002) "La polémica de los subsidios ambientales". Año IX, núm. 6. Perspectivas. Publicación de Estudios Técnicos, Inc. y Triple S, Inc.

FIVE ADDITIONAL PUBLICATIONS

Luciano, I. (abril 2002) "Diferencias conceptuales de la sustentabilidad". Año IX, núm. 4. Perspectivas. Publicación de Estudios Técnicos, Inc. y Triple S, Inc.

Luciano, I. (marzo 2002) "La población como guardián del medioambiente". Año IX, núm. 3. Perspectivas. Publicación de Estudios Técnicos, Inc. y Triple S, Inc.

Luciano, I. y C. Rodríguez. "El mercado de crédito sobre rigideces endógenas". Ensayos y Monografías. Unidad de Investigaciones Económicas. Universidad de Puerto Rico, Recinto de Río Piedras.

Rodríguez, C. e I. Luciano. (2001) "La propensión marginal al consumo en Puerto Rico (1954-1995): un análisis de cointegración". Cartas de política pública, núm.16, Facultad de Economía, Universidad Nacional Autónoma de México.

SYNERGISTIC ACTIVITIES

Worked with Estudios Tecnicos on the development of an economic plan for sustainable development of the islands of Vieques and Culebra and on the economic impacts of a management plan for the coastal zone of Puerto Rico.

Worked with Initiativa Tecnologica Centro Oriental (a non-profit) to develop a database of regional economic indicators for 8 Puerto Rican municipalities.

Analyzed the economic impact of the development project "Puerto Las Americas" in Puerto Rico and the demand for maritime services at the proposed port.

Presentations on the relationship between consumer behaviour and the ecological footprint at the XVII Coloquio mexicano de economía matemática y econometría, Universidad de Quintana Roo, Chetumal, México, (21-25 May 2007), and at the Seminario Unidad de Investigaciones Económicas, UPR-Río Piedras. Presentación del artículo "Un modelo de consumo con externalidad para estudiar los costos y las medidas de política asociadas a la huella ecológica.", junto al Profesor Carlos A. Rodríguez Ramos (with Carlos Rodríguez Ramos, April 2007).

COLLABORATORS AND CO-EDITORS

Carlos Ramos – UPR-Rio Piedras

RECENT THESIS ADVISOR and

Students: Roberto Aragón, Master Degree (University of Puerto Rico) - Thesis advisor

OWN GRADUATE ADVISORS

Advisor for M.A.: José Caraballo, UPR – Río Piedras
Advisor for Ph.D.: Fidel Aroche, UNAM

BIOGRAPHICAL SKETCH - **JAMES D. ACKERMAN, JR.**

Department of Biology, University of Puerto Rico-Rio Piedras, PO Box 23360, San Juan, PR 00931-3360, Tel. (787) 764-0000 ext. 2023, 2900, 4851, Fax: (787) 764-3875, E-mail: jdackerman@uprrp.edu

PROFESSIONAL PREPARATION

Humboldt State University, Arcata, California	Biology	B.A.	1973
Humboldt State University, Arcata, California	Biology	M.A.	1976
Florida State University, Tallahassee, Florida	Biology	Ph.D.	1981

APPOINTMENTS

Director	Dept. Biology, University of Puerto Rico, Río Piedras	1990-1994, 2006-present
Professor	Dept. Biology, University of Puerto Rico, Río Piedras	1990-present
Assoc. Prof.	Dept. Biology, University of Puerto Rico, Río Piedras	1985-1990
Assist. Prof.	Dept. Biology, University of Puerto Rico, Río Piedras	1981-1985

RESEARCH INTERESTS

Plant reproductive biology, Tropical ecology, Plant systematics, Epiphyte biology, Orchidology, Evolution of floral traits, Role of genetic drift and natural selection in population differentiation, Invasive species, Floristics and phytogeography of the Caribbean

FIVE PUBLICATIONS MOST RELATED TO PROJECT

Ackerman, J. D. 1995. An orchid flora of Puerto Rico and the Virgin Islands. Memoirs of the New York Botanical Garden 73: 1-203.

Ackerman, J. D., J. C. Trejo Torres and Y. Crespo Chuy. 2007. Orchids of the West Indies: predictability of diversity and endemism. Journal of Biogeography 34: 779-786.

Bergman, E., J. D. Ackerman, J. Thompson and J. K. Zimmerman. 2006. Land use history affects the distribution of the saprophytic orchid *Wullschlaegelia calcarata* in Puerto Rico. Biotropica 38: 492-499.

Meléndez-Ackerman, E. J., S. Aragón, M. Morales-Vargas, J. Sustache, F. S. Axelrod, C. Fuentes, J. D. Ackerman, M. Garcia and D. S. Fernández. 2005. Monitoring efforts yield new plant records for Mona Island, a tropical dry forest wonderland. Caribbean Journal of Science 41: 150-152.

Trejo-Torres, J. C. and J. D. Ackerman. 2002. Composition patterns of Caribbean limestone forests: are parsimony and classification analyses congruent? Biotropica 34: 502-515.

FIVE ADDITIONAL SIGNIFICANT PUBLICATIONS

Lasso, E. and J. D. Ackerman. 2003. Flowering phenology of *Werauhia sintenisii*, a bromeliad from the dwarf montane forest in Puerto Rico: an indicator of climate changes? Selbyana 24: 95-104.

Aragón, S. and J. D. Ackerman. 2004. Does flower color variation matter in deception pollinated *Psychilis monensis* (Orchidaceae)? Oecologia 138: 405-413.

Otero, J. T., J. D. Ackerman and P. Bayman. 2002. Diversity and host specificity of mycorrhizal fungi from tropical orchids. American Journal of Botany 89: 1852-1858.Rivera, B. and J. D. Ackerman. 2006. Bat pollination breakdown in a Caribbean columnar cactus, *Pilosocereus royenii*. Biotropica 38: 635-642.

Tremblay, R. T. and J. D. Ackerman. 2007. Floral color patterns in a tropical orchid: are they associated with reproductive success? Plant Species Biology 22: 95-105.

Tremblay, R. L., J. D. Ackerman, J. K. Zimmerman and R. N. Calvo. 2005. Variation in sexual reproduction in orchids and its evolutionary consequences: a spasmodic journey to diversification. Biological Journal of the Linnean Society 84: 1-54.

SYNERGISTIC ACTIVITIES

Mentor for undergraduate research programs: NSF-REU in Tropical Ecology at the Institute for Tropical Ecosystems Studies, El Verde Field Station, UPR; Undergraduate Mentoring in Environmental Biology program, UPR-Río Piedras; Alliance for Minority Participation program, UPR, Puerto Rico
Reviewer for 10 journals and 3 NSF proposals over the last 2 years
Institutional delegate from the University of Puerto Rico to the Assembly of Delegates, Organization of Tropical Studies
Director of the UPRRP herbarium and the Department of Biology

COLLABORATORS

Paul Bayman, Department of Biology, University of Puerto Rico-Río Piedras
Erin Bergman, San Diego State University, California
Lauri Brewster, Antioch College
William Carromero, USDA, USFS, Ocala National Forest.
Eladio Fernández, Sociedad Ornitológica Hispaniola (Santo Domingo)
Eloisa Lasso, University of Illinois, Champaign-Urbana
Juan Llamacho, Santo Domingo
Elvia J. Meléndez-Ackerman, Institute for Tropical Ecosystems Studies, University of Puerto Rico-Río Piedras
Mariely Morales, CSA Group, San Juan, Puerto Rico
Ernesto Mújica, Universidad de Pinar del Río, Soroa, Cuba
Tupac Otero, Departamento de Biología, Universidad Nacional de Colombia
Bert Rivera, Interamerican University, Bayamón, Puerto Rico
David Roubik, Smithsonian Tropical Research Institute, Panamá
Jill Thompson, University of Puerto Rico, Río Piedras
J. Carlos Trejo, Centro de Investicagiones Científicas de Yucatán, Mexico
Raymond Tremblay, Department of Biology, University of Puerto Rico, Humacao
Mark Whitten, Florida Museum of Natural History, University of Florida, Gainesville
Norris Williams, Florida Museum of Natural History, University of Florida, Gainesville
Jess Zimmerman, University of Puerto Rico, Río Piedras

Graduate Advisors

M.A.: Dennis E. Anderson, retired; Ph.D.: Norris H. Williams, University of Florida, Gainesville

Thesis Advisor & Post Doctorate Sponsor (Total Mentored As Major Professor: M.S.: 15; Ph.D.: 3; POST DOCTORATES: 2)

A. Parrilla,	M.S.	1983	University of Puerto Rico, Carolina campus
E. Hernández	M.S.	1986	University of Puerto Rico, Humacao campus
S. De Jesus	M.S.	1986	University of Puerto Rico, Bayamón campus
N. González	M.S.	1987	unknown

S. Moya	M.S.	1990	USDA, International Institute for Tropical Forestry,
E. Meléndez	M.S.	1990	University of Puerto Rico, Río Piedras campus
B. Molano	M.S.	1991	Illinois Natural History Survey, Champaign, Illinois
E. Ortiz	M.S.	1995	Phoenix College, Phoenix, Arizona
J. Salguero	M.S.	1996	CSA Group, San Juan, Puerto Rico
R. Tremblay	Ph.D.	1996	University of Puerto Rico, Humacao campus
E. Lasso	M.S.	2001	University of Illinois, Champaign-Urbana
J. C. Trejo	M.S.	2001	Centro de Investigación Científica de Yucatan, México
B. Rivera	M.S.	2001	InterAmerican University, Bayamón, Puerto Rico
S. Aragón	M.S.	2002	Worchester University, Massachusetts
J. T. Otero	Ph.D.	2002	Universidad Nacional de Colombia
M. Morales	M.S.	2003	CSA Group, San Juan, Puerto Rico
A. Cuevas	Ph.D.	in progress	
J. C. Fagua, M. Muñoz and N. P. Flores		M.S.	in progress

BIOGRAPHICAL SKETCH -- **JESS K. ZIMMERMAN**

Institute for Tropical Ecosystem Studies, University of Puerto Rico, San Juan, PR 00931
(Tel.) 787-764-0000 ext. 1-7641 – E-mail: jkzimmerman@uprrp.edu

PROFESSIONAL PREPARATION:

McGill University	Biology	B.Sc. 1980
University of Windsor	Ecology	M.Sc. 1983
University of Utah	Ecology	Ph.D. 1989
Smithsonian Env. Research Ctr.	Ecology	Post-doctoral Fellow 1989-1991

APPOINTMENTS

Professor, Institute for Tropical Ecosystem Studies, University of Puerto Rico (2002 -- present).
Program Director, Division of Environmental Biology, National Science Foundation (September 2004 – July 2006).
Director, Institute for Tropical Ecosystem Studies, University of Puerto Rico, (October 1998 – September 2004)
Councilor, Association for Tropical Biology (January 2000 – December 2001)
Lead Principal Investigator, Luquillo Long-Term Ecological Research Program (October 1998 – November 2002).
Associate Professor, Institute for Tropical Ecosystem Studies, University of Puerto Rico (July 1996- June 2002).
Scientist-in-Charge, El Verde Field Station (June 1991 – August 1996).
Scientist I, Terrestrial Ecology Division, University of Puerto Rico (June 1991 – June 1996).

PUBLICATIONS (65 TOTAL)

Most Closely Related to The Proposed Project:

Zimmerman, J.K., T.M. Aide, and A.E. Lugo. In press. Implications of land use history for natural forest regeneration and restoration strategies in Puerto Rico. Pages X – X in V. Cramer and R. Hobbs, editors. Old Fields: Dynamics and Restoration of Abandoned Farmland. Island Press.

Bergman, E., J.D. Ackerman, J. Thompson, and **J.K. Zimmerman**. 2006. Land-use history affects the distribution of the saprophytic orchid, *Wullschlaegelia calcarata*, in Puerto Rico's tabonuco forest. Biotropica 38:492-499.

Grau, H.R., T.M. Aide, **J.K. Zimmerman**, and J.R. Thomlinson. 2004. Trends and scenarios of the carbon budget in post-agriculture Puerto Rico (1936-2060). Global Change Biology 10:1163-1179.

Grau H.R., T. M. Aide, **J. K. Zimmerman**, J.R. Thomlinson, E. Helmer, and X. Zou . 2003. The ecological consequences of socioeconomic and land use changes in post agriculture Puerto Rico. *BioScience* 53:1159-1168.

Thompson, J., N.V.L. Brokaw, **J.K. Zimmerman**, R.B. Waide, E.M. Everham, III, D.J. Lodge, C. Talyor, D. Garcia-Montiel and M. Fluet. 2002. Land use history, environment, and tree composition in a tropical forest. *Ecological Applications* 12:1344-1363.

Other Publications:

Zimmerman, J.K., J. Thompson, and N. Brokaw. In press. Large tropical forest dynamics plots: Testing explanations for the maintenance of species diversity. Pages X-X in Carson, W and S. Schnitzer (eds.), Tropical Forest Community Ecology. Blackwell Publications, Blackwell, Oxford.

Zimmerman, J.K., S.J. Wright, O. Calderón, M. Aponte-Pagán, and S. Paton. 2007. Flowering and fruiting phenologies of seasonal and aseasonal neotropical forests: the role of irradiance. Journal of Tropical Ecology 23:231-251.

C. Wills, K. E. Harms, R. Condit, D. King, J. Thompson, F. He, H. C. Muller-Landau, P. Ashton, E. Losos, L. Comita, S. Hubbell, J. LaFrankie, S. Bunyavejchewin, H. S. Dattaraja, S. Davies, S. Esufali, R. Foster, N. Gunatilleke, S. Gunatilleke, P. Hall, A. Itoh, R. John, S. Kiratiprayoon, S. Loo de Lao, M. Massa, C. Nath, M.N.S. Noor, A. Rahman Kassim, R. Sukumar, H. Satyanarayana Suresh, I. Sun, S. Tan, T. Yamakura, and **J. Zimmerman**. 2006. Non-random processes maintain diversity in a tropical forest. *Science.* 311: 527-531.

Tremblay, R.L., J.D. Ackerman, **J.K. Zimmerman**, and R. Calvo. 2005. Variation in sexual reproduction in orchids and its evolutionary consequences: a spasmodic journey to diversification. Biological Journal of the Linnean Society 84:1-54.

Uriarte, M., C.D. Canham, J. Thompson and **J. K. Zimmerman**. 2004. A maximum-likelihood, spatially explicit analysis of tree growth and survival in a tropical forest. *Ecological Monographs* 74:591-614.

SYNERGISTIC ACTIVITIES

1. Participate in the Luquillo Long Term Ecological Research (LTER) Program, a multi-disciplinary study of disturbance and recovery in tropical wet forest in Puerto Rico.
2. Participate in a network of large tropical forest dynamics plots coordinated by the Center for Tropical Forest Science of the Smithsonian Tropical Research Institute.
3. Work with an educational researcher, Steven McGee (Northwestern U.), to develop a web-based curriculum to teach tropical ecology to middle school students.
4. Participate in the development of the Schoolyard LTER Program involving high school teachers in Puerto Rico.

COLLABORATORS & OTHER AFFILIATIONS

Collaborators and Co-Editors in past 48 months:
J.D. Ackerman (UPR)
T. M.Aide (UPR)
M. Aponte-Pagán UPR)
J. Barone (Columbia State, Ga)
Nick Brokaw (UPR)

O. Calderón (STRI)
R. Calvo (consultant)
C. Canham (IES)
R. Condit (STRI)
A. Covich (U.Ga.)
T.A. Crowl (Utah St.)
E. M. Everham III (Fl. Gulf Coast U)
N. Garwood (SIU)
H.R. Grau (Argentina)
CAS Hall (SUNY-ESF)
O. Hardey (Free U Brussels)
E. Helmer (IITF)
A.Lugo (IITF)
D. Jean Lodge (IITF)
W. McDowell (U.NH)
S. McGee (NWestern)
H.C. Muller-Landau (U. Mn)
K. Ogle (Princeton)
J.Pascarella (Valdosta St. U)
S. Paton (STRI)
C. Pringle (UGa)
F.N. Scatena (UPenn)
D. A. Schaefer (CAS)
S. Schnitzer (UW-Milwaukee)
W. L. Silver (Cal - Berkeley
John Thomlinson (Cal St-DH)
J. Thompson (UPR)
R. Tremblay (UPR)
M. Uriarte (Columbia)
Lars Walker (UNv)
R. B. Waide (LNO)
M. Willig (UCt)
C. Wills (UCSD)
S. Joseph Wright (STRI)
X.Zou (UPR)

Graduate and Postdoctoral Advisors: I.M. Weis, U. of Windsor; P.D. Coley, U. of Utah (graduate advisors); D.F. Whigham, Smithsonian Environmental Research Center (postgraduate advisor)

Thesis Advisor and Postgraduate-Scholar Sponsor in past 5 years: S. Alex Sloan (PhD), P. Angulo-Sandoval (PhD), H. Fernandez (PhD), and Ana Portugal (MS), University of Puerto Rico; Matthew Slocum, University of Puerto Rico (postdoctoral scholar).

BIOGRAPHICAL SKETCH –**JORGE R. ORTIZ-ZAYAS**

Institute for Tropical Ecosystem Studies, University of Puerto Rico, San Juan, PR 00931
Tel. 787/764-0000, ext. 2867-email: jorgeortiz_ites@yahoo.com

PROFFESSIONAL PREPARATION

University of Puerto Rico-Rio Piedras	Environmental Science	B.S. 1991
University of Colorado at Boulder	Environmental, Population, and Organismic Biology	Ph.D. 1998

APPOINTMENTS

-Assistant Professor, Institute for Tropical Ecosystem Studies, University of Puerto Rico, Rio Piedras Campus (September 1, 2003-present)
-Research Fellow- CREST Center for Tropical Applied Ecology and Conservation, University of Puerto Rico, Río Piedras Campus (September 1st, 2003– present).
-Scientific Collaborator - USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, Puerto Rico (1994 – present)
-Manager, Environmental Sciences Department, CSA Group, Inc. San Juan, PR (August 2001-July 2003)
-Senior Scientist, Aquatic and Terrestrial Ecology Group, CSA Group, Inc. San Juan, PR (October 1998-August 2001)
-Hydrologist (intermittent), US Geological Survey, Water Resources Division , Denver, Colorado (1986-2004)

PERTINENT PUBLICATIONS:

● Ortiz-Zayas, J.R., Cuevas, E., Mayol-Bracero, O.L., Donoso, L., Trebs, I., Figueroa-Nieves, D., McDowell, W.H. 2006. Urban influences on the nitrogen cycle in Puerto Rico. Biogeochemistry 79 (1-2): 109-133.
● Martinelli, L.A., Howarth, R., Cuevas, E., Filoso, S., Austin, A., Donoso, L., Huzsar, V., Keeney, D., Llerena, C., McIssac, G., Medina, E. Ortiz-Zayas, J.R., Scavia, S., Schindler, D.W., Soto, D. Towsend, A. 2006. The origin and fate of nitrogen in Latin America and the Caribbean. Biogeochemistry 79 (1-2): 3-24.
● Ortiz-Zayas, J.R. Lewis, W.M., Jr., Saunders, J.F., III, Scatena, F.N., McCutchan, J.M. 2005. The metabolism of a tropical rainforest stream. Journal of the Northamerican Benthological Society: 24(4): 769-783.
● Ortiz-Zayas, J.R. and Scatena, F.N. 2004. Integrated water resources management in the Luquillo Mountains, Puerto Rico: an evolving process. International Water Resources Development Journal 20 (3): 387-398.

● Goodrich, D.C., Stakhiv, E.Z., Browning-Aiken, A., Vache, K., Ortiz-Zayas, J.R., Blanco, J.F., Scatena, F.N., Varady, R.G., Bowden, W.B., Howland, W. 2005. The HELP (Hydrology for the Environment, Life and Policy) Experience in North America. Proceedings of the EWRI (ASCE Environmental and Water Resources Institute) Watershed Management Conference, Williamburg, Va.

OTHER SIGNIFICANT PUBLICATIONS:

● Ortiz-Zayas, J.R., Quiñones, F., Palacios, S., Vélez, A., Más, H. 2004. Características y condición de los embalses principales en Puerto Rico. Report Técnico Oficina del Plan de Aguas, Departamento de Recursos Naturales y Ambientales de Puerto Rico. 180 p.
● Ortiz-Zayas, J.R., Terrasa-Soler, J.J. and Villarubia-Cruz, J. 2001. Allocating Water Resources for Public Supply Within a Complex Hydroelectric System: The Case Study of Yauco, Puerto Rico. Proceedings of the WEFTEC Latin America11-14-Nov. 2001. Caribe Hilton, San Juan, P.R.
● Ortiz-Zayas, J.R. 2001. Water use, management, and limnology of the lower Río Culebrinas, Puerto Rico. Proceedings of the Sixth Caribbean Water Resources Congress held on 22-23 February 2001. Sponsored by the Puerto Rico Water Resources and Environmental Research Institute, University of Puerto Rico. Mayaguez Campus.

SYNERGISTIC ACTIVITIES

Research program in applied tropical limnology with focus on carbon metabolism and nitrogen cycling. Current research projects:

- PI on two projects. 1) "Fluvial fluxes of carbon and nitrogen in a tropical developing island: the role of urbanization" (funded by NSF-EPSCOR for $159,000). 2) "Hydrology of the breeding habitats of the endangered Puerto Rican Crested Toad" (funded by the Toronto Zoo for $44,000).
- Co-PI of three projects: NSF Luquillo LTER Project Phase IV (funded by NSF for $6 M), "Caribbean Coastal Scenarios Project (funded by the Interamerican Institute for Global Change Research for $50,000); "Teaching Ecosystem Complexity Project (funded by NSF for $145,000)
- Member of the Scientific Advisory Committee of the San Juan Bay Estuary Program
- Coordinator of the UNESCO Luquillo Mountains Hydrology for the Environment, Life and Policy (HELP) Project (2004 – present) and Liaison in Puerto Rico of the Global Water Partnership (2002–present)
- Consultant to the Puerto Rico Department of Natural and Environmental Resources, Office of the Water Plan, San Juan, PR (September 2003-February 2005)

COLLABORATORS AND OTHER AFFILIATIONS

Elvira Cuevas, University of Puerto Rico, Loreto Donoso, Instituto Venezolano de Investigaciones Científicas, Caracas, Robert Howarth, Cornell University, Luiz Martinelli, CENA, Piracicaba, SP, Brazil, Olga Mayol, University of Puerto Rico, William McDowell, University of New Hampshire, William M. Lewis, University of Colorado, Alonso Ramírez, University of Puerto Rico, Fred Scatena, University of Pennsylvania, José Terrasa, Harvard University, Ariel Lugo, USDA Forest Service International Institute of Tropical Forestry, Steven McGee, the Learning Partnership

Undergraduate and Graduate Advisors

Ariel A. Lugo, Postdoctoral Advisor, USDA Forest Service International Institute of Tropical Forestry, Fred Scatena, , USDA Forest Service International Institute of Tropical Forestry, Ferdinand Quiñones, US Geological Survey, José Molinelli, University of Puerto Rico, William M. Lewis, University of Colorado, Boulder.

Thesis Advisor and Post-Graduate Mentor. Doctoral dissertation advisor of two students (Carlos Conde and Hamlet Pérez) and one master degree student (Rafael Benítez).

BIOGRAPHICAL SKETCH – **JOSEPH HENRY VOGEL**

Department of Economics, University of Puerto Rico-Rio Piedras, San Juan PR 00931
Tel. (787) 764-0000, ext. 2451– Email: josephvogel@usa.net

PROFESSIONAL PREPARATION

Duke University, Durham, NC	Chemistry	BS 1977
American Graduate School of International Management, Glendale, AZ.	Business Administration	M.B.A 1978
Rutgers University, New Brunswick, NJ	Economics	PhD 1987

APPOINTMENTS

2003-2007 University of Puerto Rico-Rio Piedras. Associate Professor. Director of the Research Unit, Department of Economics [Jan 2005-Jan 2007]

1994-2003 *Facultad Latinoamericana de Ciencias Sociales* [FLACSO] Quito, Ecuador, Professor of Economics.

1990-94 *Centre for International Research on Communication and Information Technologies* (CIRCIT), Melbourne, Australia. Research Fellow.

1991-92 *Universidade Federal de Viçosa*, Viçosa, Brazil. Fulbright Scholar-Research/Teaching Award. Departamento de Economia Rural. August-December appointment. Follow-up award May-July. Course assignment: graduate seminar, environmental economics.

PUBLICATIONS (FIVE MOST RELEVANT)

"A Proposal Based on "The Tragedy of the Commons": A Museum of Bioprospecting, Intellectual Property Rights, and the Public Domain," in English by Ashgate and in Spanish, *Revista de Ciencias Sociales*, "Una propuesta basada en 'La tragedia de los comunes: Un museo de bioprospección, propiedad intellectual, y el dominio público." *Revista de Ciencias Sociales*, número 16, 2007, 118-135.

"Reflecting Financial and other Incentives of TMOIFGR: The Biodiversity Cartel," 30 pages in Manuel Ruíz (ed) *A Moving Target: Tracking and Monitoring of the International Flow of Genetic Resources*, IUCN-Environmental Law Center, Bonn, Germany. Forthcoming, 2007.

The Biodiversity Cartel: Transforming Traditional Knowledge into Trade Secrets, editor and author of five of ten chapters, a collaborative project of The InterAmerican Development Bank/Consejo Nacional de Desarrollo, CARE, USAID, SANREM, and EcoCiencia, 194 pages in print with accompanying software. Quito, Ecuador, CARE, 2000.

"White Paper: The Successful Use of Economic Instruments to Foster the Sustainable Use of Biodiversity: Six Cases from Latin America and the Caribbean". Available in English, Portuguese, and Spanish, discussion paper for the *Summit of the Americas on Sustainable Development*, Santa Cruz de la Sierra, Bolivia, 6-8 December 1996 (follow-up to the Summit of the Americas, Miami, USA 1994), 50 pp. *Biopolicy Journal*, volume 2, Paper 5 (PY97005), 1997. URL-http://www.bdt.org.br/bioline/py and archived with the British Library in hard copy, ISSN # 1363-2450.

Genes for Sale. New York: Oxford University Press, 1994.

PUBLICATIONS (FIVE OTHER SIGNIFICANT PUBLICATIONS)

"From the 'Tragedy of the Commons' to the 'Tragedy of the Commonplace' Analysis and Synthesis through the lens of Economic Theory." Chapter Nine of McManis, Charles, *Biodiversity & Law*, (London: EARTHSCAN, 2007), pp 115-136.

"Nothing in Bioprospecting Makes Sense Except in the Light of Economics." Book chapter. *Toward Humane Technologies*, Sense Publishers Series, forthcoming 2007.

"Sovereignty as a Trojan Horse: How the Convention on Biological Diversity Morphs Biopiracy into Biofraud." in Barabara A Hocking (ed) *Unfinished Constitutional Business? Rethinking Indigenous Self-Determination.* Australia: Aboriginal Studies Press. 2005, 228-247.

"Uninvited Guests: A Thermodynamic Approach to Resource Allocation", *Prometheus: The Journal of Issues in Technological Change, Innovation, Information Economics, Communication and Science Policy*, vol. 9, no. 2, December 1991, pp. 332-345.

"Entrepreneurship, Evolution, and the Entropy Law". *The Journal of Behavioural Economics* vol. 18, issue no. 3, 1989, pp. 185-204.

SYNERGISTIC ACTIVITIES

Director of transdisciplinary project "Amazonia in the Arts: Ecocriticism versus the Economics of Deforestation," which is an academic text with lesson ppt plans taught simultaneously in U.S. and South America in English, Spanish, and Portuguese.

Participant in "Toward Nexus of Law and Biology" financed by Australian Research Linkage International.

Panel organizer and semi-finalist for the School of Advanced Research Award at LASA2007, September 7, 2007, for the edited 8 chapter anthology *The Museum of Bioprospecting, Intellectual Property, and the Public Domain: A Place, A Process, A Philosophy* http://economia.uprrp.edu/PDF%20files/museum.pdf.

Speaker at over 200 sponsored lectures worldwide at an estimated cost to sponsors of $500,000, 70% regarding access to genetic resources and benefit-sharing, 25% economics of biodiversity, 5%, ecocriticism.

Projects and budgets: Australian Research Council International Linkage (project budgets: $50K, 2002/$85K 2007) World Bank Projects (consulting fees: 60K 1 year), InterAmerican Development Bank Projects (100K 2 years), USAID projects (20K 6 months) UNDP, IUCN, Nature Conservancy, various NGOs (short durations of varying compensation), internal grants UPR-RP (total budget: $75K 3 years).

COLLABORATORS AND CO-EDITORS

Barbara A. Hocking, PhD, Queensland University of Technology (ARC Research Linkage International 2002-2007), Camilo Gomides, PhD, University of Puerto Rico (book co-editor)

Recent Thesis Advisor And Own Graduate Advisor

Students: Joely Roman, Sylvia Gonzalez, Juan Carlos Rodriguez. (all University of Puerto Rico), Lucia Gallardo (Autonomous University of Barcelona), Montse Alban (FLACSO, Ecuador). Advisor: Shanti Tangri, PhD, Rutgers University (retired)

BIOGRAPHICAL SKETCH – **LORETTA ROBERSON**

Department of Biology, University of Puerto Rico, San Juan PR 00931
Tel. (787) 764-0000, ext. 2713 Email: Loretta.Roberson@uprrp.edu

PROFESSIONAL PREPARATION

California State University, Northridge	Biology	B.S. 1994
Stanford University, Stanford, CA	Biological Sciences	Ph.D. 2001
California State University, Northridge	Plant Ecophysiology	Postdoctorate 2002-03

APPOINTMENTS

- Adjunct Professor – Institute of Neurobiology, University of Puerto Rico, Medical Sciences Campus (October 2003 – present).
- Affiliated Researcher – Department of Biology, University of Puerto Rico, Río Piedras campus (October 2003 – present)
- Scientific Collaborator – Channel Islands Research Program, University of California, Santa Barbara (1996 – present)
- Research Associate (post-doctoral appointment), USC Wrigley Marine Science Center, California State University, Northridge (August 2002 – October 2003)
- Research Technician – Indo-US Program, National Institute of Oceanography, Goa, India (January 1997)
- Research Technician – National Undersea Research Center, Key Largo, FL (August 1995)
- Research Technician – Nearshore Marine Fish Research Program, California State University, Northridge (August 1992 – August 1994)

PUBLICATIONS

- Roberson, L.M. 2007. Materials: Strength. In: Gaines, S.D. and M.W. Denny (eds.) Encyclopedia of Tidepools and Rocky Shores, University of California Press.
- L.P. Keegan, J.J. Rosenthal, L.M. Roberson, and M.A. O'Connell (2007). Purification and assay of ADAR activity. In: Gott, J. (ed.) Methods in Enzymology: RNA Editing and Modification, Elsevier.
- Roberson, L.M. and J.J.C. Rosenthal. 2006. An accurate fluorescent assay for quantifying the extent of RNA editing. RNA. 12:1-6.
- Roberson, L.M. and J.A. Coyer. 2004. Variation in blade morphology of the kelp *Eisenia arborea*: Incipient speciation due to local water motion? Marine Ecology Progress Series 282: 115-128
- M.W. Denny and L.M. Roberson. 2002. Blade motion and nutrient flux to the kelp, *Eisenia arborea*. Biological Bulletin 203:1-13

- Roberson, L.M. 2001. Evolution of kelp morphology in response to local physical factors: The effect of small-scale water flow on nutrient uptake, growth, and speciation in the southern sea palm, *Eisenia arborea*. Ph.D. Dissertation, Department of Biological Sciences, Stanford University, pp. 255

SYNERGISTIC ACTIVITIES

- Participant, SeagrassNet Global Seagrass Monitoring Network
- Land use mitigation, habitat conservation, and creation of nature trails, Community of Cerro Gordo Ward, Vega Alta, PR

Collaborators and other affiliations

Collaborators and Co-editors

Joshua Rosenthal, University of Puerto Rico, Medical Sciences

Marirosa Molina, US Environmental Protection Agency

Carlos Diez, PR Department of Natural and Environmental Resources

Frederick Short, University of New Hampshire

Evamaria Koch, University of Maryland

Wilford Schmidt, University of Puerto Rico, Mayaguez

Mark Denny, Stanford University

James Coyer, University of Groningen

Robert Carpenter, California State University, Northridge

Jack Engle, University of California, Santa Barbara

Graduate and Post-doctoral Advisors

Robert Carpenter, Postdoctoral Advisor, California State University, Northridge

Mark Denny, Ph.D. Advisor, Stanford University

Thesis Advisor and Post-Graduate Scholar Sponsor (Undergraduate 3, 1 at present; M.S.: 1 student; Ph.D: 0; Post-doctorate: 0)

Undergraduates:	Edmy Cortijo
	Efren Rodriguez
	Ileana Freytes (current)

Graduates: Diana Martinó Cardona (M.S. candidate)

BIOGRAPHICAL SKETCH - MARIA G. DOMINGUEZ-BELLO

Department of Biology, University of Puerto Rico, P.O. Box 23360,
San Juan, PR 00931-3360. email: mgdbello2@gmail.com

PROFESSIONAL PREPARATION

University Simón Bolívar, Venezuela	Biology	BSc 1984
University of Aberdeen, Scotland	Animal Nutrition	MSc 1986
University of Aberdeen, Scotland	Microbiology	PhD 1990
Rowett Institute, Scotland/ INRA- Theix, France	Microbiology	Postdocorate 1990-1991

APPOINTMENTS

2003- ASSOCIATE Professor, Dept. Biology, University of Puerto Rico, San Juan, PR.
1999-2003 Full Researcher, Venezuelan Institute of Scientific Research, Venezuela
1990-1998 Associate Researcher, Venezuelan Institute of Scientific Research, Venezuela

PUBLICATIONS (students and post docs underlined)

Pacheco, M. A., Garcia-Amado, M.A., Bosque, C. and Dominguez Bello, M.G. Bacteria in the Crop of the Seed-Eating Green-Rumped Parrotlet. The Condor 106 (1), 2004

Dominguez-Bello, MG., Michelangeli, F., Ruiz , M.C., Pacheco, M.A., Leippe M. and de Pedro M.A. Resistance of rumen bacteria murein to bovine gastric lysozyme. BMC Ecology 4:7, 2004

Pacheco, M.A., Concepcion, J.A., Rosales Rangel, J.D., Ruiz, M.C., Michelangeli, F., and Domınguez-Bello, M.G. Stomach lysozymes of the three-toed sloth (*Bradypus variegatus*), an arboreal folivore from the Neotropics. Comp Biochem Physiol A Mol Integr Physiol. 2006 Jul 25; [Epub ahead of print] 2006.

Marini, E. Maldonado, A., Cabras, S., Hidalgo, G., Buffa, R., Marin, A., Flores, G., Racugno, W., Pericchi, L.R., Castellanos, M. E., Groeschl, M., Blaser M. J., Dominguez-Bello, M. G. *Helicobacter pylori* and intestinal parasites are not detrimental to the nutritional status of Amerindians. Am. J. Trop. Med. Hyg. 76(3): 534–540, 2007

Domínguez-Bello, M.G. How do changes in microecology affect the human host. In "Ending the War Metaphor: The Future Agenda for Unraveling the Host-Microbe Relationship. Chapter 3. Institute of Medicine of the American Academy of Sciences. The National Academies Press, Washington, 2006

OTHER SIGNIFICANT PUBLICATIONS

Grajal, A., Strahl, S.D., Parra, R., Domínguez, M.G. and Neher, A. Foregut fermentation in the Hoatzin, a neotropical leave-eating bird. Science 245:1236-1238, 1989.

Ghose, C., Perez-Perez, GI, Dominguez-Bello, MG, Pride, DT, Bravi, CM and Blaser, MJ.. East Asian genotypes of *Helicobacter pylori* strains in Amerindians provide evidence for its ancient human carriage. Proc. Natl. Acad. Sci. USA 99:15107-11, 2002.

Aspholm M, Dailide G, Ilver D, Lahmann M., Roche R, Vikström S, Sjöström R, Lindén S, Arnqvist A, Mahdavi J, Nilsson U.L, Velapatiño B, Gilman R.H, Gerhard M, Alarcon T, López-Brea M, Nakazawa T, Parkinson A.J, Fox J, Correa P, Dominguez-Bello M.G, Perez-Perez G.I, Blaser M.J, Normark S, Carlstedt I, Oscarson S, Teneberg S, Berg D.E, Borén T. Functional Adaptation in Adherence and Ethnic Tropism by *Helicobacter pylori*. Science 305:519-522, 2004

García-Amado, M. A, del Castillo J. R, Perez M. E. and Domínguez-Bello, M. G. Intestinal D-glucose and L-alanine Transport in the Japanese Quail (*Coturnix coturnix*). Poultry Science 84 (6):947-50, 2005

Domínguez-Bello, M.G. ands Blaser M.J. 2006. Evolution of *H. pylori* and *H. pylori* infections. In: Introduction to Evolutionary Biology of Bacterial and Fungal Pathogens. Chapter 37. G. Cassell, F. Baquero, C. Nombela and J.A. Gutiérrez Editors, ASM Press. 2006

SYNERGISTIC ACTIVITIES

- Vice-coordinator of Physiology and Biophysics Graduate studies, IVIC. 1994-1997
- Member of IVIC Commission of Human Rights 1996-1999
- Member of the IDSA Research Committee 2005-2008
- Member of the International Advisory Committee of the International Symposium on the Nutrition of Herbivores. 1998-present
- Reviewer: Alban Program, European Union; National Fund for Science and Technology (Fonacyt, Caracas), International Foundation for Science (IFS, Stockolm), NSF; The Auk, J. Agr. Food Chem., Physiological and Biochemical Zoology, Interciencia, Acta Cientifica Venezolana, Expert Review of Molecular Diagnostics, J. Clin Microbiol, Archives of Medical Research, Clinical Diagnostic and Laboratory Inmmunology.

CURRENT FUNDING

2006-2008 NSF-CESI Infrastructure for a new program in computer Science at UPR-RP, Biological Networks Analysis Center (BNAC). PI: O. Moreno. $20,000

2005-2007 Autonomous region of Sardinia L.R. 11.4.1996 N.19, Italy. Relation between Nutritional Status and GI infection in Morocco. PI E Marini. $12,000

2005- 2007 NSF-CREST-CATEC, Digestive microbiomes from animals PI: E. Cuevas. $13,000
2007-2009 NSF- Doctoral Dissertation Improvement, Microbial Diversity in the Crop of the Hoatzin (Opisthocomus hoazin). F. Vitorino, PhD student. PI: MGDB. $12,000
2007-2009 NSF- IOS-0716911. Microbial Phylogenetic Structure and Diversity in the Unique Fermenting Crop of the Hoatzin (*Opisthocomus hoazin*). PI: MGDB. $175,000

CURRENT COLLABORATORS:
Infectious diseases: Martin Blaser (NYU); Jeffrey Gordon (Washington Univ.)
Mathematics: Luis Pericchi, Maria E Perez (UPR)
Anthropology: Francisco Salzano and M. Catira Bortolini (UFRGS, Brasil); Elisabetta Marini (Univ. of Cagliari, Italy)

Graduate and Post-doctoral Advisors

Harry Flint (Postdoctoral); Jean P. Jouany (Postdoctoral); Fabian Michelangeli (Postdoctoral); Colin Stewart (MSc and Ph.D.)

Thesis Advisor

MSc: Marco Rincon, IVIC, 1997; Nancy Pacheco, IVIC, 1999; Estalina Baez, IVIC, 2000; Luzmary Vasquez, IVIC, 2002; Ana L. Maldonado, IVIC, 2006. **PhD**: Maria Alexandra Garcia, USB 2003; Filipa Godoy, UPR, current; Ana Luisa Maldonado, UPR, current. Postdoctoral fellows: Pulcherie Gueneau, IVIC, 2000-2002; Andreina Pacheco, IVIC, 2002-2003.

BIOGRAPHICAL SKETCH – **MARÍA-EGLÉE PÉREZ**

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PROFESSIONAL PREPARATION

Universidad Simón Bolívar	Mathematics	B.S. 1984
Universidad Simón Bolívar	Mathematics	M.S. 1987
Universidad Central de Venezuela	Mathematics	Ph.D. 1994

APPOINTMENTS

- Assistant Professor, Dept. of Mathematics, University of Puerto Rico, Río Piedras Campus, Puerto Rico. (From August 2005).
- Assistant and Associate and Professor, Dept. of Maths and Dept. of Scientific Computing and Statistics, Universidad Simón Bolívar (1987-2005).
- Visiting Associate Professor, Division of Biostatistics, University of Minnesota (January 1999 - June 1999)

PUBLICATIONS

- S. Infante, M.E. Pérez (2007) "Modelaje Bayesiano Semiparamétrico de datos censurados usando procesos Beta correlacionados". (Semiparametrical Modelling of Censored Data Using Correlated Beta Processes) Estadística (Journal of the Inter American Statistical Institute). Accepted for publication.
- M. A. García-Amado, F. Michelangeli, P. Gueneau, M. E. Perez, M.G. Domínguez-Bello, (2007) "Bacterial detoxification of saponins in the crop of the avian foregut fermenter Opisthocomus hoazin", Journal of Animal and Feed Sciences, Vol 16, Suppl. 2, (2007), pp 78–81
- J. Kadane, E. Moreno, M.E. Pérez, L.R. Pericchi (2002). "Applying non-parametric robust Bayesian analysis to non-opinionated judicial neutrality". Journal of Statistical Planning and Inference, Vol. 102, No. 2, p. 425-439.
- M. E. Pérez, R. Glass, G. Alvarez, L.R. Pericchi, R. González, A. Kapikian and I. Pérez-Schael (2001). "Rhesus rotavirus-based quadrivalent vaccine is efficacious despite age, socioeconomic conditions and seasonality in Venezuela". Vaccine, Vol. 19, No 7-8, p. 976-981
- B. Carlin and M. E. Pérez (2000) "Robust Bayesian Analysis in Medical and Epidemiological Settings". In Robust Bayesian Analysis, D. Ríos-Insúa and F. Ruggeri, Eds. Springer, New York, p. 351-372.

OTHER SIGNIFICANT PUBLICATIONS

- M. A. García-Amado, J. R. Del Castillo, M. E. Pérez, M. G. Domínguez Bello (2005) "Intestinal D-glucose and L-alanine Transport in the Japanese Quail (Coturnix coturnix)". Poultry Science Vol 86, p. 947-950.

- I. Pérez-Schael, M. Escalona, B. Salinas, M. Materán, M.E. Pérez, G. González (2003) "Intussusception-associated hospitalization among Venezuelan infants during 1998 through 2001: anticipating rotavirus vaccines". Pediatric Infectious Diseases Journal, Vol. 22, No. 3, p. 234-239.
- M. G. Domínguez-Bello, B. Beker, M. Guelrud, J. Vivas, S. Peraza, M.E. Pérez, L.R. Pericchi (2002) "Socioeconomic and seasonal variations of Helicobacter pylori infection in patients in Venezuela". American Journal of Tropical Medicine and Hygiene, Vol. 66, No. 1, p. 49-51
- L. R. Pericchi and M. E. Pérez (1994). ``Posterior robustness with more than one sampling model" (with discussion). Journal of Statistical Planning and Inference, Vol. 40, No. 2/3, p. 279-294.
- M. E. Pérez (1994). ``An automatic and proper Bayesian estimation analysis of 2×2 contingency tables with one and two fixed margins". TEST, Vol. 3, No. 2, p. 101-112.

SYNERGISTIC ACTIVITIES

- Director of the "Centro de Estadística y Software Matemático (CESMa)" (Center for Statistics and Mathematical Software) at Universidad Simón Bolívar, Caracas, Venezuela (1999-2001)
- Director of Graduate Studies in Statistics at Universidad Simón Bolívar, Caracas, Venezuela (2001-2005)
- Statistical Consultant for several companies and institutions, including Cervecería Polar and the Spanish Embassy in Venezuela.
- Member of the Classifying Committee for Academic Personnel, Universidad Simón Bolívar (2002 - 2005, President of the Committee from June 2004 to July 2005).
- Member of the Permanent Committee of the "Seminario Interuniversitario de Investigación en Matemáticas (SIDIM) (Interuniversity Mathematical Research Seminar), Puerto Rico (from August 2007)

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators and Co-editors

M.G. Dominguez-Bello (University of Puerto Rico), J. Kadane (Carnegie-Mellon University), S. Infante (Universidad de Carabobo), E. Moreno (Universidad de Granada), I. Pérez-Schael (Venezuelan Institute of Biomedicine), L.R. Pericchi (University of Puerto Rico), Carla Restrepo (University of Puerto Rico).

Graduate and Post-doctoral Advisors

L.R. Pericchi (PhD Thesis advisor. Currently at University of Puerto Rico, Rio Piedras Campus)

Thesis Advisor and Post-Graduate Scholar Sponsor

(Undergraduate 3, Diploma: 3, M.S.: 3 ; Ph.D: 1) Lugo, Haydée, 1996, M.S. in Mathematics, Universidad Simón Bolívar, Caracas, Venezuela, at present assistant profesor at Universidad Simón Bolívar; Newmann, Adollys, 2001, Diploma in Computational Statistics, USB; Rico, Richard. 2003 MS in Statistics (Honors), Universidad Simón Bolívar, at present at Universidad Nacional Abierta, Caracas, Venezuela. Infante, Sabá. 2004 PhD in Engineering, Universidad Simón Bolívar, at present associate profesor at Universidad de Carabobo, Valencia, Venezuela; Salas, Hans, 2005, Diploma in Computational Statistics, Universidad Simón Bolívar, at present epidemiologist at the National Hygiene Institute,

Caracas, Venezuela; Monsalve, Nora 2006 MS in Statistics, Universidad Simón Bolívar, at present assistant professor at Universidad Centroccidental "Lisandro Alvarado" at Barquisimeto, Venezuela; Gómez, María Constanza, 2006, Diploma in Computational Statistics, Universidad Simón Bolívar.

BIOGRAPHICAL SKETCH – **MARIO H. RODRÍGUEZ**

Department of Health Services Administration, Graduate School of Public Health, Medical Sciences Campus, University of Puerto Rico, San Juan PR 00936
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PROFESSIONAL PREPARATION

University of Puerto Rico, Mayaguez Campus	Pre - Med	BS	1986
University of Puerto Rico, Medical Sciences Campus	Environmental Health	MS	1989
University of Puerto Rico, Medical Sciences Campus	Epidemiology	MPH	1994
Carlos Albizu University	Ind.-Org. Psychology	MS	2000
Carlos Albizu University	Ind.-Org. Psychology	PhD	2002

APPOINTMENTS

-Associate Prof., University of Puerto Rico, Medical Sciences Campus, School of Public Health, 2005 – present
-Assistant Prof., University of Puerto Rico, Medical Sciences Campus, School of Public Health, 2001 - 2005
-Instructor, University of Puerto Rico, Medical Sciences Campus, School of Public Health, 1995 - 2001
-Research Assistant, University of Puerto Rico, Med. Sc. Campus, School of Public Health, 1994 - 1995
-Research Assistant, Center for HIV/AIDS Multidisciplinary Studies, UPR, Río Piedras Campus, 1989 - 1994

FIVE RELEVANT PUBLICATIONS

-González, M.J., Rivera, R. and Rodríguez, M.H. (2000). "A commentary on the role of nutrition in public health history: lessons for prevention and health reform." BioMedicina, Vol. 3, #2, p. S15.
-Rodríguez-Sánchez, MH, Martínez-Lugo, ME & Andújar, C (2003). "Accidentes en el lugar de trabajo entre personal de enfermería y su relación con el clima de salud y seguridad ocupacional". Puerto Rico Health Science Journal, Vol. 22, #6, p. 15.
-Martínez-Lugo, ME, Rodríguez-Sanchez, MH & Vargas, J (2003). "Estudio exploratorio de un grupo de miembros de la generación de los Baby Boomers y de la generación X en el lugar de trabajo". Revista Puertorriqueña de Psicología, Vol. 14, p. 181-209.

-Martínez, M., Guzmán, N., Martínez, M., Merle, J., Torres, W. & Rodríguez, M. H. (2006). "El acoso psicológico en el Trabajo en una Muestra de Empleados Públicos en Puerto Rico". Revista Interamericana de Psicología Ocupacional, vol. 23, # 1.

OTHER SIGNIFICANT PUBLICATIONS

-Cunningham, I. and Rodríguez, M.H. (1991). "Prácticas de Riesgo Relacionadas con la Transmisión del VIH y Medidas de Prevención entre Estudiantes de la Universidad de Puerto Rico: 1989 y 1990." In: "El SIDA en Puerto Rico: Acercamientos Multidisciplinarios." Universidad de Puerto Rico.
-Cunningham, I., Díaz, C., García, M. and Rodríguez, M.H. (1994). "University Students and AIDS: Some Findings from Three Surveys -- 1989, 1990, 1992." Boletín del Centro de Estudios Puertorriqueños, Hunter College, City University of New York. Vol. VI, #122, p. 44-59.
-Acosta,D., Págan, V., Torres, E, Rodríguez, M.H. and Caro, O. (2001). "Profile of the inflammatory bowel disease patient with depresive disorders. PRJSJ, Vol. 20,#3, p. 215.

SYNERGISTIC ACTIVITIES

-Co author: Development of the Graduate Certificate in Clinical Management, School of Public Health, University of Puerto Rico. Johnson & Johnson Program of Allies for the Common Good (2000-02).

-Co author: Identification of Classroom Assessment Techniques for Graduate Professional Education. IRA Funds – Central Administration, University of Puerto Rico (2001).
-Committee Coordinator: Dominican Republic–University of Puerto Rico Agreement, Proposal for Implementing the MPH Program in the Nordestana Catholic University, San Francisco de Macorís, Dominican Republic (2003) 2003.
- Co-PI: Patterns of Health Service Utilization by Insurance Status Among Children and Adolescents with Asthma in Puerto Rico, 2003-2006, funded by AHRQ.
-Co-I: Development of a Spanish Version f the Primary Care Assessment Tool (PCAT). 2006-2009. funded AHRQ.

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators and Co-editors

Carlos Andújar –University of Puerto Rico, José Capriles – University of Puerto Rico, Rene Davila – University of Puerto Rico, Rafael Guerrero – Columbia University, Ruth Ríos – University of Puerto Rico, Miguel Martínez – Carlos Albizu University, Roberto Ramírez –University of Puerto Rico, Roberto Torres – University of Puerto Rico.

Graduate and Post-doctoral Advisors

None

Thesis Advisor and Post-Graduate Scholar Sponsor

-The total number of graduate students advised: MS: 7 students; DrPH: 2, 1 In progress; PhD: 4, 3 In progress):

-Doctoral level: Rosa Seijo, Katherine Gómez, Rafael Aponte, Ray Rivera – Carlos Albizu University, Rafael Guerrero, Ivis Figueroa – University of Puerto Rico.

-MS level: Yelitza Sánchez, Yamilet Arroyo, Vivian Padilla, Antonia Paulino, Rebeca de la Cruz, Yamila Rodríguez, Gladys Colón – University of Puerto Rico.

BIOGRAPHICAL SKETCH - MARLA PEREZ-LUGO

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PROFESSIONAL PREPARATION:

University of Puerto Rico at Mayaguez	Sociology	BA, 1997
Rutgers, the State University of New Jersey	Environmental Sociology	MA, 2000
Rutgers, the State University of New Jersey	Human Dimensions of Environmental Change	Graduate Certificate, 2001
Rutgers, the State University of New Jersey	Environmental Sociology	PhD, 2003

APPOINTMENTS:

(2006-present) Associate Professor in Sociology, Department of Social Sciences - UPRM.
(2004-2005) Director of the Center for Applied Social Research, Dept. Social Sciences - UPRM.
(2003-2004) Coordinator of the Sociology Program, Dept. Social Sciences – UPRM.
(2003-2006) Assistant Professor in Sociology, Dept. Social Sciences - UPRM.
(2002-2003) Full Time Instructor, Dept. Social Sciences - UPRM.
(1998-2002) Teaching Assistant, Dept. Human Ecology - Rutgers University.
(1998 – 2001) Part Time Lecturer, Dept. Sociology - Rutgers University.

PUBLICATIONS:

Publications closely related to the proposed project -

Perez-Lugo, Marla, María Victoria Badillo y Jorge Rivera Santos (Forthcoming in the Spring, 2007) "Diseño y Avalúo de Campañas Educativas: El Caso de la Cuenca Hidrográfica del Río Grande de Añasco." [Design and Assessment of Educational Campaigns: The Case of the Río Grande de Añasco Watershed.] Journal of Public Administration, School of Public Administration of UPRRP.

Burger, J., McDermott, M. H., Chess, C., Bochenek, E., Perez-Lugo, M., & Pflugh, K. K. (August, 2003). "Evaluating Risk Communication about Fish Consumption Advisories: Efficacy of a brochure vs. a classroom lesson in Spanish and English." Risk Analysis. Vol. 23, Issue 4, pp: 791.

McDermott, M., Chess C., Kerry Kirk Pflugh, Marla Perez-Lugo, Eleanor Bochenek, and Joanna Burger (2003) "Communicating a complex message to the population most at risk: an outreach strategy for fish consumption advisories." Journal of Applied Environmental Education & Communication. 2:39-48.

Rudel, Thomas K., M. Perez-Lugo, and H. Zichal, "When fields revert to forest: development and spontaneous reforestation in post-war Puerto Rico." The Professional Geographer, Volume 52, Number 3, August 2000.

Other significant publications -

Perez-Lugo, Marla. (May 2004) "Re-Thinking Media Uses in Natural Disaster Situations: A New Focus on the Impact Phase." Sociological Inquiry. Vol. 74, No. 2. Pp 210-225.

Osinubi, O., Rovner, E., Sinha, S., Perez-Lugo, M., and Demissie, K. (2004) "Efficacy of Tobacco Dependence Treatment in the Context of a "Smoke Free Grounds" Worksite Policy: A Case Study" American Journal of Industrial Medicine. 46:180-187.

Osinubi, O., Moline, J., Rovner, E., Sinha, S., Perez-Lugo, M., Demissie, K., and Kipen H. M., (May, 2003) "A pilot Study of Telephone-Based Smoking Cessation Intervention in Asbestos Workers" Journal of Occupational and Environmental Medicine. Vol. 45, Num. 5. pp: 569-574.

Perez-Lugo, Marla. (March, 2001) "The Mass Media and Disaster Awareness in Puerto Rico: A Case Study of the Floods in Barrio Tortugo." Organizations & Environment. Volume 14, Number 1, March 2001.

Perez-Lugo, Marla. "The Mass Media, Political Fragmentation, and Environmental Injustice in Puerto Rico: A case Study of the Floods in Barrio Tortugo." Quick Response Report (QR 113). Natural Hazard Research Center at Boulder, Colorado. March 12, 1999. (http://www.colorado.edu/IBS/hazards/qr/qr113.html).

SYNERGISTIC ACTIVITIES

Board Member of the MSI Summer Initiative of the Population Fellows Program of the School of Public Health at the UMICH-Ann Arbor (2004-2006) and co-author of MOU between the Dept. of Social Sciences at UPRM and the Population Fellows Program at UMICH to establish a Research Follow-Up Program to the HSI Initiative Summer Internship. (Submitted on August, 2004; approved and signed on March 11th, 2005.)

Consultant and field work coordinator for the socioeconomic profiles of fishers and their Communities in Western and Eastern Puerto Rico" conducted by Aguirre International for the National Marine Fisheries Council and NOAA. (2004 – 2005)

Assessment Specialist for the "Partnerships for Research and Education in Materials (PREM) at the University of Puerto Rico at Mayagüez" at the Faculty of Engineering, University of Puerto Rico at Mayaguez. (2004 – 2005)

Development and assessment of an education and awareness program for the Comprehensive Integrated Management Plan for the Mayagüez Bay Watershed Project. (2003 – 2006).

Development and assessment of outreach materials for a fish consumption advisory in Elizabeth, NJ, for the Center for Environmental Communication at Rutgers University (2001-2002).

COLLABORATORS & OTHER AFFILIATIONS

Collaborators and Co-Editors - Dr. Anibal Aponte (Social Sciences, UPRM), Dr. Jose Colucci (Chemical Engineering, UPRM), Dr. Agustin Irizarry (Electrical Engineering, UPRM), Dr. Juan Carlos Martínez Cruzado (Biology, UPRM), Dr. Gustavo A. Martínez (Agronomy and Soil, UPRM), Dr. Efrain O'Neill (Electrical Engineering, UPRM), Dr. Cecilio Ortiz-Garcia (Graduate School of Public Administration, UPRRP), Dr. Jorge Rivera Santos (PRWRI, UPRM), and Dr. Frank Zinn, (School of Planning, UMICH-Ann Arbor)

Graduate and Postdoctoral Advisors – Dr. Thomas k. Rudel (Rutgers University), Dr. Karen Cerulo (Rutgers University), Dr. Karen O'Neill (Rutgers University), and Dr. Caron Chess (Rutgers University).

Thesis Advisor and Postgraduate-Scholar Sponsor - Mariel Lacourt (MA-UPRM), Widaliz Pujols (MA-UPRM), Jenniffer Santos (BA-UPRM, now at University of Delaware), and Maria Victoria Badillo (BA-UPRM).

BIOGRAPHICAL SKETCH – MEI YU

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PROFESSIONAL PREPARATION

Beijing Normal University	Statistics	B.S. 1993
Institute of Botany, Chinese Academy of Sciences	Natural Resources	Ph.D. 1998
University of Connecticut	Ecology	Postdoctorate 1998
Colorado State University	Spatial Analysis	Postdoctorate 1999-2001

APPOINTMENTS

- Associate Professor – Institute for Tropical Ecosystem Studies, University of Puerto Rico, Río Piedras Campus (September, 2007 – present).
- Associate Professor – Institute of Botany, Chinese Academy of Sciences (2002 - 2007)
- Adjunct Research Associate – Department of Environmental Science, University of Virginia (2002 – 2004)
- Ecologist (Postdoc) – Department of Rangeland Science, Colorado State University and USDA-ARS Great Plains System Research Unit (2000-2001)
- Ecologist (Postdoc) – Natural Resource Ecology Lab, Colorado State University (1999-2000)
- Ecologist (Postdoc) – Department of Natural Resource Management and Engineering, University of Connecticut (1998)
- Visiting Scholar – Department of Biology, Duke University (1999-2000).

Five Relevant Publications

- Yu, M., Xie, Y., Zhang, X., 2005, Quantification of intrinsic water use efficiency along a moisture gradient in Northeastern China, Journal of Environmental Quality. 34(4): 1311-1318

- Yu, M., Ellis, J., Epstein, H., 2004, Regional analysis of climate, primary production, and livestock density in Inner Mongolia. Journal of Environmental Quality 33(5): 1675-1681

- Yu, M., Gao, Q., Shaffer, M., 2002, Simulating interactive effects of symbiotic nitrogen fixation, CO2 elevation, and climatic change on legume growth. Journal of Environmental Quality 31(2): 634-641

- Yu, M., Gao, Q., Liu, Y., Xu, H., Shi, P., 2002, Responses of vegetation structure and primary production of a forest transect in eastern China to global change. Global Ecology and Biogeography. 11(3): 223-236

- Gao, Q., Yu, M., Liu, Y., Xu, H., and Xu, X., 2007, Modeling interplay between regional net ecosystem carbon balance and soil erosion for a crop-pasture region. Journal of Geophysical Research-Biogeosciences doi:10.1029/2007JG000455

Five Other significant publications

- Xie, Y., Yu, M., Bai, Y., Xing, X., 2006, Ecological Analysis of an Emerging Urban Landscape Pattern – Desakota: A case study in Suzhou, China. Landscape Ecology 21: 1297 – 1309

- Yu, M., Gao, Q., Yang, X., 2001, Interactions among vegetation structural dynamics, primary production, and nitrogen cycling in Chinese terrestrial ecosystems in response to global climatic change. Quaternary Period Research 21(4): 281-293.

- Yu, M. and Gao, Q., 1999, Quantitative analysis of the relationship between chemical composition of grassland plants at Xilin River Valley and their taxonomy and habitats, Acta Phytoecologica Sinica 23(4): 327-335.

- Gao, Q., Yu, M., 1998, A model of regional vegetation dynamics and its application to the study of northeast China transect (NECT) responses to global change, Global Biogeochemical Cycles 12(2): 329-344.

- Yu, M., Gao, Q., and Guo, J., 1998, Sensitive analysis of plant individual's responses to global change, Acta Botanica Sinica 40(12): 1143-1151.

Synergistic Activities

- Conducted training course on GIS application in plant ecology, Institute of Botany, CAS (2002-2005).
- Taught the section of species distribution models for the course on conservation biology, Graduate School of Chinese Academy of Sciences (2006-2007);
- Developed the WEBGIS system for the platform of Chinese Virtual Herbarium (2004-2007).

Collaborators and other affiliations

Collaborators and Co-editors

Howard E. Epstein, University of Virginia, Qiong Gao, Beijing Normal University, Yichun Xie, Eastern Michigan University

Graduate and Post-doctoral Advisors

James Ellis and Joe Trlica, Postdoctoral Advisors, Colorado State University

Harrison Yang, Postdoctoral Advisor, University of Connecticut

Qiong Gao, Ph.D. Advisor, Beijing Normal University

Thesis Advisor and Post-Graduate Scholar Sponsor (Undergraduate: 2; M.S.: 3 students) Mingwei Dong, 2004-2007, M.S. Institute of Botany, CAS, at present research associate in Wetland International (NGO); Xuecui Cao, 2006-present, Institute of Botany, CAS; Wenyan Dai, 2007- present, Institute of Botany, CAS

BIOGRAPHICAL SKETCH – **T. MITCHELL AIDE**
Department of Biology, University of Puerto Rico, San Juan PR 00931
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PROFESSIONAL PREPARATION

University of Texas at San Antonio, San Antonio, Texas	Biology	BS 1980
University of Utah, Salt Lake City, Utah	Biology	PhD 1989
Postdoctoral Institution(s) Smithsonian Tropical Research Institute, Panama and Fulbright Fellowship, Colombia	Tropical tree genetics	January 2000 – January 2002

APPOINTMENTS

Professor, Department of Biology, University of Puerto Rico, Rio Piedras, 2000-present
Associate Professor, Department of Biology, University of Puerto Rico, Rio Piedras, 1996-2000
Assistant Professor, Department of Biology, University of Puerto Rico, Rio Piedras, 1992-1996

PUBLICATIONS

Grau, H.R., T. M. Aide, J. K. Zimmerman, J. R. Thomlinson, E. Helmer, and X. Zou. 2003. The ecological consequences of socioeconomic and land-use changes in postagriculture Puerto Rico. **Bioscience** 53:1159-1168.

Grau, H.R., T. M. Aide, J. K. Zimmerman, and J. R. Thomlinson. 2004. Trends and scenarios of the carbon budget in post-agricultural Puerto Rico (1936-2060). **Global Change Biology** 10:1163-1179.

Grau H. R, T. M. Aide, and N. I. Gasparri. 2005. Globalization and soybean expansion into semiarid ecosystems of Argentina. **Ambio** 34:265-266.

Grau, H. R., N. I. Gasparri, and T. M. Aide. 2005. Agriculture expansion and deforestation in seasonally dry forests of north-west Argentina. **Environmental Conservation** 32:140-148.

Aide, T. M., and H. R. Grau. 2004. Globalization, migration, and Latin American ecosystems. **Science** 305:1915-1916.

OTHER SIGNIFICANT PUBLICATIONS

HeartsillScalley, T., and T. M. Aide. 2003. Riparian vegetation and stream habitat condition in a tropical agriculture and secondary forest mosaic. **Ecological Applications** 13:225-234.

Aide, T. M., J. K. Zimmerman, J. Pascarella, J. Marcano-Vega, and L. Rivera. 2000. Forest regeneration in a chronosequence of tropical abandoned pastures: implications for restoration ecology. **Restoration Ecology** 8:328-338.

Ruiz-Jaén, M. and T. M. Aide. 2005 Restoration Success: how is it being measured? **Restoration Ecology** 13:569-577.

Rivera-Ocasio, E., T. M. Aide, and W. O. McMillan. 2006. The influence of spatial scale on the genetic structure of a widespread tropical wetland tree, *Pterocarpus officinalis*, (Fabaceae). **Conservation Genetics** 7:251-266.

Rios-López, N. and T. M. Aide. (in press) Herpetofaunal dynamics during secondary succession in tropical limestone habitats **Herpetological Monographs**

SYNERGISTIC ACTIVITIES

- Trained >40 minority undergraduate students in research. Ten of these undergraduates are coauthors on 13 published manuscripts.
- Guest editor in a special issue of Restoration Ecology - Tropical forest regeneration in abandoned agricultural lands: implications for restoration ecology (2000. Vol. 8 #4)**.**
- Established 120 secondary forest plots that vary in age since abandonment in four regions of Puerto Rico. These chronsequences have been used by >10 different research projects.

COLLABORATORS & OTHER AFFILIATIONS

Collaborators

Alejandro Brown, (LIEY, Argentina), Jaime Cavelier (WWF – Washinton DC), R. A. Dahlgren (University of California-Davis), Hector Grau (LIEY, Argentina), W. O. McMillan (University of Puerto Rico, Fred Scatena (US Forest Service – Puerto Rico), John Thomlinson (University of Puerto Rico), Jess Zimmerman (University of Puerto Rico)

Graduate and Postdoctoral Advisors

Graduate advisor – Dr. P. Coley, Dept. of Biology, University of Utah
Postdoctoral Advisor – Dr. E. Leigh, Smithsonian Tropical Research Institute, Panama

Thesis Advisor and Postgraduate-Scholar Sponsor (graduate students – 15, Post doctoral associates – 5)

MS. - Ana Maria Eusse (Fundacion Puerto Rastrojo), Alejandro Cubiñá (Reforesta Inc.), Pilar Angulo-Sandoval (University of Puerto Rico), Teresita Lomascolo (LIEY, Argentina), Tamara Heartsill-Scalley (Utah State University), Maria Fernanda Barberena (University of Puerto Rico), Carolina Monmany (University of Puerto Rico), Maria del Carmen Ruiz (University of Puerto Rico), Miguel Acevedo

(University of Puerto Rico), Jessica Castro (University of Puerto Rico), Maria José Andrade (University of Puerto Rico)

Ph.D. - Luis Rivera (University of Puerto Rico), Humfredo Marcano (US Forest Service), Elsie Rivera (University of Puerto Rico), Andrea Izquierdo (University of Cordoba, Argentina)

Post doctoral associates - John Pascarella (Valdosta State Univsity), Luis Navarro (Universidad de Santiago de Compostela), Robert Northup (University of California, Davis), Matt Slocum (Louisiana State University), Hector Grau (University of Puerto Rico)

BIOGRAPHICAL SKETCH – **NICHOLAS V. BROKAW**

Institute for Tropical Ecosystem Studies University of Puerto Rico-Río Piedras, P.O. Box 21910, San Juan, Puerto Rico 00931-1910
Tel. (787) 764-0000, ext. 4940 – Email: nvbrokaw@uprrp.edu

PROFESSIONAL PREPARATION

Princeton University	Sociology/American Studies	A.B. 1970
University of Chicago	Biology	Ph.D. 1980

APPOINTMENTS

2002- Lead Principal Investigator, Luquillo Long-Term Ecological Research Program
2001- Professor, University of Puerto Rico-Río Piedras
2006-2007 Interim Director, Environmental Sciences Program, University of Puerto Rico-Río Piedras

1999-2000 Bullard Fellow, Harvard Forest, Harvard University
1983-2000 Senior Scientist, Manomet Center for Conservation Sciences
1980-1983 Visiting Assistant Professor, Kenyon College

PERTINENT PUBLICATIONS

Foster, D., F. Swanson, J. Aber, I. Burke, N. Brokaw, D. Tilman, and A. Knapp. 2003. The importance of land-use legacies to ecology and conservation. *BioScience* 53:77-88.

Godoy, R., H. Overman, J. Demmer, L. Apaza , E. Byron, T. Huanca, W. Leonard, E. Pérez, V. Reyes-García, V. Vadez, D. Wilkie, A. Cubas, K. McSweeney, N. Brokaw. 2002. Local financial benefits of rain forests: Comparative evidence from Amerindian societies in Bolivia and Honduras. *Ecological Economics* 40:397-409.

Thompson, J., N. Brokaw, J. K. Zimmerman, R. B. Waide, E. M. Everham, III, D. J. Lodge, C. M. Taylor, D. García-Montiel, and M. Fluet. 2002. Land use history, environment, and tree composition in a tropical forest. Ecological Applications 12:1344-1363.

Godoy, R., D. Wilkie, H. Overman, A. Cubas, G. Cubas, J. Demmer, K. McSweeney, and N. Brokaw. 2000. Valuation of consumption and sale of forest goods from a Central American rain forest. *Nature* 406:62-63.

Brokaw, N. V. L., A. A. Whitman, R. Wilson, J. M. Hagan, N. Bird, E. P. Mallory, L. K. Snook, P. J. Martins, D. Novelo, D. White, and E. Losos. 1998. Toward sustainable forestry in Belize. Pages 225-239 in R. B. Primack, D. Bray, H. A. Galletti, and I. Poinciano (eds.). *Timber, Tourists, and Temples: Conservation and Development in the Maya Forest of Belize, Guatemala, and Mexico*. Island Press, Washington, D.C.

OTHER SIGNIFICANT PUBLICATIONS

Zimmerman, J. K., J. Thompson, and N. Brokaw. In press. Large tropical forest dynamics plots: laboratories for testing ecological theory. in W. Carson and S. Schnitzer (eds.). *Tropical Forest Community Ecology*. Blackwell's.

Uriarte M., C. D. Canham, J. Thompson, J. K. Zimmerman, and N. Brokaw. 2005. Seedling recruitment in a hurricane-driven forest: Light limitation, density-dependence, and the spatial distribution of parent trees. *Journal of Ecology* 93:291-304.

Brokaw, N., and R. T. Busing. 2000. Niche versus chance and tree diversity in forest gaps. *Trends in Ecology and Evolution* 15:183-188.

Godoy, R., K. O'Neill, S. Groff, P. Kostishack, A. Cubas, J. Demmer, K. McSweeney, J. Overman, D. Wilkie, N. Brokaw, and M. Martínez. 1997. Household determinants of deforestation by Amerindians in Honduras. *World Development* 25:977-987.

Walker, L. R., N. V. L. Brokaw, D. J. Lodge, and R. B. Waide (eds.). 1991. Special Issue: Ecosystem, Plant, and Animal Responses to Hurricanes in the Caribbean. *Biotropica* 23:313-521.

RESEARCH GRANTS (PI or Co-PI)

National Science Foundation, Ecology Program, 1986
National Science Foundation, LTER Program, 1988, 1994, 2000, 2006 Lead PI)
National Science Foundation, Anthropology Program, 1993
U.S. Man and the Biosphere Program, 1996
National Science Foundation, Small Grants for Exploratory Research, 1999
The Andrew Mellon Fund, 2000
National Science Foundation, Ecology Program, 2003

Smithsonian Institution, 2004

National Science Foundation, Ecology Program, 2005

SYNERGISTIC ACTIVITIES

- Strategic Planning Group, Integrative Science for Society and the Environment, Long-Term Ecological Research Network
- Science Council, Long-Term Ecological Research Network
- Intercampus Graduate Program Committee, University of Puerto Rico-Río Piedras
- Mentor to REU students
- Board of Directors, *Mahogany For the Future*

COLLABORATORS WITHIN PAST 48 MONTHS

J. Aber (U. New Hampshire), P. Ashton (Harvard U.), G. Belovsky (Notre Dame), I. Burke, R. Busing (Oregon State U.), R. Condit (Smithsonian Institution), A. Covich (U. Georgia), T. Crowl (Utah State U.), S. Davies (Harvard U.), E. Everham (Florida Gulf Coast U.), N. Fetcher (U. Scranton), D. Foster (Harvard U.), R. Foster (Field Musuem), R. Godoy (Brandeis U.), G.

González (US Forest Service), C. Hall (SUNY ESF), S. Hess (US Fish & Wildlife), S. Hubbell (U. Georgia), P. Klawinski (Willaim Jewell Coll.), A. Knapp (Colorado State U.), S. Lao (Smithsonian Institution), D. Lodge (US Forest Service), E. Losos (Org. Tropical Studies), A. Lugo (US Forest Service), E. Mallory (independent), W. McDowell (U. New Hampshire), E. Mélendez (U. Puerto Rico), R. Myster (U. Cent. Oklahoma), C. Pringle (U. Georgia), K. Rice (independent), B. Richardson (independent), F. Scatena (U. Pennsylvania), D. Schaefer (independent), W. Silver (UC Berkeley), F. Swanson (US Forest Service), C. Taylor (Missouri Bot. Gard.), J. Thomlinson (Cal. St. Domiguez Hills), J. Thompson (U. Puerto Rico), D. Tilman (U. Minnesota), R. Waide (U. of New Mexico), L. Walker (U. Nevada), M. Willig (U. Connecticut).

Graduate Advisors
Robin Foster, A. Ross Kiester

Thesis Advisor
Adriana Herrera Montes (MS)

BIOGRAPHICAL SKETCH **–OLGA L. MAYOL BRACERO**

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Email: omayol@adam.uprr.pr

PROFESSIONAL PREPARATION

University of Puerto Rico-Río Piedras	Chemistry	BS 1989
University of Puerto Rico-Río Piedras	Analytical Chemistry	MS 1994
University of Puerto Rico-Río Piedras and Lawrence Berkeley National Laboratory	Analytical Chemistry	PhD 1998
Max Planck Institute for Chemistry, Germany	Aerosols and Climate Area	Postdoctoral, 1998-2001

APPOINTMENTS

- Associate Professor (2006 – present) - ITES, University of Puerto Rico-Río Piedras
- Assistant Professor (2002 – 2005) - ITES, University of Puerto Rico-Río Piedras

RELEVANT PUBLICATIONS

Rauber, R. M., B. Stevens, H. T. Ochs III, C. Knight, B.A. Albrecht, A.M. Blyth, C.W. Fairall J. B. Jensen, S. G. Lasher-Trapp, O. L. Mayol-Bracero, et al, "Rain in (Shallow) Cumulus over the Ocean—The RICO Campaign", *Bulletin of the American Meteorological Society*, in press, 2007.

Rauber, R. M., B. Stevens, J. Davison, S. Goeke, O. L. Mayol-Bracero, D. Rogers, P. Zuidema, H. T. Ochs III, et al., "In the Driver's Seat – RICO and Education", *Bulletin of the American Meteorological Society*, in press, 2007.

Fuzzi, S., S. Decesari, M. C. Facchini, F. Cavalli, L. Emblico, M. Mircea, M.O. Andreae, I. Trebs, A. Hoffer, P. Guyon, P. Artaxo, L.V. Rizzo, L.L. Lara, T. Pauliquevis, W. Maenhaut, N. Raes, X. Chi, O.L. Mayol-Bracero, L.L. Soto-García, M. Claeys, I. Kourtchev, J. Rissler, E. Swietlicki, E. Tagliavini, G. Schkolnik, A.H. Falkovich, Y. Rudich, G. Fisch, L.V. Gatti, Overview of the inorganic and organic composition of size-segregated aerosol in Rondônia, Brazil, from the biomass burning period to the onset of the wet season, *J. Geophys. Res.*, D01201, doi:10.1029/2005JD006741, 2007.

Chand, D.; P. Guyon; P. Artaxo; O. Schmid; O. L. Mayol-Bracero; G. Frank; L.V. Gatti; F.X. Meixner; M.A.L. Moura, and M.O. Andreae, Optical and physical properties of aerosols in the boundary layer and free troposphere over the Amazon Basin during the biomass burning season, *Atmos. Chem. Phys.* 6, 2911-2925, 2006.

Ortiz-Zayas, J., E. Cuevas, O.L. Mayol-Bracero, L. Danoso, I. Trebs, D. Figueroa-Nieves, and W. McDowell, Urban influences on the nitrogen cycle in Puerto Rico, *Biogeochemistry*, DOI 10.1007/s10533-006-9005-y, 79, 109-133, 2006.

OTHER SIGNIFICANT PUBLICATIONS

Minvielle, F.; G. Cautenet; M.O. Andreae; F. Lasserre; G. Foret; S. Cautenet; J.F. Leon; O.L. Mayol-Bracero; R. Gabriel; P. Chazette; and R. Roca, Modelling the transport of aerosols during indoex 1999 and comparison with experimental data - 1: carbonaceous aerosol distribution, *Atmos. Environ., 38,* 1811-1822, 2004.

Mayol-Bracero, O.L.; Guyon, P.; Graham, B.; Andreae, M.O.; Artaxo, P.; Facchini, M.C.; Decesari, S.; Fuzzi, S., Water-soluble organic compounds in biomass burning aerosols over Amazonia: 2. Apportionment of the chemical composition and importance of the polyacidic fraction, *J. Geophys. Res., 107,* 10.1029/2001JD000522, 2002.

Clarke, A.D.; Howell, S.; Quinn, P.K.; Bates, T.S.; Ogren, J.A.; Andrews, E.; Jefferson, A.; Massling, A.; Mayol-Bracero, O.L.; Maring, H.; Savoie, D.; and Cass, G., The INDOEX aerosol: A comparison and summary of chemical, microphysical and optical properties observed from land, ship, and aircraft, *J. Geophys. Res., 107*, 10.1029/2001JD000572, 2002.

Mayol-Bracero, O.L.; Kirchstetter, T.W.; Novakov, T.; Andreae, M.O.; Gabriel, R., Carbonaceous aerosol over the Indian Ocean during INDOEX: Chemical characterization, optical properties, and probable sources, *J. Geophys. Res., 107*, 10.1029/2000JD000039, 2002.

Lelieveld, J.; Crutzen, P.J.; Andreae, M.O.; Campos, T.; Cass, G.R.; Dickerson, R.R., Fischer, H.; de Gouw, J.A.; Hansel, A.; Jefferson, A.; Kley, D.; de Laat, A.T.J.; Lal, S.; Lawrence, M.G.; Lobert, J.M.; Mayol-Bracero, O.L.; Mitra, A.P.; Novakov, T.; Oltmans, S.J.; Prather, K.A.; Ramanathan, V.; Reiner, T.; Rodhe, H.; Scheeren, H.A.; Sikka, D.; Smit, H.G.J.; Williams, J.; Zachariasse, M., The Indian Ocean Experiment: Widespread air pollution from South and Southeast Asia, *Science, 291*, 1031-1036, 2001.

SYNERGISTIC ACTIVITIES

- Participating in the international *Rain In Cumulus over the Ocean* (RICO) and the *Puerto Rico Aerosol and Cloud Study* (PRACS) projects in Puerto Rico, Antigua and Barbuda. The projects focus on better understanding the properties (e.g., solubility, scavenging efficiencies and surface-tension behavior) that transform aerosols into CCN under natural and anthropogenic conditions.
- Participating in the international *Smoke Aerosols, Clouds, Rainfall and Climate: Aerosols from Biomass Burning Perturb Global and Regional Climate* (SMOCC 2002) project in the Brazilian Amazon, working with the chemical characterization of size-resolved samples during the dry and wet seasons.
- Working with UPR-Mayagüez professors involved in climate and atmospheric studies in Puerto Rico towards the development of the Joint Institute for Caribbean Climate Studies in the Caribbean.
- Society memberships – American Geophysical Union and European Geophysical Union.

COLLABORATORS

J. Anderson (Arizona State University, USA), M. O. Andreae, G. Frank, S. Borrman, J. Schneider, J. Lelieveld, S. Metzger (Max Planck Institute for Chemistry, Germany), P. Artaxo (University of São Paulo, Department of Physics, Brazil), D. Baumgardner and G. Raga (National University of Mexico, Mexico), H. Coe, J. Allan, M. Gysel (University of Manchester, UK), J. Collett (University of Colorado-Fort Collins, USA), M. C. Facchini, S. Fuzzi, S. Decesari (Institute of Atmospheric Sciences and Climate, CNR, Bologna, Italy), L. Gomes (Meteo-France, France), W. Maenhaut (Ghent University, Belgium), I. Matos (National Weather Service, San Juan, PR), T. Novakov and T. W. Kirchstetter (Lawrence Berkeley National Laboratory, USA), J. Ogren and P. Sheridan (NOAA/CMDL, USA), H. Puxbaum and A. Kasper-Giebl (Vienna University of Technology, Austria), B. Rauber (University of Illinois, Indiana, USA), M. H. Smith, J. Mc Quaid, J. Lingard (University of Leeds, UK).

Graduate and Post-doctoral Advisors

- MS and Ph.D. advisor - O. Rosario, University of Puerto Rico-Río Piedras, Puerto Rico, USA
- Ph.D. co-advisor - T. Novakov, Lawrence Berkeley National Laboratory, USA
- Postdoctoral advisor - M. O. Andreae, Max Planck Institute for Chemistry, Department of Biogeochemistry, Germany

Students in Research

- Graduated 1 Master. Current: undergraduates (7), MS (1), Ph.D. (4), Postdoc (1).

BIOGRAPHICAL SKETCH - **OSVALDO ROSARIO LÓPEZ**

Department of Chemistry, University of Puerto Rico-Rio Piedras,
PO Box 23346, Río Piedras, Puerto Rico 00931-3346
Tel 787-764-0000 x7367, Email: rosario_o@msn.com

PROFESSIONAL PREPARATION

University of Puerto Rico-Río Piedras	Chemistry	B.S., 1974
University of Puerto Rico-Río Piedras	Chemistry	MS, 1975
University of Puerto Rico-Río Piedras	Chemistry	Ph.D. 2001

APPOINTMENTS

1988-present: Professor of Analytical, University of Puerto Rico-Río Piedras
2004-present: Science Advisor to US FDA
1986-2002: Director of the NIH-RCMI Program, University of Puerto Rico-Río Piedras
1994-1998: Director Industry-University Research Program, University of Puerto Rico
1984-1989: Director of the NIH-BRS Program, University of Puerto Rico-Río Piedras
1983-1988: Associate Professor of Analytical Chemistry, University of Puerto Rico-Río Piedras
1981-present: Director of Mass Spectrometry Center, University of Puerto Rico-Río Piedras
1981-1989: Director of the NIH-MBRS Program, University of Puerto Rico-Río Piedras
1980-1983: Assistant Professor of Analytical Chemistry, University of Puerto Rico-Río Piedras
1978-1980: Postdoctoral Research Associate, Environmental Protection Agency, RTP, NC 27711

RESEARCH INTERESTS:

Analysis of Trace Levels of Pharmacological Compounds in the Environment; Development of Noninvasive methodology for the Analysis of Organic Pollutants in the

Body; Idetification of EDC's in Serum; Development of Methodology for the Sampling and Analysis of Organic Pollutants in the Environment

PUBLICATIONS (recent)

Díaz-Vázquez, L. M.; García, O.; Velázquez, Z.; Marrero, I.; Rosario, O.; Optimization of microwave-assisted extraction followed by solid phase micro extraction and gas chromatography-mass spectrometry detection for the assay of some semi volatile organic pollutants in sebum; J. Chromatogr. B. Analyt. Technol. Biomed. Life Sci., 825, 11-20 (2005).

Alvarez-Avilés O.; Cuadra-Rodríguez, L.; Quiñones-González, J.; González Illán, F.; and Rosario, O.; Optimization of Microwave Assisted Extraction Stir Bar Sorptive Extraction/ Thermal Desorption/ Gas Chromatography/ Mass Spectrometry Methodology for the Organic Chemical Characterization of Atmospheric Aerosols. Analytical Chimica Acta 597 (2007) 273-281.

González-Illán, F.; Díaz-Vázquez, L. M.; Ojeda-Torres, Geovanie, and Rosario, Osvaldo; Detection of FAEEs in skin surface lipids as biomarkers of ethanol consumption in alcoholics, social drinkers, sporadic drinkers and teetolaters using a methodology based on microwave-assisted extraction followed by solid phase microextraction and gas chromatography / mass spectrometry, In Press, Journal of Analytical Toxicology.

Dávila, K.; Pizarro, A.; Rosario, O.; Methodology for the evaluation of exposure to organic pollutants through the analysis of sweat. J. Chromatography B, In review.

SYNERGISTIC ACTIVITIES

Served as major professor for 15 MS and 23 PhD students, the great majority of whom were Puerto Rican

COLLABORATORS

Major Advisor for:

PhD students: Marisa Bonilla (1983), Roberto Pérez (1984), Doris Caro (1989), Aileen López (1990), Arturo Hornedo (1994), Aminda Sierra(1989), Joseph Bloom(1990), Isaura Díaz (1990), Myriam Medina(1991), Olga Mayol (1997), José Dumas(1999), Eva Font (1999, Ivelisse Colón (1999), Liza Valentín (2000), Darwin Reyes (2000), Ricardo Morales(2002), Raúl Blanco (2002), John Olmo (2003) Ivelisse Torres (2004), Liz M. Díaz (2005), Olga Alvarez(2005), Kariluz Dávila (2006), Hilda Solá (2006)

MS Students: Jaime Rodríguez (1983), Abraham Ortiz (1985), Antonio Curet (1986), Heriberto Negrón (1987), Alicia Durán (1987), Fernando Dávila (1987) Isaura Díaz (1987), Sonia Cuevas (1988), Daliza Colón (1991), Olga Mayol (1992), Antonio Quiñones (1992), Celso Reyes (1993), Milca Mercado (2001) Roberto Marrero (2003), Luz Stella Betancourt, (2004)

BIOGRAPHICAL SKETCH - **PAUL BAYMAN**

Department of Biology, University of Puerto Rico, San Juan, PR 00931
Tel. (787) 764-000, ext. 4880
E-mail: pbayman@uprrp.com

PROFESSIONAL PREPARATION

Carleton College, Northfield MN	Biology	B. S. 1980
University of California, Berkeley	Botany	Ph.D. 1987
University of California, Irvine	Plant Pathology	Postdoc 1988-1991
USDA ARS SRRC, New Orleans, Tulane University, New Orleans	Cell & Molecular Biology	Postdoc 1991-1993

APPOINTMENTS

1993- Assistant & Associate Professor of Biology, University of Puerto Rico-Río Piedras
1999-2001- Microbiologist, Plant Protection Research Unit, USDA ARS WRRC, Albany, CA (on leave from University of Puerto Rico)
2002-2003, 2007 – Coordinator, Graduate Program in Biology, University of Puerto Rico, Rio Piedras.

PUBLICATIONS (*Graduate Student Coauthor; **Undergraduate Coauthor)

Santamaría J, Bayman P. 2005. Fungal epiphytes and endophytes of coffee leaves (*Coffea arabica*). *Microbial Ecology* **50**, 1-8.

Otero JT, Bayman P, Ackerman JD. 2005. Variation in mycorrhizal performance in the epiphytic orchid *Tolumnia variegata in vitro*: the potential for natural selection. *Evolutionary Ecology* **19**: 29-43.

Otero JT, Ackerman JD, Bayman P. 2004. Differences in mycorrhizal specificity between two tropical orchids. *Molecular Ecology* **13**: 2393-2404.

Otero JT, Ackerman JD, Bayman P. 2002. Diversity and host specificity of mycorrhizal fungi from tropical orchids. *American Journal of Botany* **89**: 1852-1858.

Bayman, P, **González EJ, **Fumero JJ, Tremblay RL. 2002. Are fungi necessary? How fungicides affect growth and survival of the orchid *Lepanthes rupestris* in the field. *Journal of Ecology* **90**: 1002-1008.

OTHER SIGNIFICANT PUBLICATIONS

Bayman P. 2006. Diversity, scale and variation of endophytic fungi in leaves of tropical plants. In: *Microbiol Ecology of Aerial Plant Surfaces*. Bailey MJ, Lilley AK, Timms-Wilson TM, eds. CABI Publishing, UK, pp 37-50.

Bayman P, Baker JL. 2006. Ochratoxins: a global perspective. *Mycopathologia* 162: 215-233.

*Gamboa-Gaitán MA, *Wen S, Fetcher N & Bayman P. 2005. Effects of fungicides on endophytic fungi and photosynthesis in seedlings of a tropical tree, *Guarea guidonia* (Meliaceae). 2005. *Acta Biológica Colombiana* 10: 45-51.

Bayman P, Baker JL, Doster MA, Michailides TJ, Mahoney NE. 2002. Ochratoxin production by the *Aspergillus ochraceus* group and *A. alliaceus* in California. *Applied & Environmental Microbiology* 68: 2326-2329.

Molyneux RJ, Mahoney NE, Bayman P, Wong RY, Meyer K, Irelan N. 2002. Eutypa dieback in grapevines: differential production of acetylenic phenol metabolites by strains of *Eutypa lata*. *Journal of Agricultural and Food Chemistry* 50: 1393-1399.

SYNERGISTIC ACTIVITIES

- Reviewer, NSF
- Reviewer, journals (*Canadian Journal of Botany*, *Microbial Ecology*, *Molecular Ecology* etc.)
- Associate Editor, *Mycologia* (2001-2002)
- Member, Executive and Excursions Committees, Sierra Club of Puerto Rico (2005-)
- Consultant, environmental microbiology & mycology

COLLABORATORS (2000 – present: advisees listed below not included)

James D. Ackerman, UPR Río Piedras
James L. Baker, USDA ARS WRRC
*Adelmarie Bones, UPR Río Piedras
Bruce C. Campbell, USDA ARS WRRC
Mark A. Doster, UC Davis – Kearney AC
Ned Fetcher, U. Scranton
*José J. Fumero, UPR Río Piedras
Gary Gray, Blue Diamond Growers Inc.
*Eduardo J. Gonzalez, UPR RCM UPRRCM
E. Allen Herre (STRI, Panamá)
Nancy Irelan, E&J Gallo Inc.
Noreen Mahoney,USDA ARS WRRC
Ken Meyer, E&J Gallo Inc.
Themis J. Michailides, UC Davis KAC
Russell Molyneux, USDA ARS WRRC
Omara Ortíz-Vázquez, UPR Río Piedras
Jeff A. Palumbo, USDA ARS WRRC
*Ileana Pérez-Rodriguez, Rutgers U
*José A. Rodríguez
*Natalie Rodríguez-Desalden,
Alberto Sabat, UPR Río Piedras
Raymond L. Tremblay, UPR Humacao

Maren A. Klich, USDA ARS SRRC
*Sugei Laureano [medical technologist]
D. Jean Lodge, USDA Forest Service
*Shiyun Wen, UPR Mayaguez
Rosalind Y Wong, USDA ARS WRRC
*student co-authors

Graduate and postdoctoral advisors

O'Neill Ray Collins, PhD advisor, UC Berkeley
Peter J. Cotty, Postdoctoral supervisor, USDA ARS WRRC, New Orleans
Joan W. Bennett, Postdoctoral supervisor, Tulane Univ., New Orleans
Former and Present Graduate and Postdoctoral Advisees

Graduate students in research (last 5 years): 6

*Carmen T. Acevedo, UPR Río Piedras
*Miguel A. Gamboa, U Nacional Colombia
Edwin A. Hernández-Delgado, UPR Río Piedras
*Ligia E. Lebrón, UPR Río Piedras
*J. Tupac Otero, U Nacional Colombia-Palmira
Andrea Porras-Alfaro
*Carlos Toledo-Hernández
*Johanna Santamaría, U Arizona
*Naida Viera
*Anabella Zuluaga-Montero
***student co-authors

BIOGRAPHICAL SKETCH –**RAFAEL ARCE**

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PROFESSIONAL PREPARATION

University of Puerto Rico, Río Piedras	Chemistry	B. S. 1965
University of Wisconsin, Madison	Chemistry	Ph.D. 1971

APPOINTMENTS

1971-present – Assistant ('71-'74), Associate('71-'81), or Full ('81-present) Professor at the Department of Chemistry, University of Puerto Rico, Río Piedras.
2002-present - Program Director SCORE (NIH) Program, Faculty of Natural Sciences, University of Puerto Rico, Rio Piedras.
2002-2004 – Co-Director RISE (NIH) Program, Faculty of Natural Sciences, University of Puerto Rico, Rio Piedras.
1995-2000 - Program Director MBRS (NIH) Program, Faculty of Natural Sciences, University of Puerto Rico, Rio Piedras.
1986-92 - Dean, Faculty of Natural Sciences, University of Puerto Rico, Río Piedras.
1983-1984 - Sabbatical leave: University of Houston Photoionization of molecules in organized systems (micelles).
Summer 1985 - Visiting Scientist: Solar Energy Research Institute, Golden, Colorado, Fluorescence Spectroscopy of Purines.

1979-1983 - Coordinator Graduate Program Department of Chemistry, University of Puerto Rico, Rio Piedras

10 RELEVANT PUBLICATIONS (OUT OF 27 SINCE 1997)

Sotero, P. and Arce, R.; Studies on the phototransformations of perylene adsorbed on non-activated silica gel and alumina as models of atmospheric particulate matter; Polycyclic Aromatic Compounds; 1999, 14-15, 295.

I. Negrón-Encarnación, R. Arce and M. Jiménez, Characterization of acridine species adsorbed on $(NH_4)_2$ SO_4, SıO2, Al_2O_3 and MgO by steady state and time-resolved fluorescence and diffuse reflectance techniques, J. Physical Chemistry A, 109, 787-797, 2005.

P. Sotero and R. Arce, Surface and adsorbates effects on the photochemistry and photophysics of adsorbed perylene on unactivated silica gel and alumina, J. Photochem. and Photobiol. A: Chemistry 167, 191-199, 2004.

I. Negrón-Encarnación and R. Arce, Acridine species adsorbed on models of atmospheric particulate matter and their role in the photodegradation mechanisms under N_2 or O_2 atmospheres, Polycyclic Aromatic Compounds, 24, 607-6016, 2004.

S. Fioressi and R. Arce, Photochemical transformations of benzo[e]pyrene in solution and adsorbed on silica gel and alumina surfaces, Environ. Sci. and Technol, 2005, 39, 3646-3655.

R.A. Bermúdez, R. Arce, J.L. Colón, Photolysis of 1-pyrenemethylamine ion exchanged into zirconium phosphate framework, J. Photochemistry and Photobiology A. Chemistry, 175, 201-206, 2005.

C. García, R. Oyola, L. E. Piñero, R. Arce, J. Silva, V. Sánchez, Substitution and solvent effects on the physical properties of several series of 10-alkylated phenothiazine derivatives, J. Phys. Chem. A. 109, 3360-3371, 2005.

M.C. Morel, I. Alers, R. Arce, Photochemical degradations of 1,6 and 1,8-nitropyrene in solution, Polycyclic Aromatic Compounds, 26(3), 207-219, 2006.

L. Colón, C. Crespo-Hernández, R. Oyola, C. García, R. Arce, Role of sequence and conformation on the photochemistry and photophysics of A-T dimes. An experimental and computational approach. J. Phys. Chem. B.100, 15589-15596, 2006.

I. Negrón-Encarnación, R. Arce, Light induced transformations of aza-aromatic pollutants adsorbed on models of atmospheric particulate matter. 9(10-H) acridone, Atmospheric Environment, 2007, accepted.

GRANTS SINCE 2000

The heterogeneous photochemistry of polycyclic aromatic hydrocarbons (subproject) in particle, process and materials for modern energy needs. PI: R. Arce. Agency: Department of Energy-EPSCoR. Type: DE-FG-02-9ER75764 (Weiner). Period: 09/97 – 09/2001.

Heterogeneous photochemical transformations of ubiquitous mutagenic and carcinogenic pollutants. PI: G. Escalona. Agency: NIH-MBRS (SCORE) Program Type: S06-GM08102-31. Period: 01/02 – 06/2004.

Photochemical transformations of ubiquitous mutagenic and carcinogenic pollutants: the nitropyrenes. PI: R. Arce. Agency: NIH-MBRS (SCORE) Program. Type: S06-GM08102-33. Period: 07/05 – 06/2006.

SYNERGISTIC ACTIVITIES

- **Reviewer for:** Journal of American Chemical Society; Photochemistry and Photobiology; Journal of Photochemistry: Chemistry; National Science Foundation; Ford Foundation Fellowship Program for Minorities; Journal Physical Chemistry; Ministerio de Educación, Ciencia y Tecnología, República Argentina; Environmental Science and Technology; Petroleum Research Funds; Israel Science Foundation; Professional Committees;
- **Service since 2000: Professional:** In charge of the Physical Chemistry Review Course offered by Colegio de Químicos, several years; Scientific Advisory Committee - Convención Anual Colegio Químicos, 2002; Assisted in a dyetracing experiment for Sociedad Espeleológica de PR of the Rio Encantado Cave System; Organized symposium with American Society for Photobiology in 2005. **Academic:** Departmental President; Academic Affairs Committee, 1997-present; Project to Reconceptualize the Bachelors Curriculum, 2002. College: RCMI Advisory Committee; Coordinator of the remodeling for laboratories under the NSF-ARI project; New Building Committee; UPRRP Campus: Elected by the Academic Senate to the Institutional committee for the revision of the UPR bylaws.
- As Director of SCoRE, increased number of funded biomedical researchers at UPR-RP to 24, obtained major instrumentation for UPR-RP.
- As Dean, remodeled 11 labs at UPR-RP, obtained Faculty Development Scholarships from USED.
- As Coordinator of Physical Chemistry Laboratory - helped in develop the laboratory, set up several new experiments, contributed to the laboratory manual.

Collaborators and other affiliations

Collaborative Research with: Dr. Osvaldo Rosario, UPR - Rio Piedras ; Dr. Sixto García, UPR - School of Medicine; Dr. Mercedes Rivera, UPR – Cayey; Dr. Antonio Alegría, UPR – Humacao; Dr. Carmelo García, UPR – Humacao; Dr. Ileana Nieves, UPR – Humacao; Dr. Michael Sigman – Oak Ridge Laboratories.

Training of Students:

Over 150 undergraduate and 35 graduate students have participated in research projects under my supervision. Their results have been presented at international, national (U.S.A.), and/or local scientific meetings. Of this group of undergraduates close to 50% has gone to graduate schools in the U.S. (MIT, Michigan State University, U. California at Berkeley, Texas A&M, Georgetown, U. of Chicago), Puerto Rico, and Germany to study fields such as: Physical Chemistry, Biochemistry or Medicine. From the group of graduate students 16 are presently college professors at private or state colleges, two work for the Federal Government and the rest for the pharmaceutical industry in Puerto Rico.

BIOGRAPHICAL SKETCH - **RAFAEL L. JOGLAR**

Department of Biology, University of Puerto Rico, San Juan PR 00931
Tel. (787) 764-0000 x3567– Email: rjoglar@uprrp.edu

PROFESSIONAL PREPARATION:

University of Puerto Rico-Mayagüez	Zoology	B.S. 1976
University of Puerto Rico-Mayagüez	Biology	M.S. 1981
University of Kansas	Systematics and Ecology	Ph.D. 1986

APPOINTMENTS:

1986-1992. University of Puerto Rico: Department of Biology; Assistant Professor.
1992-1999 University of Puerto Rico: Department of Biology; Associate Professor.
1999-present University of Puerto Rico: Department of Biology; Full Professor.

PUBLICATIONS: (out of 40); Included are those most representative of current work:

Burrowes, P. A**., R. L. Joglar** and D. E. Green. 2004. Potential Causes for Amphibian Declines in Puerto Rico. Herpetologica.60(2):141–154.

Joglar, R. L., P. A. Burrowes, D. Dávila, A. Rodríguez, A. López, A. V. Longo and P. Medina 2005. *Eleutherodactylus wightmanae* Reproduction. Herpetological Review: 36(4): 433-434.

Mendelson, Joseph R. III, **et al**., 2006. Confronting Amphibian Declines and Extinctions. Science. Vol. 313: 48, 7 July 2006.

G. Velo-Antón, Burrowes, P. A.; **Joglar, R. L**.; Martínez-Solano, I.; Beard, K. H, and Parra-Olea, G. Phylogenetic study of *Eleutherodactylus coqui* (Anura: Leptodactylidae) reveals deep genetic fragmentation in Puerto Rico and pinpoints origins of Hawaiian populations. *Molecular Phylogenetics and Evolution* 45 (2007) 716-728.

Joglar, R. L., A. O. Álvarez, T. Mitchell Aide, D. Barber, P. A. Burrowes, M. A. García, A. León, Cardona, A. V. Longo, N. Pérez-Buitrago, A. Puente, Neftalí Rios-López, P. J. Tolson. 2007. Conserving the Puerto Rican herpetofauna. Applied Herpetology 4: 327-345.

OTHER SIGNIFICANT PUBLICATIONS

Joglar, R. L. 1998. Los Coquíes de Puerto Rico: Su Historia Natural y Conservación. Editorial de la Universidad de Puerto Rico. San Juan, Puerto Rico. 232 pág.

Joglar. R.L. 1999. ¡Que Cante el Coquí! Ensayos, Cartas y Otros Documentos Sobre la Conservación de la Biodiversidad de Puerto Rico. Proyecto Coquí. 160 pág.

Joglar, R. L. (editor). La Biodiversidad de Puerto Rico: Vertebrados Terrestres y Ecosistemas. Instituto de Cultura Puertorriqueña. 564 págs. + láms.

Joglar, R. L. 2003. An island enchanted by frogs, p. 201–211. *In* R.W. Henderson and R. Powell (eds), Islands and the Sea: Essays on Herpetological Explorations in the West Indies. Society

for the Study of Amphibians and Reptiles, Ithaca (New York). Contributions to Herpetology, Vol. 30.

SYNERGISTIC ACTIVITIES:

Outreach programs by means of Proyecto Coquí (a non profit organization).

(1) Web page: www. coqui. uprr.pr This is the first environmental web page in Puerto Rico.
(2) Lectures for the general public: 21 (2004-2006)
(3) Radio and TV programs: 25 (2004-2006)
(4) Collaborations with newspapers: 12 (2004-2006)
(5) Other outreach activities: 21 (2004-2006)

Recent workshops for teachers or general public (2003–2006)

Joglar, R. L. 2003. Puerto Rican Coquis : Myths and science. Workshop for public school teachers. Vieques, PR. June 11, 2003.

Joglar, R. L. 2003. Puerto Rican Biodiversity: Rich or Poor? Workshop for public school teachers. Vieques, PR. Nov. 8, 2003.

Joglar, Rafael L. 2006. Puerto Rican terrestrial vertebrales. AMP workshop for public school teachers. UPR- RURP. June 12-16, 2006.

Joglar, Rafael L. 2006. Puerto Rican ecological life zones . AMP workshop for public school teachers. UPR- RURP. June 19-23, 2006.

Joglar, Rafael L. 2006. Mona Island Biodiversity. Workshop for the Puerto Rican Conservation Trust. Mona Island, PR. Aug. 7 -11, 2006.

Amphibian Species Prioritization Meeting. Association of Zoos and Aquariums (AZA). Fort Worth Zoo, Fort Worth, Texas. July 30- August 3, 2007.

International recent workshops

Global Amphibian Assessment Workshop–Caribbean Region. 2004. Conservation International and IUCN- SSC. Dominican Republic. March 19 – 21, 2004.

Professional Memberships

Society for Conservation Biology, Society for the Study of Amphibians and Reptiles, Herpetologist League, Inc.,

RECENT RESEARCH GRANTS

Declining Amphibian Populations Task Force (UICN-SSC) 2001, ($2,000.00). "Search for Chytridiomycosis among declining populations of Puerto Rican Anurans".

Research and Analysis Network for Neotropical Amphibians (RANA) - 2002, ($ 2,000.00). "Population Surveys of Highland Amphibian and Public Disseminations of Amphibian Status in Puerto Rico".

RANA- 2003, - ($1,800.00). " Chytridomycosis Among Amphibians In Puerto Rico, Dominican Republic and Cuba."

U.S. Forest Service. Urban Program -2004. **(**$25,025.00). To publish: Guía de la Biodiversidad Urbana: Guía de la Flora y Fauna en Nuestras Ciudades y Bosques Urbanos.

Instituto de Cultura Puertorriqueña.- 2004. ($40,000.00). To publish: "Biodiversidad de Puerto Rico: Vertebrados Terrestres y Ecosistemas".

Universidad Interamericana de Puerto Rico -2004. ($50,000.00). To publish: "Biodiversidad de Puerto Rico: Vertebrados Terrestres y Ecosistemas".

Puerto Rico Conservation Trust – 2006. ($40,000.00). To publish: "Biodiversidad de Puerto Rico: Stahl, Flora y Hongos".

Sociedad de Historia Natural de Puerto Rico. 2006. ($10,000.00). To publish: "Biodiversidad de Puerto Rico: Stahl, Flora y Hongos".

COLLABORATORS AND OTHER AFFILIATIONS

- Burrowes, Patricia A.; University of Puerto Rico, Río Piedras.
- Rodríguez, Armando; Interamerican University of Puerto Rico, Bayamón.
- Santiago, Eugenio; University of Puerto Rico, Río Piedras.
- Undergraduate students trained from 1986- 2006: 74
- MS Students: Neftalí Ríos, Abimael León, Daniel Dávila.
- Graduate Advisor: Duellman, William E., University of Kansas, Lawrence, KS.

BIOGRAPHICAL SKETCH – **RAFAEL A. RIOS**
Environmental Sciences Program**,** University of Puerto Rico-Río Piedras
P.O. Box 23341, San Juan, Puerto Rico 00931
Tel. (787) 764-0000, ext. 2550, Email: rafaelrios@vmail.uprrp.edu

PROFESSIONAL PREPARATION

University of Puerto Rico	Electrical Engineering	BSEE 1969
University of Puerto Rico	Nuclear Engineering	BSNE 1971
University of Texas	Environmental Engineering	Ph.D. 1975
University of Puerto Rico	Business Admin.	MBA 1993

APPOINTMENTS

2007- Director, Environmental Sciences Program, University of Puerto Rico-Río Piedras

1996-2007 Professor, Environmental Health, University of Puerto Rico-Medical Sciences
1980-2003 Monitor, US District Court for PR, USA vs. PR Aqueduct and Sewer Authority
1980 Fulbright Fellow, Senior Engineering Lecturer, Republic of Colombia
1975-1980 Assistant and Associate Professor, Civil Engineering, University of Puerto Rico-Mayaguez
1978-1980 Director, Water Resources Research Institute, University of Puerto Rico-Mayaguez

PERTINENT PUBLICATIONS

Roubert, M., Robles, P. and R. Rios, "El Impacto de las Polleras en las Concentraciones de Nitrato en las Aguas Subterráneas y en el Suelo de la Comunidad El Húcar en Salinas, Puerto Rico", presented at the XXX Congreso Interamericano de Ingeniería Sanitaria y Ambiental (AIDIS), Punta del Este, Uruguay, November 2006, and published in the Proceedings

Alicea, A., Robles, J., Guillont, H., and R. Rios, "Performance Evaluation of Three Slow Sand Filters", presented at the 4th International Slow Sand and Alternative Biological Filtration Conference at Mulheim an der Ruhr, Germany, May 2006, and published in Recent Progress in Slow Sand and Alternative Biofiltration Processes, IWA Publishing, London, UK, 2006.

Rios, R. and I. Román, "Common Design Errors in Wastewater Treatment Plants", presented at the XXIX Congreso Interamericano de Ingeniería Sanitaria y Ambiental

(AIDIS), San Juan, Puerto Rico, August 2004, and published in the Proceedings

Román, I. and R, Rios, "Relationship Between Nitrogen and Phosphorus Concentrations and Excessive Plant Growth in Tropical Waters", presented at 6th Region I AIDIS Congreso and published in the Proceedings, Port-au-Prince, Haiti, November 2003.

Hernández, N. and R. Rios, "Evaluation of Coliphage and Fecal Coliform Densities on the Principal Canal of the Irrigation System in Southwestern Puerto Rico, presented at the XXVIII AIDIS Congress, published in the Proceedings, Cancún, México, October 2002.

OTHER SIGNIFICANT PUBLICATIONS

Vazquez, L. and R. Rios,"Estudio Sobre las Concentraciones de Nitrógeno y Fósforo y sus Efectos Sobre la Eutroficación de un Lago", presented at the V Region I AIDIS Congress, Dominican Republic, October 2001, and published in the Proceedings

López, M., Pérez, C., Súarez, E. and R. Rios, 1999 "Variations in the Survival Probabilities of the PVC-protected Red Mangrove Propagules: Testing of the Encased Replanting Technique", Puerto Rico Health Sciences Journal, 18, 387-95.

Marcantoni, C., Cotto, M. and R. Rios, "Growth of Microbial Populations in the Schmutzdecke of a Slow Sand Filter and its Relationship with Effluent Quality", presented at the Annual Conference of the American Water Works Association, Dallas, TX, June 1998.

Rios, R., "Puerto Rico's Rural Systems: How "Simplicity" Provides Quality Water", invited paper presented at the International Affairs Forum III, AWWA Annual Conference, Los Angeles, CA, June 1989.

Rios, R., "The Use of a Special Master or Monitor for Enforcement of the Clean Water Act", presented at the 55th. Annual Conference of the Water Pollution Control Federation, St. Louis, Mo., October 1982.

SYNERGISTIC ACTIVITIES

- International: environmental consultancies in ten countries 1980 to date
- Innovation: developed slow sand filter system for very small communities in Puerto Rico
- Expert witness in wastewater treatment case, Federal Public Defender, Nashville, TN
- Curriculum reform: President of curriculum committee, School of Public Health, University of PR-Medical Sciences, including the evaluation and reform of graduate curriculum
- Service: Retired Lieutenant Colonel, Army of the United States, Corps of Engineers, Secretary, Puerto Rico Interuniversity Athletic League, NSF Reviewer for Minority Institutions Science Improvement Programs and Local Course Improvement Programs.

COLLABORATORS WITHIN PAST 48 MONTHS

Adail Alicea, UPR-Medical Sciences, José Borrageros, Polytechnic University, José Capriles, UPR-Medical Sciences, José Cordero, UPR-Medical Sciences, Cruz Nazario, UPR-Medical Sciences, Ismael Pagán, UPR-Mayaguez, Cynthia Perez, UPR-Medical Sciences, Graciela Ramírez, InterAmerican University-PR, Juan Robles, UPR-Medical Sciences, Francisco Tomei, ATSDR, Octavio Vega, PR Aqueduct and Sewers Authority

Graduate Advisors

Joseph F. Malina, E. Gus Fruh, Earnest Gloyna, University of Texas

Thesis Advisor

Mayra Roubert, Ponce School of Medicine, Encijar Hassan, PR Department of Health, Zahinira Pietri, Warner Chilcott, Lesley Vazquez, USEPA; more than 100 MS students in Environmental Health and Civil Engineering

BIOGRAPHICAL SKETCH - **VANCE P. VICENTE**

Garden Hills Plaza, PMB 326, 1353 Street 19, Guaynabo, PR 00966-2700; Office/Lab: (787) 781-6503, Mobile: (787) 396-6761; Fax: (787) 783-0748; Email: vance@prtc.net

PROFESSIONAL PREPARATION

University of Puerto Rico, Río Piedras.	Biology	B. S.
University of Puerto Rico-Mayaguez	Marine Sciences	M. S. 1975
University of Puerto Rico-Mayaguez	Marine Sciences	Ph.D. 1987

APPOINTMENTS

1996-Present: Environmental Consultant/President, Vicente & Associates, Inc.
1990-Present: Adjunct Professor, Lecturer, Graduate Committee Member and Graduate School Representative of the University of Puerto Rico and other Universities in the Caribbean.
1990-Present : Previous Chairman/Member of the Scientific and Statistics Committee, U.S. NMFS/NOAA U.S. Caribbean Fisheries Management Council.
1990-Present : Previous Chairman/Member of the Habitat Panel Committee, U.S. NMFS/NOAA U.S. Caribbean Fisheries Management Council.
1993-1996: U.S. National Marine Fisheries Service U.S. Caribbean Coordinator of Fisheries and Endangered Species
1989-1993: U.S. Fish and Wildlife Service Chief, Ecological Services Acting Field Supervisor
1988-1989: Marine Ecology Division, Center for Energy (CEER, UPR) Scientist I
1987-1988: Center for Energy and Environmental Research (CEER, UPR) Environmental Scientist & Consultant
1976-1982: Marine Ecology Division, U.S. ERDA Center for Energy (CEER, UPR) Research Scientist, Benthic Ecology

5 MOST RELEVANT PEER-REVIEWED AND CONFERENCE PUBLICATIONS (OUT OF 24)

Vicente, V.P., I. Laborde and J.E. Rosario. 2007. Transplantes de corales (HEXACORALLIA: SCLERACTINIA) como medida de mitigación: el muelle terminal de EcoEléctrica. XXVI Simposio del Departamento de Recursos Naturales y Ambientales de Puerto Rico. Octubre 24-25 de 2007. 17pp.

Vicente, V.P., I. Laborde and J.E. Rosario. 2007. Evaluación de transplantes de yerbas marinas como medida de mitigación: el muelle terminal de EcoEléctrica. XXVI Simposio del Departamento de Recursos Naturales y Ambientales de Puerto Rico. Octubre 24-25 de 2007. 17pp.

Santos, R.O., V. P. Vicente, and I. Laborde. 2007. La utilización de sistemas de información geográfica y análisis de multicriterios para diseñar un área de protección marina de multiuso en las bahías estuarinas de Guayanilla y Tallaboa. XXVI Simposio del Departamento de Recursos Naturales y Ambientales de Puerto Rico. Octubre 24-25 de 2007. 15pp.

Mateo, I., I. Laborde, and V.P. Vicente. 2006. Monitoring of tropical shallow water fish communities around the EcoEléctrica Liquefied Natural Gas Import Terminal and Cogeneration Plant in Guayanilla Bay, Puerto Rico. Proc.Gulf Caribb.Fish.Inst. 57:633-652.

Vicente, V.P. 2005. El Bosque de Manglar. *In*: Puerto Rico: Patrimonio Cultural y Natural. Publisher by Gas Natural España. LAIA Books (*ed*.) Barcelona, España. 344 pp.
Vicente, V.P. 1999. Littoral ecological stability and economic development in small island states: the need for an equilibrium. *In* Small Islands: Marine Science and Sustainable Development. George Mauhl(ed). American Geophysical Union, III Series. 467 pp.

FIVE OTHER SIGNIFICANT PUBLICATIONS

Vicente, V.P. 1996. Littoral ecological stability and economic development in small island states: the need for an equilibrium. Coastal and Estuarine Studies, 51:266-283.
Vicente, V.P., N.C. Singh and A.V. Botello, 1993. Ecological implications of potential climate change and sea-level rise. *In*: Climatic Change in the Intra-Americas Sea. George Maul (ed). Edward Arnold Publishers. 389 pp.
Vicente, V.P. 1992. A summary of ecological information on the seagrass beds of Puerto Rico. *In*: Coastal Plant Communities of Latin America (pp: 123-133). E. Seliger (ed). New York Academic Press. 392pp.
Vicente, V.P., K. Rutzler and N.M. Carballeira. 1991. Comparative morphology, ecology, and fatty acid composition of West Indian *Spheciospongia* (Demospongea). Marine Ecology, 12:211-226.
Vicente, V.P. 1990. Overgrowth activity by the encrusting sponge *Chondrilla nucula* on a coral reef in Puerto Rico. *In*: New Perspectives in Sponge Biology. K. Rützler (ed). Smithsonian Press. 525 pp.

AWARDS:

1990, 1991, 1992 Special Achievement Awards: *U.S. Fish and Wildlife Service* (USFWS) U.S. Department of Interior. As Chief of Ecological Services.
1993, 1994, 1995, 1996 Special Achievement/Cash Awards: *NMFS/National Oceanic Atmospheric Administration*, U.S. Department of Commerce. As Fisheries Biologist for the U.S. Caribbean.

SYNERGISTIC ACTIVITIES

57 scientific and technical reports on marine resources, especially for Puerto Rico.
Regional field and consultant experience: National Marine Fisheries Service: developed Fisheries Management Plans, assessments during environmental emergencies (e.g. oil spills, groundings), developed conservation and management strategies for protected resources (e.g. sea turtles) and fisheries resources for the US Caribbean, consultant for the Sea Turtle Recovery Teams, Evaluated SUPERFUND sites (Humacao, P.R.), environmental spokesman during live fire tests at sea (southeast coast of Puerto Rico) U.S. Fish and Wildlife Service: Chief of Ecological Services; Participated in all activities related to wetland conservation, permit applications and sea turtle and manatee studies being conducted within the region, sea turtle coordinator for the US Caribbean, consultant to the Sea Turtle Recovery Team, regional field coordinator for the Damage Assessment and Restoration Program, Morris J. Berman Oil Spill; principal investigator of baseline studies for the Scientific Team, Ocean Thermal Energy

Conversion Plant, PR; chief scientist of research vessels R/V Palumbo and R/V Sultana; environmental studies for a proposed 900 MWe Coal/Oil fired Power Plant; Advisor and expert witness for the Department of Natural Resources (Commonwealth of Puerto Rico) during the "Barcelo vs Weinberger" Evaluation of military training activities on the natural resources of Vieques Island, Puerto Rico; conducted field studies and developed the marine section of a Management Plan for the Natural Reserve of La Cordillera, Fajardo, and Puerto Rico.

International experience including consultant and expert for: Western Atlantic Fishery Commission, 1994 Consultations on the Vasquez-Saccio Treaty between the U.S. and Colombia; Center of Marine Conservation on the development of the Global Marine Biological Diversity Strategy; Evaluation of impacts of climatic change on marine coastal systems for Caribbean Action Plan of the United Nations Environment Program; 1995 Intergovernmental Session of the IOC Sub-commission for the Caribbean and Adjacent regions; Ecological Evaluation of Les Arcadins Islands, Haiti for the development of marine parks in Haiti, Hispaniola (for the World Wildlife Fund); Gulf of Guinea Large Marine Ecosystem Study, Abidjan, Cote d'Ivoire, West Africa (for the United Nations Development Organization; Geographic Priorities for Biodiversity Conservation in Latin America and the Caribbean (Biodiversity Support Program – The Nature Conservancy)

Proposal evaluation for: National Undersea Research Program (NOAA), SK Grant Applications (NOAA), National Park Service (DOI), Florida and UPR Sea Grant Programs, Puerto Rico Conservation Foundation.

Referee for: CRC Press, Bulletin of Marine Sciences, Caribbean Journal of Science, Mote Marine Laboratory. Evaluations of environmental impacts following natural (e.g. hurricanes) and anthropogenic (e.g. oil spill) disasters.

Public outreach: Produced a Documentary on Marine Sponges, Newton's Apple; 3. Conducted public interviews on environmental problems in Puerto Rico using local Radio Stations (WEUC), WECO, WKAQ). Conducted public seminars for public schools on conservation and management of coastal resources. Participated actively on Youth Conservation Club (USDOI) as well as on UPR Sea Grant public education programs.

COLLABORATORS AND OTHER AFFILIATIONS

Graduate and Undergraduate Mentoring* - Committee member for least ten graduate students (MS and Ph.D)

BIOGRAPHICAL SKETCH - **XIAOMING ZOU**

Institute for Tropical Ecosystem Studies, University of Puerto Rico, Rio Piedras PO Box 21910, San Juan PR 00931-1910, Tel 787-764-0000 x2868 - Fax: (787) 772 1481 - Email: xzou2000@yahoo.com

EDUCATION:

Nanjing Forestry University	Forestry	BS 1982
University of Michigan	Natural Resources	MS 1988
Colorado State University	Forest Ecology	PhD 1992

APPOINTMENTS

2004-Now	Professor, ITES, University of Puerto Rico, San Juan, PR, USA
2002- Now	Affiliated Research Professor, Xishuangbanna Tropical Botanical Garden, Chinese National Academy of Sciences, Kunming, Yunnan, China.
1999-2004	Associate Professor, ITES, University of Puerto Rico, San Juan, PR.
2002-2003	Visiting Associate Professor (sabbatical leave), National Cheng Kung University, Taiwan.
1996-1999	Assistant Professor, ITES, University of Puerto Rico, San Juan, PR.
1992-1996	Scientist, Terrestrial Ecology Division, University of Puerto Rico, San Juan, PR.

FIVE SELECTED PUBLICATIONS (63 TOTAL)

Zou, X. M., M. Cao, and M. Warren. Special Section Editors. 2006. The Xishuangbanna Tropical Forests in China. *Biotropica* 38: 306-347.

Li, Y., M. Xu, and **X. M. Zou**. 2006. Effects of nutrient additions on ecosystem carbon cycle in a Puerto Rican tropical wet forest. *Global Change Biology* 12: 284-293.

Zou, X. M., H. H. Ruan, Y. Fu, X. D. Yang, L. Q. Sha. 2005. Estimating soil labile organic carbon using a sequential fumigation-incubation procedure. *Soil Biology and Biochemistry* 37 (10): 1923-1928.

Grau H. R., T. M. Aide, J. K. Zimmerman, J. R. Thomlinson, E. Helmer, **X. M. Zou**. 2003. The ecological consequences of socioeconomic and land use changes in post agriculture Puerto Rico. *BioScience* 53:1159-1168.

Sanchez, Y., **X. M. Zou**, S. Borges, and H. H. Ruan. 2003. Recovery of native earthworms in abandoned tropical pastures. *Conservation Biology* 17: 999-1006.

FIVE OTHER PUBLICATIONS

Liu, Z.G. and **X. M. Zou**. 2002. Exotic earthworms accelerate plant litter decomposition in a Puerto Rican pasture and a wet forest. *Ecological Applications* 12: 1406-1417.

Ruan, H. H., **X. M. Zou**, F. N. Scatena, and J. K. Zimmerman. 2004. Asynchronous fluctuations of soil microbial biomass and plant litterfall in a tropical wet forest. *Plant and Soil* 260: 147-154.

Warren, M., and **X. M. Zou**. 2002. Tree species effect on soil macrofauna in tropical tree plantations of Puerto Rico. *Forest Ecology and Management* 170: 161-171.

Zou, X. M. and G. Gonzalez. 2002. Earthworms in tropical tree plantations: Effects of management and relations with soil carbon and nutrient use efficiency. In: *Management of Tropical Plantation Forests and their Soil Litter System*. Chapter 11, page 289-301. M. V. Reddy (Editor). Science Publishers Inc., Enfield, NH, USA.

Heneghan, L., D.C. Coleman, **X. M. Zou**, D.A. Crossley, Jr. and B. L. Haines. 1999. Soil microarthropod contributions to decomposition dynamics: tropical-temperate comparisons of a single substrate. *Ecology* 80: 1873-1882.

SYNERGISTIC ACTIVITIES

Participation in research projects: Vegetation classification of evergreen broad-leaved forests in subtropical China, 1983-1986; Revision of nomenclature of *Botrychium* of China, 1986-1988; Landscape classification of the summer habitat for the endangered Kirtland's warbler, 1986-1988; Nitrogen transformations in tropical rainforest of Costa Rica, 1989-1992; Phosphorus transformations and the develop of a new method for estimating gross P mineralzation and immobilization rates in nitrogen fixing forests, Oregon and Hawaii, 1989-1992; Earthworms in tropical tree plantations in Hawaii, 1989-1992

PI for: USDA, Comparing Carbon Dynamics in Tropical Riparian and Upland Areas, 1998-2000; NASA, Ground Water Discharge and Tropical Land-use Change, 2000-2001; Chinese Academy of Sciences, Forest Biogeochemistry and Below-ground Soil Processes, 2002-2005; Chinese Academy of Sciences, Changes in Biotic Communities and Biogeochemical Processes Following Rubber Plantation, 2006-2009.

Co-PI for: NSF, Luquillo Long-term Ecological Research, 1994-present; NASA Tropical Land Use Change and Ecological Consequences, 1994-2002; Taiwan National Science Council, Development of a Tropical Decomposition Model for Plant Litter Decomposition, 2002-2003; Taiwan Long-term Ecological Research at Nanjenshan, Taiwan, 2003-present.

Services and recognition: Journal Editor: *Soil Biology and Biochemistry* (subject editor, 2003-2006); *Biotropica* (special issue co-editor, 2003-2004); **Media Interviews and Reports:** *Dialogo*, August 1996; *National Radio of Jamaica*, September 1996; *Discover Magazine*, September 1997; *The Science and Technology Chronique*, July 2001; *Min Shen Bao* (Taiwan) 2003; *Lian Ho Bao* (Taiwan) 2003; *Zhong Hua Ri Bao* 2003 (Taiwan); and 5 other news papers in Taiwan (2003); Public TV Broadcasting 2003 (Taiwan); US LTER Newsletter 2003; El Nevo Dia 2007; **Research Productivity Awards**: 1996 and 1999, University of Puerto Rico; **Huang Kuan-Cheng Fellowship:** 2003, The Chinese Academy of Sciences.

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators: David C. Coleman, University of Georgia; Grizelle Gonzalez, International Institute of Tropical Forestry, USDA Forest Service; Paul Hendrix, University of Georgia; Yiqing Li, Rutgers University; D. Jean Lodge, International Institute of Tropical Forestry, USDA Forest Service; Honghua Ruan, Nanjing Forestry University, China; Liqiang Sha, Xishuangbanna Tropical Botanical Garden, China; Xiaodong Yang, Xishuangbanna Tropical Botanical Garden, China; Lucy How, National Cheng Kung University, ROC; Sonia Borges, University of Puerto Rico; Jess K. Zimmerman, University of Puerto Rico; Nick Brokaw, University of Puerto Rico; John Thomlinson, University of Puerto Rico.

M.S. advisor: Burton Barnes, University of Michigan. Retired.
Ph.D. advisor: Dan Binkley, Colorado State University.
Thesis advisor (4 MS graduates, 1 currently; 1 PhD graduate, 5 currently; Post-Doctoral 1 in last five years, 0 currently). **M.S. Students:** Grizelle Gonzalez, USDA International Institute of Forestry; Yaniria Sanchez, University of Idaho, Sara Raquel, University of Andies, Columbia; Jianhui Chen and Wenting Feng, Xishuangbanna Tropical Botanical Garden. **Ph.D. Students**: Matthew Warren, University of Puerto Rico, Yiqing Li, University of Hawaii at Hilo; **Post-Doc. Fellows** Zhigang Liu, Beijing Forestry University; Honghua Ruan, Nanjing Forestry University.

BIOGRAPHICAL SKETCH – **EDWIN A. HERNÁNDEZ-DELGADO**
Department of Biology, Coral Reef Research Group, PO Box 23360 University of Puerto Rico, San Juan
PR 00931-3360, Tel. (787) 764-0000, ext. 2009 – email: coral_giac@yahoo.com

EDUCATION

University of Puerto Rico-Humacao Marine Biology B.S. 1988
University of Puerto Rico –Río Piedras Biology Environmental Microbiology M.S. 1991
University of Puerto Rico-Río Piedras Tropical Biology (Coral Reef Ecology) Ph.D.2000

APPOINTMENTS

Affiliate Researcher, Department of Biology, UPR-Río Piedras (2005-present)
Post-Doctoral Researcher, PR-NSF-EPSCoR Program, Resource Center for Science & Engineering, UPR-Río Piedras (2004-2005) Lecturer, Department of Biology, UPR-Río Piedras (2004-Present) Contractor, Environmental Defense, Miami, FL. (2003-2004) Contractor, Culebra Conservation and Development Authority, Culebra (2003-2004) Contractor, U.S. Coral Reef Initiative, Department of Natural and Environmental Resources, San Juan (2002-2003) Assistant Professor. Department of Biology, UPR-Río Piedras (2001-2003) Research Associate/Lecturer. Department of Biology, UPR-Río Piedras (1999-2000) Lecturer, Universidad del Turabo, Department of Science and Technology, Gurabo, P.R. (1997-2000)

PUBLICATIONS

Ballantine, D.L., R.S. Appeldoorn, P. Yoshioka, E. Weil, R. Armstrong, R. García, E. Otero, F. Pagán, C. Sherman, **E.A. Hernández-Delgado**, A. Bruckner, & C. Lilyestrom. Puerto Rico Coral Reefs. In, *Status of U.S. Coral Reefs*, NOAA (in press).
Hernández-Delgado, E.A., B.J. Rosado-Matías*, & A.M. Sabat. 2006. Management failures and coral decline threatens fish functional groups recovery patterns in the Luis Peña Channel No-Take Natural Reserve, Culebra Island, PR. Proc. Gulf Caribb. Fish. Inst. 57:577-605
Hernández-Delgado, E.A. 2005. Historia natural, caracterización, distribución y estado actual de los arrecifes de coral Puerto Rico. 281-356. In, R.L. Joglar (Ed.), Biodiversidad de Puerto Rico: Vertebrados Terrestres y Ecosistemas. Serie Historia Natural. Editorial Instituto de Cultura Puertorriqueña, San Juan, PR. 563 pp. García, J.R., J. Morelock, R. Castro, C. Goenaga, & **E. Hernández**. 2003. Puerto Rican reefs: Research synthesis, present threats and management perspectives. 111-130. In, J. Cortés (ed.), Latin American Coral Reefs. Elsevier Publ., Amsterdam, Holland. 497 pp.
Weil, E. **E.A. Hernández-Delgado**, A.W. Bruckner, A.L. Ortiz*, M. Nemeth*, & H. Ruiz*. 2003. Distribution and status of Acroporid (Scleractinia) populations in Puerto Rico. 71-98. In, A.W. Bruckner (ed.), Proceedings of the Caribbean *Acropora* Workshop: Potential Application of

the U.S. Endangered Species Act as a Conservation Strategy. NOAA Tech. Memorandum NMFS-OPR-24, Silver Spring, MD. 199 pp.
*=Graduate Students at the moment of manuscript submission.

FIVE OTHER SIGNIFICANT PUBLICATIONS

Sabat, A.M., **E.A. Hernández-Delgado**, & C.G. Toledo*. 2000. Demographic analysis of the effect of fishing mortality on the population dynamics of the red hind (*Epinephelus guttatus*). Proc. Gulf Caribb. Fish. Inst. 51:169-181.
Hernández-Delgado, E.A., & A.M. Sabat. 2000. Ecological status of essential fish habitats through an anthropogenic environmental stress gradient in Puerto Rican coral reefs. Proc. Gulf Caribb. Fish. Inst. 51:457-470.
Hernández-Delgado, E.A., L. Alicea-Rodríguez**, C.G. Toledo-Hernández*, & A.M. Sabat. 2000. Baseline characterization of coral reef epibenthic and fish communities within the proposed Culebra Island Marine Fishery Reserve, Puerto Rico. Proc. Gulf Caribb. Fish. Inst. 51:537-556.
Hernández-Delgado, E.A.*, & G.A. Toranzos. 1995. In situ replication studies of somatic and malespecific coliphages in a tropical pristine river. Wat. Sci. Tech. 31(5/6):247-250.
Alvarez, A.J., E.A. Hernández-Delgado*, & G.A. Toranzos. 1993. Advantages and disadvantages of traditional and molecular techniques when applied to the detection of pathogens in water. Wat. Sci. Technol. 27(3/4):253-256.
Hernández-Delgado, E.A.*, M.L. Sierra**, & G.A. Toranzos. 1991. Coliphages as alternate indicators of fecal contamination in tropical waters. Environ. Toxicol. & Water Qual. Int. J. 6:131-143.
*=Graduate Students at the moment of manuscript submission.
**=Undergraduate Students at the moment of manuscript submission.

PRESENT DUTIES AND RESEARCH

Duties: Full time Affiliate Researcher (Coordination of Caribbean Coral Reef Institute Long-Term Coral Reef Ecological Monitoring Program); Full time Research Fellow (CREST-Center for Applied Tropical Ecology and Conservation); Part-time lecturer (Marine Biology, Introduction to Ecology, Ecology of Puerto Rico); Mentor of three undergraduate research assistants; Co-mentor of one graduate M.Sc. student; Member of 6 graduate committees (3 Ph.D., 2 M.Sc., 1 M.A.). Research activities: Long-term ecological change in coral reef benthic and fish communities; Climate change impacts on coral reef ecosystem resilience; Development of a GIS-based spatial model of the distribution and status of Elkhorn Coral, *Acropora palmata*; Development of low-tech coral aquaculture methods; Restoration of bombarded coral reefs; Impacts of non-point source sewage pollution, eutrophication and sedimentation on coral reefs; Effectiveness and design of marine fishery reserves; Paleo-climatology.

SYNERGISTIC ACTIVITIES

Founder of the Coral Reef Research Group (1996); Co-founder of the Culebra Island Coral Aquaculture and Reef Rehabilitation Project (2003); Member of the Caribbean Fishery Management Council's Habitat Advisory Panel (since 2000).

COLLABORATORS

Richard Appeldoorn (UPR-Mayaguez), Manuel Valdes-Pizzini (UPR-M), Manoj Shivlani (U. Miami), Alberto Sabat (UPR-RP), Elvira Cuevas (UPR-CATEC), Jorge Ortiz (UPR-CATEC), José Norat (UPRMedical Sciences Campus), Hernando Mattei (UPR-MSC), Michelle Schärer (UPR-M), Carlos Diez (Dept. Natural and Environmental Resources), Samuel Suleimán (Sociedad Ambiente Marino), Wilson Ramírez (UPR-M), Kurt Grove (UPR-M)

UNDERGRADUATES IN RESEARCH

24 undergraduates trained between 2001 and 2007; 12 continued graduate studies; 2 continued Law school; 1 accepted at Veterinary School; 2 continued Medicine; 2 currently working; the remaining has not graduated yet. Graduate student mentoring: 1 graduate student (as co-mentor), member of 5 additional graduate committees.

Heeralal Janwa (http://ramanujan.cnnet.upr.edu/~janwa)

PROFESSIONAL PREPARATION

M.Sc. (Hons.) 1975 {80 Birla Institute of Technology & Science (BITS), Pilani, India
(Five years (B.Sc.+M.Sc.) MATH) (NSTS Fellow)
B.E. (Hons.) 1978 {81 BITS(Electrical and Electronics Engineering)
Grad. Studies 1981 {82 University of Illinois at Urbana-Champaign (in Mathematics)
Ph.D. 1982 {1986 Syracuse University (School of Computer and Information .
Science)

APPOINTMENTS

1. Full Professor (tenured) (July 01, 2002||), Associate Professor (August '97|-June 2002) Department of Mathematics and Computer Science, University of Puerto Rico, Rio Piedras.
2. Courant Institute of Mathematical Sciences, NYU, Sep 2003{Sept. 2004. Visiting Member.
3. Associate Prof. (tenured) School of Mathematics., M.R.I. (Now Harishchandra Research Institute), India (August 1997|July 1999). (On sabbatical '97{98; on leave. '98{99')
4. Reader (tenured)April 1996|)), Department of Mathematics, M.R.I., October 1992|
-July 1997.
5. Full Professor, Center for Advanced Studies in Mathematics, University of Bombay, January 1991{October 1992 (moved to MRI);
6. Visiting Fellow, School of Mathematics, Tata Institute of Fundamental Research July
1990{Jan. 1991
7. Visiting Assistant Professor, Department of Math., Michigan State University (MSU),
1989{90;
8. Harry Bateman Research Instructor, Department of [Pure] Mathematics, California Institute of Technology (CALTECH), (a faculty position) 1987{1989.
9. Visiting Member, Courant Institute of Mathematical Sciences (CIMS), NYU, 1986{1987: (Computational Algebraic Geometry Group)

SELECTED FIVE RELEVANT PUBLICATIONS: (See
http://ramanujan.cnnet.upr.edu/~janwa)
_ H. Janwa and A.K.Lal, ¥On Tanner Codes: Parameters and Decoding," Applicable Al-
gebra in Engineering, Communication and Computing,
A Springer-Verlag Journal, Vol. 13, pp. 335{347, 2003.
_ ¥McEliece like public-key cryptosystems using algebraic-geometric codes," (with O.Moreno),
Codes, Designs and Cryptography, vol. 8, no. 3, pp. 293{307, 1996.
_ ¥Double-error-correcting cyclic codes and absolutely irreducible polynomials over GF(2),"
(with G. McGuire and R.M. Wilson), JOURNAL OF ALGEBRA, vol. 178, pp. 665{676, 1995.
_ ¥Covering radius computations for binary cyclic codes," (with R. Dougherty), MATHE-
MATICS OF COMPUTATION, I, II [AMS Journal.] Vol. 57, no. 195, July 1991,
pp. 415{434 and Micro_sche Supplement s38-s218 (181 pages).
_ ¥Some new upper bounds on the covering radii of binary linear codes," IEEE Transactions
on Information Theory, vol. IT-35, no. 1, pp. 110{122, January 1989.

SELECTED FIVE OTHER PUBLICATIONS
_ Ramanujan Graphs and Their Applications. Research Monograph. Preprint dated January 1, 2007. Approx. 150 pages. (With S.S. Rangachari (TIFR)) (Cambridge University Press has solicited preliminary version).
_ H. Janwa, ¥Explicit Constructions of Asymptotic Families of Constant Degree Expander
Graphs from Algebraic Geometric (AG) Codes," CONGRESSUS NUMERANTIUM, vol. 179, 2006, pp. 193{207.
_ ¥Some Upper Bounds on the Covering Radii of Linear Codes over F_q and Their Applications," (with H.F. Mattson, Jr.), Designs, Codes and Cryptography, Vol. 18, no. 1/2/3, December 1999. (invited.)
_ ¥Hyperplane sections of Fermat varieties in IP_3 in char. 2 and some applications to cyclic codes," (with R.M. Wilson), Springer-Verlag LNCS, No. 673, 1993, pp. 180{194. (Refereed.
One of the most inuential papers in terms of citations.)
_ ¥Some optimal codes from algebraic geometry and their covering radii," European Journal

of Combinatorics, vol. 11, pp. 249{266, 1990.

SYNERGISTIC ACTIVITIES

_ Research, directing, mentoring, training activities under the following grants: Co-PI and
Co-Director NSF-CSME: (DUE#986985), [2000{2006] for $360,250 Co-PI and Co-Director for NSF-STEM (DUE#)0630927, [2006{20011], [2000-2006] for $5000K
One of the main investigators in the NSF-CNS (CISE:#0080926) [2000-2004] ($1.5 mil-
lion)
_ One of the four research exchange professors from the UPR system Chancellors and others)
that visited the Microsoft Research Headquarters in Redmond, WA, on January 18, 2001.
April 2000: Dean's committee to recommend chair for mathematics (elected by Math Dept.)
Co-Chair of the International Symposium on AAECC-17 Bangalore (Dec. 2007). Some
main topics algebraic and combinatorial methods in bioinformatics. Member of Conference Committee of AAECC-9 to AAECC-17, from 1991 on. Also, Member of several other international conference committees.
_ Served as all India level as one of professors lecturing in the Referesher courses for
College Teachers of Mathematics (at University of Bombay, University of Delhi, Bom-
bay University, Jadavpur University (declined).
_ I have created and taught several undergraduate and graduate interdisciplinary courses in the
Department of Mathematics and Department of CS (some relevant courses to this proposal
are: Information Theory and BioInformatics, Information Theory, Cryptography and
Data Security, Error-Correcting Codes and Applications, Arti_cial Intelligence.
_ Member of the interdisciplinary, and inter-campus Ph.D. in Computer Information Sci-

ence and Engineering. Also, served on over a dozen departmental committees including
the 2001 Chair Search committee. One of main invited speakers at 10 International
Conferences.

POST-DOCS: Dr. A.K. Lal and Dr. M.S. Garg (MRI); Doctoral Thesis: (In Co-Supervision)
D. Ashlok (Caltech). M.S. Garg (IIT Kanpur); Gary McGuire (Caltech), B.K. Sharma (MRI).
M.S. Thesis (the supervisor). (Qi. Guo (UPR), D. Huang (UPR).
Current Doctoral Students. Ms. Qi Guo, Fernando Piner, Carlos Beltran. Current M.S. Students
Rafael Del Valle (UPR, current).

RESEARCH COLLABORATORS: R. Dougherty (OSU) H.F. Mattson, Jr. (SU), Bogomolov (CIMS), A.K. Lal (IIT-Kanpur), V.Kumar (U.Sc.), G. McGuire (Ireland), C. Moreno (CUNY, GCT), S.S.
Rangachari (TIFR), P. Sarnak (CIMS), B.K. Sharma (AU), P. Udaya (RMIT), R.M. Wilson (Caltech),
O.Moreno (UPR), I. Rubio, P. Rivera, P. Guan, F. Castro (UPR)
GRADUATE ADVISERS: H.F. Mattson, Jr. (Ph.D.), H. Subramanian (M.Sc.

Biographical Sketch:Luis Raúl Pericchi

Professional Preparation B.A. inMaths, Universidad Simón Bolívar (USB), Caracas, Venezuela.(1975).
M.A. in Statistics, University of California, Berkeley. (1978)
Ph.D. University of London, Imperial College, Department of Mathematics (Mathematical
Statistics)(1981)
Appointments Professor Dept. of Mathematics, University of Puerto Rico, Rio Piedras Campus,
USA. 2001-present. Head of Department Aug. 2001-Aug. 2007
Assistant, Associate and Professor Dept. of Maths and Dept. of Scientific Computing and
Statistics, Universidad Sim´on Bol´ıvar (1981-2001).
Visiting appointments and research: University of S˜ao Paulo (1985), Imperial College London
(1986-7), Purdue University (1991-2), Universidad Carlos III de Madrid (1993-4, 1997), Duke
University (2000-1)

Five Publications Relevant to proposed Research

1. Berger J.O. and Pericchi L.R. (1996) The Intrinsic Bayes Factor for Model Selection and
Prediction. Jour. of the American Stat. Ass., 91, 433, p. 109-122.
2. Key J. T., Pericchi L.R.and Smith A.F.M. (1998) ”Bayesian Model Choice: What and
Why?” Bayesian Statistics 6, invited conference. Bernardo et al editors. Oxford University
Press, p. 343-370.
3. Berger J.O. and Pericchi L.R. (2001) ”Objective Bayesian Model Selection. Introduction
and Comparisons”, in Institute of Mathematical Statistics Lecture Notes-Monograph Series, Volume 38, p. 135-207. ”Model Selection”, editor: P. Lahiri.
4. Berger J.O. and Pericchi L.R. (2004) Training samples in objective Bayesian model selection.
Annals of Statistics, 32, 3, p. 841-869.

5. Pericchi L.R. (2005) "Model Selection and Hypothesis Testing based on Objective Probabilities and Bayes Factors". Elsevier B.V. Handbook of Statistics, vol. 25. p. 115-149.

Five Other Significant Publications

1. Pericchi L.R. (2001) "Bayes factor". Encyclopedia of Environmetrics. Editors: El-
Shaarawi A. and Piegorsh W. Wiley, Vol. 1, pp 148-150.
2. Kadane J., Moreno E., Pérez M.E. and Pericchi L.R. (2002) "Applying Non-Parametric
Robust Bayesian Analysis to Non-Opinionated Judicial Neutrality", Journal of Statistical
Planning and Inference, 102, p. 425-439.
3. Coles S., Pericchi L.R. and Sisson S. (2002) "A Fully Probabilistic Approach to Extreme
Rainfall Modeling". Journal of Hydrology, 273, p. 35-50.
4. Coles S. and Pericchi L.R. (2003) Anticipating catastrophes through extreme value modelling.
Jour. Royal Stat. Soc. Ser. C. Applied Statistics, 52, 4, p. 405-416.
5. Sisson S.A., Pericchi L.R. and Coles S.G. (2006) A case for a reassessment of the risk of
extreme hydrological hazards in the Caribbean. Stoch. Environ. Res. Risk Assess.
20, pp. 296-306.

Five Synergistic Activities Associate Editor: International Statistical Review 1988 - 1991;
Brazilian Journal of Probability and Satistics 1987 - present; Trabajos de Estadística (TEST)
1990 - 1997; Bayesian Analysis (Electronic Official ISBA Journal) 2004-present.
First Director of the Statistical Laboratory, and the Graduate Studies in Statistics at Univ.
Simón Bolívar; President of the Latin American Chapter of the Bernoulli Society for Probability
and Mathematical Statistics, (1996-2000); Organizer or Co-Organizer of 10 conferences,

including Latin American Congress of Probability and Mathematical Statistics CLAPEM (1983,
1998, 2001) Organizer First " Inst.Math. Statist.(IMS)-Int. Soc. Bayesian Anal.(ISBA)" joint
meeting in Puerto Rico (2003). Chair of the Program Council, International Society for Bayesian
Analysis: ISBA, (2002).

Collaborators (last 5 years) J.O. Berger (Duke University), S. Coles (University of Bristol),
M.G. Dominguez-Bello (University of Puerto Rico), J. Kadane (Carnegie-Mellon University),
E. Marini (University of Cagliari), E. Moreno (Universidad de Granada), N. Nadal (Statistical
Consultant), M.E. P´erez (Universidad Sim´on Bol´ıvar), I. P´erez-Schael (Venezuelan Institute of Biomedicine), A. Rodriguez (Duke University), B. Sans`o (UC, Santa Cruz), S. Sisson (New
South Wales, AU), A.F.M. Smith (Queen Mary and Westfield College), J. Varshavsky (Lilly
Corporation).

Ph.D. Students and Postdoctoral Advises
Three Ph.D. students have graduated under the PI's supervision. In the last five years: N.
Nadal (Statistical Consultant). Postdoctoral Associate: S. Sisson (2002-3).
Areas of Research Model Comparisons; Bayesian Analysis; Foundation of Statistics; Simulation
and MCMC Computations; Analysis of Extreme Values; Decision and Information Theory;
Bayesian Design and Analysis of Clinical Trials; Statistical Applications to Anthropology, Biology, Economics, Engineering, Medicine.
Honors,Awards and Relevant Grants Guggenheim Fellowship (1997-1998) "Bayes Factors for
Model Selection and Prediction"; Elected Ordinary Member of the International Statistical
Institute, 1989. Awards: Best publication of the year (CONICIT-Venezuela) in Engineering

(1987), in Mathematics (1992); Best Article of the year in Mathematics, Academia de Ciencias
de Granada Spain (1991); Annual Award for the best research record, Universidad Sim´on
Bol´ıvar (1997). Grants: 1) PI of 2 National Grants to the Center for Statistics and Mathematical
Software, USB; 2) Engineering and Physical Sciences Visiting Grants, United Kingdom:
Nottingham 1988-89, Liverpool 1991, Bristol 2001-2; 3) PI of the Travel Grant (NSF) for the
International Valencia Meeting on Bayesian Statistics, 2002. 4) PI research grant (NSF) DMS-
0604896, Aug. 2006-Jul. 2008. ”A synthesis of objective Bayes factors for model selection and
hypothesis testing”, $71,549. 5) PI S-STEM grant NSF, ”Acelerating Puerto Rican Students
into the National Research Effort in Mathematics and Computer Science”, 2006-2010, $500,000.

Biographical Sketch: Mariano Marcano

Professional preparation

University of Puerto Rico at Cayey Mathematics B.Sc. 1986
University of Puerto Rico at R´ıo Piedras Applied Mathematics M.Sc. 1990
State University of New York at Stony Brook Applied Mathematics Ph.D. 1998

Appointments

2007-Present: Associate Professor, Department of Computer Science, University of Puerto Rico, Río Piedras.
2003-2007: Associate Professor, Department of Mathematics, University of Puerto Rico,
Río Piedras.
1998-2003: Assistant Professor, Department of Mathematics and Computer Science, University of Puerto Rico, R´ıo Piedras.
2000-2001: Visiting Assistant Professor, Department of Mathematics, Duke University, Durham, North Carolina.

Publications

1. M. Marcano-Velázquez and P. V. Negrón-Marrero. The numerical solution of the von K´arm´an equations using multigrid methods. Congr. Numer., 94:17-28, 1993.
2. R. P. Tewarson and M. Marcano. Use of generalized inverse in a renal optimization
problem. Inverse Probl. Eng., 5:1-9, 1997.
3. R. P. Tewarson, W. Toro, and M. Marcano. Preferential interaction and inverse
problem algorithms in models of renal concentrating mechanism. Appl. Math. Lett.,
11(3):51-59, 1998.
4. M. Marcano-Vel´azquez and H. E. Layton. An Inverse Algorithm for a Mathematical

Model of an Avian Urine Concentrating Mechanism, B. Math. Biol., 65: 665-691, 2003.
5. Mariano Marcano, Anita T. Layton, and Harold E. Layton. An Optimization Algorithm
for a Distributed-Loop Model of an Avian Urine Concentrating Mechanism. B. Math. Biol., 68: 1625-1660, 2006.

Synergistic Activities

1. Organizer, Mathematical Models for Physiology, Minisymposium at 2000 SIAM (Society for Industrial and Applied Mathematics) Annual Meeting, R´ıo Grande, Puerto
Rico, July 10-14, 2000.
2. Co-organizer, XIV SIDIM ("Seminario Interuniversitario de Investigaci´on en Ciencias
Matem´aticas"), University of Puerto Rico, R´ıo Piedras, April 10, 1999.

Collaborators and Other Affiliations

1. Collaborators
(a) Harold Layton, Duke University, Department of Mathematics, Durham, North
Carolina.
(b) Anita T. Layton, Duke University, Department of Mathematics, Durham, North
Carolina.
(c) Leon C. Moore, SUNY Stony Brook, Department of Physiology and Biophysics, Stony Brook, New York.
2. Graduate and Postdoctoral Advisors
(a) Pablo V. Negrón-Marrero, M.Sc. Thesis Advisor, University of Puerto Rico.
(b) Reginald P. Tewarson, Ph.D. Thesis Advisor, State University of New York, Stony Brook, New York.
3. Thesis advisor and Postgraduate Scholar Sponsor M.Sc. Thesis Directed:

(a) Dannael Carrero (2003), University of Puerto Rico, Ponce Campus.

(b) Rubén León (2005), Centennial Telecomunications.

(c) Aniel Nieves (2006), SUNY at Stony Brook, New York.

(d) Néstor Mendoza (2007), Actuary work in the Puerto Rico's teacher union.

APPENDIX G: COPIES OF APPLICABLE PERMITS

APPENDIX H: STRATEGIC PLAN FOR STRENGTHENING THE MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES (2002-2008)

APPENDIX I: MODEL BROCHURE FOR PROGRAM PROMOTION

PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

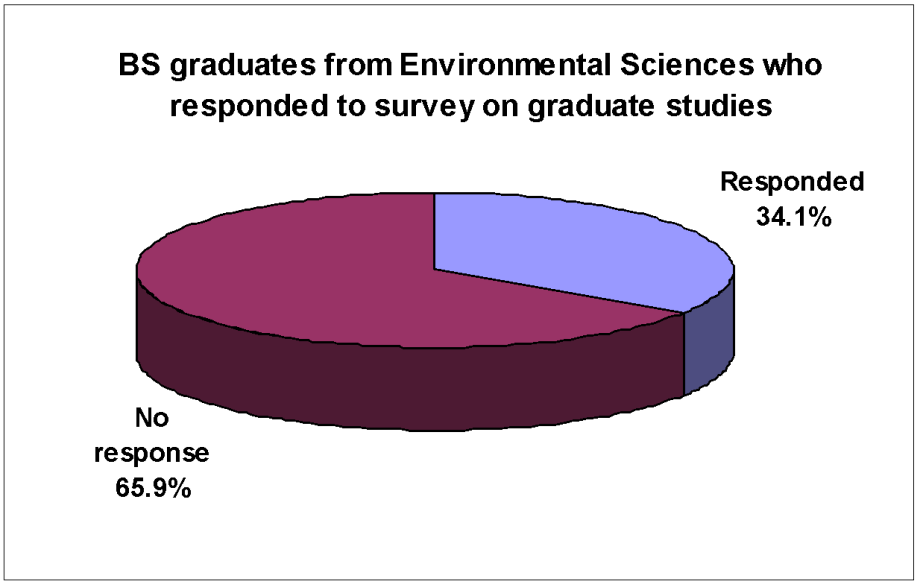
Appendix A
Study of graduates

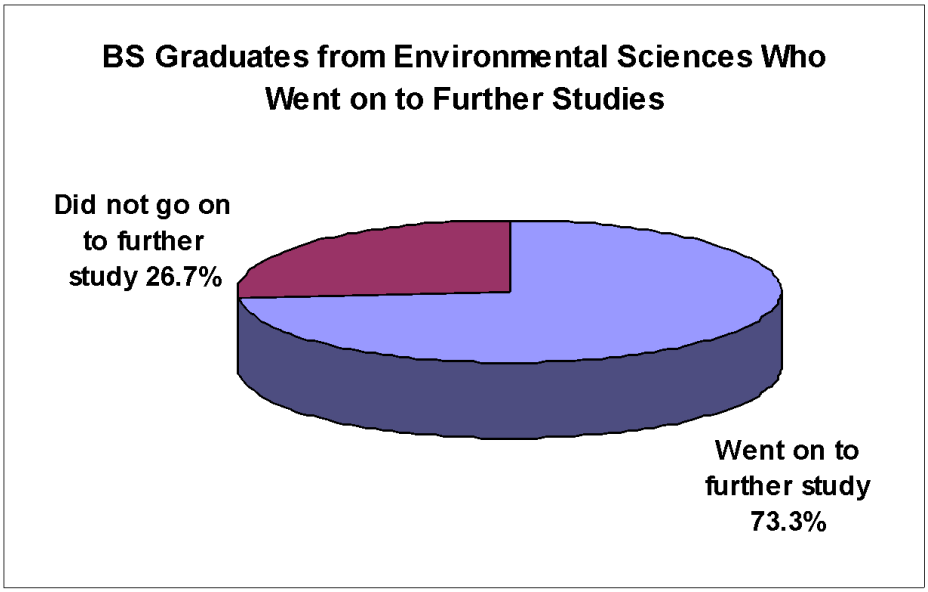
PROGRAM OF ENVIRONMENTAL SCIENCE
COLLEGE OF NATURAL SCIENCES
UNIVERSITY OF PUERTO RICO - RÍO PIEDRAS CAMPUS

SUMMARY OF DATA OBAINED FROM STUDY OF GRADUATES FROM BS PROGRAM CONCERNING GRADUATE STUDIES

Number of questionnaires sent:		176
Number of questionnaires returned	(34.1%)	60
Total number of graduates who carried out graduate studies alter completing the bachelor's in Environmental Sciences:	44 (73.3%)	
Distribution of final degrees received and area of specialty:		
Ph.D. in Environmental Sciences or related areas	5 (11.4%)	
M.S. in Environmental Sciences or related areas	19 (43.2%)	
JD (including JD - M Env.Scs.)	4 (9.1%)	

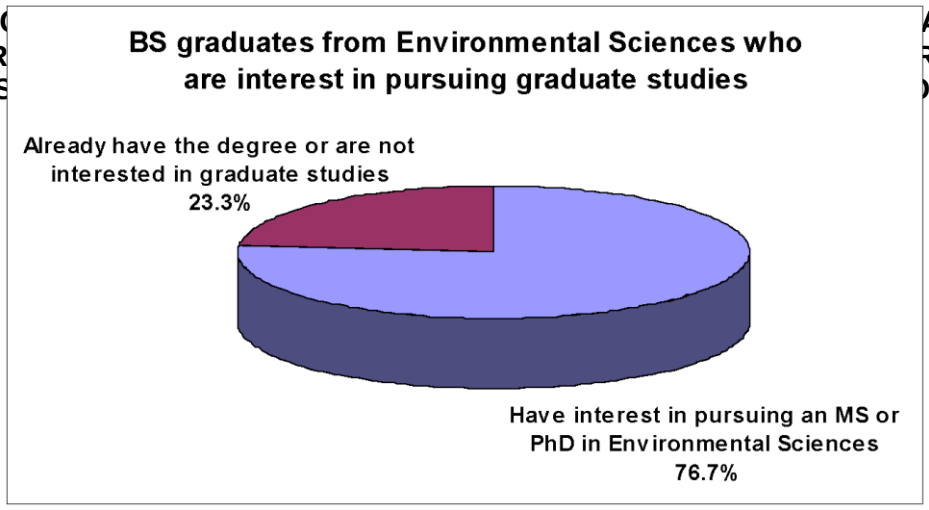
M.A. in Environmental Planning	8 (18.2%)
M.A. in other areas (MBA, Environ. Manage., etc.)	8 (18.2%)
Distribution in relation to the institution in which said degree was received	
UPR system	16 (36.4%)
Other University in Puerto Rico	11 (25.0%)
Universities in the United States	17 (38.6%)
Graduates who showed interests in pursuing graduate studies (M.S. or Ph.D.) in the UPR-RP Environmental Sciences Program:	46 (76.7%)

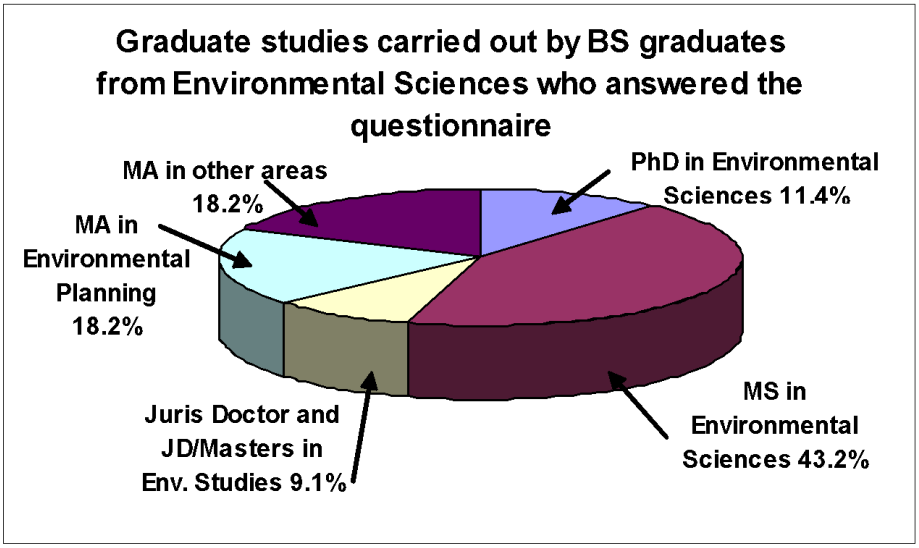

BS graduates from Environmental Sciences who responded to survey on graduate studies
Responded 34.1%
No response 65.9%

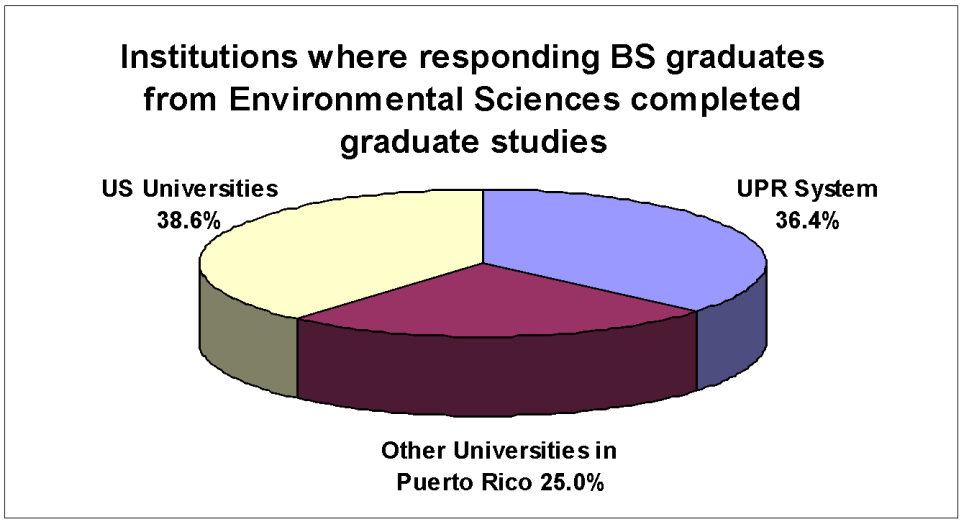

BS Graduates from Environmental Sciences Who Went on to Further Studies
Did not go on to further study 26.7%
Went on to further study 73.3%

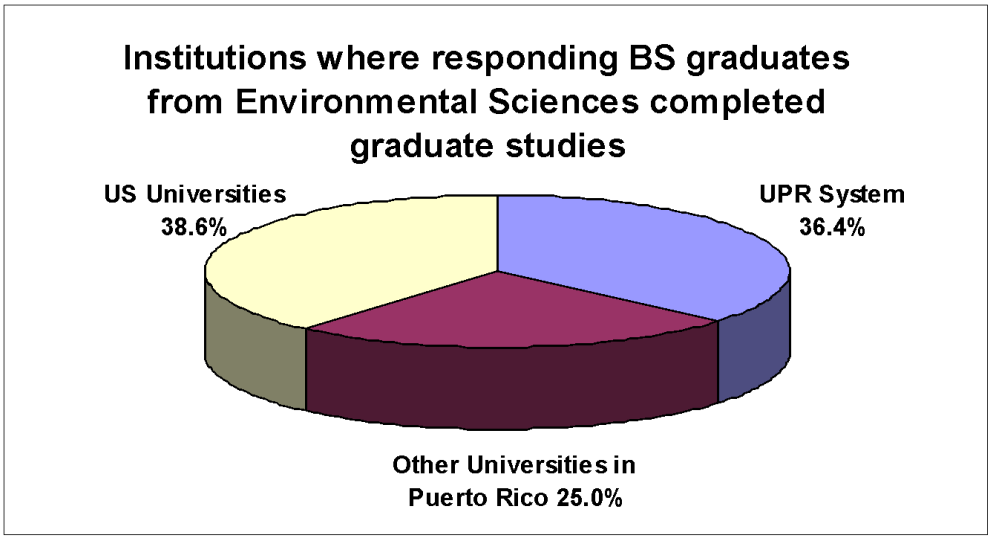
PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO


BS graduates from Environmental Sciences who are interest in pursuing graduate studies
Already have the degree or are not interested in graduate studies 23.3%
Have interest in pursuing an MS or PhD in Environmental Sciences 76.7%

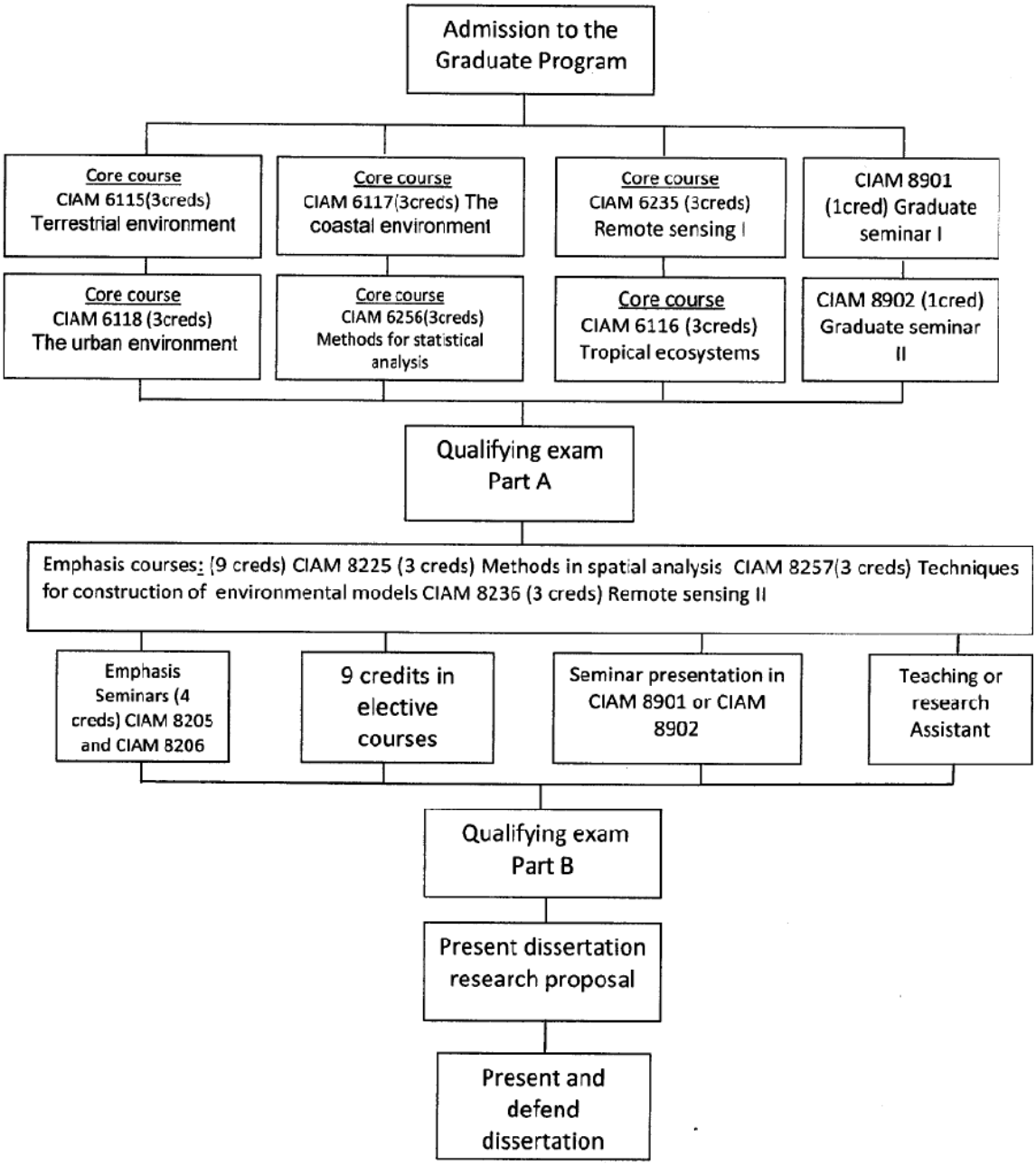

Graduate studies carried out by BS graduates from Environmental Sciences who answered the questionnaire
MA in other areas 18.2%
PhD in Environmental Sciences 11.4%
MA in Environmental Planning 18.2%
Juris Doctor and JD/Masters in Env. Studies 9.1%
MS in Environmental Sciences 43.2%


Institutions where responding BS graduates from Environmental Sciences completed graduate studies
US Universities 38.6%
UPR System 36.4%
Other Universities in Puerto Rico 25.0%


Institutions where responding BS graduates from Environmental Sciences completed graduate studies
US Universities 38.6%
UPR System 36.4%
Other Universities in Puerto Rico 25.0%

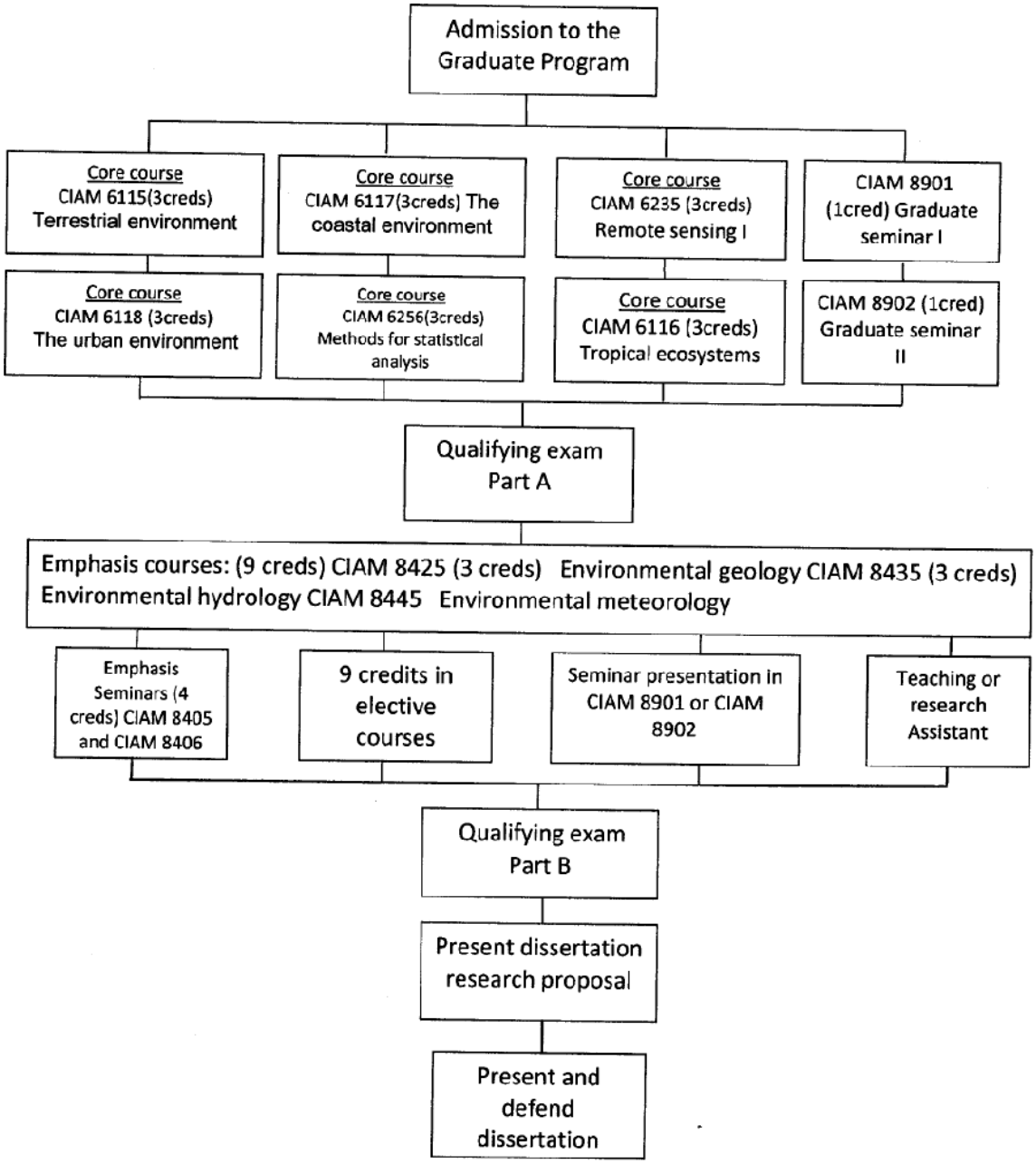
PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Requirements for the Doctorate in Environmental Sciences in the area of Environmental Modeling and Spatial Analysis



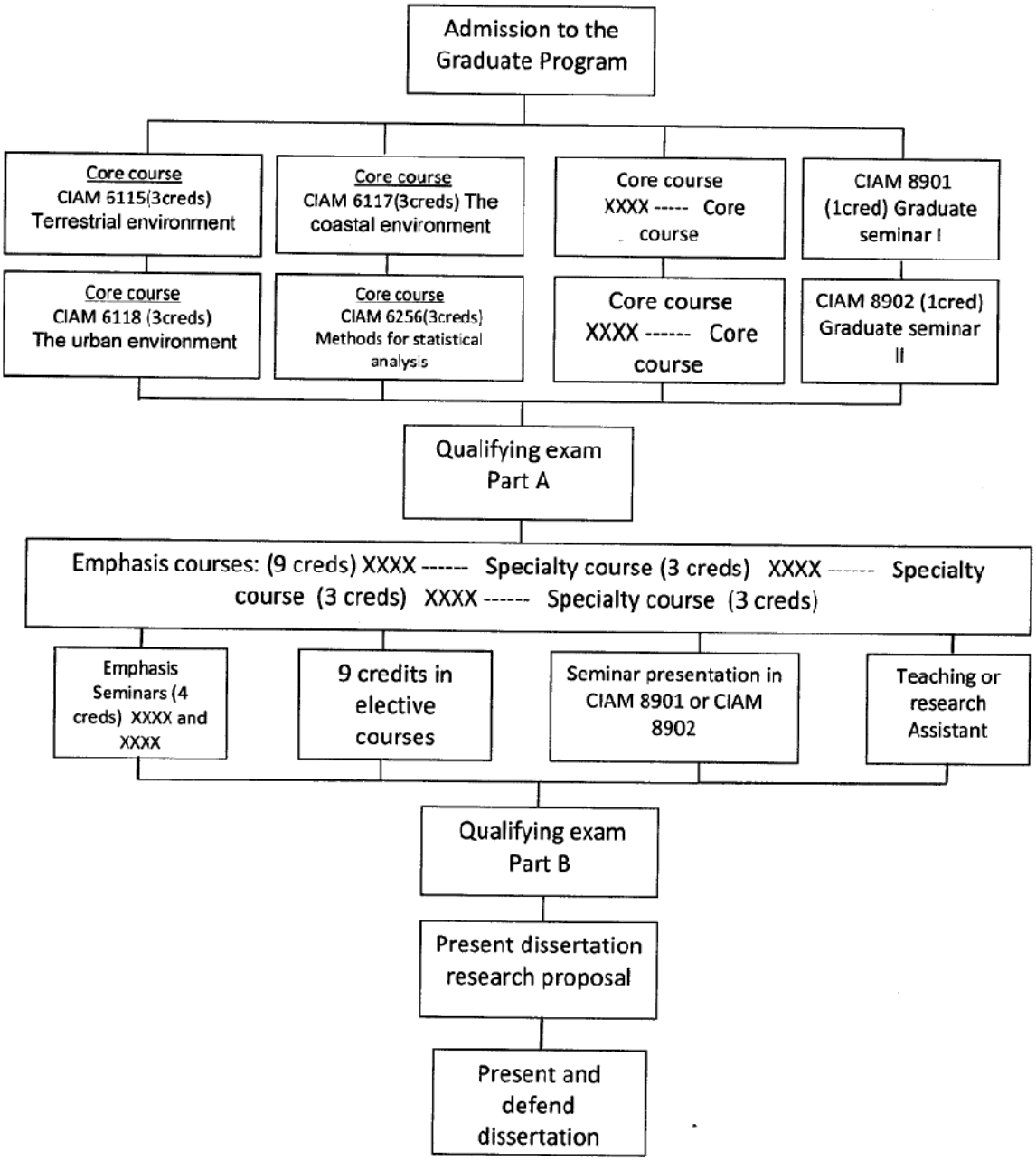
PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Requirements for the Doctorate in Environmental Sciences in the area of Management of Environmental Systems



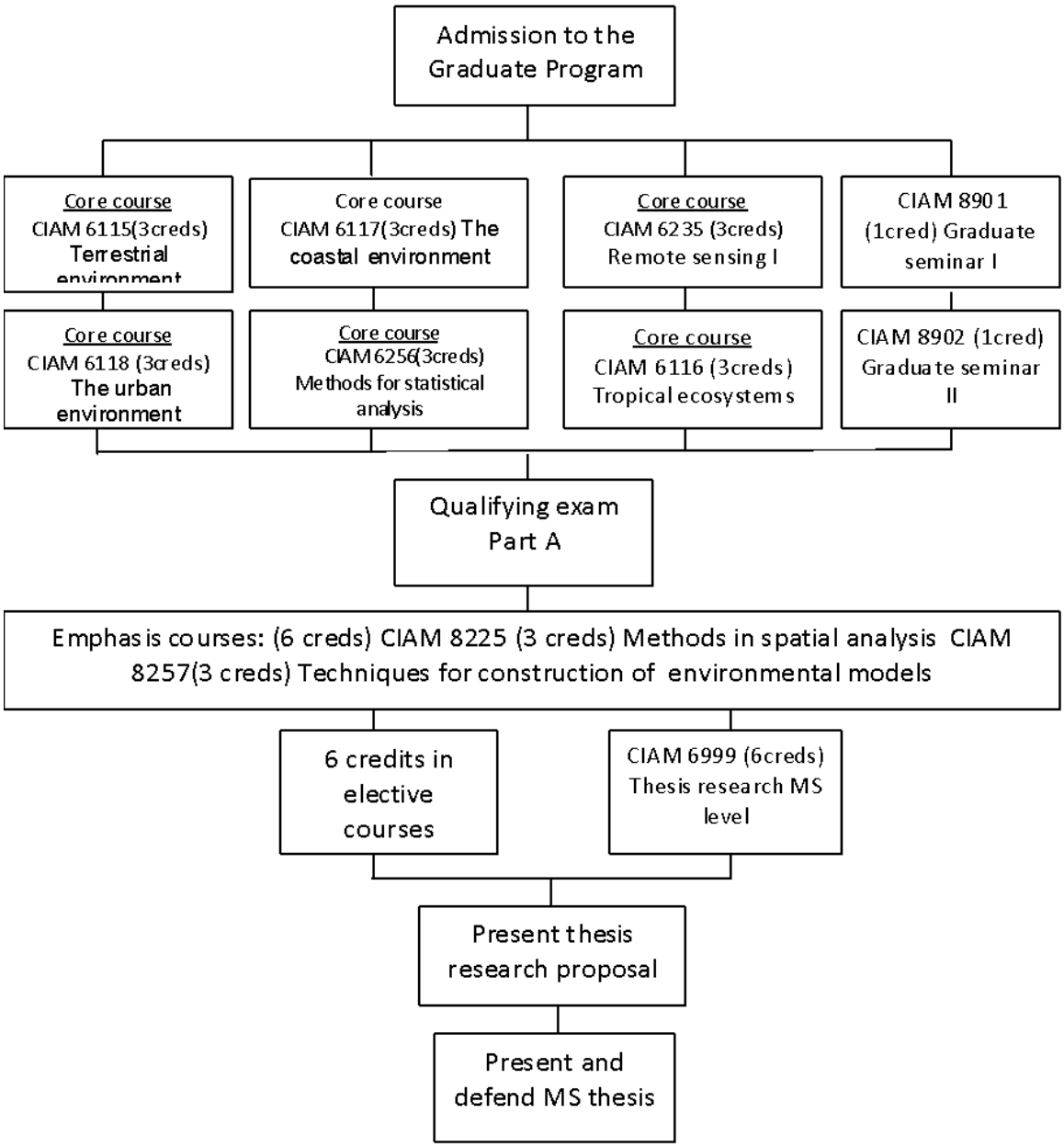
PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Requirements for the Doctorate in Environmental Sciences in the Interdisciplinary Option



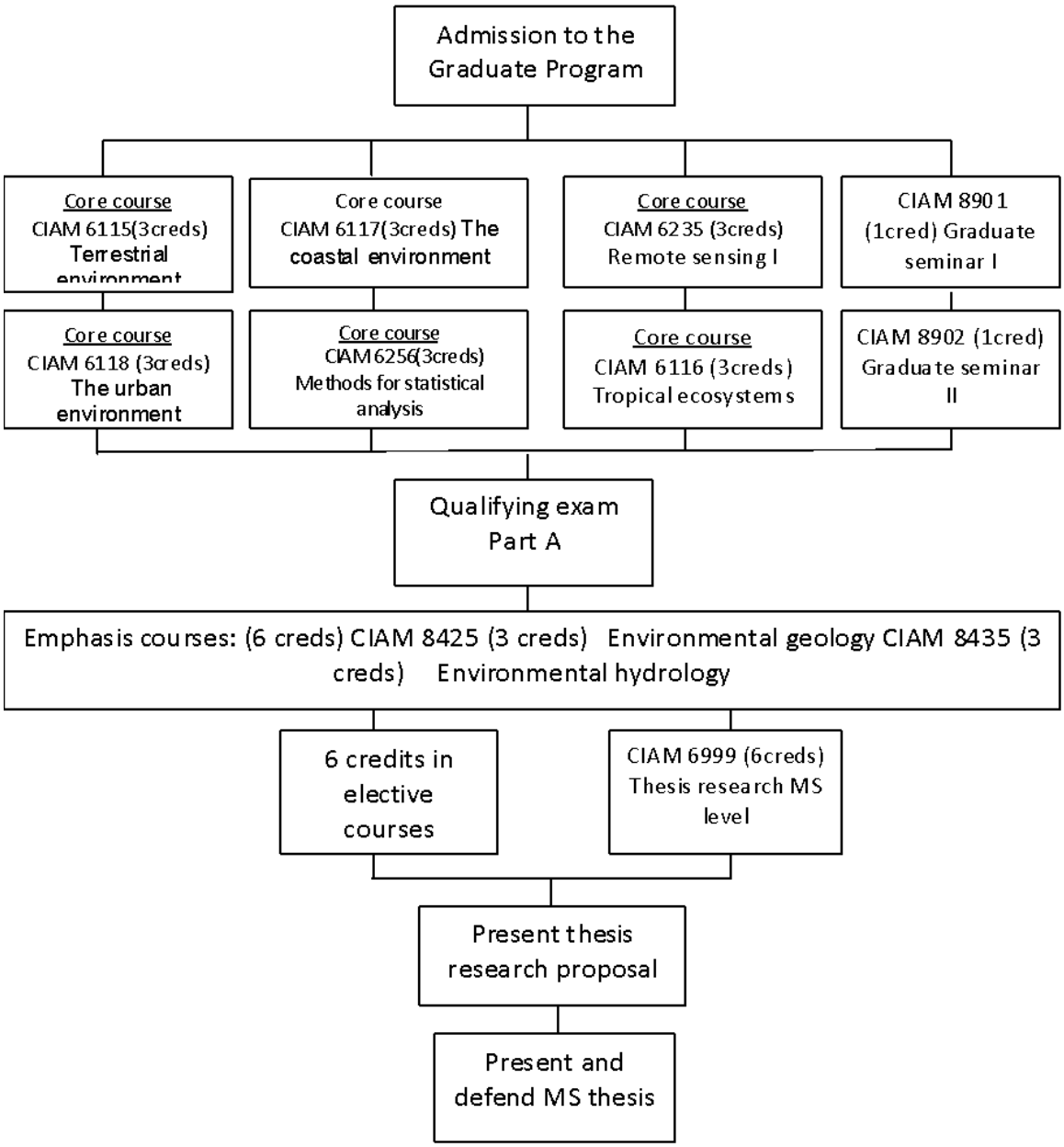
PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Requirements for the MS in Environmental Sciences in the area of Environmental Modeling and Spatial Analysis



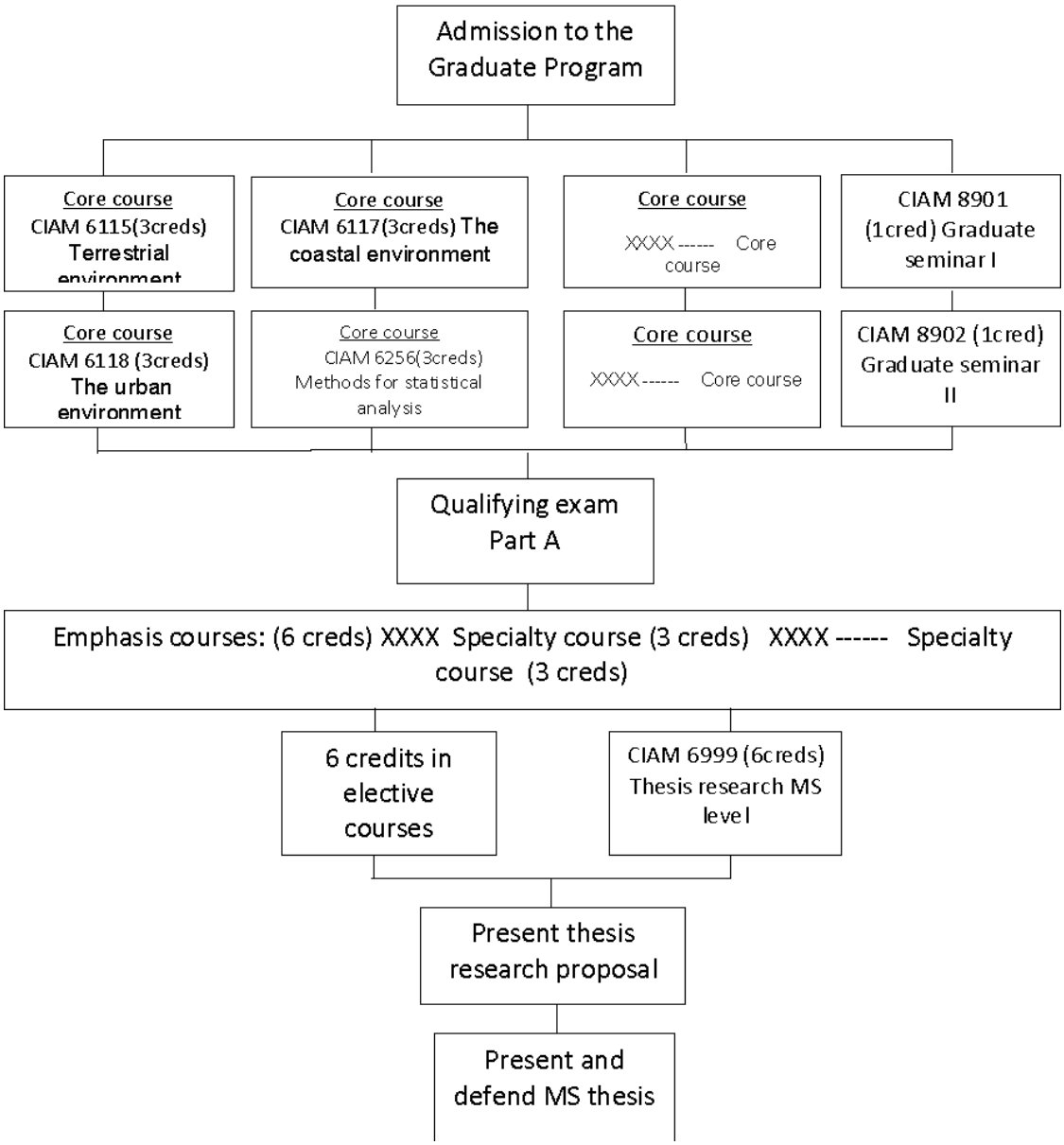
PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Requirements for the MS in Environmental Sciences in the area of Sustainable Management of Islands and Tropical Regions



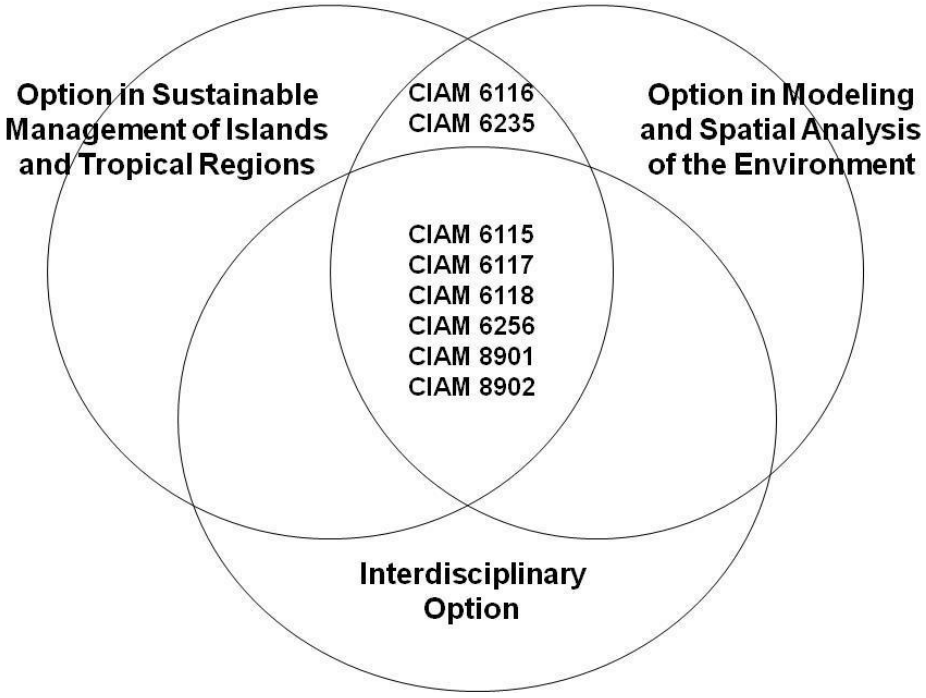
PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Requirements for the MS in Environmental Sciences in the Interdisciplinary Option

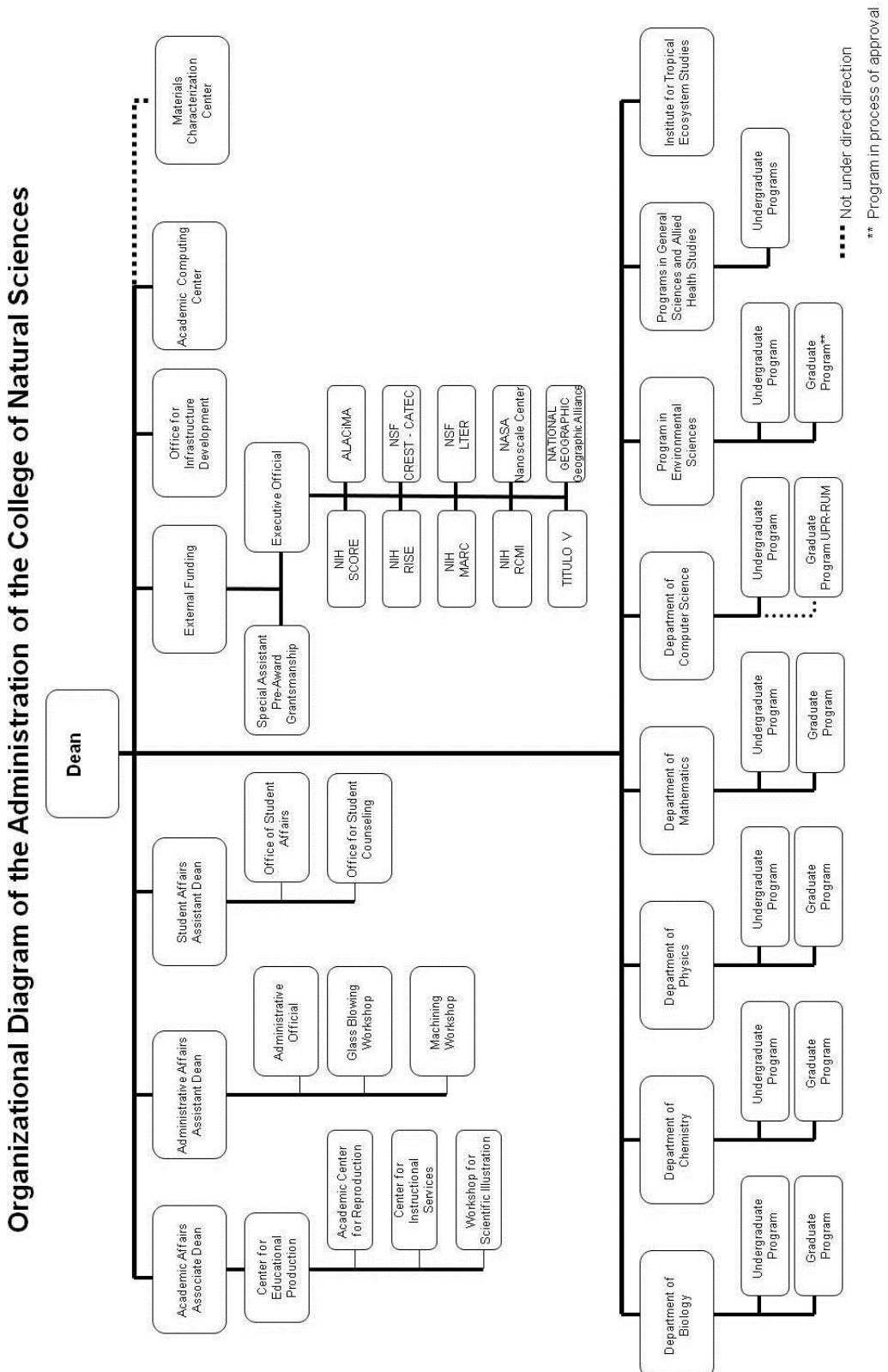


Appendix C: Courses common to the different options

Courses common to the different options



Appendix D: Organizational Diagram of the Administration of the College of Natural Sciences


Organizational Diagram of the Administration of the College of Natural Sciences
Dean
Academic Affairs Associate Dean
Center for Educational Production
Academic Center for Reproduction
Center for Instructional Services
Workshop for Scientific Illustration
Administrative Affairs Assistant Dean
Administrative Official
Glass Blowing Workshop
Machining Workshop
Student Affairs Assistant Dean
Office of Student Affairs
Office for Student Counseling
External Funding
Special Assistant Pre-Award Grantsmanship
Executive Official
NIH SCORE
ALACiMA
NIH RISE
NSF CREST - CATEC
NIH MARC
NSF LTER
NIH RCMI
NASA Nanoscale Center
TITULO V
NATIONAL GEOGRAPHIC Geographic Alliance
Office for Infrastructure Development
Academic Computing Center
Materials Characterization Center
Department of Biology
Department of Chemistry
Department of Physics
Department of Mathematics
Department of Computer Science
Program in Environmental Sciences
Programs in General Sciences and Allied Health Studies
Institute for Tropical Ecosystem Studies
Undergraduate Program
Graduate Program
Graduate Program UPR-RUM
Graduate Program**
Undergraduate Programs
Not under direct direction
** Program in process of approval

Appendix E: Proposals for new courses

Appendix E.1: Courses from other Department and Faculties

Appendix F: *Curriculum vitae* of professors available for the supervision of thesis projects

Appendix G: Copies of Applicable Permits

PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Estado Libre Asociado de Puerto Rico
Departamento de Salud
SALUD AMBIENTAL
REGIÓN METROPOLITANA

ADMINISTRACION REGLAMENTOS Y PERMISOS

SAN JUAN, Puerto Rico

La oficina de Salud Ambiental REGIONAL efectuó una inspección sanitaria el 21 DE NOVIEMBRE DE 2007 del local ubicado en UNIVERSIDAD DE PUERTO RICO, RECINTO RIO PIEDRAS del municipio de SAN JUAN Puerto Rico, el cual será dedicado a EDIFICIO EDUCATIVO CIENCIAS NATURALES I

SOLICITANTE UNIVERSIDAD DE PUERTO RICO/FRANCISCO HEREDIA

No tenemos objeción a que esa Agencia expida el permiso de uso correspondiente. Dicho endoso no constituye una autorización para la operación de las facilidades, ya que previamente **EL SOLICITANTE DEBERA PROVEERSE DE LA LICENCIA SANITARIA que para tales fines expide el Departamento de Salud.**

DADO HOY 29 DE NOVIEMBRE DE 2007

FIRMA AUTORIZADA

SELLO OFICIAL

mor

Calle Mayaguez Número 38, Urb. Pérez Morris, Hato Rey, Puerto Rico 00917
Teléfonos 787-751-8044 * 787-763-9782 * Fax 787-763-1842

Estado Libre Asociado de Puerto Rico
Departamento de Salud
SALUD AMBIENTAL
REGIÓN METROPOLITANA

ADMINISTRACION REGLAMENTOS Y PERMISOS

SAN JUAN, Puerto Rico

La oficina de Salud Ambiental REGIONAL efectuó una inspección sanitaria el 5 DE SEPTIEMBRE DE 2006 del local ubicado en AVENIDA PONCE DE LEON, RECINTO DE RIO PIEDRAS, UPR del municipio de SAN JUAN Puerto Rico, el cual será dedicado a **CIENCIAS NATURALES-FASE II**

SOLICITANTE UNIVERSIDAD DE PUERTO RICO/JORGE RAMOS FELICIANO

No tenemos objeción a que esa Agencia expida el permiso de uso correspondiente. Dicho endoso no constituye una autorización para la operación de las facilidades, ya que previamente **EL SOLICITANTE DEBERA PROVEERSE DE LA LICENCIA SANITARIA que para tales fines expide el Departamento de Salud.**

DADO HOY 6 DE SEPTIEMBRE DE 2006

FIRMA AUTORIZADA

SELLO OFICIAL

mor

Calle Mayaguez Número 38, Urb. Pérez Morris, Hato Rey, Puerto Rico 00917
Teléfonos 787-751-8044 * 787-763-9782 * Fax 787-763-1842

Estado Libre Asociado de Puerto Rico
Departamento de Salud
SALUD AMBIENTAL
REGIÓN METROPOLITANA

ADMINISTRACION REGLAMENTOS Y PERMISOS

SAN JUAN, Puerto Rico

La oficina de Salud Ambiental REGIONAL efectuó una inspección sanitaria el 21 DE NOVIEMBRE DE 2007 del local ubicado en UNIVERSIDAD DE PUERTO RICO, RECINTO RIO PIEDRAS del municipio de SAN JUAN Puerto Rico, el cual será dedicado a EDIFICIO EDUCATIVO JULIO GARCIA DIAZ

SOLICITANTE UNIVERSIDAD DE PUERTO RICO/FRANCISCO HEREDIA

No tenemos objeción a que esa Agencia expida el permiso de uso correspondiente. Dicho endoso no constituye una autorización para la operación de las facilidades, ya que previamente **EL SOLICITANTE DEBERA PROVEERSE DE LA LICENCIA SANITARIA que para tales fines expide el Departamento de Salud.**

DADO HOY 29 DE NOVIEMBRE DE 2007

FIRMA AUTORIZADA

SELLO OFICIAL

mor

Calle Mayaguez Número 38, Urb. Pérez Morris, Hato Rey, Puerto Rico 00917
Teléfonos 787-751-8044 * 787-763-9782 * Fax 787-763-1842

Estado Libre Asociado de Puerto Rico
Departamento de Salud
SALUD AMBIENTAL
REGIÓN METROPOLITANA

ADMINISTRACION REGLAMENTOS Y PERMISOS

SAN JUAN, Puerto Rico

La oficina de Salud Ambiental REGIONAL efectuó una inspección sanitaria el 21 DE NOVIEMBRE DE 2007 del local ubicado en UNIVERSIDAD DE PUERTO RICO, RECINTO RIO PIEDRAS del municipio de SAN JUAN Puerto Rico, el cual será dedicado a EDIFICIO EDUCATIVO FACUNDO BUESO

SOLICITANTE UNIVERSIDAD DE PUERTO RICO/FRANCISCO HEREDIA

No tenemos objeción a que esa Agencia expida el permiso de uso correspondiente. Dicho endoso no constituye una autorización para la operación de las facilidades, ya que previamente **EL SOLICITANTE DEBERA PROVEERSE DE LA LICENCIA SANITARIA que para tales fines expide el Departamento de Salud.**

DADO HOY 29 DE NOVIEMBRE DE 2007

FIRMA AUTORIZADA

SELLO OFICIAL

mor

Calle Mayaguez Número 38, Urb. Pérez Morris, Hato Rey, Puerto Rico 00917
Teléfonos 787-751-8044 * 787-763-9782 * Fax 787-763-1842

Calle Mayaguez Número 38, Urb. Pérez Morris, Hato Rey, Puerto Rico 00917
Teléfonos 787-751-8044 * 787-763-9782 * Fax 787-763-1842

PROPOSAL F(DOCTORAL
PROGRAM IN E OF NATURAL
SCIENCES IN THE F PUERTO RICO

PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Núm. de Radicación:
07PU2-CET00-05959

Número de Catastro:
17-087-003-728-05-000

ESTADO LIBRE ASOCIADO DE PUERTO RICO
ADMINISTRACION DE REGLAMENTOS Y PERMISOS
CENTRO EXPRESO DE TRAMITE

PERMISO DE USO

EDIFICIO CIENCIAS NATURALES II

267723

De conformidad con las disposiciones legales y reglamentarias, se expide el presente Permiso de Uso - Convencional / Institucional / Gobierno para la dirección que ubica en :

UNIV. DE P.R., RECINTO DE RIO PIEDRAS
BO. RIO PIEDRAS
SAN JUAN, PR, 00931

Dueño(s)
1 UNIVERSIDAD DE PUERTO RICO - RIO PIEDRAS (Primario)

Proponente / Contacto(s)
1 Dueño - UNIVERSIDAD DE PUERTO RICO - RECINTO DE RIO PIEDRAS

Zonificación
Zonificación 1 : P
% Topografía llana : 90
Accesos : PUBLICOS
Cabida Mesura m² : 88.046 CUERDAS

Atributos

------ Final de Atributos ------

Este permiso debe cumplir con las siguientes condiciones generales:

Este permiso no legaliza obras construidas sin permiso de esta oficina ni impide cualquier acción legal tomándose o a tomarse contra las mismas. El cumplir con los requerimientos de la Administración de Reglamentos y Permisos no exime a cualquier parte que solicite un permiso o autorización de la ARPE de cumplir con los requisitos establecidos por las leyes federales "Fair Housing Act" y "Americans With Disabilities Act". Entendiendose que este permiso no releva al peticionario de cumplir con los requerimientos del Departamento de Salud. Se cumplira con los requisitos del Cuerpo de Bomberos de Puerto Rico.
La autorización aquí emitida no tiene el propósito ni alcance de anular cualquier restricción privada (servidumbre en equidad) que resulten inconsistentes con el permiso aquí concedido. La parte que se sienta así agraviada, podrá radicar un procedimiento civil de sentencia declaratoria e injunction en el Tribunal de Primera Instancia con competencia.

Condiciones Especiales :

Primera Planta: Oficinas Administrativas, Oficinas de Profesores, Cuartos de Máquinas, Cuartos de Almacén, Sala de Reuniones, Laboratorio de Clases, Salas de Estudios, Baños, Escaleras y Pasillos.

Segunda Planta: Oficinas de Profesores, Salones de Clases, Cuartos de Máquinas, Laboratorio de Clases, Cuartos de Almacén, Pasillos, Baños y Escaleras.

Tercera Planta: Salones de Clases, Laboratorios de Ciencias, Oficinas Administrativas, Cuartos de Máquinas, Salas de Conferencias, Salas de Estudios, Baños, Escaleras y Pasillos.

---------- Final de Condiciones Especiales ----------

Ing. Luis Velez Roche
ADMINISTRADOR

Autorizado por : Ing. Carlos M. Quiñones Gonzalez
Gerente
CENTRO EXPRESO DE TRAMITE

Fecha de Aprobación : **07-18-2007**

Fecha Expedido : JUL 18 2007

Este documento no es válido sin el sello

BPR-001 5/2005

INF: NUM: 209299

Estado Libre Asociado de Puerto Rico
Cuerpo de Bomberos de Puerto Rico
Negociado de Prevención de Incendios
DIVISIÓN DE: Río Piedras

INFORME DE INSPECCION

Página 1 de 1 Páginas

CLAVE: 02 — FECHA: [illegible]	Clasificación: Serv. Comercial — Serie Ref:
Nombre del Edificio: ✓ / Solar: ___ / Establecimiento ___ / — Facundo Bueso	Dueño del Establecimiento: UPR
Dirección Física:	Dirección Postal:
	Tel: 764-0000
Pueblo: Río Piedras	Tipo de Uso:
Dueño del Edificio y Tel: UPR	Salones y Laboratorios
Asegurado con: — Tipo de Construcción: Paredes Ext: — Paredes Int: Hormigón — Techo: Hormigón	Pies Cuadrados: — Capacidad Máx: — Núm Pisos: 3

Salidas de Emergencia	Adecuado	Deficiente	Multa	N/A
001 Cantidad Existente	✓			
002 Distancia de Recorrido	✓			
003 Dirección al Abrir	✓			
004 Condiciones	✓			
005 Rotulaciones	✓			
006 Cierre Automático	✓			
007 Cerradura	✓			
008 Iluminación	✓			
009 Alumbrado de Emergencia	✓			
010 Otros		✓	P	

Equipo de Protección Contra Incendios	Adecuado	Deficiente	Multa	N/A
221 Rociadores Automáticos		✓	P	
222 Siamesa				
223 Manguera de Incendios				
224 Extintores Portátiles		✓	P	
225 Detectores de Humo				
226 Alarma				
227 Hidrantes				
228 Licencias para Servicio				
229 Otros				

Riesgos de Incendios	Adecuado	Deficiente	Multa	N/A
111 Líquidos / Gases Inflamables				
112 Sustancias Combustibles	✓			
113 Materiales Peligrosos				
114 Sistema Eléctrico	✓			
115 Limpieza y Orden	✓			
116 Maquinaria y Equipo				
117 Equipo de Cocina				
118 Áreas de No Fumar	✓			
119 Operación de Plantas G.L.P.				
120 Operación Estaciones de Gasolina				
121 Otros				

Planes de Emergencia	Adecuado	Deficiente	Multa	N/A
331 Planes de Emergencia	✓			
332 Plano de Desalojo	✓			
333 Brigadas / Escuadras de Incendio				
334 Adiestramiento				
335 Simulacros				
336 Capacidad Máxima Permitida	✓			
400 Precauciones Generales	✓			

Endosos, Certificaciones y Permisos
500 Solicitado Nuevo ___ / Renovación ___ /

OBSERVACIONES:

Fecha de Re-inspección — **Deberá cumplir con los siguientes requerimientos o condiciones en la fecha indicada.**

Código		Fecha D M A
010	Según Cap. 14 Sec. 14.4 Deberá mantener libre de obstrucciones los medios de salida	
221	Según Cap. 13 Sec. 13.3 Deberá proveer certificación de rociadores	
224	Según Cap. 13 Sec. 13.6 Deberá proveer mantenimiento a los extintores	

Certifico: Que este Informe de Inspección ha sido entregado por mí a Carlos D. Toledo, dueño ___ / Administrador ___ / Encargado ✓ / de la referida propiedad, hoy, 25 de Sept de 02. A las 9:__ AM ___ PM/ en UPR, P.R. Para que cumpla con cada uno de los requerimientos señalados de este Informe, centro de los (10) días calendario, comenzando dicho término al recibo de este documento y vence en la fecha de la reinspección arriba señalada. Que ha sido advertido por Mí de su derecho a solicitar por escrito una Vista Administrativa dentro del término señalado para realizar dichas correcciones ante el Jefe del Cuerpo de Bomberos de Puerto Rico de entender que no se ha actuado correctamente con algunos o todos los requerimientos establecidos en el presente documento.

Recibido por: [signature] Firma Inspector: [signature] /Núm.ID: ___

Advertencia: El Jefe del Cuerpo de Bomberos podrá imponer las sanciones que correspondan por incumplimiento de las correcciones aquí requeridas. (Ley 43 del 21 de junio de 1988 según enmendada y la reglamentación vigente al amparo de ésta).

BPR-001 5/2005

INF: NUM: 165525

Estado Libre Asociado de Puerto Rico
Cuerpo de Bomberos de Puerto Rico
Negociado de Prevención de Incendios
DIVISIÓN DE:

763-1234

INFORME DE INSPECCION

Página 1 de 1 Páginas

CLAVE | FECHA: de Junio de | Clasificación: Educacional | Serie Ref:

Nombre del Edificio: / Solar: / Establecimiento / | Dueño del Establecimiento: Universidad de P.R.

Dirección Física: | Dirección Postal: | Tel: 764-000

Pueblo: | Tipo de Uso: Laboratorio y Oficina

Dueño del Edificio y Tel: Universidad de P.R.

Asegurado con: | Tipo de Construcción: Paredes Ext: Paredes Int: Techo: | Pies Cuadrados: Núm Pisos: | Capacidad Máx:

Salidas de Emergencia	Adecuado	Deficiente	Multa	N/A
01 Cantidad Existente				
02 Distancia de Recorrido				
03 Dirección al Abrir				
04 Condiciones				
05 Rotulaciones				
06 Cierre Automático				
07 Cerradura				
08 Iluminación				
09 Alumbrado de Emergencia				
10 Otros				

Equipo de Protección Contra Incendios	Adecuado	Deficiente	Multa	N/A
21 Rociadores Automáticos				
22 Siamesa				
23 Manguera de Incendios				
24 Extintores Portátiles				
25 Detectores de Humo				
26 Alarma				
27 Hidrantes				
28 Licencias para Servicio				
29 Otros				

Riesgos de Incendios	Adecuado	Deficiente	Multa	N/A
111 Líquidos / Gases Inflamables				
112 Sustancias Combustibles				
113 Materiales Peligrosos				
114 Sistema Eléctrico				
115 Limpieza y Orden				
116 Maquinaria y Equipo				
117 Equipo de Cocina				
118 Áreas de No Fumar				
119 Operación de Plantas G.L.P.				
120 Operación Estaciones de Gasolina				
121 Otros				

Planes de Emergencia	Adecuado	Deficiente	Multa	N/A
331 Planes de Emergencia				
332 Plano de Desalojo				
333 Brigadas / Escuadras de Incendio				
334 Adiestramiento				
335 Simulacros				
336 Capacidad Máxima Permitida				
400 Precauciones Generales				

Endosos, Certificaciones y Permisos
500 Solicitado Nuevo / Renovación

OBSERVACIONES:

Fecha de Re-inspección 11 Junio 2007

Deberá cumplir con los siguientes requerimientos o condiciones en la fecha indicada.

Código		D	M	A
209	[illegible]	11	6	07
206	[illegible]	11	6	07
116	[illegible]	11	6	07

Certifico: Que este Informe de Inspección ha sido entregado por mí a Emiliano Rivera, dueño / Administrador / Encargado / de la referida propiedad, hoy, de Junio de 2007 A las AM PM/ en , P.R. Para que cumpla con cada uno de los requerimientos señalados de este Informe, dentro de los (10) días calendario, comenzando dicho término al recibo de este documento y vence en la fecha de la reinspección arriba señalada. Que ha sido advertido por Mí de su derecho a solicitar por escrito una Vista Administrativa dentro del término señalado para realizar dichas correcciones ante el Jefe del Cuerpo de Bomberos de Puerto Rico de entender que no se ha actuado correctamente con algunos o todos los requerimientos establecidos en el presente documento.

Recibido por: Firma Inspector: /Núm.ID:

Advertencia: El Jefe del Cuerpo de Bomberos podrá imponer las sanciones que correspondan por incumplimiento de las correcciones aquí requeridas. (Ley 43 del 21 de junio de 1988 según enmendada y la reglamentación vigente al amparo de ésta).

PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

BPR-001 5/2005

INF: NUM: 165504

Estado Libre Asociado de Puerto Rico
Cuerpo de Bomberos de Puerto Rico
Negociado de Prevención de Incendios
DIVISIÓN DE: Río Piedras

INFORME DE INSPECCION

Página 1 de 1 Páginas

CLAVE: 07 FECHA: 1 de Junio de 2007

Clasificación: Educacional Serie Ref:

Nombre del Edificio: ___ / Solar: ___ / Establecimiento ✓
Facundo Bueso

Dueño del Establecimiento: Universidad de Puerto Rico.

Dirección Física: Univ. P.R., Recinto de Río Piedras

Dirección Postal: la misma.

Tel: 381-9498 Ext. 5893

Pueblo: Río Piedras.

Tipo de Uso: Salones de Clases.

Dueño del Edificio y Tel: Universidad de Puerto Rico.

Asegurado con: Se Desconocen

Tipo de Construcción: Paredes Ext.: Hormigon Paredes Int.: Hormigon Techo: Hormigon

Pies Cuadrados: ——— Num Pisos: 4

Capacidad Máx: N/A

Salidas de Emergencia	Adecuado	Deficiente	Multa	N/A
001 Cantidad Existente	✓			
002 Distancia de Recorrido	✓			
003 Dirección al Abrir	✓			
004 Condiciones	✓			
005 Rotulaciones	✓			
006 Cierre Automático	✓			
007 Cerradura	✓			
008 Iluminación	✓			
009 Alumbrado de Emergencia	✓			
010 Otros				✓

Equipo de Protección Contra Incendios	Adecuado	Deficiente	Multa	N/A
221 Rociadores Automáticos				✓
222 Siamesa				✓
223 Manguera de Incendios		✓		
224 Extintores Portátiles		✓		
225 Detectores de Humo				✓
226 Alarma		✓		
227 Hidrantes				✓
228 Licencias para Servicio				✓
229 Otros				✓

Riesgos de Incendios	Adecuado	Deficiente	Multa	N/A
111 Liquidos / Gases Inflamables				✓
112 Sustancias Combustibles	✓			
113 Materiales Peligrosos				✓
114 Sistema Eléctrico		✓		
115 Limpieza y Orden	✓			
116 Maquinaria y Equipo				
117 Equipo de Cocina				✓
118 Areas de No Fumar				✓
119 Operación de Plantas G.L.P.				✓
120 Operación Estaciones de Gasolina				✓
121 Otros		✓		

Planes de Emergencia	Adecuado	Deficiente	Multa	N/A
331 Planes de Emergencia	✓			
332 Plano de Desalojo	✓			
333 Brigadas / Escuadras de Incendio				
334 Adiestramiento				✓
335 Simulacros				✓
336 Capacidad Máxima Permitida				✓
400 Precauciones Generales				✓

Endosos, Certificaciones y Permisos ✓
500 Solicitado Nuevo ___ / Renovación ✓

OBSERVACIONES:

Fecha de Re-inspección 14-Junio-07

Deberá cumplir con los siguientes requerimientos o condiciones en la fecha indicada.

Código		Fecha D	M	A
114	Deberán colocar todas las tapas de seguridad a los receptaculos.	14	6	7
121	Deberán remover todos los tanques que se encuentran en el pasillo			
	del piso 1 y ubicarlos en un area segura y rotular los mismos.	14	6	7
223	Se requiere la Certificación de los Gabinetes con mangueras.	14	6	7
224	Deberán dar el mantenimiento a todos los Extintores existentes.	14	6	7
226	Se requiere la Certificación del Sistema de Alarma.	14	6	7

Certifico: Que este Informe de Inspección ha sido entregado por mí a Carlos Tobas, dueño ___ / Administrador ✓ / Encargado ___ / de la referida propiedad, hoy, 1 de Junio de 07 A las 1:14 AM ___ PM en Río Piedras, P.R. Para que cumpla con cada uno de los requerimientos señalados de este Informe, dentro de los (10) días calendario, comenzando dicho término al recibo de este documento y vence en la fecha de la reinspección arriba señalada. Que ha sido advertido por Mí de su derecho a solicitar por escrito una Vista Administrativa dentro del término señalado para realizar dichas correcciones ante el Jefe del Cuerpo de Bomberos de Puerto Rico de entender que no se ha actuado correctamente con algunos o todos los requerimientos establecidos en el presente documento.

Recibido por: [signature] Firma Inspector: [signature] /Núm.ID: ___

Advertencia: El Jefe del Cuerpo de Bomberos podrá imponer las sanciones que correspondan por incumplimiento de las correcciones aquí requeridas. (Ley 43 del 21 de junio de 1988 según enmendada y la reglamentación vigente al amparo de ésta).

PROPOSAL FOR THE ESTABLISHMENT OF A MASTER'S AND DOCTORAL PROGRAM IN ENVIRONMENTAL SCIENCES AT THE COLLEGE OF NATURAL SCIENCES IN THE RÍO PIEDRAS CAMPUS OF THE UNIVERSITY OF PUERTO RICO

Appendix H: Strategic Plan for strengthening the Environmental Sciences Master's and Doctoral Programs

Subjects to attend to	**Actions to be taken**	**Performance indicators**
A. Recruitment of six professors in the areas of: Environmental Hydrology, Environmental Geology, Environmental Meteorology, Environmental Spatial Analysis, Environmental Modeling and Coastal Resources.	A-1 Begin recruitment process in the indicated areas.	A-1 Description for each position will be prepared by May 22002, in addition to a list of journals where they would be published.
	A-2 Publish announcements for these positions in the major professional journals for each area.	A-2 Between the months of June and August, the advertisements will be published in the professional journals.
	A-3 Send advertisement copies via email to those programs in recognized institutions that graduate scientists with PhD's in the projected recruiting areas.	A-3 By the end of May, advertisement copies will be have been sent to these programs.
	A-4 Evaluate the applications received for each area and, between October 2002 and March 2003, invite the best candidates to offer a seminar.	A-4 Each candidate to be considered will have offered a seminar in or before March 2003.
	A-5 Interview and evaluate these candidates. If they do not completely fulfill the requirements, the process will be repeated with other candidates.	A-5 By May 2003, a decision will have been made with respect to each position to be filled.
B. Recruit the non-faculty support personnel: Spatial Analysis Center Coordinator, Administrative Secretary IV and Academic Counselor.	B-1 Place an announcement and interview candidates in order to fill these positions by July 2003.	B-1 The Spatial Analysis Center Coordinator, Administrative Secretary IV and Academic Counselor positions will have been filled by July 2003.
Subjects to attend to	**Actions to be taken**	**Performance indicators**
C. Recruit students for the Graduate Program	C-1 Announce establishment of the Graduate Program in the local press, through the internet and among the	C-1 If the Program is approved, by January 2003, it will be advertised in the press, in the Environmental Sciences

	graduates of the Environmental Sciences Program and students of the College of Natural Sciences. Send informative material on the Program to the main higher education institutions in island and tropical region countries, as well as the major higher education institutions in Puerto Rico and the United States. C-2 Announce the Graduate Program among members of the ISA Network (a consortium of universities on islands in the Atlantic of which the Río Piedras campus is a member). C-3 If necessary, in subsequent years carry out recruiting visits to universities in tropical islands and countries like Costa Rica, Venezuela, Colombia, Jamaica, the Dominican Republic, and others C-4 Evaluate the applications received and admit those students which fulfill the requirements.	Program web page, and among graduates of the Environmental Sciences Program and students of the College of Natural Sciences. Informative material will also have been sent to the major higher education institutions already mentioned. C-2 By January 2003, the Program will have been advertised among the members of the ISA network, either by information sent by regular or electronic mail. C-3 After the first year, and periodically thereafter, the need to carry out these visits will be evaluated. C-4 By August 2003, between 10- 25 students will have been admitted to the Program.

Appendix I: Brochure for the advertisement of the Graduate Program

Appendix J: Warranty of facility availability

FACULTAD DE CIENCIAS NATURALES
UNIVERSIDAD DE PUERTO RICO
Recinto de Río Piedras
Oficina del Decano

26 de enero de 2009

Dr. Brad R. Weiner
Decano
Facultad de Ciencias Naturales
Recinto de Río Piedras
Universidad de Puerto Rico

Estimado doctor Weiner:

Los Departamentos de Química, Física, Biología, Matemáticas, Ciencia de Cómputos y el Instituto para Estudios de Ecosistemas Tropicales se comprometen a continuar respaldando a los estudiantes de los diferentes programas graduados de la Facultad de Ciencias Naturales como lo han hecho a través de los años. El compromiso de respaldo incluye el uso de facilidades y recursos para adelantar la investigación de los estudiantes graduados así como la disponibilidad del personal docente en investigación para brindar los servicios como mentores, consejeros de tesis y disertaciones y ser miembros de los Comités de tesis.

En particular reafirmamos nuestro apoyo y compromiso de servir al Propuesto Programa Graduado de Ciencias Ambientales.

Cordialmente,

James D. Ackerman
Director
Departamento de Biología

Carlos Corrada
Director
Departamento de Ciencia de Cómputos

Gerardo Morell
Director
Departamento de Física

Kai Griebenow
Director
Departamento de Química

Valentín Keyantuo
Director
Departamento de Matemáticas

Elvia Meléndez
Directora
Instituto para Estudios
de Ecosistemas Tropicales

Appendix K
Preliminary Student Assessment Plan

Preliminary Student Assessment Plan

Description of the Student Assessment Plan

The purpose of the Environmental Sciences Graduate Program is to offer Master of Sciences (M.S.) and Doctor in Philosophy (Ph.D.) degrees with a specialty in environmental sciences. Both degrees include Sustainable Management of Islands and Tropical Region and Environmental Modeling and Spatial Analysis dimensions, in addition to an Interdisciplinary option.

The plan to assess student learning in the Environmental Sciences Master's and Doctoral degrees is targeted to measure student's performance in order to obtain information that will allow the Program to carry out informed decisions related to the foundation, curriculum and the student's academic experience. The Program's graduate profile is the final parameter against which performance will be evaluated. Through the course's learning objectives and other requirements, the domains of the Campus' mission (critical capacity, effective communication, research and creation, and ethics and social responsibility) will be operationally defined within the environmental sciences setting, in order to be able to demonstrate the Program's fulfillment of the Campus' mission (see Course Table and Learning Experiences, page) using student assessment data.

Accomplishments of the learning objectives are defined in three stages throughout the Master's and Doctoral programs. These three stages are: (1) admission, where student interviews will allow the selection of applicants fulfilling the desired characteristics, define their learning starting point and establish any remedial condition required for admission; (2) an intermediate stage, consisting of courses, seminars and the graduate exam, which will measure student's learning using validated instruments and evaluation

strategies responding to the learning objectives for these curricular requirements; and (3) the final stage, which includes preparation and presentation of the proposal and thesis defense, where research and creation competences will be measured according to the objectives and guidelines established by the Program for these requirements.

Learning objectives in each curricular component will serve as the basis for the creation of evaluation instruments and rubrics that will continuously be used during assessment. In this way, learning assessment will be systematically implemented as part of each curricular requirement without the need for duplicating efforts using alternate interventions.

Prior to the admission interview during the first stage, a profile for admitted students will be determined based on aptitudes, background and skills identified by the program as those desirable for their students. This profile will also serve as a guideline for evaluation the applicant's research expectations in view of the Program's interests. In the second stage, which contains most of the required coursework, most learning objectives will be measured; mainly those related to knowledge acquired during medullar courses and the student's critical capacity as these research competences are developed. In the third stage, and as part of the proposal and thesis/dissertation evaluation, the student's effective oral and written communication skills will be determined. Ethical capacity and social responsibility will mainly be measured in courses designed for these purposes. However, it is necessary to mention that this explanation summarizes the broader view of the most outstanding competences for each stage. Each curricular component somehow relates to aspects associated with knowledge, critical capacity, effective communication, research and ethical and social responsibility therefore, as a result of the evaluation for each component, information on these competences can be obtained. Data and results from these three stages will allow making adjustments in order to improve student learning.

In the following pages, alignment of the graduate's profile with the different curricular components and the Campus's mission domains are presented (Course Tables and Curricular Experiences, page) and the manner in which assessment has been integrated in the curriculum in order to measure each component can be seen.

Program Foundations

The Program's foundations or conceptual framework are present since they determine the nature of the Environmental Sciences academic program and also provide principles which define the program's learning expectations and the curricular conceptual framework. The graduate's profile defines learning expectations against which learning results will be evaluated.

Mission
This Program has the mission to create and divulge environmental sciences scientific knowledge in order to promote the sustainable development of Puerto Rico, and other islands and tropical regions, so that current environmental necessities can be satisfied without compromising the capacity of future generations to satisfy their own needs.

Program goals and objectives	
Goals	Objetives
1. A greater integration of academic endeavors with the current and future needs of Puerto Rican society in everything related to the environment and sustainable development. 2. The search, carried out by students and faculty members, for alternatives that promote harmony among social, environmental, and economic processes for the common good. 3. Integration and adequate use of the most advanced technologies in analyzing environmental problems. 4. Active and responsible participation of the university community in the decision-making processes that affect the environment and the quality of life for Puerto Ricans. 5. The development of a scientific community that does not limit itself to the creation and transmission of knowledge, but that also generates, develops, and supports the environmental transformation	Form scientists with strong critical and analytical abilities, and a solid knowledge in the field of environmental sciences, that are capable of attending to society's needs related to the use, management, and improvement of the environment within the context of islands and tropical regions. Develop rigor in our students' search of knowledge, a strong ethical sense, and social responsibility. Form scientists with strong critical and analytical abilities, and a solid knowledge in the field of environmental sciences, that are capable of attending to society's needs related to the use, management, and improvement of the environment within the context of islands and tropical regions. Promote our students' participation in the search for solutions and

of the Island, and provides real solutions that help in solution of the problems that affect society.	alternatives to problems and issues related to the environment.
6. Establishment of an effective collaboration between the academic communities associated with the Program and governmental and federal agencies so that they may benefit from the pool of expertise in the Program in relation to management and interpretation of environmental data bases, and the search for solutions to problems confronted by the country.	Facilitate interdisciplinary and collaborative research efforts with other graduate programs in the University of Puerto Rico and with universities and public and private institutions on other islands and tropical regions. Form scientists with strong critical and analytical abilities, and a solid knowledge in the field of environmental sciences, that are capable of attending to society's needs related to the use, management, and improvement of the environment within the context of islands and tropical regions. Stimulate our students' application of knowledge acquired from study and research towards the goal of sustainable development in islands and tropical regions. Promote our students' participation in the search for solutions and alternatives to problems and issues related to the environment. Stimulate our students' application of knowledge acquired from study and research towards the goal of sustainable development in islands and tropical regions. Promote, in Puerto Rico and other islands and tropical regions, research in environmental science, particularly in what concerns problems and issues

	characteristic of islands and tropical regions. Establish effective communication with government and communities in order to direct research efforts towards the search for possible solutions to the problems confronted by islands and tropical regions, emphasizing aspects related to Puerto Rico.

Master's program graduate profile

Upon completion of the Master's degree, graduates of the Environmental Science Graduate Program will have obtained an advanced knowledge in their area of specialty, ethical values of respect for the environment and towards preservation of the moral principles that should direct a scientist's professional performance, and skills for research, group collaboration, and communication necessary to be able to carry out the following functions:

- Apply the most modern methods and techniques related to the analyses of environmental parameters, sustainable management of natural resources, modeling environmental systems or spatial environmental analyses, depending on their area of specialty.

- Design and implement environmental evaluation and management plans, especially those concerning issues and problems characteristic of islands and tropical regions.

- Carry out environmental evaluations, critically prepare and analyze documents for environmental evaluation, write environmental impact statements, and effectively communicate the results of these evaluations, by writing or by oral depositions and public hearings.

- Plan and conduct field studies, and analyze studies carried out by others to verify the adequacy of the procedures and compliance with current regulations.

- Work in a team for field studies and research projects in environmental sciences and make a significant contribution to them.

- Contribute to the solution for problems of an environmental nature using knowledge acquired through study and research, and the most recent scientific knowledge published in an area.

- Critically analyze data and information related to the environment, and propose theoretical and practical solutions to the identified environmental problems.

- Be an agent of change in their community and in society in aspects pertaining to preservation of the environment and optimal use of natural resources.

- Be an effective communicator in environmental matters in public and private forums, in scientific and professional congresses, and for audiences of all levels of knowledge, both in written and oral form.

- Occupy technical and managerial positions in local and federal governmental agencies, as well as in private companies where the services of a specialist with solid knowledge in environmental sciences are required.

Doctoral program graduate profile

Upon completion of the Doctoral degree, graduates of the Environmental Science Graduate Program will have obtained advanced knowledge in their area of specialty, ethical values of respect for the environment and towards preservation of the moral principles that should direct a scientist's professional performance, and skills for research, group collaboration, and communications necessary to carry out the following functions:

- Initiate, direct, and supervise research projects in the environmental sciences, write proposals to obtain funding for these projects, and establish collaborative relationships with other researchers.

- Advance theoretical and technical knowledge in environmental sciences by the development, application, and evaluation of protocols, sampling techniques, and quantitative analyses of environmental parameters; design of comprehensive plans for sustainable management of natural areas and environmental resources; or the development of mathematical models and spatial analysis techniques to solve complex environmental problems, according to their area of specialty.

- Integrate knowledge acquired by profound study and research, or by applying the most recent scientific knowledge published in the area, to analyze environmental problems and situations characteristic of islands and tropical regions, and to provide viable alternatives directed towards their sustainable development.

- Serve as an expert in court cases related to their area of specialty or in other situations that require assessment by a consultant with advanced knowledge in environmental sciences.

- Be an agent of change in their community and society in matters pertaining to environmental preservation and optimal use of natural resources.

- Be an effective communicator in environmental matters during public and private forums, in scientific and professional congresses, and for audiences of all levels of knowledge, both in written and oral form.

- Significantly contribute to their area of specialty in environmental sciences by means of publication of research results in professional journals of recognized excellence, the evaluation and critical analysis of work carried out by others, and by active and effective participation in local and international scientific meetings.

- Contribute to society's sustainable development by offering an integrative vision in the analysis of modern society's problems in light of anticipated social and environmental changes, promoting changes and bringing about the achievement of a better quality of life through optimal sustainable use of available natural and environmental resources, and assuming leadership positions in defense of the environment and natural resources.

- Undertake research and teaching in higher level academic institutions, or occupy leadership positions in research or administration in government or private industries.

Course Table and Learning Experiences

The following table aligns the graduate profile and the curricular components. The check marks on the left column indicate the mission domains (critical capacity, effective communication, research and creation, and ethics and social responsibility) corresponding to each aspect of the profile. The columns on the right hand indicate the instrument to be used to evaluate learning in each component according to its relation to the graduate profile.

Master's program

Critical capacity.	Research and creation	Effective comm..	Ethics and social responsibility	**Graduate Profile**	**Qualifying instrument**	**Medullar courses**	**Emphasis courses**	**Seminars**	**Emphasis seminars**	**Proposal**	**Thesis preparation and presentation**
☒	☒	☒	☒	Apply the most modern methods and techniques related to the analyses of environmental parameters, sustainable management of natural resources, modeling environmental systems or spatial environmental analyses, depending on their area of specialty.	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for thesis evaluation
☒	☒	☒	☒	Design and implement environmental evaluation and management plans, especially those concerning issues and problems characteristic of islands and tropical regions.				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for thesis evaluation
☒	☒	☒	☒	Carry out environmental evaluations, critically prepare and analyze documents for environmental evaluation, write environmental impact statements, and effectively communicate the results of these evaluations, by writing or by oral depositions and public hearings.				Validated instrument (exam, presentation or written work) Rubric containing criteria respondin	Validated instrument (exam, presentation or written work) Rubric containing criteria respondin	Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for thesis evaluation

								g to seminar objectives	g to seminar objectives		
☒	☒	☐	☐	Critically analyze data and information related to the environment, and propose theoretical and practical solutions to the identified environmental problems.	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for thesis evaluation
☒	☐	☒	☒	Be an agent of change in their community and in society in aspects pertaining to preservation of the environment and optimal use of natural resources.						Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for thesis evaluation
☐	☐	☐	☒	Occupy technical and managerial positions in local and federal governmental agencies, as well as in private companies where the services of a specialist with solid knowledge in environmental sciences are required.				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for thesis evaluation

Doctoral program

Critical capacity.	Research and creation	Effective communication	Ethics and social respon.	**Graduate Profile**	**Qualifying instrument**	**Medullar courses**	**Emphasis courses**	**Seminars**	**Emphasis seminars**	**Proposal**	**Dissertation preparation and presentation**
☒	☒	☒	☒	Initiate, direct, and supervise research projects in the environmental sciences, write proposals to obtain funding for these projects, and establish collaborative relationships with other researchers.				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for dissertation evaluation
☒	☒	☒	☒	Advance theoretical and technical knowledge in environmental sciences by the development, application, and evaluation of protocols, sampling techniques, and quantitative analyses of environmental parameters; design of comprehensive plans for sustainable management of natural areas and environmental resources; or the development of mathematical models and spatial analysis techniques to solve complex environmental				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Thesis Rubric for dissertation evaluation

				problems, according to their area of specialty.							
☒	☒	☒	☒	Integrate knowledge acquired by profound study and research, or by applying the most recent scientific knowledge published in the area, to analyze environmental problems and situations characteristic of islands and tropical regions, and to provide viable alternatives directed towards their sustainable development.		Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to course objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Dissertation Rubric for dissertation evaluation
☒	☐	☒	☒	Serve as an expert in court cases related to their area of specialty or in other situations that require assessment by a consultant with advanced knowledge in environmental sciences.				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Dissertation Rubric for dissertation evaluation
☒	☐	☒	☒	Be an agent of change in their community and society in matters pertaining to environmental preservation and optimal use of natural resources.						Thesis proposal Rubric for thesis proposal evaluation	Dissertation Rubric for dissertation evaluation
☒	☐	☒	☐	Be an effective communicator in environmental matters during public and private forums, in scientific and professional congresses, and for audiences of all levels of knowledge, both in written and oral form.				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Dissertation Rubric for dissertation evaluation

☒	☒	☒	☐	Significantly contribute to their area of specialty in environmental sciences by means of publication of research results in professional journals of recognized excellence, the evaluation and critical analysis of work carried out by others, and by active and effective participation in local and international scientific meetings.				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Dissertation Rubric for dissertation evaluation
☒	☐	☐	☒	Contribute to society's sustainable development by offering an integrative vision in the analysis of modern society's problems in light of anticipated social and environmental changes, promoting changes and bringing about the achievement of a better quality of life through optimal sustainable use of available natural and environmental resources, and assuming leadership positions in defense of the environment and natural resources.				Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Validated instrument (exam, presentation or written work) Rubric containing criteria responding to seminar objectives	Thesis proposal Rubric for thesis proposal evaluation	Dissertation Rubric for dissertation evaluation

Step 3 Study program[4]

The following study program details the order of the previously mentioned curricular components described in a general manner in the previous table in order to establish the correspondence between the assessment strategies and the remaining requirements.

Degree requirements

4

Master's and Doctoral Programs Medullar courses [1]	Credits
CIAM 6115 The terrestrial environment	3
CIAM 6117 The coastal environment	3
CIAM 6235 Remote perception	3
CIAM 6256 Statistical analysis methods	3
CIAM 8902 Graduate seminar I and II	3
CIAM 6116 Tropical ecosystems	
CIAM 6118 The urban environment	
Courses for the Sustainable Management of Islands and Tropical Regions option	
CIAM 8425 Environmental geology	3
CIAM 8435 Environmental hydrology	3
CIAM 8445 Environmental meteorology	3
Courses for the Environmental Modeling and Spatial Analysis option	
CIAM 8225 Spatial analysis methods	3
CIAM 8257 Environmental model construction techniques	3
CIAM 8236 Remote perception II	3
Seminars	
CIAM 8205 Environmental Modeling and Spatial Analysis seminar I	1
CIAM 8206 Environmental Modeling and Spatial Analysis seminar II	1
CIAM 8405 Sustainable Management of Islands and Tropical Regions seminar I	1
CIAM 8406 Sustainable Management of Islands and Tropical Regions seminar II	1

[1] CIAM6116: Tropical ecosystems and CIAM 6235: Remote perception I courses are required for those students interested in completing the degree in Environmental Modeling and Spatial Analysis or Sustainable Management of Islands and Tropical Regions. Students interested in the interdisciplinary option may take these two courses or substitute one or both for an equal amount of credits in level 5000 or 6000 courses offered by any of the other graduate programs at the College of Natural Sciences, upon prior authorization by the Program Director or Environmental Sciences Graduate Program coordinator.

[2]Master's students interested in the interdisciplinary option may take two courses in these emphasis areas or substitute them for an equal number of credits in level 8000 courses offered by other graduate programs at the College of Natural Sciences, upon prior authorization from their thesis committee. Doctoral students interested in the interdisciplinary area may take three courses in these emphasis areas or substitute them for an equal number of credits in level 8000 courses offered by other graduate programs at the College of Natural Sciences.

Curricular Sequence (Indicate if it is designed to be part time or full time**)**
X Full time

Master in Environmental Sciences: Sustainable Management of Islands and Tropical Regions option			
First year: first semester		First year: second semester	
CIAM 6115 The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117 The coastal environment	3	CIAM6118 The urban environment	3
CIAM 6235 Remote perception I	3	CIAM 6256 Statistical analysis methods	3
CIAM 8901 Graduate seminar I	1	CIAM 8902 Graduate seminar II	1
Second year: first semester		Second year: second semester	
CIAM 8425 Environmental geology	3	XXXX Elective course	3
CIAM 8435 Environmental hydrology	3	XXXX Elective course	3
CIAM 6999 Graduate research	3	CIAM 6999 Graduate research	3

Other requirements
Approve a qualifying exam in Environmental Systems during the summer of the first year. Present the thesis research proposal before beginning research work. Present and defend the Master's thesis upon completing the second year.

Master in Environmental Sciences: Environmental Modeling and Spatial Analysis option			
First year: first semester		First year: second semester	
CIAM 6115 The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117 The coastal environment	3	CIAM6118 The urban environment	3
CIAM 6235 Remote perception I	3	CIAM 6256 Statistical analysis methods	3
CIAM 8901 Graduate seminar I	1	CIAM 8902 Graduate seminar II	1

Second year: first semester		Second year: second semester	
CIAM 8225 Methods in spatial analysis	3	XXXX Elective course	3
CIAM 8257 Environmental model construction techniques	3	XXXX Elective course	3
CIAM 6999 Graduate research	3	CIAM 6999 Graduate research	3

Other requirements
Approve a qualifying exam in Environmental Systems statistical analysis during the summer of the first year. Present the thesis research proposal before beginning research work. Present and defend the Master's thesis upon completing the second year.

Master in Environmental Sciences: Interdisciplinary option			
First year: first semester		First year: second semester	
CIAM 6115 The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117 The coastal environment	3	CIAM6118 The urban environment	3
XXXX Medullar course	3	XXXX Medullar course	3
CIAM 8901 Graduate seminar I	1	CIAM 8902 Graduate seminar II	1
Second year: first semester		Second year: second semester	
XXXX Emphasis course	3	XXXX Emphasis course	3
XXXX Emphasis course	3	XXXX Emphasis course	3
CIAM 6999 Graduate research	3	CIAM 6999 Graduate research	3

Other requirements
Approve a qualifying exam in the emphasized scientific discipline during the summer of the first year. Present the thesis research proposal before beginning research work. Present and defend the Master's thesis upon completing the second year.

Doctor in Environmental Sciences: Sustainable Management of Islands and Tropical Regions option

First year: first semester		First year: second semester	
CIAM 6115 The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117 The coastal environment	3	CIAM6118 The urban environment	3
CIAM 6235 Remote perception I	3	CIAM 6256 Statistical analysis methods	3
CIAM 8901 Graduate seminar I	1	CIAM 8902 Graduate seminar II	1
Second year: first semester		Second year: second semester	
CIAM 8425 Environmental geology	3	CIAM 8445 Environmental meteorology	3
CIAM 8435 Environmental hydrology	3	XXXX Elective course	3
CIAM 8999 Graduate research	3	CIAM 8406 Sustainable Management seminar II	2
CIAM 8405 Sustainable Management seminar I	2	CIAM 8999 Graduate research	3
Third year: first semester		Third year: second semester	
XXXX Elective course	3	XXXX Elective course	3
CIAM 8999 Graduate research	6	CIAM 8999 Graduate research	6
Fourth year: first semester		Fourth year: second semester	
CIAM 8996 Thesis continuation		CIAM 8996 Thesis continuation	

Other requirements
Prepare a presentation for the Graduate Seminar course during the second year. Approve two qualifying exams in Environmental Systems and Environmental Systems statistical analysis during the summer of the first year. Present the thesis research proposal before beginning research work. Present an original research proposal during the third year. Present and defend a doctoral dissertation upon completing the fourth year.

Doctor in Environmental Sciences: Environmental Modeling and Spatial Analysis option			
First year: first semester		First year: second semester	
CIAM 6115 The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117 The coastal environment	3	CIAM6118 The urban environment	3
CIAM 6235 Remote perception I	3	CIAM 6256 Statistical analysis methods	3
CIAM 8901 Graduate seminar I	1	CIAM 8902 Graduate seminar II	1
Second year: first semester		Second year: second semester	

CIAM 8225 Methods in environmental spatial analysis	3	CIAM 8236 Remote perception II	3
CIAM 8257 Environmental model construction techniques	3	XXXX Elective course	3
CIAM 8207 Spatial analysis seminar I	2	CIAM 8206 Spatial analysis seminar II	2
CIAM 8999 Graduate research	3	CIAM 8999 Graduate research	3
Third year: first semester		Third year: second semester	
XXXX Elective course	3	XXXX Elective course	3
CIAM 8999 Graduate research	6	CIAM 8999 Graduate research	6
Fourth year: first semester		Fourth year: second semester	
CIAM 8996 Thesis continuation		CIAM 8996 Thesis continuation	

Other requirements
Prepare a presentation for the Graduate Seminar course during the second year. Approve two qualifying exams in Environmental Systems and Environmental Systems statistical analysis during the summer of the first year. Present the thesis research proposal before beginning research work. Present an original research proposal during the third year. Present and defend a doctoral dissertation upon completing the fourth year.

Doctor in Environmental Sciences: Interdisciplinary option			
First year: first semester		First year: second semester	
CIAM 6115 The terrestrial environment	3	CIAM 6116 Tropical ecosystems	3
CIAM 6117 The coastal environment	3	CIAM6118 The urban environment	3
XXXX Medullar course	3	XXXX Medullar course	3
CIAM 8901 Graduate seminar I	1	CIAM 8902 Graduate seminar II	1
Second year: first semester		Second year: second semester	
XXXX Emphasis course	3	XXXX Emphasis course	3
XXXX Emphasis course	3	XXXX Elective course	3
XXXX Emphasis course	2	XXXX Subject seminar	2
CIAM 8999 Graduate research	3	CIAM 8999 Graduate research	3
Third year: first semester		Third year: second semester	

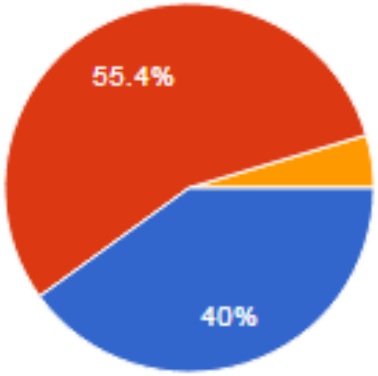
XXXX	Elective course	3	XXXX	Elective course	3
CIAM 8999	Graduate research	6	CIAM 8999	Graduate research	6
Fourth year: first semester			Fourth year: second semester		
CIAM 8996	Thesis continuation		CIAM 8996	Thesis continuation	

Other requirements
Prepare a presentation for the Graduate Seminar course during the second year. Approve two qualifying exams in Environmental Systems and Environmental Systems statistical analysis during the summer of the first year. Present the thesis research proposal before beginning research work. Present an original research proposal during the third year. Present and defend a doctoral dissertation upon completing the fourth year.

APPENDIX 5

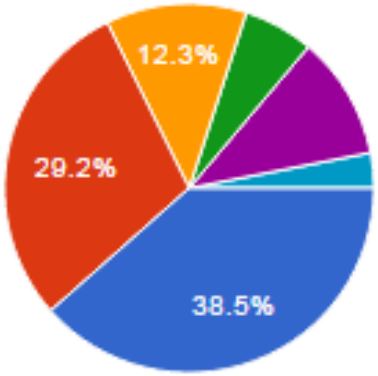
Undergraduate Student Satisfaction Survey

5) Sistema Educativo de Procedencia



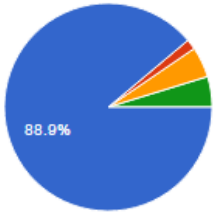
Escuela Pública	**26**	40%
Colegio Privado	**36**	55.4%
Other	**3**	4.6%

6) Año de estudio



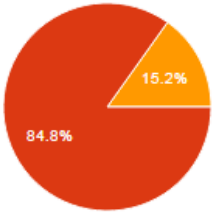
1ro	**25**	38.5%
2do	**19**	29.2%
3ro	**8**	12.3%
4to	**4**	6.2%
5to	**7**	10.8%
6to o más	**2**	3.1%

7) ¿Estas oficialmente registrado(a) en la concentración de Ciencias Ambientales o estas registrado en otra concentración?



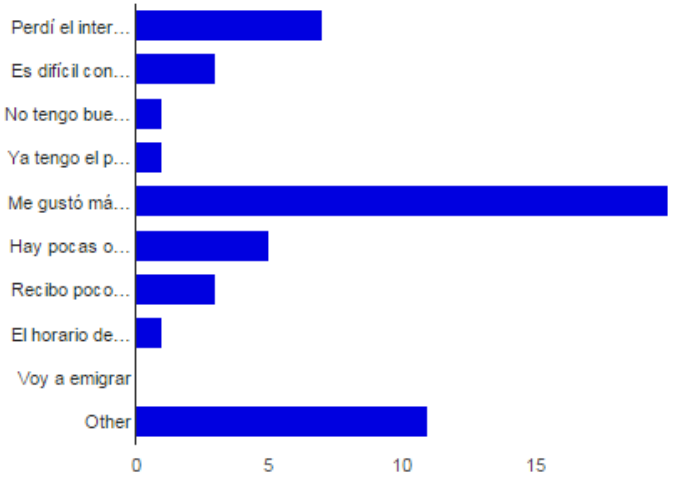
Estoy registrado(a) en el Departamento de Ciencias Ambientales como concentración oficial	56	86.2%
Estoy en registrado(a) en otra concentración en la facultad de Ciencias Naturales y quiero cambiar a Ciencias Ambientales	1	1.5%
Estoy registrado(a) en otra Facultad de la UPR y quiero cambiar a Ciencias Ambientales	3	4.6%
No estoy registrado(a) en el Departamento de Ciencias Ambientales	3	4.6%

8) Si estas registrado en Ciencias Ambientales ¿Has considerado cambiar a otra concentración?



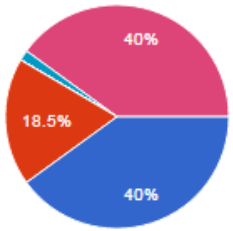
NO he considerado cambiarme de Ciencias Ambientales a otra concentración	0	0%
SI he considerado cambiarme de Ciencias Ambientales a otra concentración	28	43.8%
SI he considerado cambiarme de Ciencias Ambientales a otra Facultad de la UPR	5	7.8%
SI SI he considerado cambiarme de Ciencias Ambientales a otra universidad del sistema UPR	0	0%
SI SI he considerado cambiarme de Ciencias Ambientales a otra universidad FUERA del sistema UPR	0	0%

9) Si estas considerando cambiarte, ¿Que te ha motivado a cambiar de concentración?



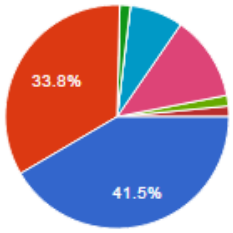
Perdí el interés en el tema	7	20.6%
Es difícil conseguir cursos	3	8.8%
No tengo buen promedio	1	2.9%
Ya tengo el promedio para cambiar a donde realmente quería	1	2.9%
Me gustó más otra disciplina	20	58.8%
Hay pocas oportunidades de empleo	5	14.7%
Recibo poco apoyo del departamento	3	8.8%
El horario de los cursos conflije con mi trabajo	1	2.9%
Voy a emigrar	0	0%
Other	11	32.4%

10) ¿Estás completando o te interesa completar una segunda concentración?



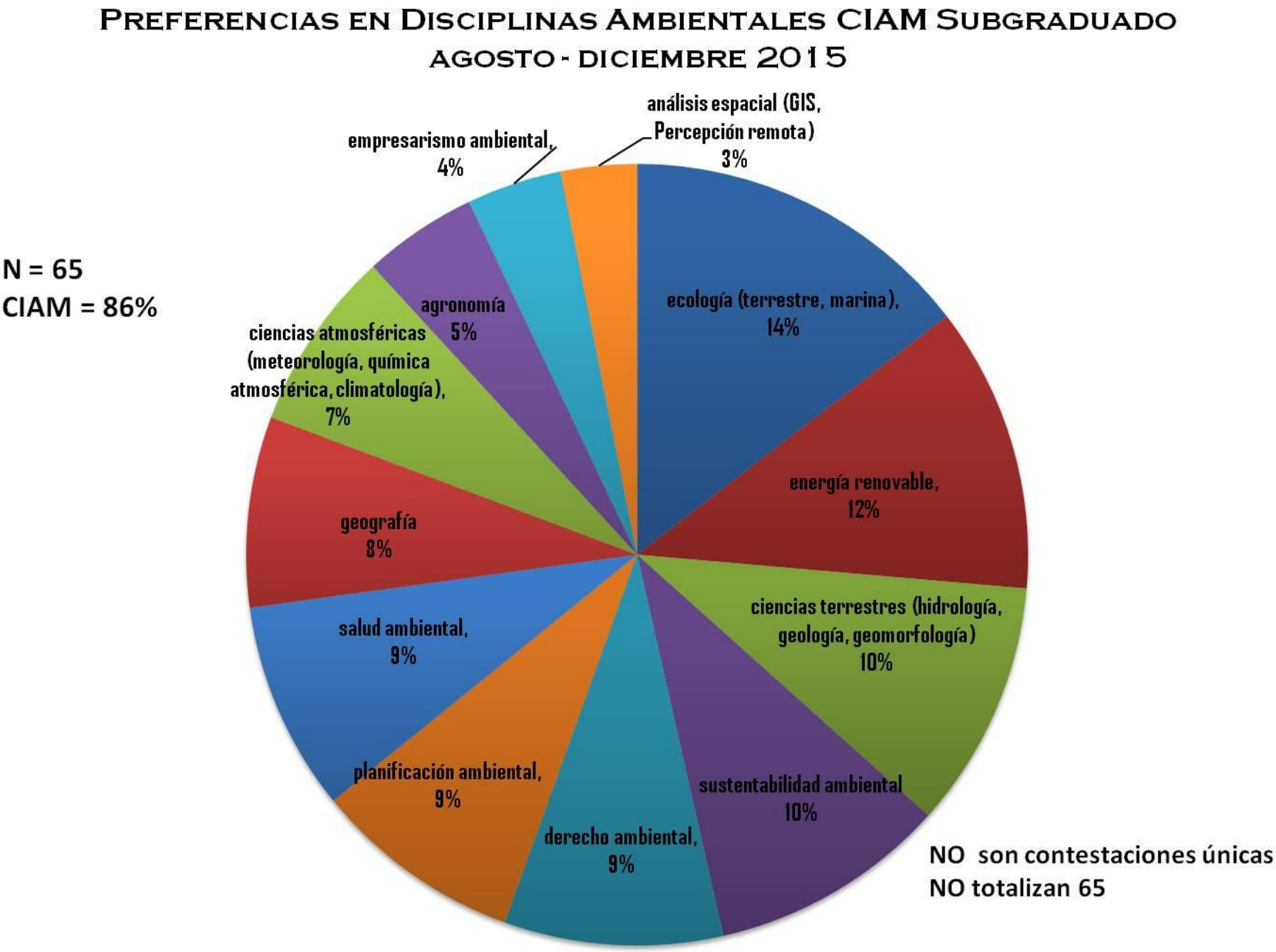
NO	26	40%
SI, en Biología	12	18.5%
SI, en Ciencias de Cómputo	0	0%
SI, en Física	0	0%
SI, en Matemáticas	0	0%
SI, en Química	1	1.5%
Other	26	40%

11) Si estás considerando cambiar de concentración ¿a cuál estás pensando cambiar?

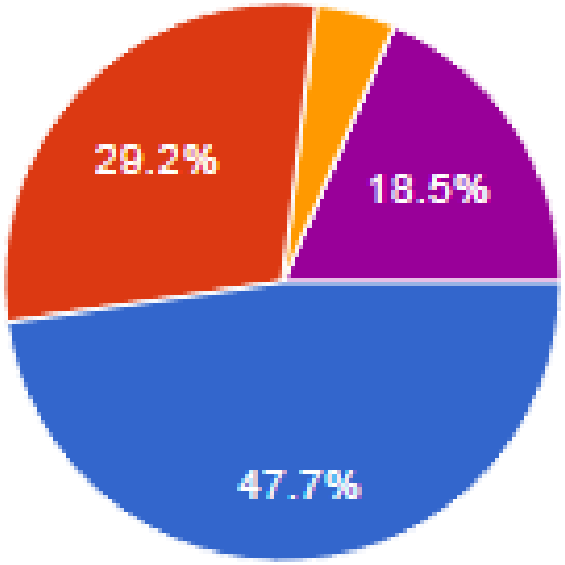


No pienso cambiarme de concentración	27	41.5%
Biología	22	33.8%
Ciencias de Cómputo	0	0%
Física	1	1.5%
Matemáticas	0	0%
Química	5	7.7%
Otra Facultad en la UPR	8	12.3%
Otra Universidad en Puerto Rico (no de intercambio ni permiso especial)	1	1.5%
Otra Universidad FUERA de Puerto Rico (no de intercambio ni permiso especial)	1	1.5%

12) Cuales de las siguientes disciplinas del campo ambiental te interesan más

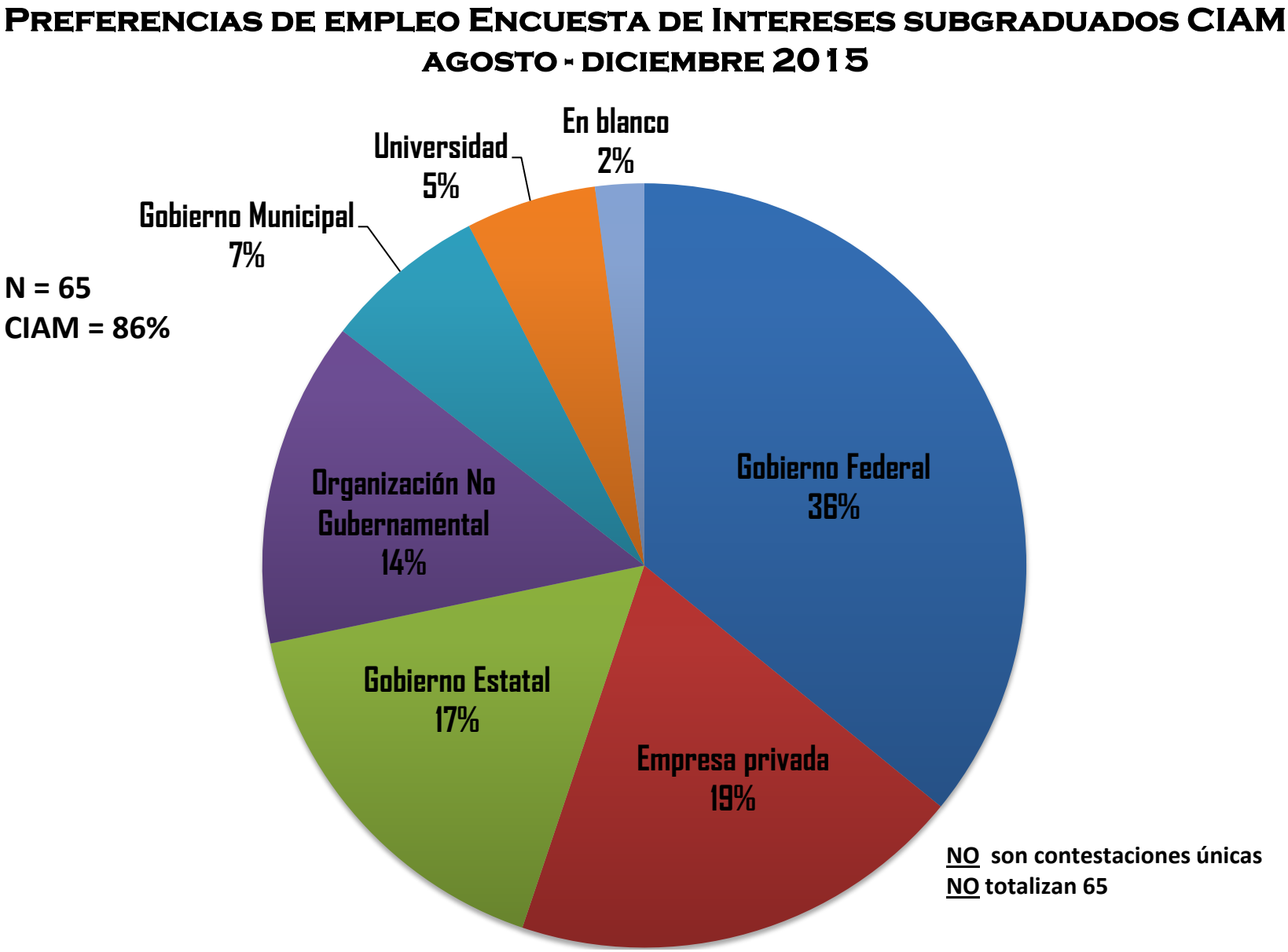


13) ¿Que piensas hacer una vez te gradúes de bachillerato

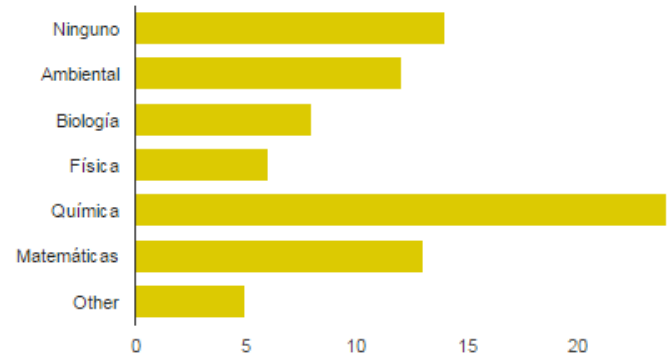


continuar estudios graduados en Puerto Rico	31	47.7%
continuar estudios graduados fuera de Puerto Rico	19	29.2%
buscar un empleo de carrera en Puerto Rico	3	4.6%
buscar un empleo de carrera fuera de Puerto Rico	0	0%
aún no se, no he decido	12	18.5%

14) Indica tus preferencias de buscar empleo en el campo ambiental en Puerto Rico



15) ¿En que cursos necesitas más ayuda?

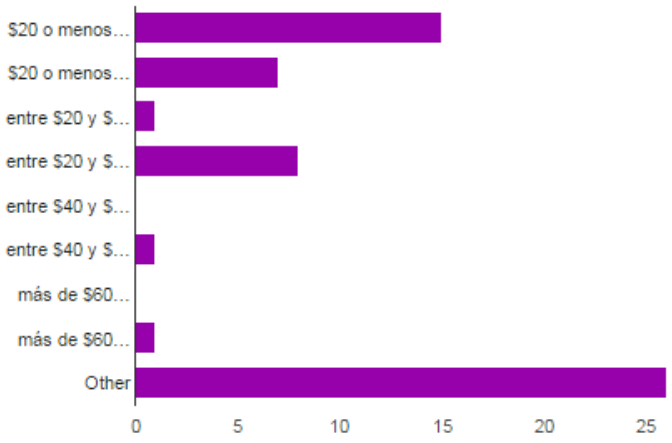


Ninguno	**14**	21.5%
Ambiental	**12**	18.5%
Biología	**8**	12.3%
Física	**6**	9.2%
Química	**24**	36.9%
Matemáticas	**13**	20%
Other	**5**	7.7%

16) ¿Has Utilizado Servicios de Tutorías?

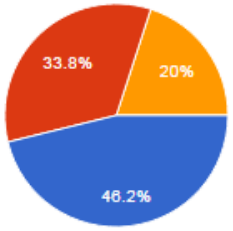
NO	**20**	30.8%
SI, de la UPR	**35**	53.8%
SI, externo a la UPR libre de costos	**2**	3.1%
SI, externo a la UPR pagando	**22**	33.8%

17) Si has pagado por servicios de tutorías externos, ¿Cuanto has pagado?



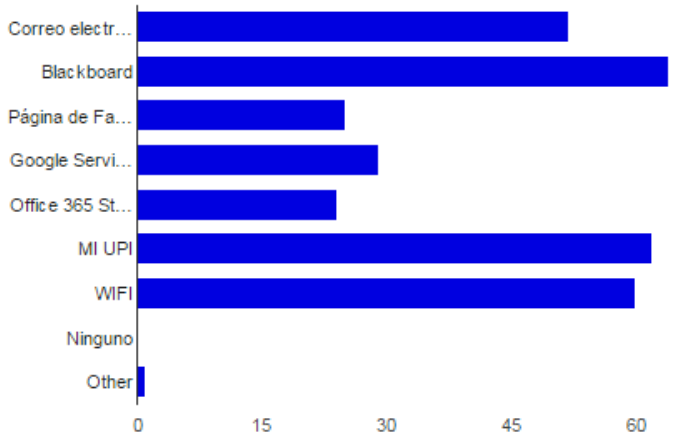
$20 o menos por hora	**15**	27.3%
$20 o menos por clase	**7**	12.7%
entre $20 y $40 por hora	**1**	1.8%
entre $20 y $40 por clase	**8**	14.5%
entre $40 y $60 por hora	**0**	0%
entre $40 y $60 por clase	**1**	1.8%
más de $60 por hora	**0**	0%
más de $60 por clase	**1**	1.8%
Other	**26**	47.3%

18) ¿Alguna vez has utilizado servicios de Asesoría Académica?



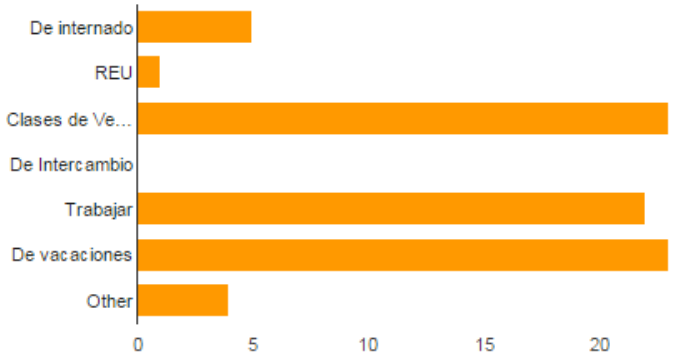
NO	30	46.2%
SI	22	33.8%
Deconocía que existía el servicio	13	20%

19) ¿Qué servicios de tecnología de la UPR has utilizado?



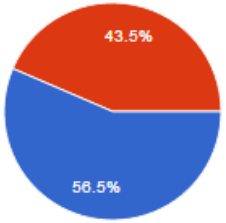
Correo electrónico	52	80%
Blackboard	64	98.5%
Página de Facebook del Departamento (CIAM)	25	38.5%
Google Services (Google Drive, Calendar, etc)	29	44.6%
Office 365 Student Advantage	24	36.9%
MI UPI	62	95.4%
WIFI	60	92.3%
Ninguno	0	0%
Other	1	1.5%

20) ¿Qué hiciste durante el pasado verano?



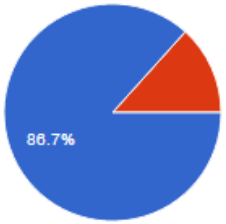
De internado	5	7.7%
REU	1	1.5%
Clases de Verano	23	35.4%
De Intercambio	0	0%
Trabajar	22	33.8%
De vacaciones	23	35.4%
Other	4	6.2%

21) ¿A cual o cuales organizaciones de la UPR perteneces?



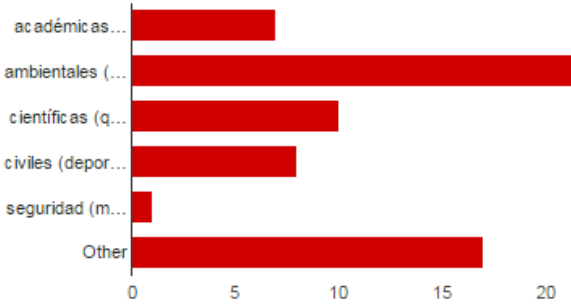
Ninguna	35	56.5%
Other	27	43.5%

22) ¿A cual o cuales organizaciones perteneces externas a la UPR?



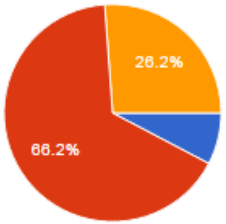
Ninguna	52	86.7%
Other	8	13.3%

23) Si perteneces a alguna organización u organizaciones, de que tipo es o son



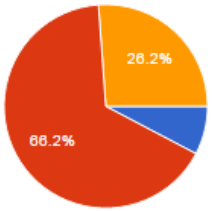
académicas (promedio, cuadro de honor, consejo de estudiantes)	7	13.2%
ambientales (conservación, ecológica, sustentabilidad ambiental, reciclaje, etc)	25	47.2%
científicas (química, biología, física, matemática)	10	18.9%
civiles (deportivas, recreativas, culturales, musicales, derechos)	8	15.1%
seguridad (militares, emergencias, ley y orden)	1	1.9%
Other	17	32.1%

24) ¿Te gustaría formar parte de una organización estudiantil del Departamento de Ciencias Ambientales?



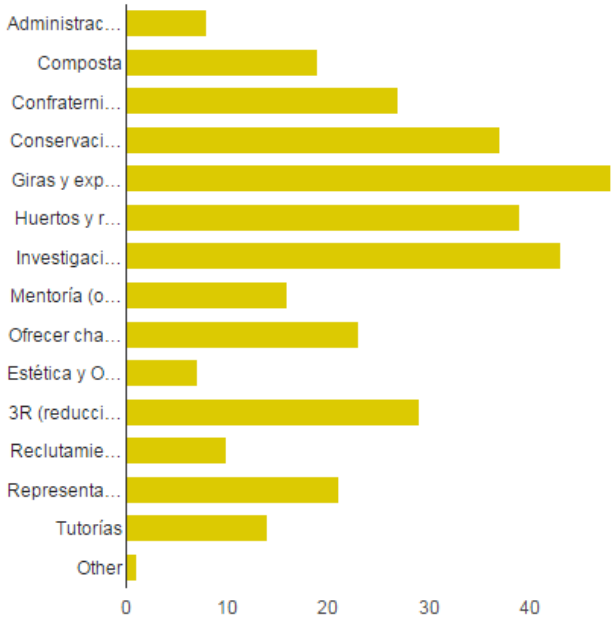
NO	5	7.7%
SI	43	66.2%
NO SE / NO estoy seguro(a)	17	26.2%

24) ¿Te gustaría formar parte de una organización estudiantil del Departamento de Ciencias Ambientales?



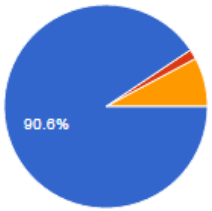
NO	5	7.7%
SI	43	66.2%
NO SE / NO estoy seguro(a)	17	26.2%

25) En que actividades te gustaría involucrarte en el Departamento?



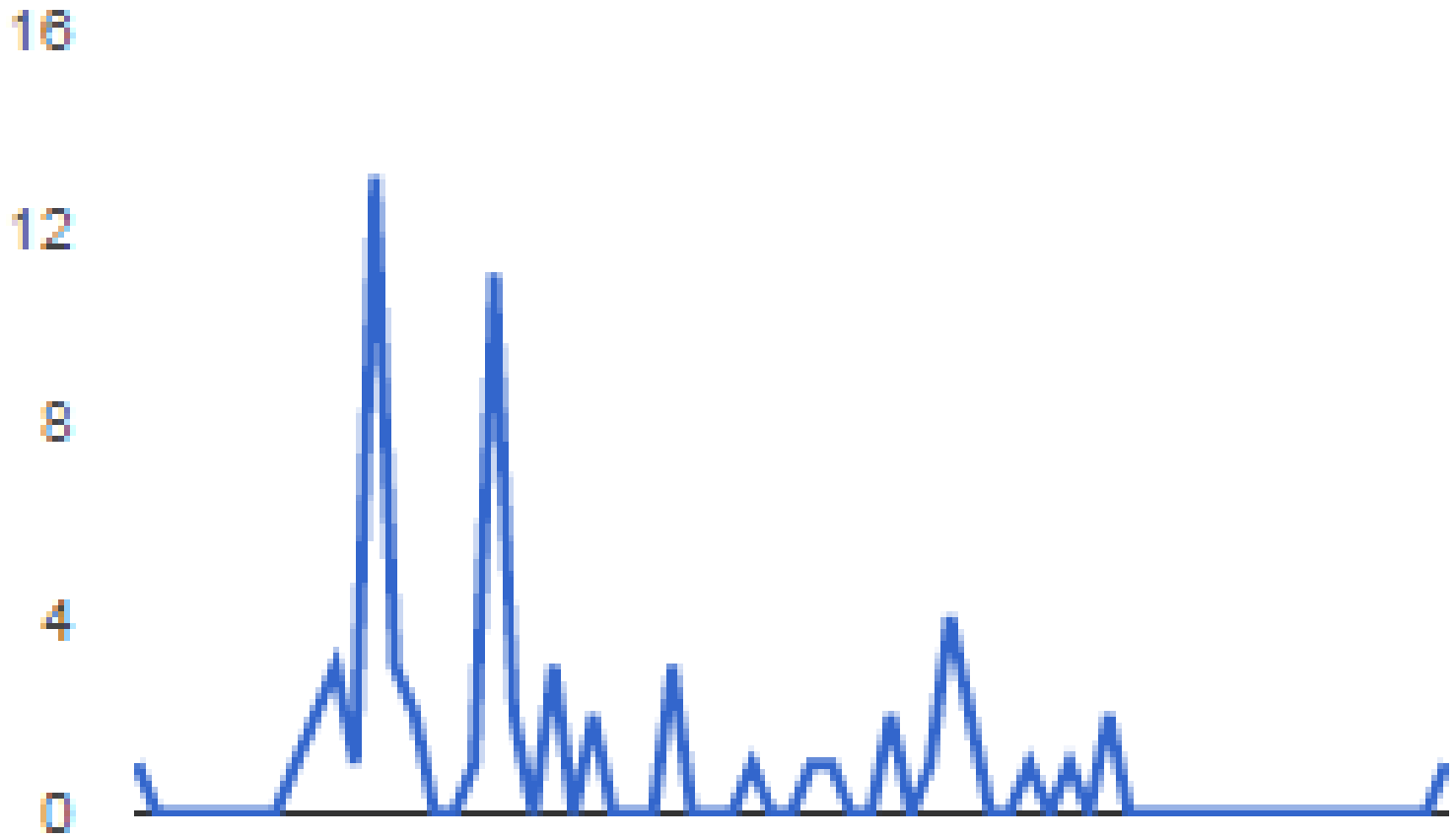
Administración	8	12.5%
Composta	19	29.7%
Confraternización	27	42.2%
Conservación de agua y energía	37	57.8%
Giras y expediciones	48	75%
Huertos y reforestación	39	60.9%
Investigación Científica	43	67.2%
Mentoría (orientar a otros estudiantes)	16	25%
Ofrecer charlas educativas (dentro y fuera del recinto)	23	35.9%
Estética y Ornato	7	10.9%
3R (reducción, rehuso y reciclaje)	29	45.3%
Reclutamiento de estudiantes	10	15.6%
Representar al Departamento en actividades oficiales	21	32.8%
Tutorías	14	21.9%
Other	1	1.6%

25) ¿Participarías de futuras encuestas del Departamento?

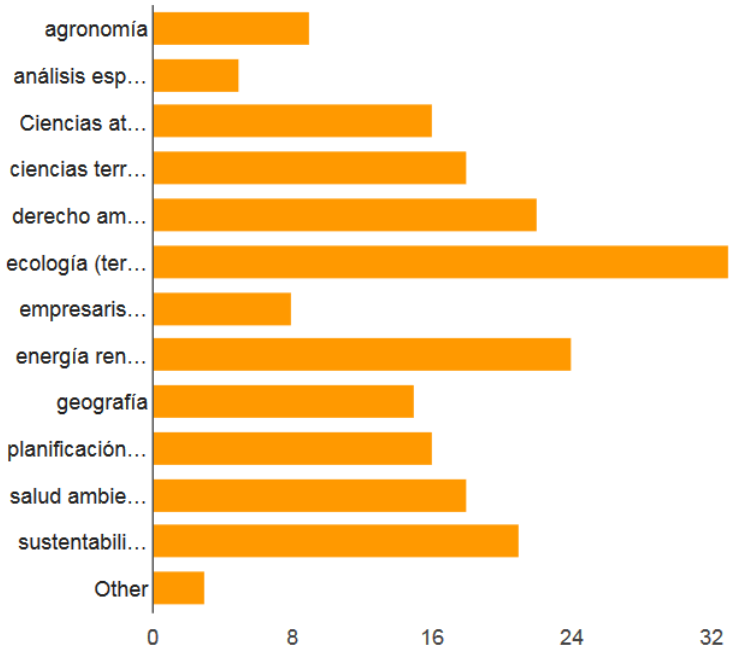


SI	58	90.6%
NO	1	1.6%
NO SE / NO estoy seguro(a)	5	7.8%

Number of daily responses



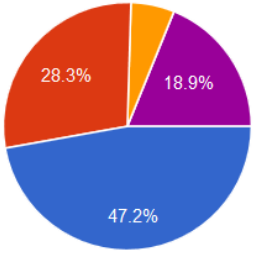
12) ¿Cuales de las siguientes disciplinas del campo ambiental te interesan más?



agronomía	9	17%
análisis espacial (GIS, percepción remota)	5	9.4%
Ciencias atmosféricas (meteorología, química atmosférica, climatología)	16	30.2%
ciencias terrestres (hidrología, geología, geomorfología)	18	34%
derecho ambiental	22	41.5%
ecología (terrestre, marina)	33	62.3%
empresarismo ambiental	8	15.1%
energía renovable	24	45.3%
geografía	15	28.3%
planificación ambiental	16	30.2%
salud ambiental	18	34%
sustentabilidad ambiental	21	39.6%
Other	3	5.7%

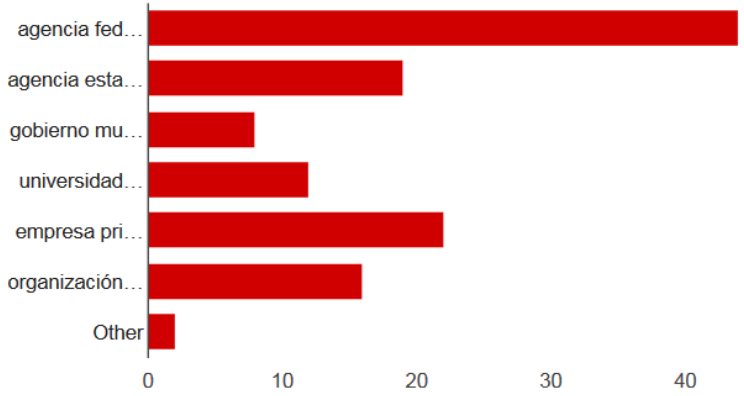
N = 53; 10/ 26/2015

13) ¿Que piensas hacer una vez te gradúes de bachillerato?



continuar estudios graduados en Puerto Rico	**25**	47.2%
continuar estudios graduados fuera de Puerto Rico	**15**	28.3%
buscar un empleo de carrera en Puerto Rico	**3**	5.7%
buscar un empleo de carrera fuera de Puerto Rico	**0**	0%
aún no se, no he decido	**10**	18.9%

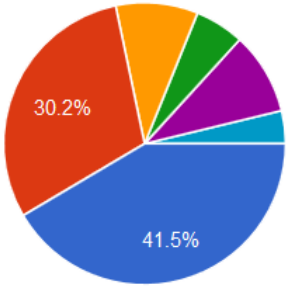
14) Indica tus preferencias para buscar empleo en el campo ambiental en Puerto Rico



agencia federal (EPA, NOAA, FWS, USGS, NWS, Forest Service) etc)	**44**	86.3%
agencia estatal (DRNA, JCA, ADS, JP etc)	**19**	37.3%
gobierno municipal	**8**	15.7%
universidad (publica o privada)	**12**	23.5%
empresa privada	**22**	43.1%
organización no gubernamental / sin fines de lucro / comunitaria	**16**	31.4%
Other	**2**	3.9%

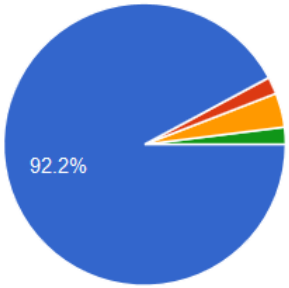
N = 53; 10/ 26/2015

6) Año de estudio



1ro	**22**	41.5%
2do	**16**	30.2%
3ro	**5**	9.4%
4to	**3**	5.7%
5to	**5**	9.4%
6to o más	**2**	3.8%

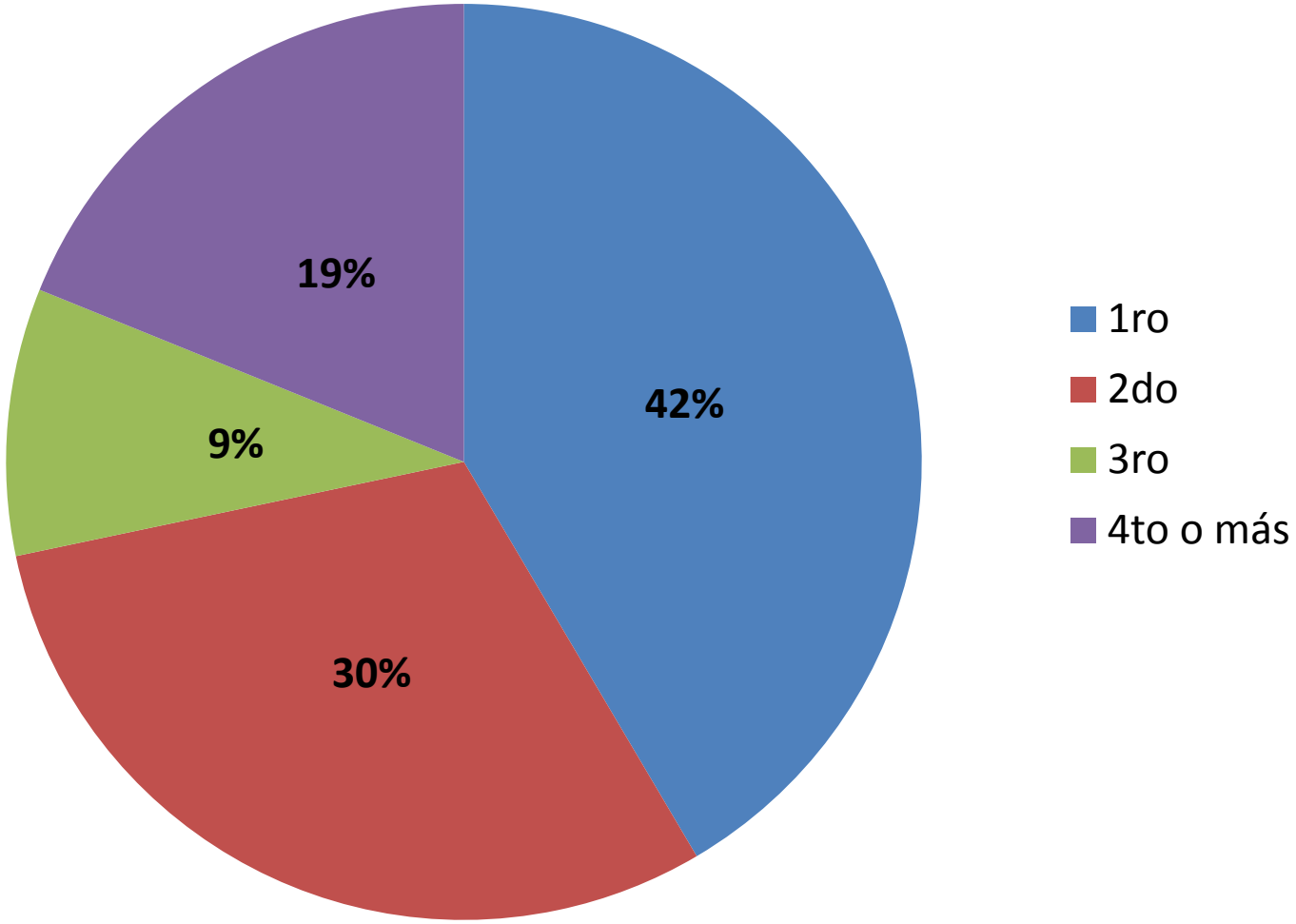
7) ¿Estas oficialmente registrado(a) en la concentración de Ciencias Ambientales o estas registrado en otra concentración?



Estoy registrado(a) en el Departamento de Ciencias Ambientales como concentración oficial	**47**	88.7%
Estoy en registrado(a) en otra concentración en la facultad de Ciencias Naturales y quiero cambiar a Ciencias Ambientales	**1**	1.9%
Estoy registrado(a) en otra Facultad de la UPR y quiero cambiar a Ciencias Ambientales	**2**	3.8%
No estoy registrado(a) en el Departamento de Ciencias Ambientales	**1**	1.9%

N = 53; 10/ 26/2015

Distribución de respondientes a la encuesta por año de estudio



N = 53; 10/ 26/2015

APPENDIX 6

Faculty Survey

Faculty Survey – Graduate Program Evaluation – Nov 24th 2015 – Prepared by E. Meléndez-Ackerman

Methodology: The survey was implemented using Survey Monkey and was sent to 91 emails (one was invalid, one email was opted out) so 89 faculty was our final pool. Faculty surveyed included all faculty servicing as advisers in the graduate program (tenured and non-tenured) as well as those that have given courses or else, served on graduate student committees. The survey included closed and open ended questions in several areas which covered their general impression of the program, curriculum, faculty, student skills and resources for research and teaching. Below you will find a summary of results followed by the actual report produced by survey monkey. At the time of this report the survey had been opened for 16 days and had received 38 responses (41.5% response rate). Twenty eight faculty disclosed their geographic origin which was distributed as follows (39.3% Puerto Rican, 39.3% US, and 21.4% international). At the time of this summary the survey has been kept open in order to keep receiving open ended responses but trends seem clear. This summary is meant to serve as a provisional report that should be completed once results are discussed and evaluated thoroughly with faculty and students.

Summary of Results

Q1 General Impression of the Program

Faculty were asked to rank the program on 18 aspects. Two were ranked particularly favorable (Mission and Goals, Faculty). Most faculty ranked these as satisfactory or very satisfactory. For all other areas, most faculty gave the program scores between satisfactory and neutral. The result give particularly low scores in the following areas: Curriculum, Student Funding, Administrative Support, and Academic Management).

Q2. Courses and Overall Curricular Experience

Faculty were asked to rank the program on 14 aspects. All but one had average scores above the satisfactory level but none had average rankings below the neutral score. Access to off-site research facilities is a highlight of the program that enhances curricular experience. Areas with the lowest rankings were Graduate Qualifying Exam, Frequency of Course offerings and pre-requisites for Admission.

Q3 Course recommendations

Many faculty suggested the development of new courses which fell into one of six target areas (See Table below). Most course suggestions were provided for content related to interdisciplinary studies (especially those related to climate change issues), advanced statistics and design, Ecosystem Science followed and Interdisciplinary studies in Environmental Chemistry and Physics.

Table of individual courses mentioned by faculty respondents in Faculty Survey 2015

Interdisciplinary studies -Social Sciences
Adaptation to climate change.

Climate - background to understand global changes
Global Changes
Resiliency of societies under climate change
Environmental Archaeology and Archaelogy of Climate Change.
Ecosystem services valuation
Economics
Sustainable design and technology
Sustainability
Ecology, Culture and Society;
Ethnography
Planning.
Environmental law,
Statistics/Experimental Desing
Bayesian statistics for environmental sciences
Research statistical analysis course
Advanced statistics
Qualitative methods
Bayesian statistics
Design and Analysis of Experiments, Scientific Writing
Design and Analysis of Experiments
Experimental design
Advance experimental design
Ecology/Ecosystem Science/Resource Management
Forest management
forest function and management
Integrated water resources management for tropical watersheds
Environmental Soil Science course soil as interface between terrestrial ecosystems and geohydrological environment)
Ecosystem Ecology
Global material and energy flows and cycles
Advanced Ecology
Evolution
Environmental Chemistry/Physics
Environmental Chemistry on-a-shoestring
Environmental Chemistry course-chemistry of water-soil-plant-atmosphere continuum
Environmental Physics - physics of water-soil-plant atmosphere continuum
Environmental physics
Env. Biomolecular Sciences
Nanoparticles in the environment
Nanotechnology
Communication
Writing
Communicating science,
Speaking
Informatics

Information/Database development and management,
Bioinformatics

Q4. Student Skills

Faculty ranked their degree of satisfaction in regard to 14 student skills most of which are aligned with the campus wide learning objectives. Social responsibility of students and their ability to do team work were skills that showed a high degree of satisfaction (Over 60% of the faculty expressed that they were satisfied or very satisfied). Statistical skills and written communication showed the lowest average satisfaction scores among faculty.

Q5. Faculty

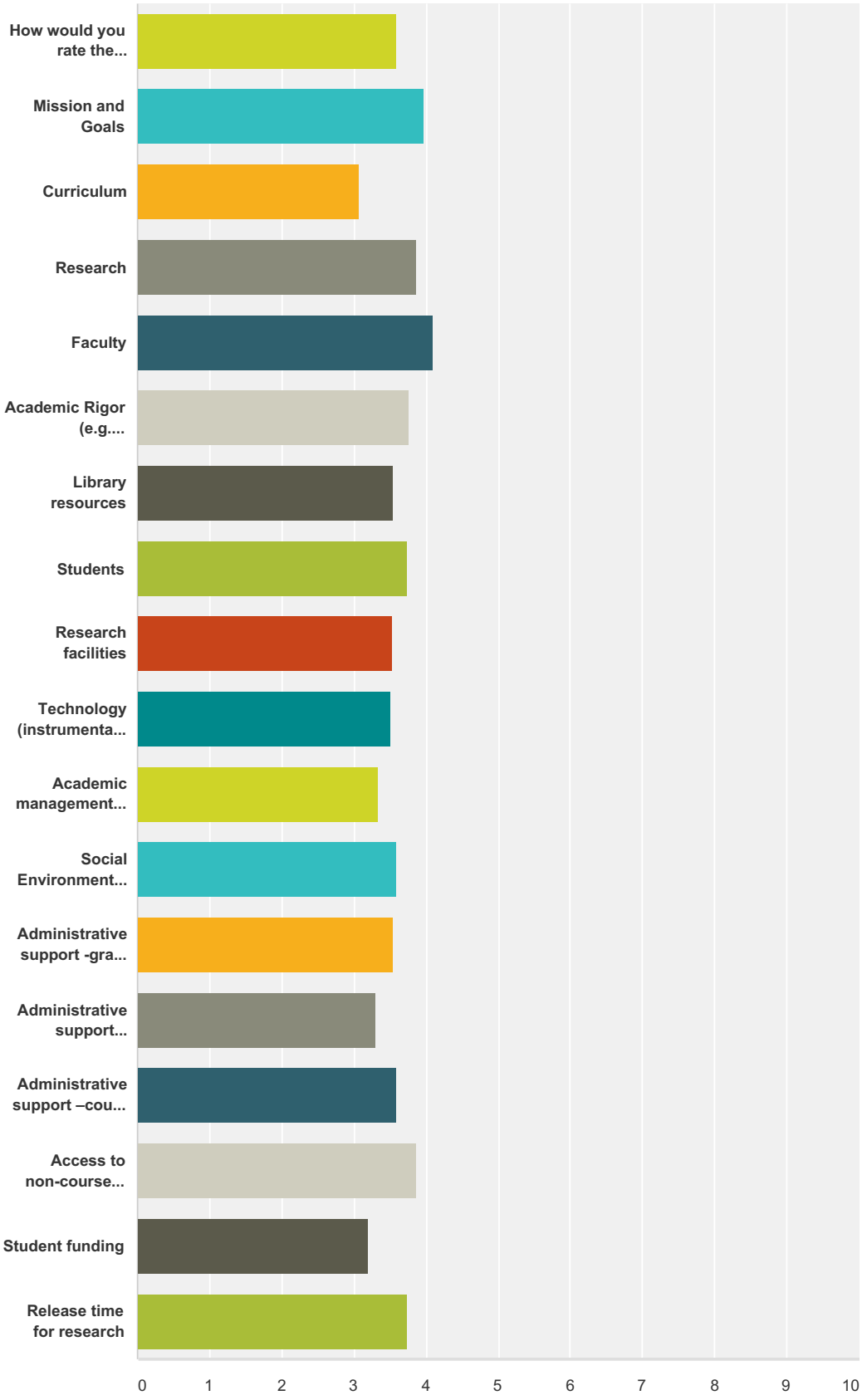
Faculty were asked to rank 8 areas pertaining to faculty issues. Over 81% of the faculty were satisfied or very satisfied with the graduate faculty of this program. Research productivity was received some of the highest satisfaction marks across the whole survey. This is worth mentioning as many of the 38 respondent are likely not to be directly affiliated to the Department of Env. Sciences which only has 12 tenured faculty.

Q 6. Essential Resources for Faculty Teaching and Productivity

Here faculty ranked eight elements within this area. Of campus research facilities received the highest satisfaction marks relative to elements in this and all areas within the faculty survey. With over an 85% of the faculty expressing that they are either satisfied or highly satisfied, these facilities are seen as an asset to this program. Safety of teaching facilities also received high marks (85% satisfied or very satisfied). The lowest satisfaction marks were provided for quality of laboratories, access to office/working space for student and administrative resouces.

Q1 General impression of the program

Answered: 38 Skipped: 0



	Very deficient	Deficient	Neutral	Satisfactory	Very satisfactory	Total	Weighted Average

How would you rate the graduate program?	**2.70%** 1	**13.51%** 5	**16.22%** 6	**56.76%** 21	**10.81%** 4	37	3.59
Mission and Goals	**0.00%** 0	**3.03%** 1	**18.18%** 6	**57.58%** 19	**21.21%** 7	33	3.97
Curriculum	**3.03%** 1	**27.27%** 9	**36.36%** 12	**27.27%** 9	**6.06%** 2	33	3.06
Research	**0.00%** 0	**8.57%** 3	**22.86%** 8	**42.86%** 15	**25.71%** 9	35	3.86
Faculty	**0.00%** 0	**11.43%** 4	**5.71%** 2	**45.71%** 16	**37.14%** 13	35	4.09
Academic Rigor (e.g. intellectually challenging)	**0.00%** 0	**9.09%** 3	**21.21%** 7	**54.55%** 18	**15.15%** 5	33	3.76
Library resources	**0.00%** 0	**17.86%** 5	**28.57%** 8	**35.71%** 10	**17.86%** 5	28	3.54
Students	**0.00%** 0	**11.43%** 4	**20.00%** 7	**51.43%** 18	**17.14%** 6	35	3.74
Research facilities	**0.00%** 0	**15.63%** 5	**21.88%** 7	**56.25%** 18	**6.25%** 2	32	3.53
Technology (instrumentation, IT, network)	**0.00%** 0	**15.63%** 5	**28.13%** 9	**46.88%** 15	**9.38%** 3	32	3.50
Academic management (coordination, recuitment, student orientation, web site, program assessment, clarity of regulations)	**6.25%** 2	**12.50%** 4	**34.38%** 11	**34.38%** 11	**12.50%** 4	32	3.34
Social Environment /Peer Group Support	**0.00%** 0	**10.00%** 3	**33.33%** 10	**43.33%** 13	**13.33%** 4	30	3.60
Administrative support -grant management	**3.85%** 1	**3.85%** 1	**34.62%** 9	**50.00%** 13	**7.69%** 2	26	3.54
Administrative support -facilities management	**3.57%** 1	**17.86%** 5	**32.14%** 9	**39.29%** 11	**7.14%** 2	28	3.29
Administrative support –course support	**4.00%** 1	**4.00%** 1	**32.00%** 8	**48.00%** 12	**12.00%** 3	25	3.60
Access to non-course activities – seminars, symposia	**0.00%** 0	**6.45%** 2	**16.13%** 5	**61.29%** 19	**16.13%** 5	31	3.87
Student funding	**0.00%** 0	**29.63%** 8	**25.93%** 7	**40.74%** 11	**3.70%** 1	27	3.19
Release time for research	**7.69%** 2	**0.00%** 0	**19.23%** 5	**57.69%** 15	**15.38%** 4	26	3.73

#	Comments for "How would you rate the graduate program?"	Date
1	I would invest more effort on guiding the students through the research process earlier in their degree, so that they are not as lost when they begin working on their thesis and they can finish on time.	11/23/2015 9:03 AM
2	The current program is set up as if we were offering a professional degree, as if students were to be certified for particular tasks. The symptoms of this emphasis are that there is too much coursework and too many distribution requirements (there is no need for all students to take courses in marine, terrestrial, etc. fields). The program should emphasize research more. There is no need for "tracks". Certainly students needs some core skills, but emphasis should be on learning how to keep learning, how to be a scholar and researcher. The student and his or her mentors can devise the student's own track. The capable environmental scientist emerging form our graduate program will know how to ask questions and get the information they need and devise their own "track" (such as a background in marine, terrestrial, etc. fields) toward the goal of their work. A professional degree is a good thing, but it is not what we are offering here. We are offering the Master's and PhD, which are about research ability.	11/15/2015 9:04 AM
3	My interaction with the Program has been very limited	11/12/2015 8:31 PM

4	We need to tighten quantitative skills and communications skills of our graduate students before they face their proposal & qualifying exams. Too many are going into the exams poorly prepared.	11/12/2015 1:16 AM
5	This program does not have enough room to promote cross interdisciplinary studies. It is difficult to have students from other field to start a graduate program because he/she can not take undergraduate courses as part of graduate program (for credits).	11/11/2015 10:21 PM
6	Reduce course load	11/11/2015 7:19 PM
7	We need to revise our strategic plan to allow faculty to further develop our strengths and to identify potential areas for future growth according to trends in the field.	11/11/2015 3:54 PM
8	I'm not familiar with all aspects of the graduate program but the professors seem very motivated and the students serious about learning	11/11/2015 12:53 PM
9	The program is healthy and off to a good start, with strong interest from faculty and healthy student enrollment, and extremely high societal relevance. Below I detail some ways that it might be improved. Most of these suggestions for improvement have to do with the limitations of the initial proposal for establishing the graduate program, which did not have a clear vision of the critical role of research in graduate education.	11/11/2015 12:27 PM
10	More diverse and flexible course offering.	11/9/2015 5:07 PM
11	We have a very low retention and graduation rate that need to be addressed. Let's lock the students in as early as freshmen by providing them with internship and summer job placement in Environmental Sciences	11/9/2015 4:46 PM
12	Positive: Very relevant in terms of what it offers Negative: Improve processes related to student recruitment, faculty evaluation (all faculty must receive an annual evaluation report) and monitoring of achievement indicators.	11/9/2015 4:39 PM
#	**Comments for "Mission and Goals"**	**Date**
1	I am not familiar with these.	11/23/2015 9:03 AM
2	I don't know about them	11/12/2015 8:31 PM
3	I do not remember what the mission and goals are	11/11/2015 7:19 PM
4	They are very ambitious and perhaps too long .	11/11/2015 3:54 PM
5	Again, see my comments above. Sorry I can't answer in more detail.	11/11/2015 12:53 PM
6	I think the mission and goals need to be thought through carefully in terms of what you expect the graduates to be prepared to do. A science MS and PhD graduate program should be preparing students who are competent researchers, including critical and synthetic thinking, how to use the literature, communication via writing and speaking, and quantitative analysis, with strong understanding of the scientific method and skill in using it. It is not a professional degree.	11/11/2015 12:27 PM
7	not quite familiar with them	11/10/2015 10:21 PM
8	Puerto Rico environment should be our main focus.	11/9/2015 4:46 PM
9	Re-evaluate goals to highlight area strengths or to reflect student interest.	11/9/2015 4:39 PM
#	**Comments for "Curriculum"**	**Date**
1	Students (IGERT) are required too many courses.	11/24/2015 3:16 PM
2	I am not familiar with this	11/23/2015 9:03 AM
3	I am not familiar with it	11/15/2015 3:21 PM
4	La oferta de cursos es muy limitada.	11/15/2015 11:40 AM
5	Course offerings are good. However there is no need for "tracks". Students and professor can devise the students individual course plan.	11/15/2015 9:04 AM
6	I learned recently that there were 4 required courses even for M.Sc. students. This is perhaps too much - more flexibility in the curriculum may help the students explore more options.	11/12/2015 8:31 PM
7	I would hate to say add more "remedial" courses, but if we continue to recruit students from all disciplines we either have to force them to take more undergraduate remedial work or offer low level courses ourselves. We need to get more lab skills to our students. Most of our grad. students are not prepared to do lab work (chemistry, molecular biology or microbiology). I cannot judge them on field work but I know wet labs are a mystery to them.	11/12/2015 1:16 AM
8	Better statistical courses More up to date Using public dimain high power software Students come to us consulting without Proper backgrounds	11/11/2015 11:14 PM

9	graduate students shall be allowed to take undergraduate courses to receive credits.	11/11/2015 10:21 PM
10	Reduce course load	11/11/2015 7:19 PM
11	Should be revised and aligned with a departmental strategic development plan.	11/11/2015 3:54 PM
12	Again, see my comments above. Sorry I can't answer in more detail.	11/11/2015 12:53 PM
13	The curriculum needs to be reworked. The required courses are excessive, and limit the degree to which a student and his/her advisors can tailor the courses taken to a student's individual needs and interests. The excessive course requirements also get in the way of students starting into research ASAP. The curriculum needs to be more challenging. Many are taught at a basic level. The curriculum should also be more responsive to current environmental issues faced by Puerto Rico and the larger society. These things are so urgent, and the curriculum should inspire students to dig into research on socially relevant issues ASAP.	11/11/2015 12:27 PM
14	Courses are too applied. There is also a need to provide solid fundations in science	11/11/2015 12:13 PM
15	More integration with other disciplines are needed.	11/11/2015 11:30 AM
16	Curriculum needs to be more flexible for research needs of individual students. Fewer core classes or the ability to substitute core classes from other Departments (Biology, Chemistry) is needed.	11/10/2015 10:12 AM
17	Too many required courses for graduate students - fewer courses the better so student can focus on courses or better yet seminars directly related to their research interests.	11/10/2015 9:28 AM
18	More diverse and flexible course offering.	11/9/2015 5:07 PM
19	How can we make PR an environmentally sustainable place to live? We need a more targeted curriculum. Also, we need to look at other programs offered on the island to avoid duplication.	11/9/2015 4:46 PM
20	Program is too course heavy, courses need to reflect faculty strengths.	11/9/2015 4:39 PM
#	**Comments for "Research"**	**Date**
1	While there is much excellent research, more attention has to be paid to improving the quality of research, particularly that pertaining interdisciplinary projects.	11/23/2015 9:03 AM
2	Facilitate and promote a broad range (journals, book chapters, newspaper articles, websites) of publication outlets for student research.	11/16/2015 9:03 PM
3	Hay muy buenas areas de investigacion pero tambien uno poco limitadas las opciones. Cuando se expande arofesores de otras areas como quimica, biologia, fisica,... Las opciones aumentan.	11/15/2015 11:40 AM
4	Research experience should be more emphasized right from the beginning.	11/15/2015 9:04 AM
5	Faculty participating in the Graduate Program have neat projects. I know very little about the research conducted by the graduate students.	11/12/2015 8:31 PM
6	Two areas need improvment: faculty diversity (next question) and physical plant We need better facilities for pilot scale research. We need facilities where things can smell bad without causing a crisis with our neighbors.	11/12/2015 1:16 AM
7	allow graduate students from other fields to take undergraduate courses as part of their course credit requirements	11/11/2015 10:21 PM
8	More time in research, less in courses. Applied problems should still be theory-based ... I am not familiar with the program enough to know whether this is an issue or not	11/11/2015 7:19 PM
9	Students must published their research before graduation.	11/11/2015 3:54 PM
10	Here I can comment on. The research done at UPR Rio Piedras seem excellent. The faculty member I work most with, Olga Mayol, is a strong researcher.	11/11/2015 12:53 PM
11	Students should be participating in research in lab rotations, or developing their own projects, even if small pilot projects, from the first semester on. Research really needs a much higher profile in the graduate program.	11/11/2015 12:27 PM
12	Students are still taking a long time to pick topics and some appear descriptive.	11/11/2015 12:13 PM
13	Student's are in need the basic research tools to improve the final outcome.	11/11/2015 11:30 AM
14	Required course work detracts from research effort - student should jump into exploratory research after first year.	11/10/2015 9:28 AM
15	Heavily biased in a couple of areas.	11/9/2015 5:07 PM
16	But we need more undergraduate involvement	11/9/2015 4:46 PM
17	Overall it is a very productive program	11/9/2015 4:39 PM
#	**Comments for "Faculty"**	**Date**

1	Todos los profesores de erian ser evaluados en sus cursos de modo que nos aseguremos que todos cumplan con su responsabilidad como se debe y que puedan ir mejorando en lo que puedan ser sus deficiencias o debilidades.	11/15/2015 11:40 AM
2	We could use some additional specialties, as describe in the recent plan for hiring. Also the faculty should show students how being an environmental scientist means that you keep learning. One way faculty can do this is by attending the departmental seminar.	11/15/2015 9:04 AM
3	The few that I know seem to do a fine job.	11/12/2015 8:31 PM
4	For historical reasons ecology is over-represented and other disciplines underrespresented in the faculty. We have an unbalanced faculty - for historical reasons. We need environmental microbiologists and environmental chemists. We need Ecological Economists. I would like to see a second environmental engineer and a second marine biologist.	11/12/2015 1:16 AM
5	Recruit faculty that are highly competitive, not just locally, but nationally and internationally	11/11/2015 7:19 PM
6	Faculty are very dedicated and highly productive.	11/11/2015 3:54 PM
7	Wow, excellent faculty	11/11/2015 12:53 PM
8	Faculty need to be more cohesive as a group: need to develop as a community, including more participation in the research seminar program, both attending and sharing the research going on in their labs.	11/11/2015 12:27 PM
9	Need more faculty in "earth sciences" such as hydrology and meteorology. Also, support for students conducting socio-ecological studies is difficult to obtain.	11/10/2015 10:12 AM
10	Fine, and in my experience cooperative and collegial	11/10/2015 9:28 AM
11	More faculty are need to provide a greater diversity of courses.	11/9/2015 5:07 PM
12	very diverse! But we do not know exactly what they are working on. This should facilitate collaboration.	11/9/2015 4:46 PM
13	Positve: Otherwise it is great in that there is a friendly environment and good rapport among most faculty members which provides a good working environment. Negative: There is a need to fill expertise gaps based on mission and goals.	11/9/2015 4:39 PM

#	Comments for "Academic Rigor (e.g. intellectually challenging)"	Date
1	Tenemos que ver como nos aseguramos de evaluar con el mismo rigor a todos los estudiantes en sus examenes de grado y propuestas.	11/15/2015 11:40 AM
2	Our students are not becoming independent and self-motivated researchers (at least not quickly enough). They have less than two years to learn that they are in charge of their own education now and they have to be able to communicate their own ideas effectively. They are not getting to that point by the end of their course work.	11/12/2015 1:16 AM
3	I have little basis for judgement here, hence the neutral tick	11/11/2015 7:19 PM
4	I probably can't comment much on this point but the students are excellent.	11/11/2015 12:53 PM
5	A basic ecology course should be required of entrants to the grad program. Students should have stronger quantitative skills on entry. Students with these qualifications would allow the curriculum to be more rigorous, as well as more succinct. In addition the seminar courses required of students should be reading seminars, NOT the departmental seminar for credit. This gives students the idea that they do not need to attend the seminar after the first year, or after they are no longer receiving credit for it.	11/11/2015 12:27 PM
6	Students need more experience in the design and analysis of experiments, academic writing, and problem solving.	11/9/2015 5:07 PM
7	Can our students compete for jobs upon graduation? I do think so! But there's always room for improvement!	11/9/2015 4:46 PM
8	Graduate exams are rigorous (several students have failed to pass), my courses are but I am no sure that can speak about the program as a whole without data.	11/9/2015 4:39 PM
9	My feeling is that as a new program it is a little lacking in rigor. One change would be to ask for at least two strong research based chapters in the PhD thesis that will lead to paper manuscripts	11/9/2015 4:29 PM

#	Comments for "Library resources"	Date
1	Library resources have to be improved, particularly subscriptions to journals that deal with Holistic environmental approaches, including human relations with the environment.	11/23/2015 9:03 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
3	No estoy del todp al dia en los recursos que tiene el estudiante en la biblioteca.	11/15/2015 11:40 AM
4	I find very few articles there that help with my own research but I doubt it has a solution. I need articles on engineering and applied microbiology and without a school of engineering I doubt there is a demand for those types of journals. On the other hand, the reference librarians who help us with interlibrary loans are always good and efficient.	11/12/2015 1:16 AM

5	Play the lottery. It simply takes money.	11/11/2015 7:19 PM
6	I didn't use the library and so cannot comment on.	11/11/2015 12:53 PM
7	I am not sure of the status of the library resources. I strongly suggest that someone review this, to locate disciplinary areas where key journals and books are missing. A bigger challenge is to get the students to actually use the library resources available.	11/11/2015 12:27 PM
8	This is a difficult question, students can use a lot of internet resources. Libraries could be now for study stations	11/11/2015 12:13 PM
9	do not know	11/10/2015 10:21 PM
10	More online journal access.	11/9/2015 5:07 PM
11	These days, the internet facilitate access. We also need to take advantage of Federal Labs on the island, such as IITF (USDA) and others.	11/9/2015 4:46 PM
12	Increase access to more journals. I am unable to access about 30% of what I search.	11/9/2015 4:39 PM
13	More online access to journals would be good, but costs money	11/9/2015 4:29 PM
#	**Comments for "Students"**	**Date**
1	There are very good students, but there are others that require stronger mentoring to facilitate their development.	11/23/2015 9:03 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
3	Deb mos ser rigurosos en la seleccion de estudiantes y haver que cumplan a tiempo con todos sus requisitos.	11/15/2015 11:40 AM
4	Students need to understand that our program teaches them how to be environmental scientists, able to tackle environmental problems. This means both having knowledge of the environment and the ability to get that knowledge. The fact that they do not understand this is shown by the low graduate student attendance at the departmental seminar. Students apparently believe that they should only go to seminars on topics in their field.	11/15/2015 9:04 AM
5	I have interacted with 3 students and have been surprised by their inability to critically read papers.	11/12/2015 8:31 PM
6	In may role as Adjunct Professor, I have only had the opportunity to interact with one student, Roselyn Mendez, who has impressed me with her initiative and self-education skills.	11/12/2015 3:19 PM
7	Satisfied with several caveats: 1) Since we recruit from so many fields, we need to get them into more 'remedial' courses to give them the basics. these will probably have to be undergraduate courses which means taking at least one semester of remedial work before starting their graduate program. I find our students are very good at synthesizing and regurgitating existing knowledge but very weak in (1) experimental design and developing research strategies; & (2) critical review of the existing scientific literature. IT is hard to get them to articulate their own views on the published literature.	11/12/2015 1:16 AM
8	I think there has been improvement here. When the program first started, the pool of students was not what it should have been. Thankfully, things are changing.	11/11/2015 7:19 PM
9	We must be more strict with our admissions as some accepted students are lacking the basic skills and are falling behind.	11/11/2015 3:54 PM
10	I probably can't comment much on this point but the students are excellent.	11/11/2015 12:53 PM
11	Students need to be encouraged to develop more curiosity, a questioning attitude, and desire to seek out the findings of opinions of others via the literature and seminars, and then to get on to explore their own ideas in their research. Their passion for learning and exploration needs to be ignited.	11/11/2015 12:27 PM
12	We still have a mixture of students, a few good and few no so good.	11/11/2015 12:13 PM
13	We need to attract more students with research focus rather than environmental activist focus. Not sure how to do this though.	11/10/2015 9:28 AM
14	More rigorous acceptance guidelines.	11/9/2015 5:07 PM
15	Lack of motivation from their part. We may need to provide more PEAFs to keep them in the lab. Having 2 jobs take time away from graduation	11/9/2015 4:46 PM
16	Positive: High diversity of interests, high diversity of students (PR, international, US), very enthusiastic. The variance in skills and competencies is too high. Some exceed expectation but others require a lot of work. We should do a better job at defining the profile of newly admitted students.	11/9/2015 4:39 PM
#	**Comments for "Research facilities"**	**Date**

1	Deben mejorar en la disponibilidad de equipo para campo, de tal forma que los estudiantes no tengan que comprarlos, sino que estén disponibles para su uso, con la salvedad de que son responsables de restituirlos si lo destruyen o le provocan una avería.	11/23/2015 10:08 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
3	I know little about these.	11/12/2015 8:31 PM
4	We need: (1) teaching labs. (2) a wet lab for a pilot plant and larger aquaculture facilitites. (3) air conditioning that does not pose a threat to human survival (4) long term maintenance on ALL instrumentation as promised by the University when we got the grants (5) better electricity (6) permanent technicians that keep the labs functioning (7) Internet connectivity (both wired and WIFI that is at least as fast as the old dial-up modem days!; (8) telephones (the new system is already giving problems) (9) hoods that work (10) more graduate student office space (11) STABLE backup power	11/12/2015 1:16 AM
5	we need to build strong labs to support courses and field trips.	11/11/2015 10:21 PM
6	Labs have radically improved for some faculty. Finally. So, things are looking up in this regard.	11/11/2015 7:19 PM
7	We have very good facilities and others require more maintenance.	11/11/2015 3:54 PM
8	Wow, the facilities that Olga Mayol and others have are excellent.	11/11/2015 12:53 PM
9	The department counts with about 6-8 labs in key areas of environmental science that have been recently renovated. However, space for a couple of key areas need urgent attention, especially for renewable energy. This is potentially a big research area for Puerto Rico, that need a lot more attention.	11/11/2015 12:27 PM
10	There are a number of instruments that have been left unattended and have not been maintained properly. As a department we should be more responsible for the maintenance of our instruments and for making them open access.	11/10/2015 5:37 PM
11	Difficult for me to evaluate as most my group's work is field work and facilities are not important to us.	11/10/2015 9:28 AM
12	Very few dedicated facilities that are maintained and managed for ease of access and use.	11/9/2015 5:07 PM
13	One needs a lil bit of creativity. But the work can be done. However we need better support from the administration for processing of chemicals ordering and equipment repairs	11/9/2015 4:46 PM
14	Positive: Labs have bee remodeled, and some are being constructed. Current labs/offices need better support from UPR facilities personnel when things break. In some cases faculty are expected to be more involved (time wise and financially) than they should. There should be beteer administrative support to handle these things and a maintenance plan for facilities.	11/9/2015 4:39 PM

#	Comments for "Technology (instrumentation, IT, network)"	Date
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
2	Idemt	11/12/2015 8:31 PM
3	See above. We need maintenance on the insturmentation we already own. We need our own insturmentation lab to liberate our insturments from the chemistry lab. the shared teaching/research lab idea with analytical chemistry has not worked very well. We need to separate teaching labs from resaerch labs.	11/12/2015 1:16 AM
4	Lab equipment are not unto dated	11/11/2015 10:21 PM
5	I do not know what people need or lack.	11/11/2015 7:19 PM
6	Need digital projectors in all classrooms and upgraded licenses in our GIS labs.	11/11/2015 3:54 PM
7	Excellent instrumentation!	11/11/2015 12:53 PM
8	The department has a lot of instrumentation available in the recently renovated laboratories. However, in areas key to environmental science, such as analytical chemistry, it has been very difficult to access critical equipment that is either limited or non-existing in environmental science, but available in other departments. A more collaborative spirit among departments would promote research and education in ALL disciplines involved.	11/11/2015 12:27 PM
9	Continuous internet service is not a priority.	11/9/2015 5:07 PM
10	Same as above! Repair is a slow process	11/9/2015 4:46 PM
11	Positive - The IT personnel is great but it is not dedicated to the graduate program full time. Negative: There needs to be technology plan and more uniformity as to the quality of internet infrastructure across the different facilities managed by the Dept of Env. Sciences.	11/9/2015 4:39 PM

#	Comments for "Academic management (coordination, recuitment, student orientation, web site, program assessment, clarity of regulations)"	Date

1	The program needs more commitment from tenured and tenure-tract faculty towards these endeavors.	11/24/2015 3:16 PM
2	I am not familiar with this	11/23/2015 9:03 AM
3	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
4	Hace falta mas personal de apoyo en estas labores para que podamos ser mas eficientes.	11/15/2015 11:40 AM
5	We need to improve the web site. This takes a lot of work. Look at some stateside departmental websites and the wealth of information they offer on faculty and research. A good website can recruit good students.	11/15/2015 9:04 AM
6	Idem.	11/12/2015 8:31 PM
7	We need an instruction manual for each of the big administrative jobs that are turning over rapidly (graduate coordination; undergraduate coordination; Assessment; Student evaluations; Department adminstration;) We need a systematic method for version control on official documents like the regulations, committee certifications and amendments, web site content, etc. Some University departments split the directors job into two separate jobs - an academic director and an admistrative director. This might make life easier for the people who fill those roles.	11/12/2015 1:16 AM
8	Management has been poor. Curriculum integration with other departments is largely lacking. Academic Affairs has been missing. There has been improvement over the last year, but the Department still has growing pains and is not quite as functional as more established departments	11/11/2015 7:19 PM
9	Olga is extremely motivated to bring me and others in to help with teaching classes and training students.	11/11/2015 12:53 PM
10	I do not know how things are currently, but I would ask - Do students know what they are supposed to do when? Are they making timely progress through their course of study and research? What are the road blocks they are encountering? Do the department and grad program regs impose unnecessary burdens, or do they facilitate student progress, while promoting program rigor?	11/11/2015 12:27 PM
11	Students need a lot more guidance from coordinator and also mentors	11/11/2015 12:13 PM
12	not familiar with them	11/10/2015 10:21 PM
13	We need to promote the department more.	11/10/2015 5:37 PM
14	Seems ok, uncertain what to suggest.	11/10/2015 9:28 AM
15	Communication and guidelines/plan that is actually followed semester to semester.	11/9/2015 5:07 PM
16	There's plenty of room for improvement. A student shouldn't have to travel to Rio Piedras to get info on admission.	11/9/2015 4:46 PM
17	Positive: Coordinators have always being very accessible, Good efforts at local student recruitment. Negative: Program assessment logistics and goals have not been made clear to faculty and students. There have been lots of changes in regulation/assessment documents since the program started. Program needs to evaluate its elements in a more integrated/ efficient way and publish these results more often. Website need a make over.	11/9/2015 4:39 PM

#	Comments for "Social Environment /Peer Group Support"	Date
1	Deben fomentar actividades inclusivas para que los estudiantes formen grupos en proyectos de investigación conjunta entre profesores. De igual forma que cada profesor hace reuniones de grupo con sus estudiantes de investigación, por lo menos una vez al mes se debería hacer una reunion social - científica entre los estudiantes que participen en los proyectos de tal forma que puedan formar lazos y apoyarse mutuamente en la investigación.	11/23/2015 10:08 AM
2	I am not familiar with this	11/23/2015 9:03 AM
3	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
4	Idem.	11/12/2015 8:31 PM
5	Can't comment on	11/11/2015 12:53 PM
6	I would ask - Have students and faculty been queried about their satisfaction and suggestions for the social environment of the graduate program? Because the faculty in the program are scattered across many other administrative units, special effort should be made to bring them together on different occasions for interchange, and to develop a supportive network. I believe that better social interaction among students might follow from that.	11/11/2015 12:27 PM
7	I don't know how to respond as I have insufficient experience to know.	11/10/2015 9:28 AM
8	Generate a plan of departmental activities that coincide with events like Earth Day to boost participation and also department visibility.	11/9/2015 5:07 PM
9	Non existent! One needs to create his/her own	11/9/2015 4:46 PM
10	It is very good at the faculty,	11/9/2015 4:39 PM

#	Comments for "Administrative support -grant management"	Date
1	I am not familiar with this	11/23/2015 9:03 AM
2	Idem.	11/12/2015 8:31 PM
3	1) Each year that goes by, DEGI wants even more lead time for receiving a proposal otherwise they treaten not to process it. We don't have the luxury of time to meet their long deadlines, so we end up submitting fewer proposals as they die in DEGI or the Rector's office. The finance office record of handling annual/ quarterly and final reports for funding agencies is not very good. To do research you need the infrastructure. We DON'T have infrastructure to carry out the research we would like to do. OPASA complains about safety violations in our labs but tasks they they themselves were assigned are NOT implemented in a timely fashion.	11/12/2015 1:16 AM
4	I do not have grants through the Department so have no basis for judgement	11/11/2015 7:19 PM
5	Must merge all administrative grant management resources to be more effective.	11/11/2015 3:54 PM
6	Can't comment on	11/11/2015 12:53 PM
7	I am not sure how this is functioning right now. Faculty with grants can give the best input on this. And students who are paid off of grants. Does what needs to happen occur without difficulty for the professor with a grant, and in a timely way? Faculty can waste so much time dealing with a grant, that they are discouraged from seeking external funding.	11/11/2015 12:27 PM
8	Not appropriate question as my grant & administrative support come from outside UPR.	11/10/2015 9:28 AM
9	Stricter guidelines of how to process orders and follow up on administration and management.	11/9/2015 5:07 PM
10	Pretty good! DEGI is on top of that!	11/9/2015 4:46 PM
11	Positive: Staff is very supportive and go out of their way to do stuff. Negative: Unclear if current staff can handle more granyts	11/9/2015 4:39 PM

#	Comments for "Administrative support -facilities management"	Date
1	I am not familiar with this	11/23/2015 9:03 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
3	Aqui no siempre la respuesta de la universidad es de a uerdo a la necesidad. Necesitamos respuesta mas rapida de la universidad a los problemas en los laboratorios/facilidades de investigacion tanto dento como fuera del recinto.	11/15/2015 11:40 AM
4	Idem.	11/12/2015 8:31 PM
5	OPASA complains about safety violations in our labs but tasks they they themselves were assigned are NOT implemented in a timely fashion. We have been waiting 5 years for hood repairs in the CRES lab. We have been watiing about 4 years for the aquaculture facilities to be completed. Nobody will ever again request a grant that requires some kind of physical plant investment under these conditions.	11/12/2015 1:16 AM
6	At least for El Verde, support is fairly good.	11/11/2015 7:19 PM
7	Public bathrooms are very bad. Ground keeping is poor.	11/11/2015 3:54 PM
8	Can't comment on	11/11/2015 12:53 PM
9	The new labs look in good shape. Are the professors in various facilities encountering problems?	11/11/2015 12:27 PM
10	Do we really have this?	11/10/2015 5:37 PM
11	Not appropriate question as my grant & administrative support come from outside UPR.	11/10/2015 9:28 AM
12	A more transparent and rapid method of requesting service that allows for follow up.	11/9/2015 5:07 PM
13	There's room for improvement. The process or response time is really slow.	11/9/2015 4:46 PM
14	Positive: IT/computer staff is great! Negative: Hot and cold as to what different staff are able to do when a pipe breaks.	11/9/2015 4:39 PM

#	Comments for "Administrative support –course support"	Date
1	I am not familiar with this	11/23/2015 9:03 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
3	Idem.	11/12/2015 8:31 PM
4	No basis for judgement	11/11/2015 7:19 PM
5	Can't comment on	11/11/2015 12:53 PM

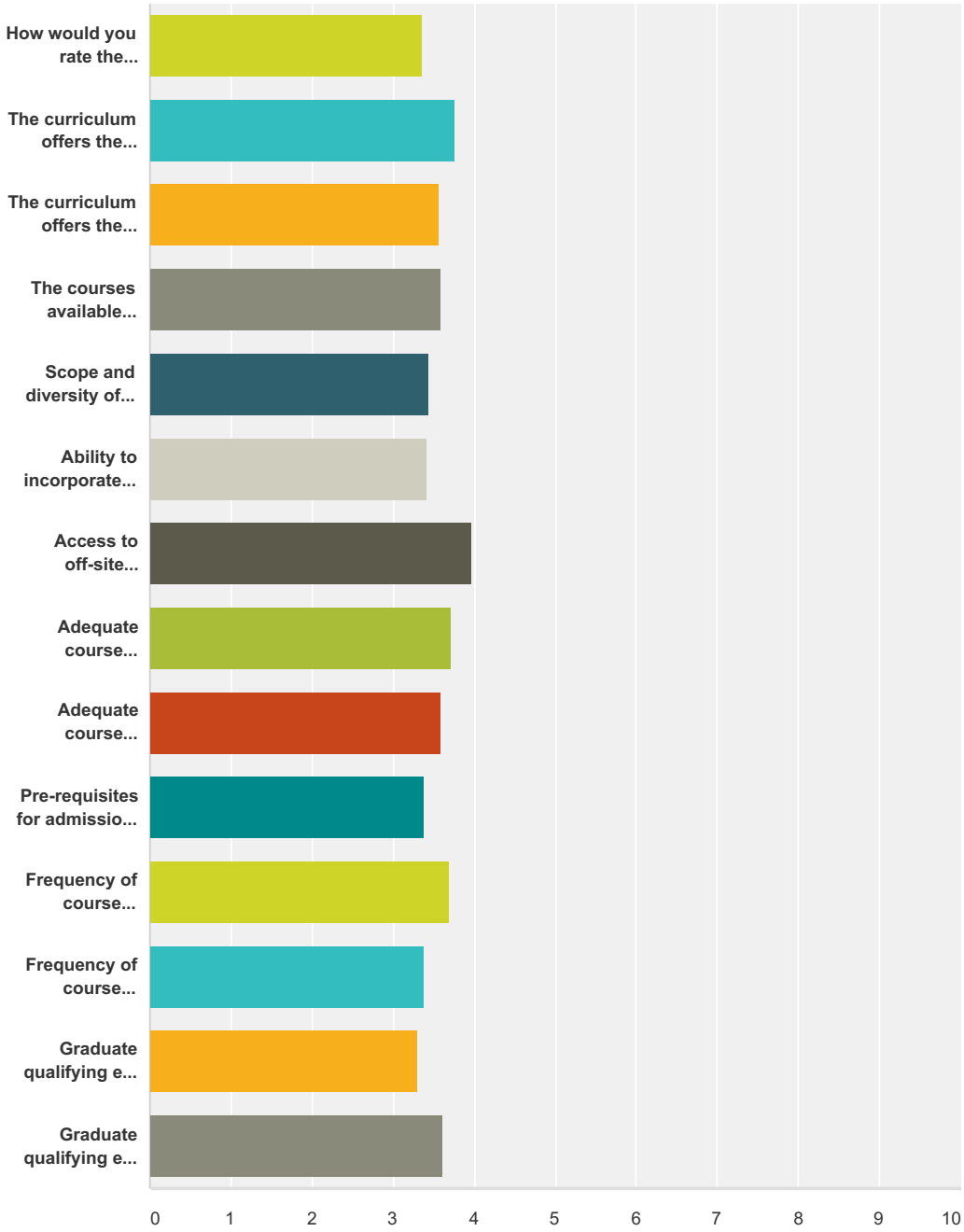
6	A related question I would ask - should courses be reaching a broader audience, than just grad students? How about increase use of CienciaPR for reaching a broader audience for the program in general?	11/11/2015 12:27 PM
7	Not appropriate question as my grant & administrative support come from outside UPR. I do not teach so can't say.	11/10/2015 9:28 AM
8	Funds for field trips and guest speakers.	11/9/2015 5:07 PM
9	Internet is at best spotty in the classroom. Please provide assistance.	11/9/2015 4:46 PM
10	Positive: I have gotten a lot of help on the little details from the Department's staff.	11/9/2015 4:39 PM
#	**Comments for "Access to non-course activities – seminars, symposia"**	**Date**
1	I am not familiar with this	11/23/2015 9:03 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
3	As mentioned above, faculty and students should attend the departmental seminar. I was grievously embarrassed last week when a professor from the Biology Department spoke at our departmental seminar and only 3 Environmental Sciences faculty attended! And there were few grad students. Students should not be given credit for attending the seminar. They should go to learn about the field and become effective scientists. Faculty must insist that their grad students attend the seminar. The departmental seminar should be a shared, unifying event for the department. Of course, one cannot always attend, but attendance should be the custom.	11/15/2015 9:04 AM
4	Has regular seminar - little attended though.	11/12/2015 8:31 PM
5	I always receive timely notification of seminars.	11/12/2015 3:19 PM
6	Some conflict with Biology seminars, and I often must choose which to go to ... Avoid scheduling such obvious conflicts	11/11/2015 7:19 PM
7	Excellent, from my experiences teaching two classes and participating in activites afterwards.	11/11/2015 12:53 PM
8	A seminar schedule, if tentative, should be set up at the beginning of the semester, so that people can plan ahead...Higher profile public awareness is needed for seminars and other open departmental activities.	11/11/2015 12:27 PM
9	Good active seminar program. Also like the idea of undergraduate seminars.	11/10/2015 9:28 AM
10	Better communication.	11/9/2015 5:07 PM
11	very good! Jess is doing a great job hosting the seminar series. Just that I'd like to see a better representation of faculty interest in there.	11/9/2015 4:46 PM
12	Positive: Lots of access to opportunities when available, undergraduate and graduate seminars are well organized and have good schedules.	11/9/2015 4:39 PM
#	**Comments for "Student funding"**	**Date**
1	I am not familiar with this	11/23/2015 9:03 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
3	Hacen falta mas programas que puedan ahudar al estudiante en esta area y buenos administradores de los mismos.	11/15/2015 11:40 AM
4	They seem to receive TA's.	11/12/2015 8:31 PM
5	the University does a great job in trying to dig up enough funds to finance students with PEAF's. Our problem is our students are not brining in enough scholarship money (many don't even try) and our faculty are no longer obtaining as many training grants. I don't think there is a solution for this unless we simply shrink the student body - which would be counterproductive for the graduate program	11/12/2015 1:16 AM
6	Probably more effort needs to be put into seeking additional student support, and informing students of opportunities and encouraging them to apply.	11/11/2015 12:27 PM
7	Final projects require $$$$ en many cases.	11/11/2015 11:30 AM
8	Peaf support is constantly fluctuating and difficult to manage.	11/10/2015 10:12 AM
9	I have no support for my graduate students, but this is a fault of my institution and not UPR. Of course, like everyone I would love to see more funding for student support, but not realistic in current economic climate on the island.	11/10/2015 9:28 AM
10	Require students to apply for outside funding such as the NSF graduate research fellowship.	11/9/2015 5:07 PM
11	Almost non existent. New admission has been limited to 5 for next year due to funding. Not all grad students are on PEAFs.	11/9/2015 4:46 PM

12	Graduate student salaries scales (1,000/month / 10 months for PhDs are totally non-competitive in the universe of graduate programs. We have lost students to other programs with better funding.	11/9/2015 4:39 PM
13	I'm aware of a lack of TA in environmental sciences and the difficulty of finding funding for students. One option we are exploring in my lab is to set up a fund that can be used to pay skilled students to undertake research projects not connected with their graduate work ie. a replacement for a TA / RA, a form of technical specialist. I have lots of people willing to pay for bioinformatic analysis that the students could do	11/9/2015 4:29 PM

#	Comments for "Release time for research"	Date
1	I am not familiar with this	11/23/2015 9:03 AM
2	It is not defined the administrative way to support with release time professors that are not part of faculty	11/22/2015 7:21 PM
3	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:21 PM
4	This is good right now. We know it is threatened. We need to take preemptive action by establishing strong requirements for release time, so that administrators see that we do not take it for granted and are controlling release time rigorously.	11/15/2015 9:04 AM
5	NA	11/12/2015 8:31 PM
6	n/a	11/12/2015 1:16 AM
7	I am not familiar with release time of all faculty in DES but it seems on par with other Nat Sci departments, which is good.	11/11/2015 7:19 PM
8	I cannot comment on	11/11/2015 12:53 PM
9	This looks like it might soon be endangered. The faculty need to highlight the contributions that their research is making, globally and for Puerto Rico. They need to be much more pro-active about this. Make the case for release time more apparent.	11/11/2015 12:27 PM
10	Not relevant as I am adjunct and do not teach.	11/10/2015 9:28 AM
11	Use release time to hire course instructors.	11/9/2015 5:07 PM
12	Something to work on. But it seems like that the administration is flexible on that.	11/9/2015 4:46 PM
13	POSITIVE: Currently release time for research/semester : 3 credits teaching 9 credits release time This academic load is adequate and necessary for research productivity. There is some flexibility in terms of teaching your full years load in one semester and not teaching in the other.	11/9/2015 4:39 PM

Q2 Courses, Overall Experience

Answered: 34 Skipped: 4



	Very deficient	Deficient	Neutral	Satisfactory	Very satisfactory	Total	Weighted Average
How would you rate the graduate curriculum and curricular experience?	3.33% 1	13.33% 4	30.00% 9	50.00% 15	3.33% 1	30	3.37
The curriculum offers the skills and knowledge required for a master's degree in Science.	0.00% 0	0.00% 0	34.38% 11	56.25% 18	9.38% 3	32	3.75
The curriculum offers the skills and knowledge required for a PhD in Science.	0.00% 0	9.68% 3	25.81% 8	61.29% 19	3.23% 1	31	3.58

The courses available provide students with the necessary skills and knowledge to successfully carry out graduate level research (ie. There is nothing missing).	**0.00%** 0	**6.25%** 2	**34.38%** 11	**53.13%** 17	**6.25%** 2	32	3.59
Scope and diversity of courses.	**0.00%** 0	**10.34%** 3	**41.38%** 12	**41.38%** 12	**6.90%** 2	29	3.45
Ability to incorporate ethics training in curriculum.	**0.00%** 0	**11.54%** 3	**38.46%** 10	**46.15%** 12	**3.85%** 1	26	3.42
Access to off-site locations for collaborative research opportunities (IITF, USGS, San Juan Bay Estuary, Toa Baja, El Verde Field S	**0.00%** 0	**3.57%** 1	**21.43%** 6	**50.00%** 14	**25.00%** 7	28	3.96
Adequate course requirements to complete MSc degree (# of credits required)	**0.00%** 0	**7.14%** 2	**32.14%** 9	**42.86%** 12	**17.86%** 5	28	3.71
Adequate course requirements to complete PhD degree (# of credits required)	**0.00%** 0	**11.11%** 3	**33.33%** 9	**40.74%** 11	**14.81%** 4	27	3.59
Pre-requisites for admission (are they enough?)	**0.00%** 0	**13.04%** 3	**39.13%** 9	**43.48%** 10	**4.35%** 1	23	3.39
Frequency of course offerings for required courses	**0.00%** 0	**0.00%** 0	**52.17%** 12	**26.09%** 6	**21.74%** 5	23	3.70
Frequency of course offerings for elective courses	**0.00%** 0	**8.70%** 2	**56.52%** 13	**21.74%** 5	**13.04%** 3	23	3.39
Graduate qualifying exam Part A (need, structure, content)	**7.14%** 2	**14.29%** 4	**28.57%** 8	**42.86%** 12	**7.14%** 2	28	3.29
Graduate qualifying exam Part B (need, structure, content)	**0.00%** 0	**10.71%** 3	**28.57%** 8	**50.00%** 14	**10.71%** 3	28	3.61

#	Comments for "How would you rate the graduate curriculum and curricular experience?"	Date
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	See previous comments.	11/15/2015 9:18 AM
4	Reduce course load	11/11/2015 7:30 PM
5	We need to rethink it completely. There are courses that have never being offered.	11/11/2015 4:49 PM
6	See the answer on the first page on the graduate curriculum.	11/11/2015 1:14 PM
7	Uneven course availability.	11/10/2015 10:17 AM
8	Too may basic courses for students, which delays starting their research. I'd reduce number of required courses and encourage more seminars specific to the student's research interests.	11/10/2015 9:42 AM
9	Positive: Excellent for the interdisciplinary option, students are able to design their degree to fit their interests Negative: Not as many curricular options for the two specialized research tracks.	11/9/2015 5:25 PM
10	But there's room for improvement...such as students recruitment and internet access in every room	11/9/2015 5:01 PM
#	**Comments for "The curriculum offers the skills and knowledge required for a master's degree in Science."**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	See previous comments.	11/15/2015 9:18 AM
4	Yes, just too many requirements, and the basic courses could be offered at a higher level. See response to curriculum on page 1.	11/11/2015 1:14 PM
5	I don't really know, but seems like too many required courses. Perahps this is required at the MS level, but not for the Ph.D. level.	11/10/2015 9:42 AM

6	Positive: The curriculum does a good job at improving oral communication, team work and interdisciplinary skills, applied ecological knowledge, applied social sciences skills. Negative: The program does not do as well at improving time management skills, mathematical/analytical skills (high variance in success), written communication skills despite attempts.	11/9/2015 5:25 PM
7	Faculty has the expertise. Students need more support...financial and academic	11/9/2015 5:01 PM
#	**Comments for "The curriculum offers the skills and knowledge required for a PhD in Science."**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	See previous comments.	11/15/2015 9:18 AM
4	Yes, just too many requirements, and the basic courses could be offered at a higher level. See response to curriculum on page 1.	11/11/2015 1:14 PM
5	Insufficient number of seminar courses where students can read the literature and make presentations.	11/10/2015 10:17 AM
6	I don't really know, but seems like too many required courses. Perahps this is required at the MS level, but not for the Ph.D. level.	11/10/2015 9:42 AM
7	More training in quantitative skills is needed, e.g. statistics for ecosystem and environmental analysis	11/9/2015 9:15 PM
8	Positive: The curriculum does a good job at improving oral communication, team work and interdisciplinary skills, applied ecological knowledge, applied social sciences skills. Negative: The program does not do as well at improving time management skills, mathematical/analytical skills (high variance in success), written communication skills despite attempts.	11/9/2015 5:25 PM
9	New knowledge can be generated! The focus that is lacking is maybe economics....translational research! IP...	11/9/2015 5:01 PM
#	**Comments for "The courses available provide students with the necessary skills and knowledge to successfully carry out graduate level research (ie. There is nothing missing)."**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	We need more emphasis on research in the first year.	11/15/2015 9:18 AM
4	I believe a missing element is a good course in Environmental Soil Science, soils being the interface between terrestrial ecosystems and the geohydrological environment.	11/12/2015 3:56 PM
5	More opportunity to carry out pilot projects, do lab rotations should be part of the curriculum.	11/11/2015 1:14 PM
6	See above.	11/10/2015 10:17 AM
7	I do not know. Always a need for good applied statistics courses.	11/10/2015 9:42 AM
8	There needs to be more courses in a. experimental design/statistics/modelling, high variance in the knowledge of students. b. qualitative methods specially for those students interested in studies that integrate social sciences questions.	11/9/2015 5:25 PM
9	Depends on the students interests! If they wanna focus on economics or sustainability...they probably have to look elsewhere. But expertise can be found on campus. That's where joint programs come in	11/9/2015 5:01 PM
#	**Comments for "Scope and diversity of courses."**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Reduce the number of required courses. This would also liberate faculty to teach other courses, if there are fewer sections if the required courses.	11/15/2015 9:18 AM
4	We should try to offer more diverse courses.	11/11/2015 4:49 PM
5	I am not sure about this.	11/11/2015 1:14 PM
6	Difficult to say. Faculty all have participate in teaching courses, so it is not clear where added course diversity would come from	11/10/2015 10:17 AM
7	I am insufficiently informed to know an answer to this.	11/10/2015 9:42 AM

8	Make courses from other colleges (social-sciences/architecture/businesses/education) more readily available to students. It is unclear if the courses created by IGERT can be sustained without assigned in-house faculty assigned to them	11/9/2015 5:25 PM
9	very good!	11/9/2015 5:01 PM
#	**Comments for "Ability to incorporate ethics training in curriculum."**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Is ethics training incorporated explicitly in the curriculum? If not, it should be offered as a required workshop, or as part of a required course.	11/11/2015 1:14 PM
4	Mmm, is there any now?	11/10/2015 9:42 AM
5	Easier to do in some courses more than others.	11/9/2015 5:25 PM
6	non existent! This has to be taught separately	11/9/2015 5:01 PM
#	**Comments for "Access to off-site locations for collaborative research opportunities (IITF, USGS, San Juan Bay Estuary, Toa Baja, El Verde Field S"**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Is this part of the research experience of students? If not, it would be a good idea to have collaborative research opportunities or lab rotations as a course in the first year. Or a mentoring course, where an entering students works with an older student on their established research for a semester, overseen of course, by a faculty advisor.	11/11/2015 1:14 PM
4	We need vehicles	11/11/2015 12:17 PM
5	The program either manages some of these sites or else has good contacts with these sites	11/9/2015 5:25 PM
6	But do or students take advantage of that! Faculty members need to encourage that more.	11/9/2015 5:01 PM
#	**Comments for "Adequate course requirements to complete MSc degree (# of credits required)"**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	If 4 courses and an identical exams is the norm I would certainly change this.	11/12/2015 8:38 PM
4	Reduce course loads	11/11/2015 7:30 PM
5	Over sufficient requirements.	11/11/2015 1:14 PM
6	Seems like too many required courses for MSc, would reduce required, but not change number of required credits.	11/10/2015 9:42 AM
7	Too course heavy and too many general courses. Reduce courses by half, allow substitution specialized seminars requirements for attendance to the department seminars and increase research credits. Allow graduate committee to gauge student needs and gauge the need for courses and to select the graduate courses required by the student.	11/9/2015 5:25 PM
8	it's similar to most grad programs out there!	11/9/2015 5:01 PM
#	**Comments for "Adequate course requirements to complete PhD degree (# of credits required)"**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Idem	11/12/2015 8:38 PM
4	Reduce course loads	11/11/2015 7:30 PM
5	Oversufficient requirements.	11/11/2015 1:14 PM
6	Too may required courses for Ph.D. and would reduce number of credits required.	11/10/2015 9:42 AM
7	Too course heavy and too many general courses. Reduce courses by half, allow substitution specialized seminars requirements for attendance to the department seminars and increase research credits. Allow graduate committee to gauge student needs and gauge the need for courses and to select the graduate courses required by the student.	11/9/2015 5:25 PM
8	same as above. There's not much of a difference between what we offer and other programs out there	11/9/2015 5:01 PM
#	**Comments for "Pre-requisites for admission (are they enough?)"**	**Date**

1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Entering students should have core science courses already.	11/15/2015 9:18 AM
4	Do not know what these are	11/12/2015 8:38 PM
5	Increase IGS. It's too low	11/11/2015 7:30 PM
6	The GRE or an equivalent test should be required to all students.	11/11/2015 4:49 PM
7	A course in ecology should be added to the prerequisites. This would allow an increase in rigor in the basic courses of the program. Ecology is basic to environmental science.	11/11/2015 1:14 PM
8	I do not know.	11/10/2015 9:42 AM
9	No there should be some sort of way to profile students in terms of their statistical and oral communication skills as well as commitment as full-time students.	11/9/2015 5:25 PM
10	we need to emphasize an interest in tropical island environment	11/9/2015 5:01 PM
#	**Comments for "Frequency of course offerings for required courses"**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Do not know the offerings	11/12/2015 8:38 PM
4	I do not know about this.	11/11/2015 1:14 PM
5	I do not know.	11/10/2015 9:42 AM
6	Now that Tecnicas is offered twice a year! Other core course may need to follow suit	11/9/2015 5:01 PM
#	**Comments for "Frequency of course offerings for elective courses"**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Do not know the offerings	11/12/2015 8:38 PM
4	We should try to offer more diverse courses.	11/11/2015 4:49 PM
5	I do not know about this.	11/11/2015 1:14 PM
6	I do not know.	11/10/2015 9:42 AM
#	**Comments for "Graduate qualifying exam Part A (need, structure, content)"**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	Needs better integration with research proposal.	11/16/2015 9:08 PM
3	I think a qualifying exam and a thesis proposal defense are enough. I like the Biology Department model.	11/15/2015 9:18 AM
4	Do not know details	11/12/2015 8:38 PM
5	I think this exam is an unnecessary hurdle. This degree program is not for preparing professionals.	11/11/2015 1:14 PM
6	This should be revised	11/11/2015 12:17 PM
7	Probably could eliminate this and substitute the research proposal.	11/10/2015 10:17 AM
8	This has fallen to the same group of people every year and is testing knowledge from courses taken. This should be an exam that tests the general knowledge of students in regard to their dissertation research. Students should enroll in research credits and produce a good literature review that identifies potential gaps in knowledge and research questions. This exam could be a set of general questions set in the general context of the student's research and generated by a set of five faculty that rotated every year. These questions would gauge general student's knowledge and skills (analytical/critical thinking/communication -oral and written).	11/9/2015 5:25 PM
#	**Comments for "Graduate qualifying exam Part B (need, structure, content)"**	**Date**
1	I have supported the Program from another Department, and am thus not familiar with this aspect.	11/23/2015 9:15 AM
2	Should be before research proposal.	11/16/2015 9:08 PM
3	Do not know details	11/12/2015 8:38 PM

4	One qualifying exam is sufficient for	11/11/2015 1:14 PM
5	Needs revision	11/11/2015 12:17 PM
6	This should be the proposal defense (a test of research skills)	11/9/2015 5:25 PM

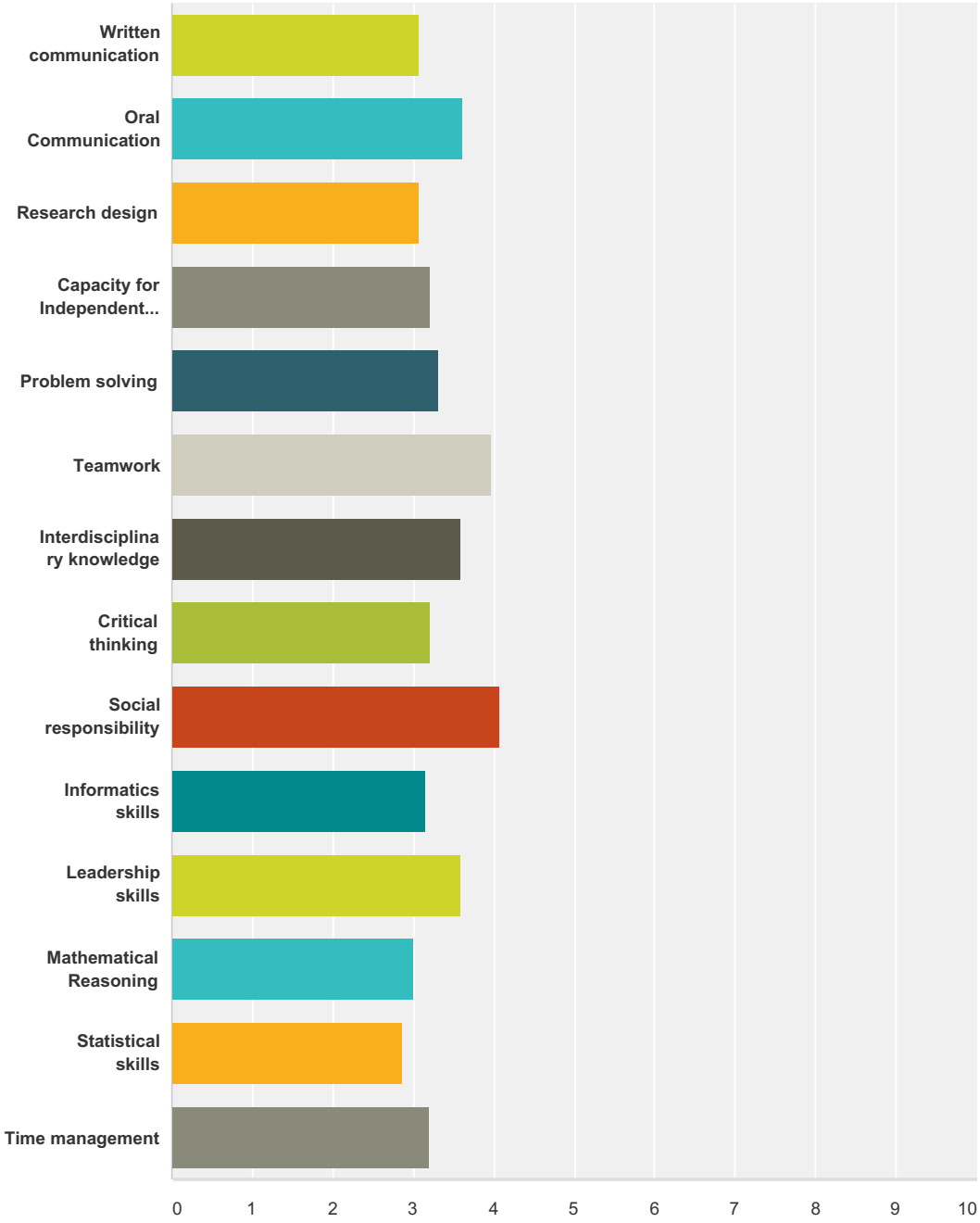
Q3 If you can recommend three to five new courses for the program, what will they be? Explain why and provide comments please.

Answered: 18 Skipped: 20

#	Responses	Date
1	I would double-classify courses from the Department of Anthropology in Social Sciences. Courses already existing that could be useful to Environmental Sciences are: Ecology, Culture and Society; Environmental Archaeology and Archaelogy of Climate Change. I would also recommend new graduate courses that incorporate people and social dynamics into the environment picture, from a solid, up-to-date position on the research of human ecodynamics. I would also suggest a graduate version of Ecology and Society. The Environmental Science Department is seriously lacking the social dynamics within the environment.	11/23/2015 9:15 AM
2	Forest management, Nanoparticles in the environment, Communicating science, Information/Database development and management, Evolution, Ethnography, Environmental Chemistry on-a-shoestring,	11/16/2015 9:08 PM
3	Courses in the Earth Sciences and Engineering	11/15/2015 6:28 PM
4	Advance experimental design Writing and speaking	11/15/2015 9:18 AM
5	Environmental Soil Science course soil as interface between terrestrial ecosystems and geohydrological environment) Environmental Chemistry course-chemistry of water-soil-plant-atmosphere continuum Environmental Physics - physics of water-soil-plant atmosphere continuum (much of this is may already be covered in existing Environmental Hydrology and Meteorology courses)	11/12/2015 3:56 PM
6	Soil Microbial Ecology or Environmental Microbiology: Most environmental problems are directly or indirectly associated with soils. And all chemicals are processed directly or indirectly by soil microbes. Chemical Analyses for Environmental Sciences: Students needs to have the knowledge of which chemicals reflect the environmental problems and how to analyze them.	11/11/2015 10:34 PM
7	1, Integrated water resources management for tropical watersheds 2. Bayesian statistics for environmental sciences 3. Resiliency of societies under climate change	11/11/2015 4:49 PM
8	My prejudice would be more courses in general on forest function and management, adaptation to climate change.	11/11/2015 1:14 PM
9	Experimental design	11/11/2015 12:17 PM
10	Nanotechnology	11/11/2015 12:10 PM
11	The main course that we need is a research statistical analysis course. It would be ideal to have a lab component.	11/10/2015 5:45 PM
12	Advanced statistics Ecosystem Ecology Environmental physics	11/9/2015 9:15 PM
13	qualitative methods bayesian statistics ecosystem services valuation meterology	11/9/2015 5:25 PM
14	Interdisciplinary courses, such as environmental law, economics and planning.	11/9/2015 5:16 PM
15	Sustainable design and technology, Global material and energy flows and cycles, Design and Analysis of Experiments, Scientific Writing	11/9/2015 5:13 PM
16	1 - Sustainability 2- Env. Biomolecualr Sciences 3- Bioinformatics	11/9/2015 5:01 PM
17	Bioinformatics could be offered as a joint env sci course with Biology	11/9/2015 4:41 PM
18	Climate - background to understand global changes Gobal Changes Advanced Ecology Ecosystem Ecology Biodiversity	11/9/2015 4:28 PM

Q4 Student skills: How would you rate newly recruited students in terms of their ability to perform the following skills?Keep in mind that suggested action items can take place during both the pre-and post-student recruitment phase.

Answered: 29 Skipped: 9



	Very deficient	Deficient	Neutra	Satisfactory	Very satisfactory	Total	Weighted Average

Written communication	**0.00%** 0	**17.86%** 5	**57.14%** 16	**25.00%** 7	**0.00%** 0	28	3.07
Oral Communication	**0.00%** 0	**3.57%** 1	**35.71%** 10	**57.14%** 16	**3.57%** 1	28	3.61
Research design	**3.70%** 1	**22.22%** 6	**44.44%** 12	**22.22%** 6	**7.41%** 2	27	3.07
Capacity for Independent Research	**3.57%** 1	**21.43%** 6	**32.14%** 9	**35.71%** 10	**7.14%** 2	28	3.21
Problem solving	**0.00%** 0	**14.29%** 4	**46.43%** 13	**32.14%** 9	**7.14%** 2	28	3.32
Teamwork	**0.00%** 0	**0.00%** 0	**25.93%** 7	**51.85%** 14	**22.22%** 6	27	3.96
Interdisciplinary knowledge	**0.00%** 0	**7.41%** 2	**44.44%** 12	**29.63%** 8	**18.52%** 5	27	3.59
Critical thinking	**0.00%** 0	**21.43%** 6	**42.86%** 12	**28.57%** 8	**7.14%** 2	28	3.21
Social responsibility	**0.00%** 0	**0.00%** 0	**25.93%** 7	**40.74%** 11	**33.33%** 9	27	4.07
Informatics skills	**0.00%** 0	**26.92%** 7	**38.46%** 10	**26.92%** 7	**7.69%** 2	26	3.15
Leadership skills	**0.00%** 0	**0.00%** 0	**55.56%** 15	**29.63%** 8	**14.81%** 4	27	3.59
Mathematical Reasoning	**0.00%** 0	**29.63%** 8	**48.15%** 13	**14.81%** 4	**7.41%** 2	27	3.00
Statistical skills	**7.69%** 2	**30.77%** 8	**38.46%** 10	**15.38%** 4	**7.69%** 2	26	2.85
Time management	**3.85%** 1	**19.23%** 5	**38.46%** 10	**30.77%** 8	**7.69%** 2	26	3.19

#	Comments for "Written communication"	Date
1	There is a lot of variability. Some have the skills, others do not. In my experience with 3 students, two have the skills the other not.	11/24/2015 3:25 PM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Require a lot of writing in the courses Have a writing course	11/15/2015 9:18 AM
4	Students need to write more!! Writing should be part of classes, if not already. There should be a seminar course on their research tool box: scientific writing, oral presentations. Students should be encouraged early to do research and to communicate their findings in scientific publications.	11/11/2015 1:14 PM
5	For this and all of the questions that follow, students vary WIDELY in their abilities, so I am answering "Neutral" on all.	11/10/2015 10:17 AM
6	-require the scientific writing course to those that need it -mandate the incorporation of writing goals (doing annotated bibliographies, introductions to proposal sections) in research courses when taken during the first two years in the program.	11/9/2015 5:25 PM
7	very poor writing skills. Maybe we should make Nick's course mandatory	11/9/2015 5:01 PM
#	**Comments for "Oral Communication"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
2	Students need to communicate their research more to the public!! Oral presentations should be part of classes, if not already. There should be a seminar course on their research tool box: scientific writing, oral presentations. Students should be encouraged to attend and present at local, national, international meetings.	11/11/2015 1:14 PM
3	Or students students are generally very good at this	11/9/2015 5:25 PM
#	**Comments for "Research design"**	**Date**

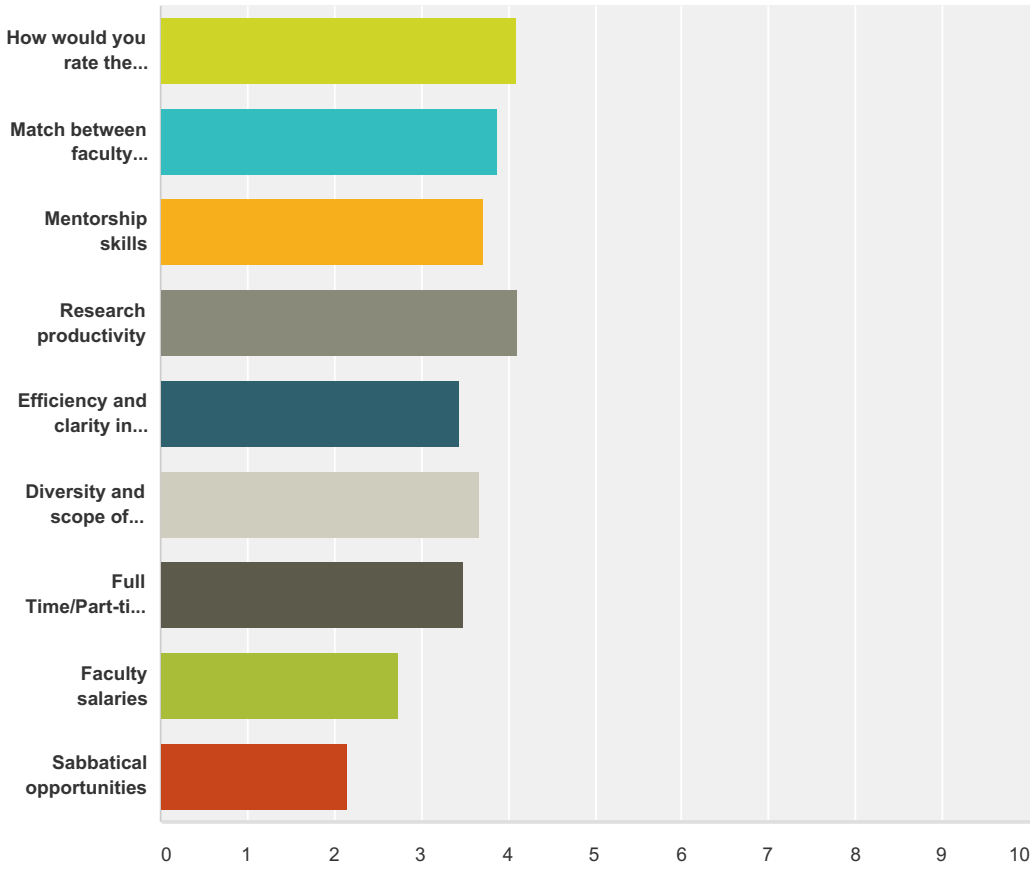
1	There is a lot of variability. Some have the skills, others do not. In my experience with 3 students, two have the skills the other not.	11/24/2015 3:25 PM
2	Research proposal drafts and research proposal seminar	11/16/2015 9:08 PM
3	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
4	More on experimental design	11/15/2015 9:18 AM
5	Courses should be heavy in research focus: recognizing problems, designing solutions	11/11/2015 7:30 PM
6	There should be a course offered in the first semester on research design: whether as observational, spatial, case history, modeling, or experimental. The elements of good experimental design. This would be the basis for a second course on quantitative analysis,depending on the direction of student interests.	11/11/2015 1:14 PM
7	This is not a deficiency only for Environmental Sciences, but a general deficiency for most entering graduate students, including those in Biology. - Problem goes back to undergraduate training where students rarely have opportunities to design research.	11/10/2015 9:42 AM
8	There is a large variance. Evaluate how this skill is currently integrated into the curriculum and develop strategies based on results	11/9/2015 5:25 PM
9	Lacking in almost every aspect. Maybe a Statistics course can help remediate that	11/9/2015 5:01 PM
#	**Comments for "Capacity for Independent Research"**	**Date**
1	There is a lot of variability. Some have the skills, others do not. In my experience with 3 students, two have the skills the other not.	11/24/2015 3:25 PM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	we need new lab facilities for new courses such as Soils and the Environment	11/11/2015 10:34 PM
4	This should be promoted in the first semester, starting with a course on lab rotation, collaborative research, or independent pilot research project.	11/11/2015 1:14 PM
5	This is not a deficiency only for Environmental Sciences, but a general deficiency for most entering graduate students, including those in Biology. - Problem goes back to undergraduate training where students rarely have opportunities to design research.	11/10/2015 9:42 AM
6	Some students require a lot of help on the research design /identifying a theory to address but once that is achieved they are often take off.	11/9/2015 5:25 PM
7	They need a lot of guidance and oversight	11/9/2015 5:01 PM
#	**Comments for "Problem solving"**	**Date**
1	There is a lot of variability. Some have the skills, others do not. In my experience with 3 students, two have the skills the other not.	11/24/2015 3:25 PM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Students may be too hesitant about just starting in on research. Problem solving should be promoted in the experimental design course in the first semester, where the students bring in the issue faced in a research problem that they are also picking up the first semester (see previous question)	11/11/2015 1:14 PM
4	This is not a deficiency only for Environmental Sciences, but a general deficiency for most entering graduate students, including those in Biology. - Problem goes back to undergraduate training where students rarely have opportunities to design research.	11/10/2015 9:42 AM
5	critical thinking is lacking! Maybe another area of focus	11/9/2015 5:01 PM
#	**Comments for "Teamwork"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
2	I really like the idea of promoting this in a collaborative research project that students could participate in, starting in their first semester.	11/11/2015 1:14 PM
3	They do work well with others.	11/9/2015 5:01 PM
#	**Comments for "Interdisciplinary knowledge"**	**Date**
1	Considero que los estudiantes del Recinto llegan con una buena base interdisciplinaria al programa.	11/23/2015 10:29 AM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM

3	Encourage student to read broadly, attend all seminars.	11/15/2015 9:18 AM
4	Our labs do not allow for many interdisciplinary work, e.g. soil microbial molecular studies.	11/11/2015 10:34 PM
5	I think the interdisciplinary option for the PhD and MS is really great, for promoting students to work across disciplines. Environmental science is an integrative science. To promote interdisciplinary knowledge more, there might be more interaction with other depts , disciplines (including sociales, econ, law, education, architecture, agriculture, etc). via seminar courses, joint conferences- more geared to issues than disciplinary boundaries.	11/11/2015 1:14 PM
#	**Comments for "Critical thinking"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
2	When teaching emphasize alternative explanations for patterns and processes, and always question results and interpretation. Have courses base on primary literature and critique it.	11/15/2015 9:18 AM
3	probably deficient	11/11/2015 7:30 PM
4	I believe students need to do more critical survey of the literature. This should occur in the seminar courses (three are 3 required for the PhD??) where they ought to be reading and reflecting on the scientific literature, to build the base for their own research and disciplinary understanding. For good critical thinking, you need 1) to be able to reflect and ask questions and 2) a basis in your field.	11/11/2015 1:14 PM
5	This is not a deficiency only for Environmental Sciences, but a general deficiency for most entering graduate students, including those in Biology. - Problem goes back to undergraduate training where students rarely have opportunities to develop critical thinking.	11/10/2015 9:42 AM
6	Standardize goals for research courses during the first two years of graduate school	11/9/2015 5:25 PM
7	see above	11/9/2015 5:01 PM
#	**Comments for "Social responsibility"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
2	probably good	11/11/2015 7:30 PM
3	From what I see of env sci graduate students, they do have a sense of social responsibility. This could be increased with more collaboration with NGOs, govt agencies, businesses, dealing with local, regional, and global issues.	11/11/2015 1:14 PM
4	They are excellent at this	11/9/2015 5:25 PM
5	Very active and engaged in the community!	11/9/2015 5:01 PM
#	**Comments for "Informatics skills"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
2	probably deficient, but one size should not fit all	11/11/2015 7:30 PM
3	Students need more awareness and skill with BIG DATA!! This should be promoted in an intro research design course, and then incorporated as appropriate into courses on quantitative skills.	11/11/2015 1:14 PM
4	It depends of what is meant by this.	11/9/2015 5:25 PM
5	see abpve	11/9/2015 5:01 PM
6	Poor. difficult to address - need a push on quantitative skills in general and just R	11/9/2015 4:41 PM
#	**Comments for "Leadership skills"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
2	Leadership for what end? One way to work with this is more student participation in governance of the graduate program, more responsiveness to student concerns. Model good leadership and responsiveness to them. And help to create mechanisms for students to have more collaboration with communities and organizations for research. This would help them gain leadership experience very quickly!	11/11/2015 1:14 PM
3	Most students are very involved	11/9/2015 5:25 PM
4	can be improved!	11/9/2015 5:01 PM
#	**Comments for "Mathematical Reasoning"**	**Date**
1	One yes, two no.	11/24/2015 3:25 PM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM

3	Cut back on required courses so that students can learn on their own skills like this. Mentors can guide students toward this self education.	11/15/2015 9:18 AM
4	probably deficient, but high variable. One size should not fit all	11/11/2015 7:30 PM
5	Yes! Students need this! I think a first year 2 course sequence on 1) intro to research design and 2) a course on analysis (different kinds, depending on what is appropriate: spatial, modeling, parametric stats, Bayesian stats), would put them in a much better state for attacking research seriously early-on.	11/11/2015 1:14 PM
6	There is a high variance - better pre-screen of students during the recruitment process or offer remedial alternatives. Also evaluate how these are integrated into the curriculum	11/9/2015 5:25 PM
7	see above! Statistics required. Tecnicas can only do so much!	11/9/2015 5:01 PM
8	Linear algebra should be incorporated into curriculum somehow, also exposure to scripting / programming	11/9/2015 4:41 PM
#	**Comments for "Statistical skills"**	**Date**
1	One yes, two no.	11/24/2015 3:25 PM
2	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
3	Cut back on required courses so that students can learn on their own skills like this. Mentors can guide students toward this self education.	11/15/2015 9:18 AM
4	Hire a faculty member with excellent communication skills and desire to emphasize biometry/statistics & teach it. Probably from the perspective of utilizing "R"	11/11/2015 7:30 PM
5	See response for mathematical reasoning. Mathematical and statistical skills are not so distinct to me.	11/11/2015 1:14 PM
6	Please see my course suggestion above.	11/10/2015 5:45 PM
7	More basic experimental design and statistics courses - perhaps a seminar or seminars reviewing papers providing examples of GLM, Bayesian statistics, information theoretical approach etc.	11/10/2015 9:42 AM
8	It may has something to do with the math training.	11/9/2015 9:15 PM
9	There is a high variance - either do a better pre-screen of students during the recruitment process or else offer remedial alternatives. Also evaluate how these are integrated into the curriculum	11/9/2015 5:25 PM
10	see above! A well-structured or targeted statistics course should be mandatory for CIAM students	11/9/2015 5:01 PM
#	**Comments for "Time management"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:22 PM
2	My perception is that students are not moving in a timely manner through their program of study. Not enough sense of urgency? Grad school a holding tank? Don't know what is coming next?	11/11/2015 1:14 PM
3	Good question- if you come up with a solution please contact me.	11/10/2015 9:42 AM
4	Very few students are able to keep to a schedule but drivers may vary: some are not full time students in practice, some value more performance in courses over performance in research, some can not balance TA goals with courses and research (not able to multitask). Pre-screen students better, create better guidelines about our expectations, many students do not think that they should do research during the summer.	11/9/2015 5:25 PM
5	It all depend of the mentor! But students in general tend to be bad with time management	11/9/2015 5:01 PM

Q5 FACULTY

Answered: 33 Skipped: 5



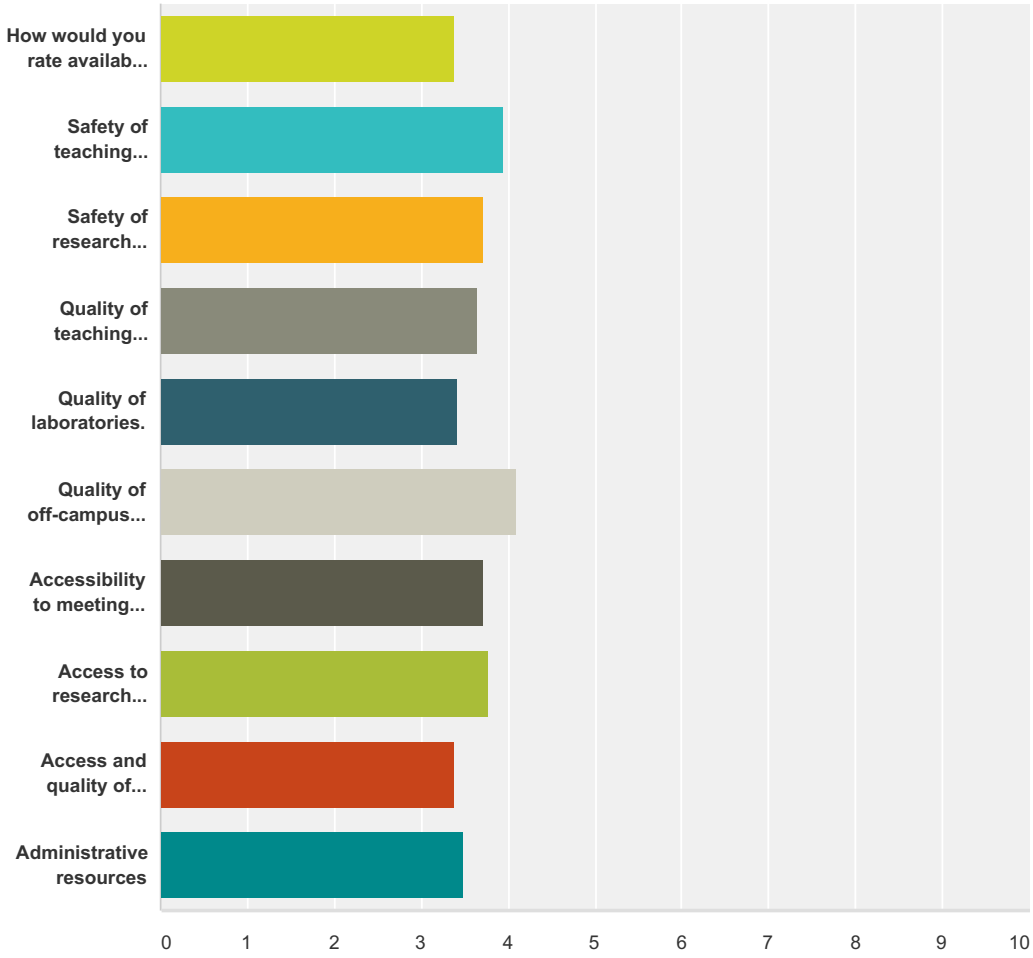
	Very deficient	Deficient	Regular	Satisfactory	Very satisfactory	Total	Weighted Average
How would you rate the graduate faculty overall?	0.00% 0	3.13% 1	12.50% 4	56.25% 18	28.13% 9	32	4.09
Match between faculty expertise and course offerings.	0.00% 0	3.85% 1	30.77% 8	38.46% 10	26.92% 7	26	3.88
Mentorship skills	4.00% 1	0.00% 0	36.00% 9	40.00% 10	20.00% 5	25	3.72
Research productivity	0.00% 0	3.70% 1	18.52% 5	40.74% 11	37.04% 10	27	4.11
Efficiency and clarity in faculty evaluation reporting.	5.00% 1	10.00% 2	35.00% 7	35.00% 7	15.00% 3	20	3.45
Diversity and scope of research areas	4.17% 1	8.33% 2	20.83% 5	50.00% 12	16.67% 4	24	3.67
Full Time/Part-time faculty ratio	4.76% 1	9.52% 2	28.57% 6	47.62% 10	9.52% 2	21	3.48
Faculty salaries	18.18% 4	18.18% 4	36.36% 8	27.27% 6	0.00% 0	22	2.73
Sabbatical opportunities	36.36% 8	27.27% 6	22.73% 5	13.64% 3	0.00% 0	22	2.14

#	Comments for "How would you rate the graduate faculty overall?"	Date
1	Improve recruitment process. Are faculty performance in class being evaluated by students?	11/11/2015 7:44 PM
2	I think in general there are quality faculty available to the program.	11/11/2015 1:39 PM
3	The department has some very good, dedicated people, so I have no recommendations for improvement.	11/10/2015 9:49 AM
4	Great collegiality, very productive for the most part.	11/9/2015 6:02 PM
5	very diverse with a lot to offer. But as a small faculty, students are limited in their choices. We can only accept students who are interested in what we are researching.	11/9/2015 5:09 PM
#	**Comments for "Match between faculty expertise and course offerings."**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Do not know	11/12/2015 8:41 PM
3	I do not know about the current state of this.	11/11/2015 1:39 PM
4	I can't evaluate this question as I don't know the courses; perhaps better to have the graduate students respond as they may know better than faculty.	11/10/2015 9:49 AM
5	Good match for interdisciplinary option, more needed for the the specialized tracks. We a faculty that can do interdisciplinary research combining social and natural sciences. Our capacity to maintain outside faculty will be diminished with budget cuts. One strategy is to complement our faculty with more adjunct faculty but this process needs a major improvement.	11/9/2015 6:02 PM
#	**Comments for "Mentorship skills"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	It might be a good idea to meet and talk about what makes a good mentor, what things a mentor should do, what things a mentor should make sure their students are learning, not facts but skills.	11/15/2015 9:30 AM
3	Do not know	11/12/2015 8:41 PM
4	Some faculty have good mentoring skills, some could use improvement. A mechanism for self assessment, training, and feedback from students would be useful. Faculty often do not recognize that they need to improve their mentoring skills.	11/11/2015 1:39 PM
5	Don't know - this is a question for the graduate students, but perhaps provide specifics as to what is meant by mentorship skills.	11/10/2015 9:49 AM
6	This is not standardized and should be. Faculty need to be evaluated to be able to identify problems when present.	11/9/2015 6:02 PM
7	Time is of the essence! Time release may resolve that!	11/9/2015 5:09 PM
#	**Comments for "Research productivity"**	**Date**
1	As with most departments, there is too much variance here. Improve recruitment process. Use tenure decisions wisely; they should not be automatic.	11/11/2015 7:44 PM
2	Maybe the basic metrics need to be assessed first. How are faculty doing with supervising undergrad and grad students in research? How are they doing with publications, presentations, funding to support their research and that of their students? After that, what do the faculty tell you they need to increase their productivity?	11/11/2015 1:39 PM
3	Don't know as I've never seen a summary of faculty publications each year or over a five year period. I would like to see though.	11/10/2015 9:49 AM
4	when considering available resources!	11/9/2015 5:09 PM
#	**Comments for "Efficiency and clarity in faculty evaluation reporting."**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Do not understand the questions	11/12/2015 8:41 PM
3	Annual reports must be submitted by faculty under a new format.	11/11/2015 4:54 PM
4	I do not know about this.	11/11/2015 1:39 PM
5	No experience with this as I don't teach.	11/10/2015 9:49 AM
6	Positive: Non-tenured faculty get evaluated thoroughly. Negative: Tenured faculty need to receive annual evaluation. They never see their teaching evaluations.	11/9/2015 6:02 PM

#	Comments for "Diversity and scope of research areas"	Date
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	We must reorganize our capacities and areas of future development.	11/11/2015 4:54 PM
3	It would seem that the faculty participants in the envi sci grad program cover an array of topics.	11/11/2015 1:39 PM
4	Insufficient experience to evaluate.	11/10/2015 9:49 AM
5	Good but could be better to include, economics, marine sciences, social sciences	11/9/2015 6:02 PM
6	specifics areas are missing, such as economics and climate! But then again....as a small faculty, there's so much we can offer	11/9/2015 5:09 PM
#	**Comments for "Full Time/Part-time faculty ratio"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Do not know	11/12/2015 8:41 PM
3	Plazas, plazas, plazas. Part-time faculty is slave labor, they should be paid according to scale of full time lecturer. All it takes is money.	11/11/2015 7:44 PM
4	More full time faculty who are committed to the students, research and the institution, are always preferable to an equivalent number of teaching hours covered by part time faculty.	11/11/2015 1:39 PM
5	Insufficient experience to evaluate.	11/10/2015 9:49 AM
#	**Comments for "Faculty salaries"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	With or without compensaciones	11/12/2015 8:41 PM
3	We are far below peers	11/11/2015 10:38 PM
4	See comment above. We have had no significant increases in salary for many years. All it takes is money.	11/11/2015 7:44 PM
5	Obviously, this needs some assist, but with the current crisis in Puerto Rico, what can be done about it?	11/11/2015 1:39 PM
6	As an institution we get below average salaries.	11/10/2015 5:48 PM
7	Not appropriate for me as I'm adjunct.	11/10/2015 9:49 AM
8	Our salaries are one of the lowest in the US considering that we are a research university. solution increase salaries based on merit criteria.	11/9/2015 6:02 PM
9	are we competitive with other schools out there?	11/9/2015 5:09 PM
10	salaries are poor and this affects hiriing / retention and motivation	11/9/2015 4:43 PM
#	**Comments for "Sabbatical opportunities"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Good, if we stay with the usual model of a possible sabbatical every seven years	11/15/2015 9:30 AM
3	When we have had sabbaticals, they were the most generous. The problem is that there have been very few (some last year?) to none over the last 5-6 years. Are they back this year?	11/11/2015 7:44 PM
4	Sabbatical study needs to be reactivated and promoted. It enriches the entire academic community when faculty return with their new knowledge and perspectives.	11/11/2015 1:39 PM
5	There are none.	11/11/2015 12:19 PM
6	Not available.	11/11/2015 12:11 PM
7	Not appropriate for me as I'm adjunct.	11/10/2015 9:49 AM
8	Bad with the fiscal crisis.	11/9/2015 6:02 PM

Q6 Essential resources for faculty, teaching and productivity

Answered: 27 Skipped: 11



	Very deficient	Deficient	Neutral	Satisfactory	Very satisfactory	Total	Weighted Average
How would you rate available resources for teaching and research by faculty and students?	4.35% 1	13.04% 3	26.09% 6	52.17% 12	4.35% 1	23	3.39
Safety of teaching facilities.	0.00% 0	0.00% 0	13.64% 3	77.27% 17	9.09% 2	22	3.95
Safety of research facilities.	0.00% 0	9.52% 2	14.29% 3	71.43% 15	4.76% 1	21	3.71
Quality of teaching classrooms.	0.00% 0	17.39% 4	13.04% 3	56.52% 13	13.04% 3	23	3.65
Quality of laboratories.	0.00% 0	9.52% 2	38.10% 8	52.38% 11	0.00% 0	21	3.43
Quality of off-campus research facilities (El Verde, Cabezas de San Juan, Pico del Este, Toa Baja – Please restrict comments to the state of infrastructure only).	0.00% 0	4.55% 1	9.09% 2	59.09% 13	27.27% 6	22	4.09
Accessibility to meeting rooms	0.00% 0	4.76% 1	33.33% 7	47.62% 10	14.29% 3	21	3.71

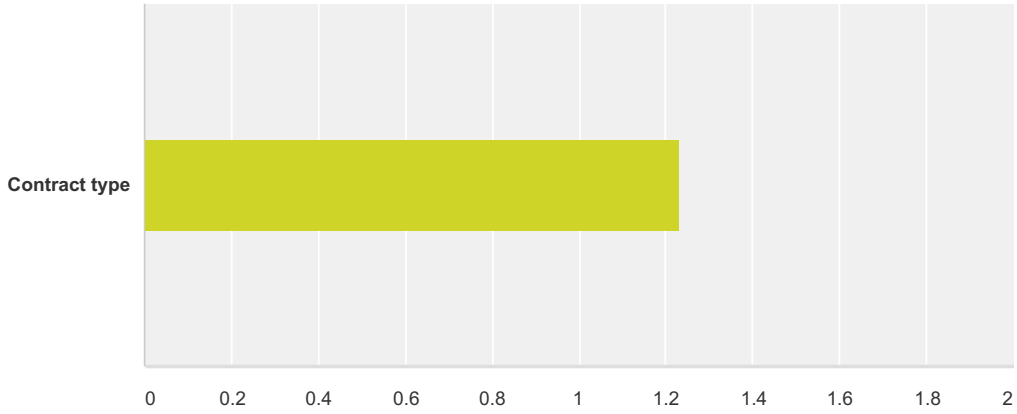
Access to research facilities	**0.00%** 0	**4.55%** 1	**36.36%** 8	**36.36%** 8	**22.73%** 5	22	3.77
Access and quality of office/working space for students	**0.00%** 0	**19.05%** 4	**33.33%** 7	**38.10%** 8	**9.52%** 2	21	3.38
Administrative resources	**4.35%** 1	**4.35%** 1	**39.13%** 9	**43.48%** 10	**8.70%** 2	23	3.48

#	Comments for "How would you rate available resources for teaching and research by faculty and students?"	Date
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Do not know.	11/11/2015 1:39 PM
3	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
4	As mentioned above, we should convert all the classrooms into smart classrooms to facilitate access to web resources and promote long distance learning	11/9/2015 5:09 PM
#	**Comments for "Safety of teaching facilities."**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Do not know.	11/11/2015 1:39 PM
3	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
#	**Comments for "Safety of research facilities."**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Better maintenance of doors; closed access needed for some laboratories in FB	11/11/2015 7:44 PM
3	Do not know.	11/11/2015 1:39 PM
4	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
#	**Comments for "Quality of teaching classrooms."**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Rooms often cannot be darkened sufficiently for presentations	11/11/2015 7:44 PM
3	The teaching classrooms seem ok to me. I understand that all classrooms now have electronic projectors installed.	11/11/2015 1:39 PM
4	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
5	Lab 233 should have a projector installed	11/9/2015 9:19 PM
6	lacking as above! Maybe the rooms where I'm teaching are lacking. Internet is spotty at best!	11/9/2015 5:09 PM
#	**Comments for "Quality of laboratories."**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	equip new labs for new courses	11/11/2015 10:38 PM
3	Some of the research facilities, especially for renewable energy, need more floor space, hood space, etc.	11/11/2015 1:39 PM
4	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
5	Great research laboratories but we lack a teaching laboratory facility dedicated to Environmental Sciences. Also a maintenance plan for research labs is lacking. new labs lack emergency power generators so running experiments and protecting equipment can be an issue.	11/9/2015 6:02 PM
6	Time to process equipment repairs needs to be improved	11/9/2015 5:09 PM
#	**Comments for "Quality of off-campus research facilities (El Verde, Cabezas de San Juan, Pico del Este, Toa Baja – Please restrict comments to the state of infrastructure only)."**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Do not know them.	11/12/2015 8:41 PM
3	I do know that El Verde is under renovation...	11/11/2015 1:39 PM
4	Seems adequate at least for El Verde field station and Sabana Field Research Station for which I am acquainted.	11/10/2015 9:49 AM

5	Better funding towards some facilities is needed, but within the context of a fiscal crisis is hard to know what to recommend. Ideally there	11/9/2015 6:02 PM
6	Students and faculty should take more advantage of that	11/9/2015 5:09 PM
#	**Comments for "Accessibility to meeting rooms"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	We need a medium-sized meeting room for committee and program meetings. Naturales is an obsolete building, constructed when the college was mainly about classroom teaching (or designed by someone who thought that). Consequently there are not enough medium-sized meeting spaces for grad student committee meetings, program meetings (e.g., IGERT), seminars and so on. 229 is good but not enough and it is not designed for meetings and has too many people coming and going through it.	11/15/2015 9:30 AM
3	Do not undestand the questions	11/12/2015 8:41 PM
4	More access to meeting space is needed, especially a decent room for seminars! This would promote participation!	11/11/2015 1:39 PM
5	This is tough throughout the campus.	11/10/2015 5:48 PM
6	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
7	There is good access to conference rooms inside and outside the Department. The "red graduada" has video conferencing facilities.	11/9/2015 6:02 PM
8	Flexibility and time management are key here!	11/9/2015 5:09 PM
#	**Comments for "Access to research facilities"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Does Env Sci have access to the shared facilities of other departments? If not, a more collaborative spirit needs to be promoted among departments, to the enrichment of all.	11/11/2015 1:39 PM
3	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
4	take some creativity...but can be done!	11/9/2015 5:09 PM
#	**Comments for "Access and quality of office/working space for students"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	Do not know what is available	11/12/2015 8:41 PM
3	I do not know about this.	11/11/2015 1:39 PM
4	We need to put more time and effort into upgrading the space in which students work.	11/10/2015 5:48 PM
5	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
6	students do not complain	11/9/2015 6:02 PM
7	seriously lacking!	11/9/2015 5:09 PM
#	**Comments for "Administrative resources"**	**Date**
1	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
2	I do not know about this.	11/11/2015 1:39 PM
3	Insufficient knowledge to provide an answer	11/10/2015 9:49 AM
4	We need a better map of the distribution of responsibilities among staff and who to go for what. There needs to be a more concerted support to collect reporting data and avoid repetitive reporting	11/9/2015 6:02 PM

Q7 Demographic profile

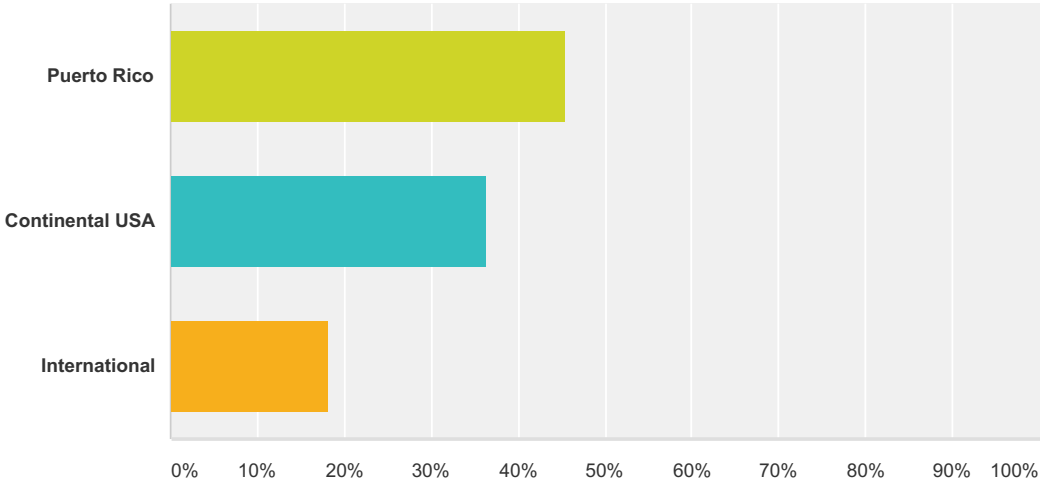
Answered: 31 Skipped: 7



	Full Time Tenured	Full-time Tenure track	Full-time - Contract	Part Time - contract	Member of another department at UPR-RP	Member of another institution	Total	Weighted Average
Contract type	**41.94%** 13	**16.13%** 5	**0.00%** 0	**0.00%** 0	**19.35%** 6	**22.58%** 7	31	1.23

Q8 Where are you from?

Answered: 33 Skipped: 5



Answer Choices	Responses	
Puerto Rico	**45.45%**	15
Continental USA	**36.36%**	12
International	**18.18%**	6
Total		**33**

Q9 What recommendations would provide for a better student experience in the graduate program?

Answered: 18 Skipped: 20

#	Responses	Date
1	Be more selective of students admitted, increase the standards.	11/24/2015 3:30 PM
2	Mejora el apoyo entre los mismos estudiantes atreves de fomentar actividades sociales, proveerles el espacio para que se reúnan estudiantes de distintos profesores y discutan los aspectos de sus proyectos de investigación, etc.	11/23/2015 10:47 AM
3	Actually, I think that the type of class I taught, for two weeks, allowed a lot of direct interaction with me and the students.	11/22/2015 10:14 PM
4	Be more strong in mentoring	11/22/2015 7:24 PM
5	An introductory seminar type course for all new student cohorts that touches upon all aspects of environmental science per the mission of the department. The course would be team taught/lectured by all departmental-associated faculty. This course would serve to improve student exposure to all aspects of env. science. This will also serve as a bonding experience by having each cohort of students meet and interact with each other, as well as meeting all department-associated faculty. Seminar would be pass/fail, and based upon class participation, presentations and classroom exchanges. (No formally graded tests).	11/16/2015 9:18 PM
6	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
7	More emphasis on research and on developing the capacity to learn during and forever after graduate school.	11/15/2015 9:34 AM
8	We can have annual event in El Verde for all graduate students.	11/11/2015 10:42 PM
9	Promote more graduate student interactions and allow them to offer more undergraduate seminars. Teach from the beginning the skills to write and publish a paper before they graduate.	11/11/2015 4:57 PM
10	See comments on curriculum, courses, research.	11/11/2015 1:40 PM
11	Provide opportunities for fellowships , to keep them fully dedicated to their projects	11/10/2015 10:25 PM
12	An more integrated effort to maintain instruments and make them available for all of our students with the proper training.	11/10/2015 5:49 PM
13	Perhaps more seminars based on original literature and less on courses so students can get a stronger introduction to research and current issues in environmental sciences. Also, any way that student interaction can be encouraged it should be. Kudos for a solid weekly seminar program!	11/10/2015 9:53 AM
14	Better access to funding opportunities, develop a program-wide plan to achieve this.	11/9/2015 6:04 PM
15	Better structured plan of activities, opportunities, links to government agency partners and more flexible curriculum.	11/9/2015 5:16 PM
16	PEAFs will allow them to focus on studying and not running town trying to make a dollar to pay their bills. As faculty my plan is to continue looking for grant money that can support them and provide them access to high quality research either through collaboration or others	11/9/2015 5:13 PM
17	Improve funding - 'technical specialist' might be one approach	11/9/2015 4:45 PM
18	More interactive activities among faculty, students, and supporting stuff.	11/9/2015 4:34 PM

Q10 What changes, if any, can you offer to enrich the curriculum?

Answered: 15 Skipped: 23

#	Responses	Date
1	Pienso que currículo es muy completo, sin embargo debe proveer experiencias de campo que le permita al estudiante aplicar los aprendido en el curso. En los cursos de química y biología que lo estudiante se vean expuestos a la química en el suelo, en las aguas , etc. y como esto afecta los recursos. Que puedan entender y reconocer los distintos elementos y sus efectos en los suelos, en las aguas y en el ecosistema en general. La queja que he escuchado de algunos estudiantes es que todo se queda a nivel de teoría en los cursos pero que la experiencia en la practica no la han recibido.	11/23/2015 10:47 AM
2	I would say visiting professors, as was I.	11/22/2015 10:14 PM
3	An introductory seminar type course for all new student cohorts that touches upon all aspects of environmental science per the mission of the department. The course would be team taught/lectured by all departmental-associated faculty. This course would serve to improve student exposure to all aspects of env. science. This will also serve as a bonding experience by having each cohort of students meet and interact with each other, as well as meeting all department-associated faculty. Seminar would be pass/fail, and based upon class participation, presentations and classroom exchanges. (No formally graded tests).	11/16/2015 9:18 PM
4	I do not have information, knowledge or experience to allow me to answer this question	11/15/2015 3:24 PM
5	Make sure there are sufficient courses based on reading the literature and writing.	11/15/2015 9:34 AM
6	I see the need for more interfacing of environmental sciences with physics, chemistry and mathematics, particularly in the areas of environmental modeling. This should complement current strengths of the program in areas related to biology and ecology. Such interfacing would require: 1) strategic faculty appointments; 2) establishing linkages with physics, chemistry and mathematics faculty; 3) attracting graduate students with strong backgrounds in physics and mathematics into the environmental sciences; and 4) and facilitating acquisition of physics/mathematics skills by students with backgrounds in the life sciences.	11/12/2015 4:25 PM
7	Allow interdisciplinary student to take undergraduate courses as part of the requirement for graduate course credits.	11/11/2015 10:42 PM
8	Focal areas of expertise must be identified and promoted. A balanced curriculum that offers interdisciplinarity and areas of specialization within are needed,	11/11/2015 4:57 PM
9	See comments on curriculum, courses, research.	11/11/2015 1:40 PM
10	I would encourage that students develop journal club.	11/10/2015 5:49 PM
11	increase interdisciplinary (team taught courses), make courses from other colleges more accessible to our students	11/9/2015 6:04 PM
12	More interdisciplinary courses, such as environmental law, economics and planning	11/9/2015 5:18 PM
13	Develop new courses and worldwide collaborations. I have collaborators in Germany, Sweden, Brazil who would be happy to receive faculty and students for an extended period of time to learn new tools and work on new projects. Since funding is always an issue, this will have to be worked out first.	11/9/2015 5:13 PM
14	Focus more on technological innovation	11/9/2015 4:45 PM
15	Data acquisition and management Global change studies	11/9/2015 4:34 PM

APPENDIX 7

Student Surveys

APPENDIX 8

Assessment Plan

APPENDIX 8

Assessment Plan

Plan de Assessment del Aprendizaje estudiantil de Cinco Años (2014-2019)
Programa de Ciencias Ambientales

Resumen del Plan de Cinco Años (2014-2019):

Dominios del aprendizaje estudiantil a evaluar por año académico

Dominios del aprendizaje	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Comunicación efectiva	√	√	√	√	√
Investigación y creación	√	√	√	√	√
Pensamiento crítico	√	√	√	√	√
Responsabilidad social					√
Razonamiento lógico matemático			√		
Competencia de información	√			√	
Conocimiento, destrezas y aptitudes propias de la disciplina	√				
Integración de conocimiento				√	
Curiosidad intelectual			√		
Capacidad para el estudio independiente			√		
Liderazgo					√
Trabajo en equipo		√			

Plan de Assessment del Aprendizaje estudiantil de Cinco Años (2014-2019)
Programa de Ciencias Ambientales

Año Académico	Dominios a evaluar	Objetivos de aprendizaje	Cursos donde se evaluará
2014-2015	Comunicación efectiva	Presentar resultados de investigación en forma escrita y exponerlos a discusión abierta con claridad y precisión.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Investigación y creación	Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Pensamiento crítico	Analizar los resultados de la investigación.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Conocimiento, destrezas y aptitudes propias de la disciplina	Analizar los procesos geológicos naturales e inducidos propios de islas y regiones tropicales. Analizar los patrones de cambio ambiental y su efecto en los diversos componentes de la cuenca hidrográfica, así como los cambios en los flujos de energía y materia como consecuencia del impacto de las actividades humanas.	CIAM 8425, CIAM 6115
	Competencia de información	Desarrollar en los estudiantes el rigor en la búsqueda del conocimiento, y un alto sentido ético y de responsabilidad social.	CIAM 6999, CIAM 8999, CIAM 6910,

Año Académico	Dominios a evaluar	Objetivos de aprendizaje	Cursos donde se evaluará
2015-2016	Comunicación efectiva	Presentar resultados de investigación en forma escrita y exponerlos a discusión abierta con claridad y precisión.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Investigación y creación	Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Pensamiento crítico	Analizar los resultados de la investigación.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Trabajo en equipo	Fomentar la participación de otros estudiantes en la búsqueda de soluciones y de alternativas para asuntos y problemas relacionados al ambiente.	CIAM 6115

Plan de Assessment del Aprendizaje estudiantil de Cinco Años (2014-2019)
Programa de Ciencias Ambientales

Año Académico	Dominios a evaluar	Objetivos de aprendizaje	Cursos donde se evaluará
2016-2017	Comunicación efectiva	Presentar resultados de investigación en forma escrita y exponerlos a discusión abierta con claridad y precisión.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Investigación y creación	Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Pensamiento crítico	Analizar los resultados de la investigación.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Razonamiento lógico matemático	Aplicar diversos métodos de análisis estadístico al estudio de los sistemas ambientales.	CIAM 6256
	Curiosidad intelectual	Diseñar estrategias de planificación dirigidas a proteger los ecosistemas y ambientes costeros en zonas tropicales.	CIAM 6117
	Capacidad para el estudio independiente	Diseñar estrategias de planificación dirigidas a proteger los ecosistemas y ambientes costeros en zonas tropicales.	CIAM 6117

Plan de Assessment del Aprendizaje estudiantil de Cinco Años (2014-2019)
Programa de Ciencias Ambientales

Año Académico	Dominios a evaluar	Objetivos de aprendizaje	Cursos donde se evaluará
2017-2018	Comunicación efectiva	Presentar resultados de investigación en forma escrita y exponerlos a discusión abierta con claridad y precisión.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Investigación y creación	Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Pensamiento crítico	Analizar los resultados de la investigación	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Competencia de información	Desarrollar en los estudiantes el rigor en la búsqueda del conocimiento, y un alto sentido ético y de responsabilidad social.	CIAM 6118, EXAMEN DE GRADO
	Integración de conocimiento	Integrar conocimientos adquiridos mediante el estudio profundo y la investigación.	EXAMEN DE GRADO

Plan de Assessment del Aprendizaje estudiantil de Cinco Años (2014-2019)
Programa de Ciencias Ambientales

Año Académico	Dominios a evaluar	Objetivos de aprendizaje	Cursos donde se evaluará
2018-2019	Comunicación efectiva	Presentar resultados de investigación en forma escrita y exponerlos a discusión abierta con claridad y precisión.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Investigación y creación	Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Pensamiento crítico	Analizar los resultados de la investigación.	CIAM 6999, CIAM 8999, CIAM 6910, CIAM 8425
	Responsabilidad social	desarrollar en los estudiantes el rigor en la búsqueda del conocimiento, y un alto sentido ético y de responsabilidad social.	CIAM 6118, CIAM 6990, BIOETICA
	Liderazgo	Participar en la búsqueda de soluciones y de alternativas para asuntos y problemas relacionados al ambiente.	CIAM 6990

Critical Analysis Criteria

Identifies and appropriately formulates the problem, question, or topic: Clearly identifies the challenge and the intrinsic or implicit aspects of the subject. Identifies and explains essential relationships between and among concepts.

Presents, evaluates, analyzes, and uses data / evidence properly: Demonstrates that he/she has selected and evaluated the information. Examines the evidence and the sources from which it was obtained, questions the accuracy and relevance of the data or information gathered. Demonstrates clear organization of ideas according to the importance and impact that each entails.

Develops the argument using other perspectives and positions: Integrates perspectives from a variety of sources to justify the analysis. The analysis of other positions is accurate. Is immersed in a complex process of assessment and justification of challenging ideas.

Effective communication criteria

The language communicates ideas clearly and efficiently. Words are consistent and orderly so that the approach can be understood easily. Uses language appropriate to the discipline. Communication is rich and eloquent. The style is appropriate for the audience and the subject. The organization is clear, the transitions between ideas are smooth. Supports arguments with valid statements and sources. Sources are cited correctly, showing understanding of the concepts discussed.

Original thought criteria:

Develops, presents, and communicates own perspective, hypothesis or positions: Presents and justifies his own view or hypothesis while integrating contrary interpretations. Properly identifies own posture, applying experience and data/information gathered.

University of Puerto Rico
Río Piedras Campus
Natural Science Faculty
Environmental Science Department
Environmental Science Graduate Program

Description of a New Course

1. **Title:** **"**Graduate Research ('Rotation')"

2. **Suggested codification:** "CIAM 6910"

3. **Nu. hours/credit:** 1 - 3 contact hours per week (equivalent to 15 - 45 hours/1 - 3 credits per semester)

4. **Prerequisites, co-requisites and other requirements:** Authorization of the Coordinator of the Environmental Science Graduate Program.

5. **Course description:** Research in Environmental Science supervised by a faculty member in their laboratory, to introduce starting graduate students to concepts, procedures, and techniques employed to conduct research in a specific area. Course may be taken up to two times for a maximum of 6 credits by a student in the M.S. program and up to three times for a maximum of 9 credits by a Ph.D. student.

   Descripción del curso: Investigación en Ciencias Ambientales supervisada por un miembro de la facultad en su laboratorio, para introducir a estudiantes graduados nuevos los conceptos, procedimientos y técnicas empleadas para llevar a cabo la investigación en un área específica. Este curso se puede tomar hasta dos veces por un máximo de 6 créditos por un estudiante en el programa de M.S. y hasta tres veces para un máximo de 9 créditos por un estudiante doctoral.

6. **Objectives**:
   Once completing the course, students will:

   1. Apply the scientific method to solve problems in environmental sciences or related fields.
   2. Analyze and interpret critically the literature published in scientific journals in the area of interest.
   3. Select an original problem on a current topic in environmental sciences or related fields and develop an experimental design aimed at resolving the problem.
   4. Apply modern techniques and methodologies in the selected research area.
   5. Make a written or oral presentation of their research topic to the results of their project.
   6. Develop evaluation criteria and social ethics of research.

7. **Course outline and time distribution:**

Topic	Assigned Time (hours)
Experimental design.	N/A
Field and laboratory research skills.	N/A
Analysis and presentation of research results.	N/A

The course consists of 1-3 credit hours per semester. Students are expected to invest the number of hours needed to complete the research necessary to advance the preparation of the master's thesis or doctoral dissertation.

8. **Instructional strategies:** Demonstrations and practice in experimental techniques and / or methodologies, discussions, oral and written presentations.

   * *Arrangements will be made to provide reasonable accommodation for disabled students who require it.*

9. **Minimal resources available or required:** Laboratory or field facilities**.**

10. **Evaluation strategies:** Achievements will be evaluated by the faculty member hosting the student.

Attitudes towards the research (Dedication, responsability, independence, creativity)	20%
Written or oral presentation of research project	80%
Total	**100%**

** Reasonable accommodation will be made for students with special needs.*

11. **Grading:** Pass (PS, PN, PB), No Pass (NP)

12. **Bibliography:**

a. American Psychological Association, Publication Manual of the American Psychological Association, 6th Ed (2009), 272 pp

b. Block, S. 1996. The DOs and DON'Ts of poster presentation. Biophysical Journal 71:3527-3529

c. Pechenik, J.A. 2007. A Short Guide to Writing about Biology, 6th edition. HarperCollins College Publishers, New York.

d. Purrington, C.B. 2009. Advice on designing scientific posters. http://www.swarthmore.edu/NatSci/cpurrin1/posteradvice.htm. Accesado el 18 de noviembre de 2010.

e. The Associated Press Stylebook 2009 (Associated Press Stylebook and Briefing on Media Law), 43rd Ed, Basic Books; 416 pp

f. The Chicago Manual of Style, 16th Edition (2010), University of Chicago Press, 1026 pp

g. Torres, L. (2002) Estrategias de Intervención para Inclusión. San Juan: Isla Negra.

h. Torres, L. (2002) Asistencia Tecnológica Derecho de Todos. San Juan: Isla Negra.

i. Turabian, Kate L., Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, A Manual for Writers of Research Papers, Theses, and Dissertations, Seventh Edition: Chicago Style for Students and Researchers (Chicago Guides to Writing, Editing, and

Publishing), 7th edition (2007), University of Chicago Press, 436 pp

13. Recommended internet resources:

http://ori.dhhs.gov/education/products/montana_round1/research_ethics.html Online research ethics course, accessed 20 August 2013.

http://www.cur.org/ accessed 20 August 2013

http://www.nature.com/scitable/ebooks/english-communication-for-scientists-14053993 English Communication for Scientists, accessed 20 August 2013.

http://ori.hhs.gov/avoiding-plagiarism-self-plagiarism-and-other-questionable-writing-practices-guide-ethical-writing A guide to ethical writing, The Office of Research Integrity, accessed 20 August 2013.

http://owl.english.purdue.edu/ Purdue University Online Writing Lab, accessed 20 August 2013.

14. Disability Statement: The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.

Universidad De Puerto Rico
Recinto de Río Piedras
Facultad de Ciencias Naturales
Departamento de Ciencias Ambientales
Programa Graduado de Ciencias Ambientales

Descripción de Curso Nuevo

1. **Título:** "Investigación graduada para la Maestría en Ciencias Ambientales"

2. **Codificación sugerida:** "CIAM 6999"

3. **No. de horas/crédito:** 1 - 3 horas contacto semanales (equivalente a 45 - 135 horas/1 - 3 créditos por semestre)

4. **Pre-requisitos, co-requisitos y otros requerimientos:** Autorización del Director o del Coordinador del Programa Graduado de Ciencias Ambientales. El estudiante podrá tomar cualquier combinación de créditos durante su estadía en el programa de maestría, con previa autorización de su supervisor de tesis, siempre que complete un total de 6 créditos de CIAM 6999 antes de graduarse.

5. **Descripción del curso:** Investigación de tesis conducente al grado de Maestría en Ciencias Ambientales.

   Course description: Thesis research leading to the Master degree in Environmental Sciences.

6. **Objetivos:**

   Una vez aprobado el curso, el estudiante será capaz de:

   1. Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.
   2. Desarrollar sus destrezas de investigación en el campo y en el laboratorio.
   3. Integrar conceptos fundamentales de ciencias ambientales en un área particular de investigación.
   4. Analizar sus propios resultados de la investigación, presentarlos en forma escrita y exponerlos a discusión abierta.

7. **Bosquejo de contenido y distribución de tiempo**

Tema	Semanas	Tiempo Asignado (horas)
Repaso y análisis de literatura Trabajo de investigación de campo y laboratorio. Redacción de la tesis y defensa de la misma.	Semanas 1-15	45-135

El curso consta de 45-135 horas por semestre. Un estudiante matriculado en este curso será considerado como estudiante a tiempo completo del Programa de Maestría en Ciencias Ambientales y del Recinto de Río Piedras de la Universidad de Puerto Rico.

8. **Estrategias instruccionales:** Trabajo de investigación de laboratorio y de campo.
   * *Se harán los arreglos para proveer acomodo razonable a los estudiantes con impedimentos que lo requieran.*

9. **Recursos mínimos disponibles o requeridos:** Recursos bibliotecarios, facilidades de laboratorio apropiadas a la investigación, programados especializados e instrumentación de campo.

10. **Estrategias de evaluación:** Evaluación de progreso realizada por el supervisor de tesis. **Evaluación diferenciada a los estudiantes con necesidades especiales.*

11. **Sistema de calificación:** PS, PN, PB, NP

12. **Libro de Texto Sugerido:** No aplica

13. **Bibliografía:** No aplica

    Recursos de Internet Recomendados: No aplica

14. **Derechos de Estudiantes con Impedimentos**: La Universidad de Puerto Rico cumple con todas las leyes federales, estatales y reglamentos concernientes a discriminación, incluyendo "The American Disabilities Act" (Ley ADA) y la Ley 51 del Estado Libre Asociado de Puerto Rico. Los estudiantes que reciban servicios de rehabilitación vocacional deben comunicarse con el (la) profesor(a) al principio del semestre para planificar el acomodo razonable y equipo asistido necesario conforme a las recomendaciones de la Oficina de Asuntos para las Personas con Impedimento (OAPI) del Decanato de Estudiantes. También aquéllos estudiantes que requieren de algún tipo de asistencia o acomodo deben comunicarse con el (la) profesor(a).

Universidad De Puerto Rico
Recinto de Río Piedras
Facultad de Ciencias Naturales
Departamento de Ciencias Ambientales
Programa Graduado de Ciencias Ambientales

Descripción de Curso Nuevo

1. **Título:** "Investigación graduada para el grado doctoral en Ciencias Ambientales"

2. **Codificación sugerida:** "CIAM 8999"

3. **No. de horas/crédito:** 3 - 6 horas contacto semanales (equivalente a 135 - 270 horas/3 - 6 créditos por semestre)

4. **Pre-requisitos, co-requisitos y otros requerimientos:** Autorización del Director o del Coordinador del Programa Graduado de Ciencias Ambientales. El estudiante podrá tomar cualquier combinación de créditos durante su estadía en el programa doctoral, con previa autorización de su supervisor de tesis, siempre que complete un total de 18 créditos de CIAM 8999 antes de graduarse.

5. **Descripción del curso:** Investigación de tesis conducente al grado doctoral en Ciencias Ambientales.

   Course description: Dissertation research leading to the Doctorate degree in Environmental Sciences.

6. **Objetivos:**

   Una vez aprobado el curso, el estudiante será capaz de:
   1. Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.
   2. Desarrollar sus destrezas de investigación en el campo y en el laboratorio.
   3. Integrar conceptos fundamentales de ciencias ambientales en un área particular de investigación.
   4. Analizar sus propios resultados de la investigación, presentarlos en forma escrita y exponerlos a discusión abierta.

7. **Bosquejo de contenido y distribución de tiempo**

Tema	Semanas	Tiempo Asignado (horas)
Repaso y análisis de literatura. Trabajo de investigación de campo y laboratorio. Redacción de la tesis y defensa de la misma.	Semanas 1-15	135-270

El curso consta de 135-270 horas por semestre. Un estudiante matriculado en este curso

será considerado como estudiante a tiempo completo del Programa Doctoral en Ciencias Ambientales y del Recinto de Río Piedras de la Universidad de Puerto Rico.

8. **Estrategias instruccionales:** Trabajo de investigación de laboratorio y de campo.
   * *Se harán los arreglos para proveer acomodo razonable a los estudiantes con impedimentos que lo requieran.*

9. **Recursos mínimos disponibles:** Recursos bibliotecarios, facilidades de laboratorio apropiadas a la investigación, programados especializados e instrumentación de campo.

10. **Estrategias de evaluación**: Evaluación de progreso realizada por el supervisor de tesis y los consejeros del estudiante. Presentación y defensa de la tesis ante la comunidad académica.

11. **Sistema de Calificación:** PS, PN, PB, NP

12. **Libro de Texto Sugerido:** No aplica

13. **Bibliografía:** No aplica

    Recursos de Internet Recomendados: No aplica

14. **Derechos de los estudiantes con Impedimentos:** La Universidad de Puerto Rico cumple con las leyes y regulaciones estatales y federales concernientes a discrimen, incluyendo la Ley 51 del Estado Libre Asociado de Puerto Rico y la ley federal conocida como el American with Disabilities Act 1990 (ADA). Los estudiantes que reciben servicios de rehabilitación vocacional o que requieren algún tipo de asistencia deberán informar al profesor(a) a cargo del curso acerca de esta situación para recibir acomodo razonable para tener acceso igual a la educación y los servicios que ofrece la Universidad de Puerto Rico conforme a las recomendaciones de la Oficina de Asuntos para las personas con Impedimentos (OAPI) del Decanato de Estudiantes.

ENVIRONMENTAL SCIENCES GRADUATE PROGRAM
COLLEGE OF NATURAL SCIENCES
UNIVERSITY OF PUERTO RICO
RÍO PIEDRAS CAMPUS

Research Course Evaluation

Introduction:

The purpose of this evaluation is to encourage communication between graduate students and their research supervisor and evaluate the results of the research experience provided by each research course. During the period of course registration, the research supervisor and the student will discuss and list the student's research goals for the semester based on Departamental Criteria for Student Success (see end of this document for description). At the end of the semester, the student and research supervisor will revise the goals and determine if they were met. Both student and research supervisor will sign this document at the beginning and end of the course. Completing this document is mandatory for any research related course (including, but not limited to, CIAM 6910, CIAM 6999, CIAM 8999, CIAM 6896, CIAM 8896).

I. Beginning of semester: Data about the Student and the Research Supervisor
II. Beginning of semester: Goals and Meetings
III. End of semester: Evaluation of student's achievements at the
IV. End of semester: Evaluation of research course by student
V. End of semester: Comments and Certification

I. Data about the Student and the Research Supervisor

Student's name: _____ (Name) _____ (Last name)

Student Number: _____

Degree sought ☐ Masters ☐ Ph.D.

Supervisor's name _____

Department _____

Supervisor's Extension _____ Research Supervisor's e-mail _____

Course number: _____ Course name: _____

Academic Year 20____ - 20____ _____ 1st semester _____ 2nd semester _____ summer

II. Beginning of semester: Goals and Meetings

a) Main goals of research course: Before the course starts, the student and his/her supervisor will discuss their goals for the semester to help the student advance in his/her academic development.

Specific goals agreed upon BEGINNING of semester based on Departmental Goals **Instructions:** **1. Write goals in the cells below.** **2. Identify with an X the criteria* that will be evaluated with each goal. Note one goal may evaluate various criteria** *Meaning of these criteria can be found at the end of this document		Critical Thinking	Research creation and original thought	Effective communication
1				
2				
3				
4				
5				

b) Meeting times:

How often during the semester the student and research supervisor will meet to achieve the goals mentioned above: _____

During course registration, student and research supervisor verify that the goals for the semester are clear and achievable. Departmental goals of critical thinking, original thought and effective communication (Description included at the end of this document) will be discussed at the beginning of the semester.

Comments and Certification Before BEGINNING of Research Course

Student's Comments:	Supervisor's Comments:
_____	_____
_____	_____
_____	_____

We certify that we have discussed the expected goals before the beginning of the course:

_____	_____
Student's name	Supervisor's name
_____	_____
Student's signature	Supervisor's signature
_____	_____
Date	Date

III. End of semester: Evaluation of student's achievements

a) Evaluation of attainment of student's goals based on Departamental criteria*

*Meaning of these criteria can be found at the end of this document

END of SEMESTER evaluation of student's achievement's based on Departmental Criteria				EXCELENT	GOOD	AVERAGE	POOR	VERY POOR
	Critical Thinking	Research creation and original thought	Effective communication					
1								
Evaluation Method								
2								
Evaluation Method								
3								
Evaluation Method								
4								
Evaluation Method								
5								
Evaluation Method								

C – Additional Comments on Students Performance

IV. Evaluation of research course by student

	Yes	No
1. Did you discuss your goals with your supervisor before the start of the semester?	☐	☐
2. How often did you meet with your supervisor?		
3. Did you receive appropriate and sufficient guidance during the course?	☐	☐
4. Was your work periodically evaluated regarding its quality?	☐	☐

5. Mention your most important achievements during this research course? (for example: training in X skill, advancement in scientific writing and oral communication, improvement in critical thinking, developing a theoretical framework, advancement in proposal writing, publications, development of creative ideas, etc)

6. How did this course help you advance your goals as a graduate student in Environmental Sciences?

7. Mention here any suggestions to improve the experience of future students in a research course like this.

V. End of Semester Comments and Certification

Comments and Certification at the End of Research Course

Student's Comments:	Supervisor's Comment:

We certify that we have discussed these goals at the end of the course:

Student's name	Supervisor's name
Student's signature	Supervisor's signature
Date	Date

---------- o ----------

Description of Environmental Sciences Graduate Program criteria for graduate student's success

Critical Analysis Criteria

Identifies and appropriately formulates the problem, question, or topic: Clearly identifies the challenge and the intrinsic or implicit aspects of the subject. Identifies and explains essential relationships between and among concepts.

Presents, evaluates, analyzes, and uses data / evidence properly: Demonstrates that he/she has selected and evaluated the information. Examines the evidence and the sources from which it was obtained, questions the accuracy and relevance of the data or information gathered. Demonstrates clear organization of ideas according to the importance and impact that each entails.

Develops the argument using other perspectives and positions: Integrates perspectives from a variety of sources to justify the analysis. The analysis of other positions is accurate. Is immersed in a complex process of assessment and justification of challenging ideas.

Effective communication criteria

The language communicates ideas clearly and efficiently. Words are consistent and orderly so that the approach can be understood easily. Uses language appropriate to the discipline. Communication is rich and eloquent. The style is appropriate for the audience and the subject. The organization is clear, the transitions between ideas are smooth. Supports arguments with valid statements and sources. Sources are cited correctly, showing understanding of the concepts discussed.

Original thought criteria:

Develops, presents, and communicates own perspective, hypothesis or positions: Presents and justifies his own view or hypothesis while integrating contrary interpretations. Properly identifies own posture, applying experience and data/information gathered.

Student Name: _____ Departament: Environmental Sciences

Thesis/ /Dissertation/ / Rubric – Completed by:_____Date:_____

Attribute	Does Not Meet Expectations	Meets Expectations	Exceeds Expectations
Overall quality of science	☐ Arguments incoherent or flawed ☐ Objectives are poorly defined ☐ Demonstrates poor understanding of theoretical concepts ☐ Displays limited creativity and insight ☐ Little potential for success of research	☐ Arguments are coherent and clear ☐ Objectives are clear ☐ Demonstrates understanding of theoretical concepts ☐ Displays creativity and insight ☐ Good potential for success of research	☐ Arguments are superior ☐ Objectives are well defined ☐ Demonstrates mastery of theoretical concepts ☐ Displays exceptional creativity and insight ☐ Excellent potential for success of research
Information literacy	☐ Reflects poor understanding of subject matter and associated literature ☐ Lacks regulatory compliance ☐ Documentation is inadequate	☐ Reflects understanding of subject matter and associated literature ☐ Considers regulatory compliance ☐ Documentation is adequate	☐ Reflects mastery of subject matter and associated literature. ☐ Demonstrates regulatory compliance ☐ Documentation is excellent
Overall breadth of knowledge	☐ Demonstrates rudimentary critical thinking skills ☐ Presentation reveals critical weaknesses in depth of knowledge in subject matter ☐ Presentation is narrow in scope	☐ Demonstrates average critical thinking skills ☐ Presentation reveals some depth of knowledge in subject matter ☐ Presentation reveals the ability to draw from knowledge in several disciplines	☐ Exhibits mature, critical thinking skills ☐ Presentation reveals exceptional depth of subject of knowledge ☐ Presentation reveals the ability to interconnect and extend knowledge from multiple disciplines
Quality of oral communication	☐ **U**se and knowledge of technical terminology and concepts is poor ☐ Oral expressions is poor ☐ Organization of ideas is poor	☐ **U**se and knowledge of technical terminology and concepts is adequate ☐ oral expressions is adequate ☐ Organization of ideas is adequate	☐ **U**se and knowledge of technical terminology and concepts is excellent ☐ oral expressions is excellent ☐ Organization of ideas is excellent
Overall Assessment	☐ Does not meet expectations	☐ Meets Expectations	☐ Exceeds Expectations
Confidential Comments:			

Revisada diciembre 2014

Oral Presentation Rubric

TRAIT	4	3	2	1
NONVERBAL SKILLS				
EYE CONTACT	Holds attention of entire audience with the use of direct eye contact, seldom looking at notes.	Consistent use of direct eye contact with audience, but still returns to notes.	Displayed minimal eye contact with audience, while reading mostly from the notes.	No eye contact with audience, as entire report is read from notes.
BODY LANGUAGE	Movements seem fluid and help the audience visualize.	Made movements or gestures that enhances articulation.	Very little movement or descriptive gestures.	No movement or descriptive gestures.
POISE	Student displays relaxed, self-confident nature about self, with no mistakes.	Makes minor mistakes, but quickly recovers from them; displays little or no tension.	Displays mild tension; has trouble recovering from mistakes.	Tension and nervousness is obvious; has trouble recovering from mistakes.

COMMENTS:

VERBAL SKILLS				
ENTHUSIASM	Demonstrates a strong, positive feeling about topic during entire presentation.	Occasionally shows positive feelings about topic.	Shows some negativity toward topic presented.	Shows absolutely no interest in topic presented.
ELOCUTION	Student uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation.	Student's voice is clear. Student pronounces most words correctly. Most audience members can hear presentation.	Student's voice is low. Student incorrectly pronounces terms. Audience members have difficulty hearing presentation.	Student mumbles, incorrectly pronounces terms, and speaks too quietly for a majority of students to hear.

COMMENTS:

CONTENT				
SUBJECT KNOWLEDGE	Student demonstrates full knowledge by answering all class questions with explanations and elaboration.	Student is at ease with expected answers to all questions, without elaboration.	Student is uncomfortable with information and is able to answer only rudimentary questions.	Student does not have grasp of information; student cannot answer questions about subject.
ORGANIZATION	Student presents information in logical, interesting sequence which audience can follow.	Student presents information in logical sequence which audience can follow.	Audience has difficulty following presentation because student jumps around.	Audience cannot understand presentation because there is no sequence of information.
MECHANICS	Presentation has no misspellings or grammatical errors.	Presentation has no more than two misspellings and/or grammatical errors.	Presentation has three misspellings and/or grammatical errors.	Student's presentation has four or more spelling and/or grammatical errors.

COMMENTS:

Student Name: _____ Environmental Science: Master☐ Ph.D☐ Date: _____ Completed by:_____

Exam Rubric

Attribute	☐ Does Not Meet Expectations	☐ Meets Expectations	☐ Exceeds Expectations
Overall quality of science	☐ Arguments incoherent or flawed ☐ Objectives are poorly defined ☐ Demonstrates rudimentary critical thinking skills ☐ Reflects poor understanding of subject matter and associated literature ☐ Demonstrates poor understanding of theoretical concepts ☐ Displays limited creativity and insight ☐ Little potential for success of research	☐ Arguments are coherent and clear ☐ Objectives are clear ☐ Demonstrates average critical thinking skills ☐ Reflects understanding of subject matter and associated literature ☐ Demonstrates understanding of theoretical concepts ☐ Displays creativity and insight ☐ Good potential for success of research	☐ Arguments are superior ☐ Objectives are well defined ☐ Exhibits mature, critical thinking skills ☐ Reflects mastery of subject matter and associated literature. ☐ Demonstrates mastery of theoretical concepts ☐ Displays exceptional creativity and insight ☐ Excellent potential for success of research
Attribute	**☐ Does Not Meet Expectations**	**☐ Meets Expectations**	**☐Exceeds Expectations**
Overall breadth of knowledge	☐ Reveals critical weaknesses in depth of knowledge in subject matter ☐Does not reflect well developed critical thinking skills ☐ Is narrow in scope	☐ Reveals some depth of knowledge in subject matter ☐ Reveals above average critical thinking skills ☐Reveals the ability to draw from knowledge in several areas of the disciplines	☐ Reveals exceptional depth of subject of knowledge ☐Reveals well developed critical thinking skills ☐ Reveals the ability to interconnect and extend knowledge from multiple areas of the disciplines☐
Attribute	**☐ Does Not Meet Expectations**	**☐ Meets Expectations**	**☐Exceeds Expectations**
Quality of response to questions	☐ Responses are incomplete or require prompting ☐ Arguments are poorly presented ☐ Exhibits a lack of knowledge in subject area ☐ Responses doo not meet level expected of a MASTER/PhD graduate	☐ Responses are complete ☐ Arguments are well organized ☐ Exhibits adequate knowledge in subject area ☐ Responses meet level expected of a MASTER/PhD graduate	☐ Responses are eloquent ☐Arguments are skillfully presented ☐ Exhibits superior knowledge in subject area ☐ Responses exceed level expected of a MASTER/PhD graduate
Overall Assessment	☐ Does not meet expectations	☐ Meets Expectations	☐ Exceeds Expectations

Rúbrica CIAM 8425 Dra. Rosana Grafals revisada: noviembre 2014

Criterios	Nivel 1: Inadecuado	Nivel 2: En desarrollo	Nivel 3: Ejemplar
Instrucciones	No sigue las instrucciones en la mayoría del ejercicio. Faltan algunas de las contestaciones. 0pt	Muestra enfoque y esfuerzo limitados. Sigue las instrucciones pero no en todas las preguntas. Algunas contestaciones están incompletas. 0.5pt	Sigue las instrucciones al pie de la letra, contestando cada una de las preguntas y refiriéndose a las distintas partes del ejercicio. 1pts
Organización	Estructura desorganizada. Muestra dificultad para definir las partes del ejercicio. Dificultad para comunicar estructura eficiente. 0pt	Presenta un poco de desorganización. Tiene dificultad para mostrar qué contestación corresponde a qué pregunta. 0.5pt	Presenta la tarea estrictamente en el orden en que se realizó siguiendo la estructura y organización del ejercicio. 1pts
Claridad y precisión al contestar	Utiliza muchas oraciones incompletas, con poco propósito y/o redundantes. Le falta fluidez a los párrafos. Escribe poco y/o deja preguntas en blanco. Se nota el poco esfuerzo realizado. 1pt	Utiliza oraciones completas pero no todo el tiempo. En ocasiones le falta fluidez en los párrafos. Las oraciones pueden ser redundantes y no es muy cuidadoso seleccionando el vocabulario adecuado. Le falta especificidad. 2pts	Utiliza oraciones completas. La estructura de los párrafos tiene principio, cuerpo y fin. Evita las redundancias. Selecciona el vocabulario con cuidado para contestar con precisión y en pocas palabras. 3pts
Conocimiento de conceptos	Identifica los conceptos en ocasiones. Tiene dificultad para explicar en sus propias palabras y demostrar entendimiento. 0pts	Identifica los conceptos pero no siempre logra explicarlos o relacionarlos con exactitud. 1pts	Identifica, diferencia y explica los conceptos con exactitud. 2pts
Solución de problemas	Presenta dificultad para analizar y explicar los conceptos. Análisis crítico ausente. Evidencia de poco o ningún esfuerzo. 0pts	Analiza crítico limitado de conceptos discutidos. Razonamiento ambiguo y esquivo. Esfuerzo limitado. 1pts	Analiza críticamente aplicando los conceptos y el razonamiento apropiados y efectivo para cada problema 2pts
Creatividad y originalidad	No presenta aportaciones individuales ni creativas. 0pt	Presenta dificultad para incorporar razonamiento individual y creativo efectivamente. 1pts	Incorpora ideas propias que no necesariamente se discutieron a directamente y profundamente en clase. 2pts

Criterios	Nivel 1: Inadecuado	Nivel 2: En desarrollo	Nivel 3: Ejemplar

Instrucciones	No sigue las instrucciones en la mayoría del ejercicio. Faltan algunas de las contestaciones. 0pt	Muestra enfoque y esfuerzo limitados. Sigue las instrucciones pero no en todas las preguntas. Algunas contestaciones están incompletas. 1pt	Sigue las instrucciones al pie de la letra, contestando cada una de las preguntas y refiriéndose a las distintas partes del ejercicio. 2pts
Organización	Estructura desorganizada. Muestra dificultad para definir las partes del ejercicio. Dificultad para comunicar estructura eficiente. 0pt	Presenta un poco de desorganización. Tiene dificultad para mostrar qué contestación corresponde a qué pregunta. 1pt	Presenta la tarea estrictamente en el orden en que se realizó siguiendo la estructura y organización del ejercicio. 2pts
Claridad y precisión al contestar	Utiliza muchas oraciones incompletas, con poco propósito y/o redundantes. Le falta fluidez a los párrafos. Escribe poco y/o deja preguntas en blanco. Se nota el poco esfuerzo realizado. 1pt	Utiliza oraciones completas pero no todo el tiempo. En ocasiones le falta fluidez en los párrafos. Las oraciones pueden ser redundantes y no es muy cuidadoso seleccionando el vocabulario adecuado. Le falta especificidad. 3pts	Utiliza oraciones completas. La estructura de los párrafos tiene principio, cuerpo y fin. Evita las redundancias. Selecciona el vocabulario con cuidado para contestar con precisión y en pocas palabras. 6pts
Conocimiento de conceptos	Identifica los conceptos en ocasiones. Tiene dificultad para explicar en sus propias palabras y demostrar entendimiento. 1pts	Identifica los conceptos pero no siempre logra explicarlos o relacionarlos con exactitud. 3pts	Identifica, diferencia y explica los conceptos con exactitud. 6pts
Solución de problemas	Presenta dificultad para analizar y explicar los conceptos. Análisis crítico ausente. Evidencia de poco o ningún esfuerzo. 2pts	Analiza crítico limitado de conceptos discutidos. Razonamiento ambiguo y esquivo. Esfuerzo limitado. 4pts	Analiza críticamente aplicando los conceptos y el razonamiento apropiados y efectivo para cada problema 7pts
Creatividad y originalidad	No presenta aportaciones individuales ni creativas. 2pt	Presenta dificultad para incorporar razonamiento individual y creativo efectivamente. 4pts	Incorpora ideas propias que no necesariamente se discutieron a directamente y profundamente en clase. 7pts

Incorpora ideas propias que no necesariamente se discutieron a directamente y profundamente en clase.
Analiza críticamente aplicando los conceptos y el razonamiento apropiados y efectivo para cada problema
Identifica, diferencia y explica los conceptos con exactitud.

Utiliza oraciones completas. La estructura de los párrafos tiene principio, cuerpo y fin. Evita las redundancias. Selecciona el vocabulario con cuidado para contestar con precisión y en pocas palabras.

APPENDIX 9

Assessment Results

Assessment results – Research Courses 2013-2014

Count of Student Number Row Labels	Total
excellent	7
good	4
(blank)	1
Grand Total	**12**

A- Degree

Academic Level	Num. of students	Percentaje
Masters	3	25%
PhD	9	75%

B- Course

Academic Level	Num. of students	Percentaje
CIAM6669	1	8%
CIAM6669/8999	1	8%
CIAM6910	6	50%
CIAM6999	1	8%
CIAM8999	1	8%
(blank)	2	17%

C- Classifications of Course Goals in Domains

Domain	Communication	Research	Research and Communication	Team Work	Information Competency	Blank
Goal 1	3 (25%)	7 (58%)	1(8%)	1(8%)	-	-
Goal 2	1(8%)	10 (83%)	-	1(8%)	-	-
Goal 3	2 (17%)	8 (67%)	-	-	1(8%)	1(8%)
Goal 4	1(8%)	8 (67%)	-	-	-	3 (25%)
Goal 5	1(8%)	3 (25%)	-	-	-	8 (67%)

D- Evaluations of Course Goals

Domain	Excellent	Good	Average	Poor	Very poor	Blank or N/A
Goal 1	10 (83%)	1(8%)	-	-	-	1(8%)
Goal 2	8 (67%)	3 (25%)	-	-	-	1(8%)
Goal 3	9 (75%)	1(8%)	-	-	-	2 (17%)
Goal 4	6 (50%)	2 (17%)	-	-	-	4 (33%)
Goal 5	1(8%)	1(8%)	-	-	-	10 (83%)

E- Evaluation of Student's Achievement's based on Departmental Goals

Domain	Excellent	Good	Average	Poor	Very poor	Blank or N/A
Critical Thinking	9 (75%)	2 (17%)	-	-	-	1(8%)
Research creation and original thought	10 (83%)	1 (8%)	-	-	-	1(8%)
Effective communication	7 (58%)	4 (33%)	-	-	-	1(8%)

Informe Anual

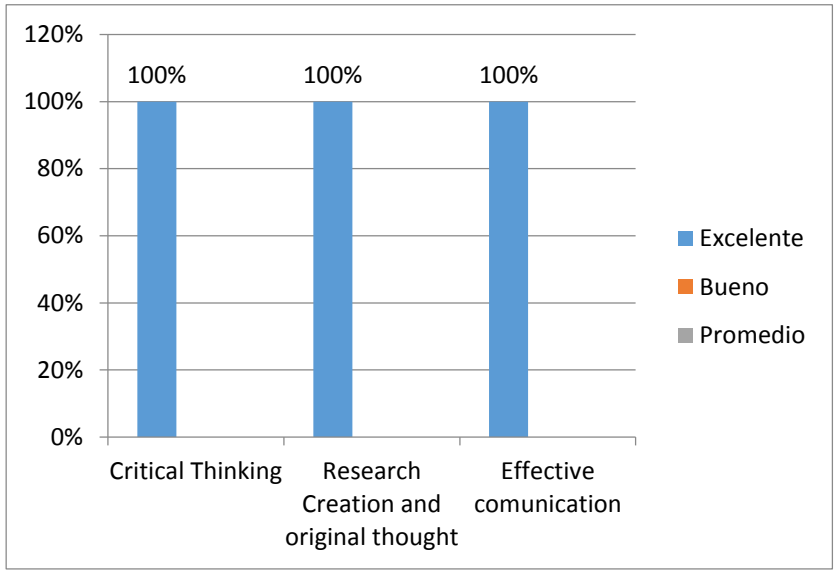
Programa Graduado de Ciencias Ambientales

Resumen de datos del Segundo Semestre Académico 2014-2015

A. Curso CIAM 6999

CIAM RESEARCH	Excelente		Bueno		Promedio		Pobre		Muy Pobre		No Presenta
	5	%	4	%	3	%	2	%	1	%	NP
Critical Thinking	1	100%	0	0%	0	0%	0	0%	0	0%	4
Research Creation and original thought	1	100%	0	0%	0	0%	0	0%	0	0%	4
Effective communication	1	100%	0	0%	0	0%	0	0%	0	0%	4

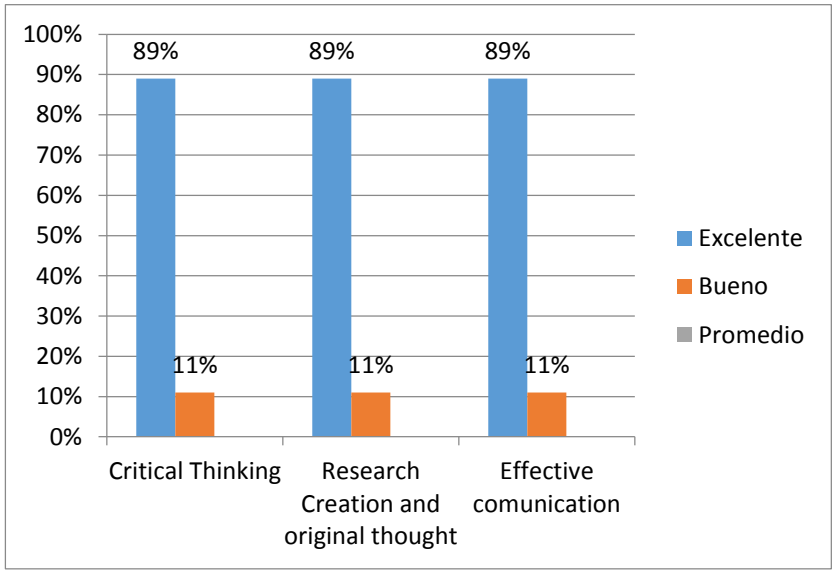
CIAM RESEARCH	3 ó mas		2 ó menos	
	N	%	N	%
Critical Thinking	1	100%	0	0%
Research Creation and original thought	1	100%	0	0%
Effective communication	1	100%	0	0%



B. Curso CIAM 6910

CIAM RESEARCH	Excelente		Bueno		Promedio		Pobre		Muy Pobre		No Presenta
	5	%	4	%	3	%	2	%	1	%	NP
Critical Thinking	8	89%	1	11%	0	0%	0	0%	0	0%	2
Research Creation and original thought	8	89%	1	11%	0	0%	0	0%	0	0%	2
Effective communication	8	89%	1	11%	0	0%	0	0%	0	0%	2

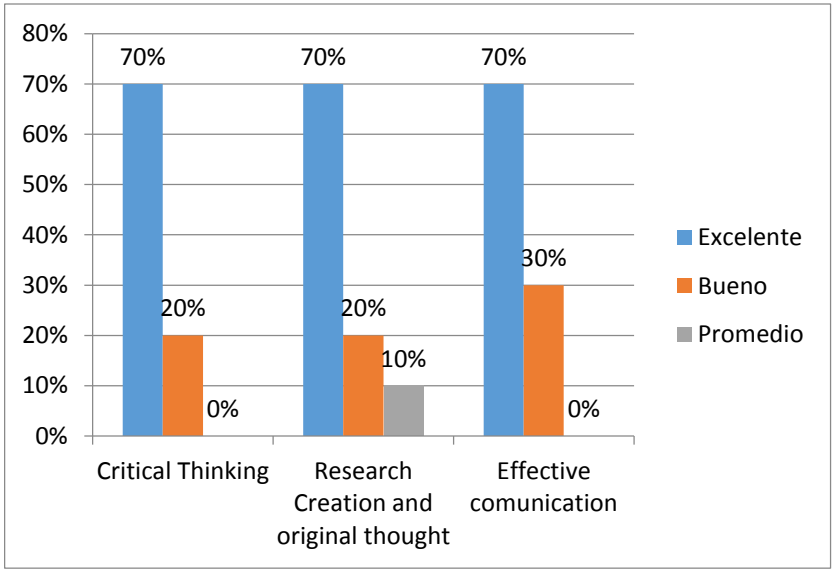
CIAM RESEARCH	3 ó mas		2 ó menos	
	N	%	N	%
Critical Thinking	9	100%	0	0%
Research Creation and original thought	9	100%	0	0%
Effective communication	9	100%	0	0%



C. Curso CIAM 8999

CIAM RESEARCH	Excelente		Bueno		Promedio		Pobre		Muy Pobre		No Presenta
	5	%	4	%	3	%	2	%	1	%	NP
Critical Thinking	7	70%	2	20%	0	0%	1	10%	0	0%	5
Research Creation and original thought	7	70%	2	20%	1	10%	0	0%	0	0%	5
Effective communication	7	70%	3	30%	0	0%	0	0%	0	0%	5

CIAM RESEARCH	3 ó mas		2 ó menos	
	N	%	N	%
Critical Thinking	9	90%	1	10%
Research Creation and original thought	10	100%	0	0%
Effective communication	10	100%	0	0%



Informe Anual

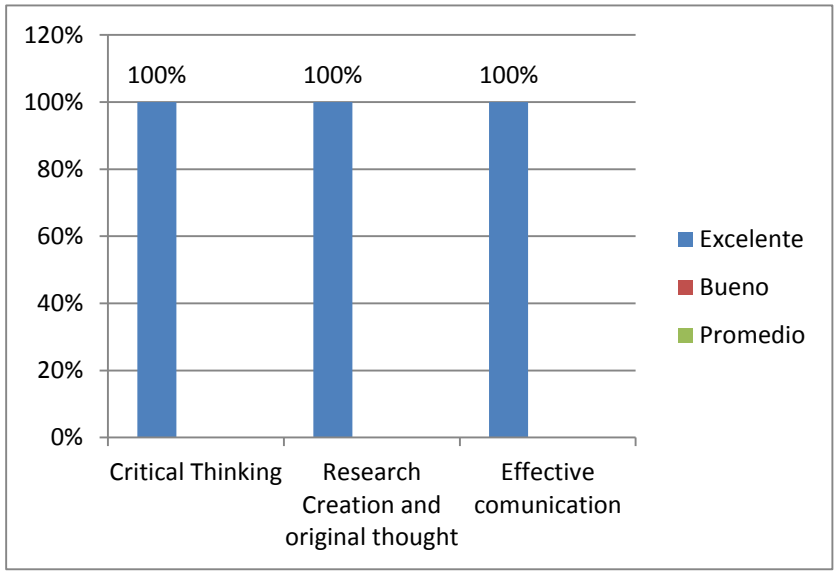
Programa Graduado de Ciencias Ambientales

Resumen de datos del Segundo Semestre Académico 2014-2015

A. Curso CIAM 6999

CIAM RESEARCH	Excelente		Bueno		Promedio		Pobre		Muy Pobre		No Presenta
	5	%	4	%	3	%	2	%	1	%	NP
Critical Thinking	1	100%	0	0%	0	0%	0	0%	0	0%	4
Research Creation and original thought	1	100%	0	0%	0	0%	0	0%	0	0%	4
Effective communication	1	100%	0	0%	0	0%	0	0%	0	0%	4

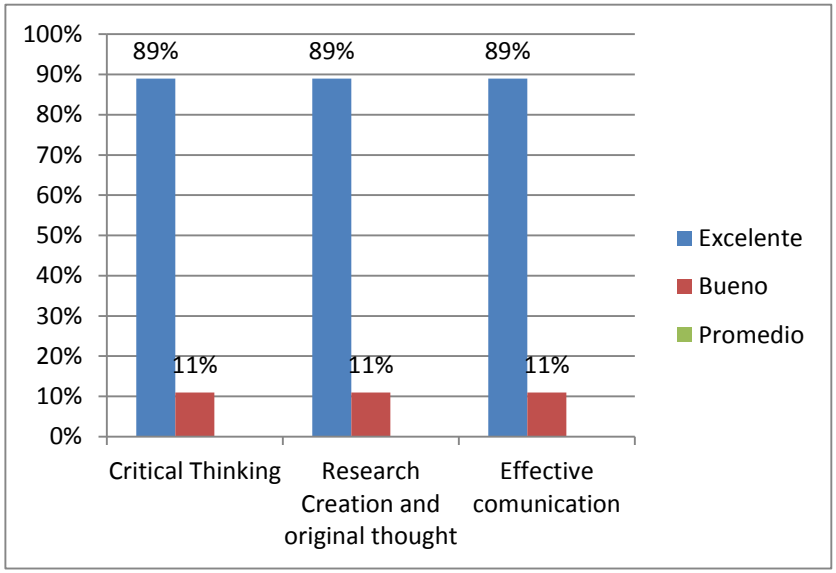
CIAM RESEARCH	3 ó mas		2 ó menos	
	N	%	N	%
Critical Thinking	1	100%	0	0%
Research Creation and original thought	1	100%	0	0%
Effective communication	1	100%	0	0%



B. Curso CIAM 6910

CIAM RESEARCH	Excelente		Bueno		Promedio		Pobre		Muy Pobre		No Presenta
	5	%	4	%	3	%	2	%	1	%	NP
Critical Thinking	8	89%	1	11%	0	0%	0	0%	0	0%	2
Research Creation and original thought	8	89%	1	11%	0	0%	0	0%	0	0%	2
Effective communication	8	89%	1	11%	0	0%	0	0%	0	0%	2

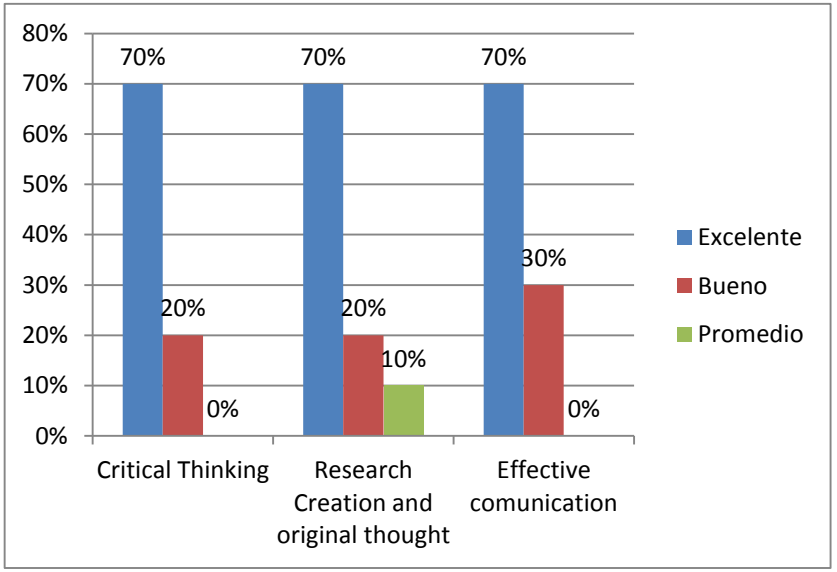
CIAM RESEARCH	3 ó mas		2 ó menos	
	N	%	N	%
Critical Thinking	9	100%	0	0%
Research Creation and original thought	9	100%	0	0%
Effective communication	9	100%	0	0%



C. Curso CIAM 8999

CIAM RESEARCH	Excelente		Bueno		Promedio		Pobre		Muy Pobre		No Presenta
	5	%	4	%	3	%	2	%	1	%	NP
Critical Thinking	7	70%	2	20%	0	0%	1	10%	0	0%	5
Research Creation and original thought	7	70%	2	20%	1	10%	0	0%	0	0%	5
Effective communication	7	70%	3	30%	0	0%	0	0%	0	0%	5

CIAM RESEARCH	3 ó mas		2 ó menos	
	N	%	N	%
Critical Thinking	9	90%	1	10%
Research Creation and original thought	10	100%	0	0%
Effective communication	10	100%	0	0%



OFICINA DE EVALUACIÓN DEL APRENDIZAJE ESTUDIANTIL • UPRRP

UNIVERSIDAD DE PUERTO RICO
RECINTO DE RÍO PIEDRAS

INFORME ANUAL DE *ASSESSMENT* DEL APRENDIZAJE ESTUDIANTIL

PARTE I - DOMINIOS DE LA MISIÓN DEL RECINTO

Programa Académico o Concentración: Programa Graduado de Ciencias Ambientales (MS/PhD) Año Académico: Primer y Segundo Semestre 2014-2015

Dominios de la Misión del Recinto evaluado	Objetivos de aprendizaje estudiantil	Curso o instancia en el cual se recopiló la información	Actividad e Instrumento de avalúo usado (medida directa o indirecta)	Resultados: Comparación del logro esperado con los hallazgos	Acción transformadora a tomarse
Investigación y creación	Formular, diseñar y evaluar un problema de investigación en un área particular de ciencias ambientales.	Tesis CIAM 6999, o Disertación CIAM 8999, CIAM 6910	Rúbrica para tesis y disertación 001: Research creation and original thought criteria Evaluación de cursos de Investigación	**Logro esperado: El 75% de los estudiantes obtendrá un promedio entre *meets and exceeds expectations* conforme a la rúbrica.** **PRIMER SEMESTRE** **A nivel doctoral** se alcanzó y superó el logro esperado **Medida directa**: el 100% (2/2) de los estudiantes a nivel de doctorado obtuvo una puntuación *entre meets or excedes expectations* conforme a la rúbrica.	Continuar el fortalecimiento de una cultura de avalúo en el aprendizaje estudiantil graduado. Revisar los documentos utilizados para uniformar su utilización.

Coordinador/a de assessment: Dr. Gary Gervais Decano/a Facultad: Dr. Carlos I. González Fecha sometido: octubre 2015

Dominios de la Misión del Recinto evaluado	Objetivos de aprendizaje estudiantil	Curso o instancia en el cual se recopiló la información	Actividad e Instrumento de avalúo usado (medida directa o indirecta)	Resultados: Comparación del logro esperado con los hallazgos	Acción transformadora a tomarse
				SEGUNDO SEMESTRE **Logro esperado: El 75% de los estudiantes obtendrá una evaluación entre excelente y promedio en los cursos de investigación.** **A nivel <u>de maestría</u>** se alcanzó y superó el logro esperado: **CIAM 6999** **Medida directa**: el 100% (1/1) de los estudiantes de maestría obtuvo una puntuación de excelente. **A nivel <u>de maestría</u>** se alcanzó y superó el logro esperado: **CIAM 6910** **Medida directa**: el 100% (9/9) de los estudiantes de maestría obtuvo una puntuación de excelente y bueno. **A nivel <u>doctoral</u>** se alcanzó y superó el logro esperado: **CIAM 8999** **Medida directa**: el 100% (10/10) de los estudiantes de maestría obtuvo una puntuación entre excelente y promedio.	
Comunicación efectiva	Presentar resultados de investigación en forma escrita y exponerlos a discusión abierta con claridad y precisión.	Tesis CIAM 6999, o Disertación CIAM 8999,	Rúbrica para tesis y disertación 001:Effective communication criteria	**Logro esperado: El 75% de los estudiantes obtendrá un promedio entre *meets and exceeds expectations* conforme a la rúbrica.**	Continuar el fortalecimiento de una cultura de avalúo en el aprendizaje estudiantil graduado. Revisar los documentos utilizados para uniformar su utilización.

Dominios de la Misión del Recinto evaluado	Objetivos de aprendizaje estudiantil	Curso o instancia en el cual se recopiló la información	Actividad e Instrumento de avalúo usado (medida directa o indirecta)	Resultados: Comparación del logro esperado con los hallazgos	Acción transformadora a tomarse
		CIAM 6910		**PRIMER SEMESTRE** **A nivel <u>doctoral</u>** se alcanzó y superó el logro esperado **Medida directa**: el 100% (2/2) de los estudiantes a nivel de doctorado obtuvo una puntuación *entre meets or excedes expectations* conforme a la rúbrica. **SEGUNDO SEMESTRE** **Logro esperado: El 75% de los estudiantes obtendrá una evaluación entre excelente y promedio en los cursos de investigación.** **A nivel <u>de maestría</u>** se alcanzó y superó el logro esperado: **CIAM 6999** **Medida directa**: el 100% (1/1) de los estudiantes de maestría obtuvo una puntuación de excelente. **A nivel <u>de maestría</u>** se alcanzó y superó el logro esperado: **CIAM 6910**	

Dominios de la Misión del Recinto evaluado	Objetivos de aprendizaje estudiantil	Curso o instancia en el cual se recopiló la información	Actividad e Instrumento de avalúo usado (medida directa o indirecta)	Resultados: Comparación del logro esperado con los hallazgos	Acción transformadora a tomarse
				Medida directa: el 100% (9/9) de los estudiantes de maestría obtuvo una puntuación de excelente y bueno. **A nivel <u>doctoral</u>** se alcanzó y superó el logro esperado: **CIAM 8999** **Medida directa**: el 100% (10/10) de los estudiantes de maestría obtuvo una puntuación entre excelente y promedio	
Pensamiento critico	Analizar los resultados de la investigación.	Tesis CIAM 6999, o Disertación CIAM 8999, CIAM 6910	Rúbrica para tesis y disertación 001: Critical analyisis criteria	**Logro esperado: El 75% de los estudiantes obtendrá un promedio entre *meets and exceeds expectations* conforme a la rúbrica.** **PRIMER SEMESTRE** **A nivel <u>doctoral</u>** se alcanzó y superó el logro esperado **Medida directa**: el 100% (2/2) de los estudiantes a nivel de doctorado obtuvo una puntuación *entre meets or excedes expectations* conforme a la rúbrica. **SEGUNDO SEMESTRE** **Logro esperado: El 75% de los estudiantes obtendrá una evaluación entre excelente y promedio en los cursos de investigación.**	Continuar el fortalecimiento de una cultura de avalúo en el aprendizaje estudiantil graduado. Revisar los documentos utilizados para uniformar su utilización.

Coordinador/a de assessment: Dr. Gary Gervais Decano/a Facultad: Dr. Carlos I. González Fecha sometido: octubre 2015

Dominios de la Misión del Recinto evaluado	Objetivos de aprendizaje estudiantil	Curso o instancia en el cual se recopiló la información	Actividad e Instrumento de avalúo usado (medida directa o indirecta)	Resultados: Comparación del logro esperado con los hallazgos	Acción transformadora a tomarse
				A nivel de maestría se alcanzó y superó el logro esperado: **CIAM 6999** **Medida directa**: el 100% (1/1) de los estudiantes de maestría obtuvo una puntuación de excelente. **A nivel de maestría** se alcanzó y superó el logro esperado: **CIAM 6910** **Medida directa**: el 100% (9/9) de los estudiantes de maestría obtuvo una puntuación de excelente y bueno. **A nivel doctoral** se alcanzó y superó el logro esperado: **CIAM 8999** **Medida directa**: el 90% (9/10) de los estudiantes de maestría obtuvo una puntuación entre excelente y promedio	

PARTE II. Resumen del avalúo llevado a cabo: **En una hoja de papel adicional**, describa **brevemente** las actividades de avalúo llevadas a cabo, cómo fueron desarrollados los instrumentos de avalúo usados, los hallazgos y el análisis de estos hallazgos. Por favor, incluya los instrumentos de avalúo usados. Indique cómo se evaluarán las acciones transformadoras propuestas.

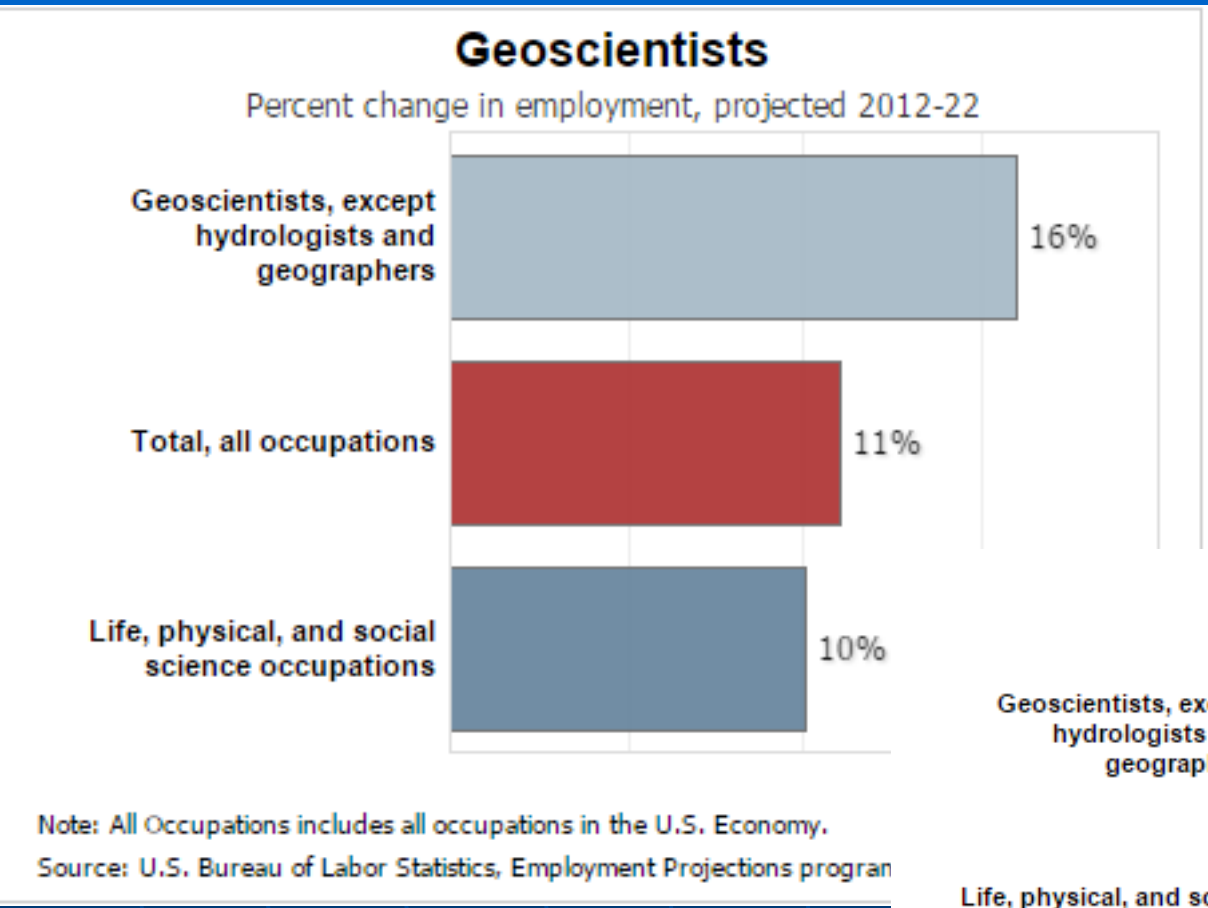
Los dominios de investigación /creación, comunicación efectiva y pensamiento crítico fueron evaluados en la defensa de tesis y en la presentación del seminario de defensa de tesis a nivel de maestría y nivel doctoral en disertación. Para los tres dominios se recogieron medidas directas, en este caso las evaluaciones realizadas por profesores mediante la rúbrica correspondiente. Las rúbricas utilizadas para la tesis y la disertación fueron consideradas y aprobadas por la facultad graduada. La información correspondiente al primer semestre del año académico fue trabajada por la Dra, Lillian Cordero y la Dra. Rosana Grafals. El informe anual fue elaborado en coordinación con la Oficina de Evaluación del Aprendizaje Estudiantil y el Dr. Gary Gervais. En el anejo se incluye la tabulación de los instrumentos de evaluación administrados durante el segundo semestre.

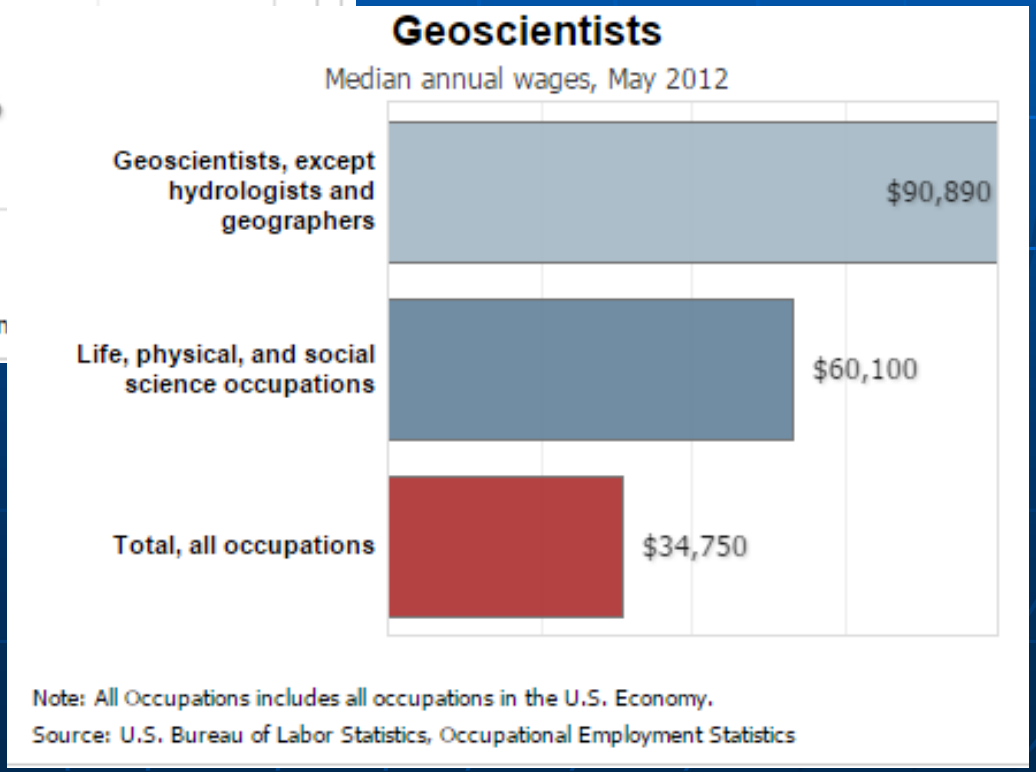
Coordinador/a de assessment: Dr. Gary Gervais Decano/a Facultad: Dr. Carlos I. González Fecha sometido: octubre 2015

APPENDIX 10

Geoscientists Job Statistics

US Bureau of Labor Statistic





US Department of Labor, Employment & Training Administration

- one of three technologies listed as High Growth

Contact Us

Solutions for Business

- Workforce Investment System
- Government Incentives, Tax Credits, and Assistance
- Workforce and Career Information
- Workforce Solutions
- Education and Training

ETA Initiatives

- Ready To Work
- ARRA Grants
- Trade Adjustment Assistance Community College and Career Training grants (TAACCCT)
- H-1B Technical Skills Training Grants
- Green Jobs Initiatives
- Health Care Initiatives
- Community-Based Job

High Growth Industry Profile - Geospatial Technology

Industry Snapshots

- Revenues from the public sector lead geospatial market growth and account for more than one-third of total revenue. While federal governments were among the early adopters of GIS technology, recent trends toward devolving more responsibilities to states and localities have spurred those entities to become important consumers of GIS. While industries in the regulated sector, such as utilities, telecommunications, transportation and education, are the largest consumers of GIS/geospatial solutions, private-sector growth remains dependent upon business adoption based on the added-value these technologies provide. (Daratech, GIS/Geospatial Markets and Opportunities)
- Geospatial products and specialists are expected to play a large role in homeland security activities. Information gathering needs to protect critical infrastructure have resulted in an enormous increase in the demand for such skills and jobs. (Lorraine Castro, NIMA Human Resources Department)
- Because the uses for geospatial technology are so widespread and diverse, the market is growing at an annual rate of almost 35 percent, with the commercial subsection of the market expanding at the rate of 100 percent each year. (Geospatial Information & Technology Association)

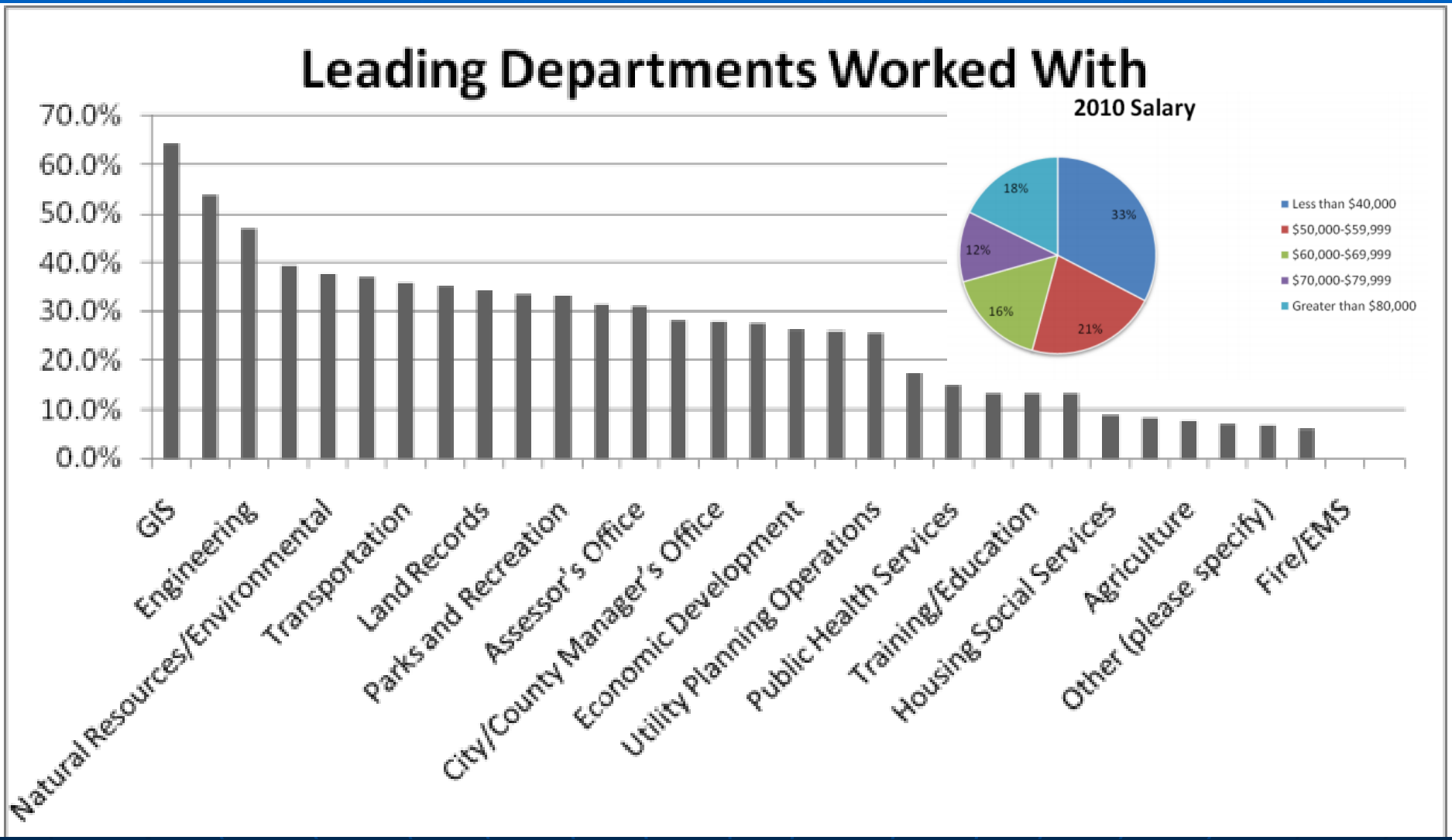
Workforce Issues

Skills, Competencies, and Training

- Emerging occupations within the geospatial technology industry require developing competency models for new applications of geospatial technology. Aligning training in geospatial applications with industry developed competency models is essential to developing the necessary pipeline of skilled workers. This approach is necessary for preparing entry-level workers with basic skills to ensure career success.
- Increasing demand for readily available, consistent, accurate, complete and current geographic information and the widespread availability and use of advanced technologies offer great job opportunities for people with many different talents and educational backgrounds. (U.S. Geological Survey and U.S. Bureau of Labor Statistics)

URISA Salary Survey for IT/GIS Professionals

http://www.urisa.org/clientuploads/directory/Documents/Books%20and%20Quick%20Study/OverallFindings11.pdf



APPENDIX 11

Luquillo Research and Opportunities: Outreach/Education, Facilities

Luquillo Experimental Forest: Research History and Opportunities

Editors

Nancy L. Harris[1], Ariel E. Lugo[2], Sandra Brown,[1] and Tamara Heartsill Scalley.[2]

U.S. Department of Agriculture

Forest Service

EFR-1

May 2012

[1] *Winrock International, Ecosystem Services, 2121 Crystal Drive, Suite 500, Arlington, VA 22202*

[2] *U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, 1201 Calle Ceiba, Jardín Botánico Sur, Río Piedras, PR 00926–1115*

19. Education and Outreach

E. Meléndez Ackerman

Concerted efforts by scientists affiliated with the Institute for Tropical Ecosystems Studies [ITES; formerly the Terrestrial Ecology Division of the Center for Energy and Environmental Research, University of Puerto Rico-Río Piedras] and the Forest Service's International Institute for Tropical Forestry (IITF), Luquillo (LUQ) Long Term Ecological Research (LTER) Program, and El Yunque National Forest have led to developing an array of venues for environmental education and public outreach. Current education and outreach strategies range from the training of future professionals and researchers in ecological and environmental sciences to activities aimed at educating the public on issues related to water and to ecosystem conservation and management strategies in the Luquillo Mountains.

Graduate Education—The LUQ LTER Program has been a magnet for graduate students seeking to conduct research in areas related to tropical ecology. Between 2000 and 2007, more than 30 students working under the sponsorship of the LUQ LTER have earned doctoral or master's degrees. Three current LUQ LTER senior investigators began their careers as graduate students with LUQ LTER senior investigator advisors. The ITES contributes to graduate education in the Luquillo Mountains through the management of the El Verde Field Station (EVFS), which provides logistical support and lodging to ecology course participants who visit the station regularly and on- and off-island graduate students who conduct research for their degree programs.

Summer Internships—Accessible, hands-on research experiences have been proven as an effective strategy for the recruitment and retention of students into the field of ecology because these experiences get them excited about science in general. Each summer, the EVFS, home base of the LUQ LTER Program, hosts the Research Experience for Undergraduates in Ecology and Evolution (REU) summer program (http://ites.upr.edu/REU/). This program is part of a nationwide initiative sponsored by the National Science Foundation's (NSF's) Research Experience for Undergraduate Program that was designed to develop and enhance the knowledge and skills needed for students to conduct their own independent research. Students become familiar with ongoing research at the Luquillo Experimental Forest (LEF) and are paired with research mentors who are actively conducting research in various disciplines (e.g., plant ecology, community ecology, ecosystem research, nutrient cycling, and plant-animal interactions), in different systems (e.g., plant, soils, streams) and levels of organization (from microorganisms to ecosystems). Students are expected to attend workshops and research seminars and conduct scientific research that they will write and publish an article about after completing the internship. The 8-week REU program has been active at the EVFS since 2000 and has supported full fellowships for undergraduate students. The program has become very popular among students; more than 130 applications are received each year from students from all over the country to fill the 8 fellowships offered each summer. Since 2000, the REU program has sponsored research experiences for 76 students from Puerto Rico and the continental United States. Additional undergraduate student research training has also been possible in part through supplemental NSF-REU funds and individual grants from LTER scientists working in the LEF.

Kindergarten to Grade 12 Outreach—Researchers from ITES and IITF have been key contributors in developing science education and training activities that target both teachers and students at the Kindergarten to Grade 12 (K-12) level. Some of the most successful activities incorporate data and lessons learned from the LUQ LTER. Some of the programs are described below.

The *Journey to El Yunque* (http://elyunque.net/journey.html) program is a joint effort between ITES (LTER scientist J.K. Zimmerman) and The Learning Partnership (educational researcher S. McGee), intended to replace 4 weeks of the standard biology curriculum devoted to ecology at the 6th grade level. The Puerto Rico Department of Education has held workshops for more than 500 teachers to share with them this educational resource. In *Journey to El Yunque*, students are able to work with predictive models and compare predictions with LUQ LTER-generated data.

The mission of the *LUQ LTER Schoolyard* (http://luq.lternet.edu/outreach/schoolyard/index.html) program is to increase ecological literacy and promote a scientific culture in K-12 environments and disseminate workshops, internships, and seminars to K-12 teachers and students. This program has leveraged funds from NSF's Instructional Materials Development program and the Puerto Rico Department of Education to develop programs that have reached some 900 Puerto Rico high school teachers**.** Workshops and internships led by ITES and IITF have been provided to students and teachers at the EVFS, the official research site of LUQ LTER.

Ecoplexity is an NSF-funded Web site created by the Teaching Ecological Complexity program (http://ecoplexity.org/home; LTER-ITES scientist Jorge Ortiz Co-PI). This Web site is designed to train high school science teachers to conduct field ecology research and use qualitative modeling to broaden their understanding of complexity, diversity, and ecology as a science. The Web site incorporates products from five LTER Schoolyard sites (including LUQ LTER) and contains a variety of resources (protocols, databases, field guides, links) to help teachers design experiments.

The *Hydrology for the Environment, Life, and Policy (HELP)* program is a joint global initiative between the United Nations Scientific Organization (UNESCO) and the World Metereological Organization aimed at improving the linkage between hydrology and society through facilitating the development of global watershed networks where scientists,

policymakers, and stakeholders can form alliances to maximize economic and social welfare without compromising the sustainability of watershed ecosystems (Ortiz Zayas and Scatena, 2004). In 2001, this UNESCO and Forest Service Washington Office partnership initiative established an international network of watersheds and incorporated seven watersheds in Eastern Puerto Rico (Río Grande de Loíza, Río Espíritu Santo, Río Mameyes, Río Sabana, Río Fajardo, Río Santiago, Río Blanco) that all originate in the Luquillo Mountains. Guided by the goals of the international principle of integrated watershed resource management, HELP's goal is to promote the concept of integrated management of water resources in the Luquillo Mountains (http://luquillohelp.upr.edu/). With that guiding principle, the Luquillo-HELP program seeks to foster the effective dissemination of information related to the water resources of the Luquillo Mountains among all the social sectors of the eastern region of Puerto Rico accountable for managing water resources. Targeted groups include the communities that depend on the water supply from the Luquillo Mountains, water resource managers, scientists focused on hydrology research, government agencies in charge of administering water resources, and government officials in charge of developing public policy on water use. The program is sustained using external funds that support annual workshops and panel discussions to educate the public on issues related to water use, management, and research and includes sponsors from Federal and State agencies including the Forest Service's El Yunque National Forest and IITF, U.S. Geological Survey, U.S. Army Corps of Engineers, Puerto Rico Aqueduct and Sewer Authority, Water Resources Division, Water Plan Office of Department of Natural and Environmental Resources, and The Environmental Quality Board of the Commonwealth of Puerto Rico.

The *El Portal Visitor Center* for the El Yunque National Forest is located on Highway PR 191 at the entrance to the El Yunque National Forest. El Portal offers interactive exhibits designed to inform the visiting public about important aspects related to tropical rain forest diversity and function. Visitors can also request guided tours through the forest. The El Portal Visitor Center is one of several visitor information centers located throughout the forest. The El Yunque receives an estimated 1.2 million visitors annually from Puerto Rico and the continental United States combined. Given the large influx of people into the Luquillo Mountains, El Portal, and associated facilities at El Yunque National Forest, these facilities provide an important outlet for scientific information generated by research and academic institutions about the LEF.

20. Facilities

E. Meléndez Ackerman

Building Facilities

The El Yunque National Forest, also the Luquillo Experimental Forest (LEF), is home to several research facilities that provide logistical support to researchers, students, technicians, and managers from local and off-island institutions. The living and working facilities throughout the forest are described below. The establishment and maintenance of these facilities have contributed greatly to developing cutting-edge research in ecosystem function at the LEF and its position as one of the most well studied tropical forests in the world.

The El Verde Field Station (EVFS), which is situated at 350-meter (m) elevation on the northeastern slope of the Luquillo Mountains, has been a vital location for research and training efforts since the middle of the past century (table 39). It has a rich history, both culturally and scientifically, with some facilities dating back to the late 1930s and some long-term research sites dating back to the 1940s. The station is surrounded by tabonuco forest, the most well-studied vegetation type in the LEF. In 1988, the National Science Foundation established the Luquillo (LUQ) Long Term Ecological Research (LTER) Program and the EVFS has been the principal site for LTER research ever since. The EVFS has provided logistical support to scientists from more than 50 institutions in Puerto Rico and overseas. It is probably the oldest terrestrial ecology field station in Puerto Rico and has increased in usage over time.

Table 39. Activities associated with the El Verde Research Station over the past seven decades.

Years	Activity
1940s	The U.S. Department of Agriculture, Forest Service starts ecological research in four vegetation zones.
1960s	Rain Forest Project, sponsored by the Atomic Energy Commission, studied ecosystem processes at large scales.
1970s	Terrestrial Ecology Division of the Center for Energy and Environment Research conducted research on nutrient cycling and energy flow.
1980s	Rain Forest Cycling and Transport Project initiated by the U.S. Department of Energy and the University of Puerto Rico.
1988 to today	Large-scale, long-term monitoring projects and experiments implemented, many based out of the El Verde Research Area. Some of the largest and most recent include the nutrient addition plots (NSF-MRCE, NSF-CREST), population and community monitoring projects of The Luquillo Long-Term Ecological Research Program (NSF-LTER), The Forest Dynamics Plot (NSF, Andrew Mellon Foundation), and, the most recent, the Canopy Trimming Experiment, established in 2006 (NSF-LTER).

NSF is National Science Foundation
MRCE is Minority Research Centers of Excellence
CREST is Center for Research Excellence in Science and Technology

The Institute for Tropical Ecosystem Studies (ITES) administers the EVFS and surrounding research area (80 acres) under an agreement with the Forest Service. Core facilities include two dormitory buildings and laboratory facilities. An original building with historic value was constructed in 1937 and renovated in the early 1960s at the start of the Howard Odum's Rain Forest Project. A second dormitory-style apartment building was inaugurated in 2007 and has improved the quality of the accommodations at El Verde significantly. Laboratory facilities at EVFS include offices, wet and dry laboratories, storage rooms, a locker room, a carpentry shop, a biodiversity collections room, and a combined conference and computer room. Laboratories at the field station are supplemented by modern analytical facilities operated by ITES in San Juan. Biodiversity collections at the EVFS contain complete collections of the fungi, ferns and dicots, amphibians, and reptiles of the LEF. The herbarium collection will be digitized to incorporate El Verde specimens to the University of Puerto Rico-Río Piedras Virtual Herbarium.

In the forest, researchers have access to a permanent walkup tower that supports environmental monitoring equipment and provides access to canopy vegetation and fauna. This tower also houses a station for the National Atmospheric Deposition Program. A footbridge within the research area allows passage over the Quebrada Sonadora to experimental field plots.

Sabana Field Research Station and Bisley Experimental Watersheds—The Sabana Field Research Station is situated at 265-m elevation within a small community at the outskirts of the LEF. The station is managed by the Forest Service, International Institute of Tropical Forestry (IITF), and houses laboratory facilities and living quarters for visiting students and senior researchers. High-speed Internet is also available within facilities. The site has year-round road access and is just a short drive from the three Bisley Experimental Watersheds where several researchers conduct their studies. The IITF has conducted detailed watershed studies in these adjacent watersheds since 1987, and the site has been part of the LUQ LTER Program since its creation in 1988. The Bisley Experimental Watersheds are located within forest dominated by tabonuco trees and consist of three drainages dedicated to the study of watershed processes within steep forest areas. The research area contains two canopy towers with climate stations and three gauged watersheds nested within the gauged Río Mameyes watershed. Experimental research areas also include a network of permanent vegetation and soil plots and areas dedicated to the study

APPENDIX 12

San Juan ULTRA Final Report

Cover

Federal Agency and Organization Element to Which Report is Submitted:
4900
Federal Grant or Other Identifying Number Assigned by Agency:
0948507
Project Title:
ULTRA-Ex: Social-Ecological System Change, Vulnerability, and the Future of a Tropical City
PD/PI Name:

1. **Ariel E Lugo, Principal Investigator**
2. **Elvia Melendez-Ackerman, Co-Principal Investigator**
3. **Tischa Munoz-Erickson, Co-Principal Investigator**
4. **Luis E Santiago, Co-Principal Investigator**
5. **Jose Seguinot-Barbosa, Co-Principal Investigator**

Recipient Organization:
Fundacion Puertorriquena de Conservacion
Project/Grant Period:
09/15/2010 - 02/28/2014
Reporting Period:
09/01/2013 - 02/28/2014
Submitting Official (if other than PD\PI):

1. **Tischa Munoz-Erickson**
2. **Co-Principal Investigator**

Submission Date:
05/26/2014
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)
Tischa Munoz-Erickson

Accomplishments

*** What are the major goals of the project?**

The San Juan ULTRA-Ex project seeks to develop scientific understanding of the city of San Juan, and in particular the Río Piedras River Watershed (RPRW), as a social-ecological system. The overall objective of the project is to analyze and evaluate the factors affecting the vulnerability and sustainability of the RPRW as the main watershed supporting the city using a transdisciplinary approach that integrates scientific theories and methods from various natural and social sciences with the knowledge and decision-making priorities of city stakeholders as they work towards planning and developing future development strategies for the city.

In the Impacts section we cover the overall outcomes accomplished by San Juan ULTRA over the past four years. In this section we cover specificall the activities and outcomes since September of 2013. Over the past eight months we continued to focus our efforts on synthesizing results, reporting (publishing), developing strategies to sustain the project as a long-term research program, and sharing and communicating the scientific results with the public and our policy partners in San Juan. We report our

activities under the following categories:

(1) **Interdisciplinary Research and Synthesis** of the social-ecological characteristics and condition of the RPRW over the last two years of field work, data collection, and modeling.

(2) **Publication and dissemination** of the scientific results through scientific, policy, and public outlets.

(3) **Institutionalization and network expansion** of interdisciplinary and collaborative scientific research in local and academic institutions to sustain long-term research on social-ecological research in San Juan

(4) **Education and community outreach activities** to involve students, professionals, and members of the public in scientific and education activities about the Rio Piedras River Watershed and the city of San Juan.

(5) Application and implementation of scientific results to a diverse of public and urban planning relevant topics.

*** What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities:

(1) **Interdisciplinary Research and Synthesis**:

6. Conducted follow-up interviews with stakeholders in San Juan Municipality on the governance and knowledge systems analysis conducted in the first year of San Juan ULTRA-Ex. David Flores, a Presidential Management Fellow with the USDA Forest Service, came to San Juan on detail to collaborate on this research.
7. Continued the water quality monitoring along ULTRA's social-ecological sampling sites across the Rio Piedras River Watershed
8. Initiated an analysis fo the documents used to plan and justify the current authorized plan for the channelization of the rio Piedras as part of our consultation with the Municipality of San Juan.
9. Conducted a third graduate seminar on Social-Ecological Systems. Students obtained class credit this year for the seminar.

(2) **Publication and dissemination**:

3. ULTRA researchers continued giving presentations at scientific forums (e.g. Global Land Project Open Science Meeting in Germany), field trips (e.g., Enrique Martí Col), and graduate lectures (e.g., UPR Urban Systems Seminar).
4. Since the fall of 2013, 17 articles have been submitted to journals, 15 are either in press or published.

(3) **Institutionalization and network expansion:**

1. ULTRA researchers are participating in other city networks, including the NSF RCN in Urban Sustainability and the Forest Service Urban Field Station network.

(4) **Education and community outreach activities:**

1. In collaboration with the San Juan Bay Estuary Program, a local non-profit organization, initiated a project entitled "Puente A Puente" (Bridges to Bridges), to promote artistic interactions and interpretations of the ULTRA science on the Rio Piedras River Watershed and produce art installations for 10 bridges that pass over the river. http://sanjuanultra.org/bridges-rivers-and-streams-bio-cultural-interactions-with-the-piedras-river-watershed/. Project activities carried out so far include: presentation of Environmental Cinema, oral history workshops, and reforestation projects.

(5) Application and implementation

1. ULTRA researchers worked with the Municipality of San Juan to hold a public education and discussion workshop on river restoration and flood control to explore alternatives to channelization of the city's main river, the rio Piedras. An expert on the Kissimmee River in Florida was invited as part of the workshop.
2. As a result of the workshop, ULTRA researchers were consulted by the Municipality of San Juan for the development of a proposal to the Puerto Rico Department of the Environment and Natural Resources to conduct science and education workshops on the theme of 'Green alternatives to flood control in the city'.

Specific Objectives:

Significant Results:

Key outcomes or Other achievements:

(1) **Interdisciplinary Research and Synthesis**:

1. Established an External Scientific Advisory Committee with renowed local, national, and international urban social-ecological scientists. They will be visiting San Juan in the near future to evaluate San Juan ULTRA's scientific program and provide recommendations for future research.
2. We have a paper In press that summarizes and synthesizes the key findings from the social-ecological systems study of San Juan. The paper is entitled "Emerging synthesis from the social-ecological systems study of a tropical city" and is in press as part of the Special Feature for San Juan ULTRA in Ecology and Society. http://www.ecologyandsociety.org/issues/view.php?sf=88. Please see the uploaded files for a near final version of this publication.

(2) **Publication and dissemination**:

1. Eleven manuscripts have been accepted (four already published) as part of a Special Issue in the journal Ecology and Society, entitled "Understanding the vulnerability and sustainability of urban social-ecological systems in the tropics: Perspectives from the city of San Juan" http://www.ecologyandsociety.org/issues/view.php?sf=88
2. San Juan ULTRA-Ex was featured in International Innovation, a magazine dedicated to distribute and disseminate scientific innovations to an international audience of decision-makers, professionals, other stakeholders interested in science and technological innovation. PI and Co-PI Ariel E. Lugo and Tischa A. Muñoz-Erickson were interviewed. Please see uploaded files for a copy of the article.
3. Updated San Juan ULTRA website to include scientific publications and profiles of the

research projects (www.sanjuanultra.org)

(3) **Institutionalization and network expansion:**

1. The Social-Ecological Systems Seminar has now become a regular seminar in the University of Puerto Rico and students can obtain credit towards their degree. In addition, the seminar is open and participants from outside the university or ULTRA, such as planners and practitioners, are participating.
2. The San Juan Urban Field Station has been officially established in the USDA Forest Service International Institute of Tropical Forestry, to formalize the instiutional continuity of San Juan ULTRA. The SJ Urban Field Station is now actively involved in the network of Forest Service Urban Field Stations, including collaborations with the Baltimore, New York, Philadelphia, Los Angeles, and Chicago UFS.
3. Through its participation in other city networks, such as the NSF RCN in Urban Sustainability and the Forest Service Urban Field Station, the San Juan ULTRA research network has expanded its composition of researchers and cities, providing new research collaborations among local and national and international researchers. For instance, ULTRA researchers are collaborating with researchers in other cities to conduct cross-city comparisons to see the relevance of San Juan ULTRA findings more broadly.
4. New researchers from new disciplines have joined the ULTRA research network, including from sociology, landscape architecture, and engineering.
5. Presidetial Management Fellow working for the Forest Service came to San Juan on detail to collaborate in the San Juan ULTRA project. This PMF now has a student helping him with the research he conducted while in San Juan.
6. ULTRA researchers collaborated with researchers and institutions across the country and internationally to submit interdisciplinary urban research proposals, including:

- NSF-SRN Ecology and Design: Urban Sustainability Research Netwrok, Submitted by Parsons New School of Design ($12 million, April 2014, pending), with University of Puerto Rico (Rio Piedras, Medical Sciences, and Mayaguez); Polytechnic University, and USDA Forest Service
- NSF-SRN Urban resilience to climate change-driven extreme events, Submitted by Arizona State University ($11,999,692, April 2014, pending), with University of Puerto Rico (Rio Piedras and Medical Sciences) and USDA Forest Service.
- USDA Forest Service National Urban and Community Forestry Advisory Council, Community Services Decision Support Tool (COSER): A interactive management process approach, Submited by Fundación Puertorriqueña de Conservación ($93,240, May 15, pending)

(4) **Education and community outreach activities:**

1. The Puente A Puente project has involved the collaboration of the Municipality of San Juan, the PR Department of Environment and Natural Resources, the Luis Muñoz Marín Foundation, and other local organizations. The project is funded by the Forest Service State and Private Forestry program. http://sanjuanultra.org/bridges-rivers-and-streams-bio-cultural-interactions-with-the-piedras-river-watershed. Thus far this project has engage close to 128 people from the public, including the elderly and school children, in cinema, oral history, and reforestation activities.
2. ULTRA researchers continue to give lectures to undergradute and graduate courses on urban social-ecological issues. Muñoz-Erickson recently gave an invited

lecture to a graduate course in the UPR (Rio Piedras) on Urban Systems, and Elvia Meléndez-Ackerman has given invited lectures to Environmental Economic courses in UPR Rio Piedras and Medical Sciences Campus. Meléndez Ackerman also serves as a mentor of 10th grade students who will be evaluating the variation in pest attack among native species growing at a local arboretume in San Juan, managed by Fundación Luis Muñoz Marín.

3. We have trained and mentored close to 50 undergraduate students and 40 graduate students (including NSF IGERT doctoral students at the University of Puerto Rico, Río Piedras. A number of our undergraduate and graduate students have been succesful at receiving awards and acceptance to participate or present at scientific conferences and workshops, including a SESYNC sponsored workshop for socio-environmental data intensive and synthesis (Please see the Opportunity for training and professional development section below for details).

(5) Application and implementation:

1. At the request of the Municipality of San Juan, we collaborated in developing a public workshop in November of 2013 to discuss issues of floodingin the Río Piedras, entitled "Altnernatives to flood control in the Río Piedras: the case of the Kissimmee River Restoration Project, Florida" and we invited Dr. Steve Bousquin to give a conference and consult with local municipality and planners on their accomplishments in riparian restoration in Florida.
2. Municipality of San Juan proposal (in collaboration with ULTRA) to the Puerto Rico Department of the Environment and Natural Resources, 'Green alternatives to flood control in the city', was succesful. ULTRA researchers are now working with municipal planners in the conceptualization and coordination of workshops.
3. ULTRA researchers are engaged in various local community efforts to provide technical support for green infrastructure projects across the city, evaluate public policy, and develop proposals and new initiatives that bring multiple expertise into the planning process of the city.
4. Through our education and community outreach programs we have engaged member of the public in reforestation activities at multiple sites throughout the RPRW.

*** What opportunities for training and professional development has the project provided?**

A number of these students obtained opportunities to advance their careers in interdisciplinary settings, through doctoral studies, professional workplaces, and funding awards. Here are some examples of Trainee Accomplishments since last reporting period (September 2013)

1. ***Chris Nycht:*** Fellowship in Urban Forestry from the Garden Club of America, ($4,000K) to do research in Urban Forestry in San Juan in 2014. Two abstracts accepted, one for the 2014 Ecological Society of America meeting.
2. ***Molly Ramsey*** participated and presented her paper at the Social Coast Forum 2014. Social Science for Coastal Decision-Making February 18 - 20, 2014, Charleston, South Carolina
3. ***Chris Nycht/Molly Ramsey/Ana Trujillo, Hagmel Rivera***- Their proposal was accepted to participate in a workshop for data-intensive analysis and/or modeling projects that advance socio-environmental synthesis research sponsored

by **SESYNC's** 2014 Computational Summer Institute (CSI) in Annapolis, MD,July 7-11

4. ***Nicholas Correa*** – accepted for Summer Research Experience for Undergraduates at the Missouri Botanical Garden
5. ***Stella Gonzalez –*** 2014 UDALL Scholarship Recipient, accepted to participate in an exchange semester program at the University of New Mexico next fall (CAREERS in FS) and in a study Abroad Semester Program in Ecuador next Spring.
6. ***Sofia Olivero participated*** in the course: Teaching Socio-Environmental Synthesis with Case Studies." The course was held at SESYNC (National Socio-Environmental Synthesis Center) in Annapolis, MD on July 23-26, 2013. A product of this course was an online module by Olivero and Melendez-Ackerman Titled :The Rivas Case Study:. The module addresses environmental problems faced by agro- ecosystems in the face of climate change. The module was implemented in the Introductory Course in Environmental Sciences at the University of Puerto Rico (CINA 3005) and can be accessed online at http://www.secync.org/the-rivas-case-study-case-study-13.
7. ***SofiaOlivero's* Agents of Change project** engaged 15 participants (3 grad students, 3 faculty and 9 undergrads) and two submitted manuscript to *Acta Cientifica and* two senior theses thus far.
8. ***Sofia Olivero*** was accepted to participate in the OTS Course Tropical Ecology and Ecological Approach in La Selva Costa Rica, in the Summer of 2014.

At the request of the Municipality of San Juan, we collaborated in developing a public workshop in November of 2013 to discuss issues of flooding. The workshop was titled flood control in the Río Piedras: the case of the Kissimmee River Restoration Project, Florida" and included a talk by Dr. Steve Bousquin, a scientist working for the Kissimmee River Restoration Project, and panelists Dr. Ariel Lugo, Dr. Pablo Méndez-Lázaro, and Dr. Carlos M. Padín Bibiloni. This workshop provided an opportunity for local planners, architects, and other practitioners to count the workshop as credts towards their professional development.

*** How have the results been disseminated to communities of interest?**

Results have been disseminated through various scientific, policy, community, and artistic venues, including: scientific publications and technical transfer toosl (e.g., bulletins, website, and scientific magazines), scientific conferences, the workshop we held in collaboration with the Municipality of San Juan, quarterly science meetings, our environmental education activities with local communities and schools, and the art intervention projects we are currently developing with local NGO's (e.g. Puente A Puente). We are also very active in announcing and sharing information via email and personal interactions with local stakeholders.

Supporting Files

	Filename	Description
(Download)	p36-38_Ariel_Lugo_and_Tischa_Munoz-Erickson-International Innovation_low res.pdf	Article that featured San Juan ULTRA in International Inn dedicated to the dissemination of advances in science ar private, and public stakeholders.
(Download)	Munoz-Erickson et al._SES Synthesis_In Press.pdf	Manuscript In Press that provides a synthesis of the over ecological system studies of San Juan over the past four a Final Report of the entire project. Please note that this

Back to the top

Products

Books

Book Chapters

Conference Papers and Presentations

Tischa A. Muñoz-Erickson (2014). *Building knowledge-action systems in San Juan, Puerto Rico*. Global Land Project, Open Science Meeting. Berlin, Germany. Status = OTHER; Acknowledgement of Federal Support = Yes

Khrisia Torres Camacho, Sofia Olivero, Angelica Erazo, José Fontanéz, Elizabeth Díaz, Karla Torres, Nicolás Correa, y Elvia Meléndez-Ackerman (2014). *How do people get their yard plants?*. Segundo Encuentro Sub-graduado de Investigación y Creación (SESIC), Iniciativas de Investigación y Actividad Creativa Subgraduada. Hotel Condado Plaza, San Juan, PR. Status = OTHER; Acknowledgement of Federal Support = Yes

Khrisia Torres Camacho, Sofia Olivero, Anglica Erazo, José Fontanéz, Elizabeth Díaz, Karla Torres, Nicolás Correa, y Elvia Meléndez-Ackerman. (2014). *How do people get their years plants? Plant sources in an urban environment.*. 49th ACS Junior Technical Meeting, 34th Puerto Rico Interdisciplinary Scientific Meeting. University of Puerto Rico, Cayey Campus. Status = OTHER; Acknowledgement of Federal Support = Yes

Sofia Olivero and Elvia Meléndez-Ackerman (2013). *Local perceptions on residential green infrastructure within the Rio Piedras Watershed*. C4I3: Ecosystem Services for Sustainability.Third Conference for Sustainability IGERTs. Portland, Oregon. Status = OTHER; Acknowledgement of Federal Support = Yes

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Angelica Erazo, Sofia Olivero, José Fontanéz (2014). *Market value of food grown in Rio Piedras Watershed residential yards.*. My Sustainable Campus - Science for Sustainability: a celebration of knowledge and action. University of Puerto Rico, Rio Piedras Campus. Status = OTHER; Acknowledgement of Federal Support = Yes

Molly Ramsey (2014). *Social-ecological dynamics of flooding within an urban, subtropical watershed: The development of an interdisciplinary research question.*. Department of Environmental Sciences Undergraduate Department Seminar. University of Puerto Rico, Rio Piedras Campus. Status = OTHER; Acknowledgement of Federal Support = Yes

Inventions

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Cusack D.F. (2012). Soil nitrogen levels are linked to decomposition enzyme activities along an urban-remote tropical forest gradient.. *Soil Biology and Biogeochemistry*. 57 192. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

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García-Montiel, D., J. Verdejo-Ortíz, R. Santiago-Bartolomei, C. Vila, L. Santiago, E. Meléndez-Ackerman. (2014). Food sources and accessibility and waste disposal patterns across an urban tropical watershed, implications for the flow of materials and energy.. *Ecology and Society*. 19 (1), 37. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

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Meléndez-Ackerman, E., R. Santiago-Bartolomei, C. Vila, L. Santiago, J. C. Verdejo-Ortíz, D. García-Montiel, H. Manrique, and E. Hernández-Calo (). Social-economic drivers of yard sustainable practices in a tropical city: testing generality of bottom up vs. top down drivers.. *Ecology and Society*. .

Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Muñoz-Erickson T. A., A.E. Lugo, E. Meléndez-Ackerman, L.E. Santiago Acevedo, J. Seguinot-Barbosa, P. Méndez-Lázaro, M. Hall. B. Quintero, A. Ramírez, D. García-Montiel, J. R. Ortíz-Zayas, C.M. Concepción, R. Gilmore Pontius Jr., O. Ramos González, R. Santiago-Bartolomei, J.C. Verdejo Ortíz, M. Luz Cruz-Torres, J. Giusti, J. Vallejo, L. Cray, B. McDowell, J. Zimmerman, V. Cuadrado-Landrau, and M. Figueroa (). Knowledge to serve the city: Insights from an emerging knowledge-action network to address vulnerability and sustainability in San Juan, Puerto Rico.. *Cities and the Environment*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Muñoz-Erickson, T. A. (2014). Co-production of knowledge-action systems in urban sustainable governance: the KASA approach.. *Environmental Science and Policy*. 37 182. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Muñoz-Erickson, T. A. (2014). Multiple pathways to sustainability in the city: the case of San Juan, Puerto Rico. *Ecology and Society*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

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Méndez-Lázaro, P., A. Nieves-Santiago, J. Miranda-Bermúdez. (). Precipitation trend analysis, heavy rainfall, and dry days in San Juan, Puerto Rico. *Ecology and Society*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

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Ramos Gonzalez, O. (). The green areas of San Juan.. *Ecology and Society*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal

Support = Yes ; Peer Reviewed = Yes

Ramos-Santiago, L.E., L. Villanueva-Cubero, J. C. Verdejo-Oriz, Raúl Santiago-Bartolomei, L. Santiago, and Y. Rodríguez-Meléndez (2014). Green area loss in San Juan's inner-ring suburban neighborhoods: a multdisciplinary approach to analyzing green/gray area dynamics. *Ecology and Society*. 19 (2), 4. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Ramírez, A., A. Engman, K.G. Rosas, O. Pérez-Reyes, and D.M. Martinó. (2012). Urban impacts on tropical island stress: some key aspects influencing ecosystem response.. *Urban Ecosystems*. 15 315. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Ramírez, A., K. G. Rosas, A. E. Lugo, and O. Ramos Gonzalez (). Spatio-temporal variation in stream water chemistry in a tropical urban watershed.. *Ecology and Society*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Santiago, L., J.C. Verdejo-Ortíz, R. Santiago-Bartolomei, E. Meléndez-Ackerman, and D. García-Montiel (2014). Uneven access and uderutilization of ecological amenities in urban parks of the Rio Piedras Watershed. *Ecology and Society*. 19 (1), 26. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Torres Camacho, K.A., E.J. Meléndez-Camacho, E. Díaz, N. Correa, C. Vilá, A. Erazo, J. Fontanéz, L. Santiago, and J. Seguinot (). How do people get their yard plants: social-economic factors that may influence the access to native plants to residents of an urban watershed.. *Acta Científica*. . Status = SUBMITTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Vila, C., E. Meléndez-Ackerman, Raúl Santiago-Bartolomei, D. García-Montiel, L. Lastra, C. Figueroa, J. Fumero (). Plant species diversity of residential yards across a tropical watershed: implications for urban sustainability.. *Ecology and Society*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licenses

Other Products

Survey Instruments. Web-based Green Infrastructure Mapping Tool that allows user to register sites along the watershed and enter information through a survey on the sites condition, use, values, and services. http://thinkamap.org/wp-content/share/bda/datosmap/sjultra/registro.php

2002 High-resolution green infrastructure map for San Juan. Publicly available through website: http://thinkamap.org/wp-content/share/bda/datosmap/sjultra/mapa

Other Publications

Patents

Technologies or Techniques

Thesis/Dissertations

Harold Manrique. *Assessing riparian structure and composition in Quebrada Chiclana, Puerto Rico, a restored tropical creek.*. (2013). University of Puerto Rico, Río Piedras. Acknowledgement of Federal Support = Yes

Lori Cornell. *Assessment and modeling of hydrologic response to urbanization in the Rio Piedras Watershed, San Juan, PR: Applying a social-ecological framework using the Integrated Assessment Toolbox.*. (2014). State University of New York,. Acknowledgement of Federal Support = Yes

Yankiomy Hernández. *Drivers of plan biodiversity within residential yards: Potential roles of laws, regulations, and residential covenants.*. (2014). University of Puerto Rico, Rio Piedras. Acknowledgement of Federal Support = Yes

Tischa A. Muñoz-Erickson. *How cities think: knowledge-action systems analysis for urban sustainable governance in San Juan, Puerto Rico*. (2012). Arizona State University. Acknowledgement of Federal Support = Yes

Khrisia Torres. *How do people get their yard plants: social-economic factors that may influence the access to native plants to residents of an urban watershed.*. (2014). University of Puerto Rico, Rio Piedras. Acknowledgement of Federal Support = Yes

Rubén Hernández. *Recreation and health at the Río Piedras River Watershed.*. (2012). University of Puerto Rico, Medical Science Campus. Acknowledgement of Federal Support = Yes

Raúl Santiago-Bartolomei. *Riparian and pluvial restoration of the Rio Piedras and its tributaries: a collaborative framework in the management of ecosystem services*. (2012). University of Puerto Rico, Río Piedras. Acknowledgement of Federal Support = Yes

Websites

Back to the top

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role
Lugo, Ariel	PD/PI

Melendez-Ackerman, Elvia	Co PD/PI
Munoz-Erickson, Tischa	Co PD/PI
Santiago, Luis	Co PD/PI
Seguinot-Barbosa, Jose	Co PD/PI
Barreto, Maritza	Co-Investigator
Carlo Joglar, Tomás	Co-Investigator
Concepcion, Carmen	Co-Investigator
Cusack, Daniela	Co-Investigator
Flores Mangual, Mario	Co-Investigator
Flores Mangual, David	Co-Investigator
García-Montiel, Diana	Co-Investigator
Hall, Myrna	Co-Investigator
Hall, Charlie	Co-Investigator
Heartsill, Tamara	Co-Investigator
Martinuzzi, Sebastián	Co-Investigator
McDowell, William	Co-Investigator
Méndez-Lázaro, Pablo	Co-Investigator
Ortíz-Zayas, Jorge	Co-Investigator
Pontius, Robert 'Gil'	Co-Investigator
Ramos, Olga	Co-Investigator
Ramírez, Alonso	Co-Investigator
Santos, Jennifer	Co-Investigator
Terrasa, José Juan	Co-Investigator
Cuadrado-Landrau, Victor	Other Professional
González, Gabriela	Other Professional
Santiago-Bartolomei, Raúl	Other Professional
Vallejo, Julio	Other Professional
Rosas, Keysa	Technician
Branoff, Benjamin	Graduate Student (research assistant)
Cornell, Lori	Graduate Student (research assistant)
Eraso, Angela	Graduate Student (research assistant)
Guzmán, Paula	Graduate Student (research assistant)
Hernandez, Ruben	Graduate Student (research assistant)
Manrique, Harold	Graduate Student (research assistant)
Nycht, Chris	Graduate Student (research assistant)
Olivero, Sofia	Graduate Student (research assistant)
Quintero, Braulio	Graduate Student (research assistant)
Ramos, Luis	Graduate Student (research assistant)
Ramsey, Molly	Graduate Student (research assistant)
Trujillo, Ana	Graduate Student (research assistant)
Vila, Cristina	Graduate Student (research assistant)
Villanueva, Luis	Graduate Student (research assistant)
Angely Colon, Sofia	Undergraduate Student
Bonilla, Ali	Undergraduate Student
Correa, Nicholas	Undergraduate Student
Diaz Torres, Elizabeth	Undergraduate Student
Fontanez, Jose	Undergraduate Student
Garay, Aramis	Undergraduate Student
Henderson, Amanda	Undergraduate Student
Hernandez, Yankiomy	Undergraduate Student
Lopez, Carla	Undergraduate Student

Peter, Delgado	Undergraduate Student
Torres, Khrisia	Undergraduate Student
Verdejo, Julio	Consultant

Full details of individuals who have worked on the project:

Ariel E Lugo **Email:** alugo@fs.fed.us **Most Senior Project Role:** PD/PI **Nearest Person Month Work**

Contribution to the Project: Principal Investigator for the project.

Funding Support: None

International Collaboration: No **International Travel:** No

Elvia Melendez-Ackerman **Email:** elmelend@gmail.com **Most Senior Project Role:** Co PD/PI **Neare**

Contribution to the Project: Co-PI of the project. Directed the Agents of Change project and Social-Ecol

Funding Support: None

International Collaboration: No **International Travel:** No

Tischa Munoz-Erickson **Email:** tmunozerickson@gmail.com **Most Senior Project Role:** Co PD/PI **Ne**

Contribution to the Project: Program Manager. Involved in most research and education aspects of the p and development of funding proposals.

Funding Support: None

International Collaboration: No **International Travel:** Yes, Germany - 1 years, 1 months, 5 days

Luis E Santiago **Email:** santia2@coqui.net **Most Senior Project Role:** Co PD/PI **Nearest Person Mo**

Contribution to the Project: Co-Principal Investigator of project. Participated in Agents of Change, Social

Funding Support: None

International Collaboration: No **International Travel:** No

Jose Seguinot-Barbosa **Email:** jose.seguinot@upr.edu **Most Senior Project Role:** Co PD/PI **Neares**

Contribution to the Project: Co-Principal investigator of project. Participant in funding proposal developm

Funding Support: None

International Collaboration: No **International Travel:** No

Maritza Barreto **Email:** maritzabarretoorta@gmail.com **Most Senior Project Role:** Co-Investigator **Ne**

Contribution to the Project: Collaborated in the development of the CREST proposal to institutionalize sc collaborating with faculty of the Department of Environmental Sciences through a new lab facility and traini

Funding Support: None

International Collaboration: No **International Travel:** No

Tomás Carlo Joglar **Email:** tac17@psu.edu **Most Senior Project Role:** Co-Investigator **Nearest Pers**

Contribution to the Project: Contributed to the development of new research projects to analyze animal-p the CREST proposal.

Funding Support: None

International Collaboration: No **International Travel:** No

Carmen M Concepcion **Email:** concepcioncm@yahoo.com **Most Senior Project Role:** Co-Investigator

Contribution to the Project: Professor in the Graduate School of Planning, University of Puerto Rico. Col Municipality of San Juan.

Funding Support: none

International Collaboration: No **International Travel:** No

Daniela Cusack **Email:** dcusack@geog.ucsb.edu **Most Senior Project Role:** Co-Investigator **Nearest**

Contribution to the Project: Led the soil biochemical analysis of forested areas in the city of San Juan ar

Funding Support: None

International Collaboration: No **International Travel:** No

Mario Flores Mangual **Email:** mario.flores1@upr.edu **Most Senior Project Role:** Co-Investigator **Nea**

Contribution to the Project: Collaborated in the development of research proposals and contribute soil s the RPRW.

Funding Support: none

International Collaboration: No **International Travel:** No

David Flores Mangual **Email:** davidflores@fs.fed.us **Most Senior Project Role:** Co-Investigator **Near**

Contribution to the Project: Research collaborator on ULTRA governance research with Tischa A. Muño

Funding Support: Presidential Management Fellow, USDA Forest Service

International Collaboration: No **International Travel:** No

Diana García-Montiel **Email:** dgarcia@ites.upr.edu **Most Senior Project Role:** Co-Investigator **Neare**

Contribution to the Project: Diana was a key collaborator in the implementation of household surveys, le expertise to the project as a whole.

Funding Support: None

International Collaboration: No **International Travel:** No

Myrna Hall **Email:** mhhall@esf.edu **Most Senior Project Role:** Co-Investigator **Nearest Person Mont**

Contribution to the Project: Myrna directed Lori Cornell's research on hydrological response to urbanizat

project as a whole.

Funding Support: None

International Collaboration: No **International Travel:** No

Charlie Hall **Email:** chall@esf.edu **Most Senior Project Role:** Co-Investigator **Nearest Person Month**

Contribution to the Project: Advises Braulio Quintero on the analysis of vulnerability to scarcity of energy

Funding Support: None

International Collaboration: No **International Travel:** No

Tamara Heartsill **Email:** theartsill@fs.fed.us **Most Senior Project Role:** Co-Investigator **Nearest Pers**

Contribution to the Project: Contributed to the development of new research projects on linkages betwee associations in the RPRW. Participated in Social-Ecological Systems Seminar

Funding Support: None

International Collaboration: No **International Travel:** No

Sebastián Martinuzzi **Email:** sebamartinuzzi@gmail.com **Most Senior Project Role:** Co-Investigator

Contribution to the Project: Post Doc from University of Wisconsin, Madison on the mapping and analysi

Funding Support: none

International Collaboration: No **International Travel:** No

William McDowell **Email:** bill.mcdowell@unh.edu **Most Senior Project Role:** Co-Investigator **Nearest**

Contribution to the Project: Collaborator in the long-term water sampling and monitoring of the RPRW ar

Funding Support: None

International Collaboration: No **International Travel:** No

Pablo Méndez-Lázaro **Email:** pablo.mendez1@upr.edu **Most Senior Project Role:** Co-Investigator **N**

Contribution to the Project: Pablo leads main efforts in analyzing hydrological and climatic changes for th serves as a link between San Juan ULTRA and the Puerto Rico Climate Change Council.

Funding Support: None

International Collaboration: No **International Travel:** No

Jorge Ortíz-Zayas **Email:** jorgeortiz_ites@yahoo.com **Most Senior Project Role:** Co-Investigator **Nea**

Contribution to the Project: Jorge leads the Quebrada Chiclana project, a evaluation of riparian restorati

Funding Support: None

International Collaboration: No **International Travel:** No

Robert 'Gil' Pontius **Email:** rpontius@clarku.edu **Most Senior Project Role:** Co-Investigator **Nearest**

Contribution to the Project: Gil led the spatial analysis of land cover classification using different land co statistical expertise to the project as a whole.

Funding Support: None

International Collaboration: No **International Travel:** No

Olga Ramos **Email:** oramos@fs.fed.us **Most Senior Project Role:** Co-Investigator **Nearest Person M**

Contribution to the Project: Olga led the development of the spatial analysis of the green infrastructure a

Funding Support: None

International Collaboration: No **International Travel:** No

Alonso Ramírez **Email:** aramirez@ramirezlab.ne **Most Senior Project Role:** Co-Investigator **Nearest**

Contribution to the Project: Leader of the long-term water monitoring program in the RPRW and studies

Funding Support: None

International Collaboration: No **International Travel:** No

Jennifer Santos **Email:** jennifer.santos@gmail.com **Most Senior Project Role:** Co-Investigator **Neare**

Contribution to the Project: Jennifer has been involved in ULTRA's Social-Ecological System Graduate S

Funding Support: None

International Collaboration: No **International Travel:** No

José Juan Terrasa **Email:** jjts2703@yahoo.com **Most Senior Project Role:** Co-Investigator **Nearest**

Contribution to the Project: Collaborator in funding proposals related to the design of green infrastructur

Funding Support: none

International Collaboration: No **International Travel:** No

Victor Cuadrado-Landrau **Email:** thinkamap@gmail.com **Most Senior Project Role:** Other Profession

Contribution to the Project: Information manager and webpage developer for the project.

Funding Support: None

International Collaboration: No **International Travel:** No

Gabriela González **Email:** gabriela@thinkamap.com **Most Senior Project Role:** Other Professional **N**

Contribution to the Project: Provides editorial services for product dissemination/communication through

Funding Support: None

International Collaboration: No **International Travel:** No

Raúl Santiago-Bartolomei **Email:** rauls1984@gmail.com **Most Senior Project Role:** Other Profession

Contribution to the Project: Raúl obtained his Master's degree as a research assistant in ULTRA and is
As a professional in a private consulting firm, Raúl continues to participate and collaborate with ULTRA.

Funding Support: None

International Collaboration: No **International Travel:** No

Julio Vallejo **Email:** vallejo_gonzalez@yahoo.com **Most Senior Project Role:** Other Professional **Nea**

Contribution to the Project: Led the development of education and community outreach events for ULTR
elementary schools, collecting oral histories, and organizing an environmental fair for public education and

Funding Support: US Forest Service State and Private Program

International Collaboration: No **International Travel:** No

Keysa Rosas **Email:** keysa.rosas@gmail.com **Most Senior Project Role:** Technician **Nearest Perso**

Contribution to the Project: Keysa led the field water sampling across the RPRW

Funding Support: None

International Collaboration: No **International Travel:** No

Benjamin Branoff **Email:** benjamin.branoff@gmail.com **Most Senior Project Role:** Graduate Student

Contribution to the Project: Student of PI Ariel Lugo, working on ULTRA-related research and participan

Funding Support: IGERT at University of Puerto Rico, Rio Piedras

International Collaboration: No **International Travel:** No

Lori Cornell **Email:** lmcornell1@gmail.com **Most Senior Project Role:** Graduate Student (research ass

Contribution to the Project: Lori carried out a assessment and modeling of hydrologic response to urban

Funding Support: None

International Collaboration: No **International Travel:** No

Angela Eraso **Email:** angei1787@gmail.com **Most Senior Project Role:** Graduate Student (research a

Contribution to the Project: PhD- UPR Rio Piedras

Funding Support: none

International Collaboration: No **International Travel:** No

Paula M. Guzmán **Email:** paula.m.guzman@upr.edu **Most Senior Project Role:** Graduate Student (res

Contribution to the Project: Master's student working with Pablo Méndez-Lázaro at University of Puerto

Funding Support: none

International Collaboration: No **International Travel:** No

Ruben Hernandez **Email:** rubenjhernandez@gmail.com **Most Senior Project Role:** Graduate Student

Contribution to the Project: As part of his Doctoral dissertation, Rubén analyzed recreation and health b

Funding Support: None

International Collaboration: No **International Travel:** No

Harold Manrique **Email:** harold_river19@hotmail.com **Most Senior Project Role:** Graduate Student (r

Contribution to the Project: As part of his Master's thesis, Harold studied the effects of restoration practi

Funding Support: None

International Collaboration: No **International Travel:** No

Chris Nycht **Email:** chris.nytch@ites.upr.edu **Most Senior Project Role:** Graduate Student (research a

Contribution to the Project: PhD student in the University of Puerto Rico. Contributed to proposal develo related to the Rio Piedras River Watershed.

Funding Support: NSF IGERT

International Collaboration: No **International Travel:** No

Sofia Olivero **Email:** sofia.olivero@gmail.com **Most Senior Project Role:** Graduate Student (research

Contribution to the Project: University of Puerto Rico graduate student conducting ULTRA-related resea

Funding Support: IGERT, University of Puerto Rico, Rio Piedras

International Collaboration: No **International Travel:** No

Braulio Quintero **Email:** braulioquintero@gmail.com **Most Senior Project Role:** Graduate Student (re

Contribution to the Project: As part of his Doctoral dissertation, Braulio examines the potential vulnerabil assessing the effect the scarcity of energy resources on economic activity. Participated in Social-Ecologica

Funding Support: None

International Collaboration: No **International Travel:** No

Luis Ramos **Email:** estudiopd@gmail.com **Most Senior Project Role:** Graduate Student (research ass

Contribution to the Project: Luis is now a Doctoral student in the Department of Urban and Regional Pla writing and proposal development.

Funding Support: None

International Collaboration: No **International Travel:** No

Molly Ramsey **Email:** ramsey.molly@gmail.com **Most Senior Project Role:** Graduate Student (researc

Contribution to the Project: PhD student in the University of Puerto Rico. Contributed to proposal develo

related to the Rio Piedras River Watershed. Participated in Social-Ecological Systems Graduate Seminar

Funding Support: NSF IGERT, University of Puerto Rico, Rio Piedras

International Collaboration: No **International Travel:** No

Ana Trujillo **Email:** anatrujillo2002@yahoo.com **Most Senior Project Role:** Graduate Student (researc

Contribution to the Project: University of Puerto Rico graduate student working on ULTRA-related resea

Funding Support: None

International Collaboration: No **International Travel:** No

Cristina Vila **Email:** cristinapr88@hotmail.com **Most Senior Project Role:** Graduate Student (research

Contribution to the Project: Student and co-author in manuscripts.

Funding Support: None

International Collaboration: No **International Travel:** No

Luis Villanueva **Email:** luis.villanuevacubero@upr.edu **Most Senior Project Role:** Graduate Student (r

Contribution to the Project: Student and co-author in manuscripts

Funding Support: None

International Collaboration: No **International Travel:** No

Sofia Angely Colon **Email:** sofiacr39@hotmail.com **Most Senior Project Role:** Undergraduate Studen

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Ali Bonilla **Email:** aleja9393@gmail.com **Most Senior Project Role:** Undergraduate Student **Nearest**

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Nicholas Correa **Email:** ncp2903@gmail.com **Most Senior Project Role:** Undergraduate Student **Nea**

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Elizabeth Diaz Torres **Email:** ediaz13@msn.com **Most Senior Project Role:** Undergraduate Student

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Jose Fontanez **Email:** jafontanez72@gmail.com **Most Senior Project Role:** Undergraduate Student **N**

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Aramis Garay **Email:** aramisgaray@gmail.com **Most Senior Project Role:** Undergraduate Student **Ne**

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Amanda Henderson **Email:** amanda.hender@yahoo.com **Most Senior Project Role:** Undergraduate S

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Yankiomy Hernandez **Email:** loreins250@live.com **Most Senior Project Role:** Undergraduate Student

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Carla Lopez **Email:** carla.lpez09@gmail.com **Most Senior Project Role:** Undergraduate Student **Nea**

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Delgado Peter **Email:** peter.suazo@hotmail.com **Most Senior Project Role:** Undergraduate Student

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Khrisia Torres **Email:** khrisia.torres@gmail.com **Most Senior Project Role:** Undergraduate Student

Contribution to the Project: University of Puerto Rico undergraduate student participating in class led by practices research.

Funding Support: none

International Collaboration: No **International Travel:** No

Julio Verdejo **Email:** juliocv@gmail.com **Most Senior Project Role:** Consultant **Nearest Person Mon**

Contribution to the Project: Co-author in manuscripts and collaborator in the development of new resear

Funding Support: none

International Collaboration: No **International Travel:** No

What other organizations have been involved as partners?

Name	Type of Partner
Arboretum de Cupey	Other Nonprofits
Arizona State University	Academic Institut
IGERT in Urbanizing Tropics, University of Puerto Rico	Academic Institut
Institute of Tropical Ecosystem Studies	Academic Institut
La Chiwinha	Other Organizatio
Municipality Family and Community Dept	State or Local Go
National Weather Service	State or Local Go
PR Department of Education	State or Local Go
Polytechnic University	Academic Institut
Puerto Rico Department of Environment and Natural Resources	State or Local Go
Puerto Rico Tourism Office	State or Local Go
REU in Tropical Ecology and Evolution	Academic Institut
Centro Para Puerto Rico	Other Nonprofits
Rio Piedras Urban Action Center	Academic Institut
Rutgers University	Academic Institut
Río Piedras Botanical Gardens	Academic Institut
San Juan Bay Estuary Program	Other Nonprofits
San Juan Municipality, Department of Urban Planning	State or Local Go
SustainaMetrix	Other Nonprofits
Trina Padilla de Sanz High School	School or School
USFS Northern Research Station	State or Local Go
USFS State and Private Programs	State or Local Go
Univeristy of Puerto Rico	Academic Institut
Ciudades GAIA	Other Nonprofits

University of California	Academic Institut
University of New Hampshire	Academic Institut
University of Wisconsin	Academic Institut
Clark Unversity	Academic Institut
Colorado State University	Academic Institut
Conservation Trust	Other Nonprofits
ESF SUNY	Academic Institut
Environmental Studies and Forestry Department at SUNY	Academic Institut
Fundación Luis Muñoz Marín	Other Nonprofits

Full details of organizations that have been involved as partners:

Arboretum de Cupey

Organization Type: Other Nonprofits **Organization Location:** San Juan

Partner's Contribution to the Project: In-Kind Support

More Detail on Partner and Contribution:

Arizona State University

Organization Type: Academic Institution **Organization Location:** Arizona

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

Centro Para Puerto Rico

Organization Type: Other Nonprofits **Organization Location:** San Juan

Partner's Contribution to the Project: Facilities

More Detail on Partner and Contribution:

Ciudades GAIA

Organization Type: Other Nonprofits **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support

More Detail on Partner and Contribution:

Clark Unversity

Organization Type: Academic Institution **Organization Location:** United States

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

Colorado State University

Organization Type: Academic Institution **Organization Location:** Colorado

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

Conservation Trust

Organization Type: Other Nonprofits **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support

More Detail on Partner and Contribution:

ESF SUNY

Organization Type: Academic Institution **Organization Location:** United States

Partner's Contribution to the Project: In-Kind Support Collaborative Research

More Detail on Partner and Contribution:

Environmental Studies and Forestry Department at SUNY

Organization Type: Academic Institution **Organization Location:** Syracuse

Partner's Contribution to the Project: Financial support In-Kind Support Collaborative Research P

More Detail on Partner and Contribution:

Fundación Luis Muñoz Marín

Organization Type: Other Nonprofits **Organization Location:** San Juan, Puerto Rico

Partner's Contribution to the Project: Facilities Personnel Exchanges

More Detail on Partner and Contribution: FLMM staff participates in ULTRA activities, including collabor facilitates available for ULTRA activities.

IGERT in Urbanizing Tropics, University of Puerto Rico

Organization Type: Academic Institution **Organization Location:** Puerto Rico

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution: A number of ULTRA-Ex investigators serve as advisers or cor ULTRA-Ex projects as part of their program requirements, and one fellow is doing an internship with ULTR

Institute of Tropical Ecosystem Studies

Organization Type: Academic Institution **Organization Location:** United States

Partner's Contribution to the Project: In-Kind Support Facilities Collaborative Research

More Detail on Partner and Contribution:

La Chiwinha

Organization Type: Other Organizations (foreign or domestic) **Organization Location:** San Juan

Partner's Contribution to the Project: Facilities

More Detail on Partner and Contribution:

Municipality Family and Community Dept

Organization Type: State or Local Government **Organization Location:** San Juan

Partner's Contribution to the Project: In-Kind Support

More Detail on Partner and Contribution:

National Weather Service

Organization Type: State or Local Government **Organization Location:** United States

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

PR Department of Education

Organization Type: State or Local Government **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support

More Detail on Partner and Contribution:

Polytechnic University

Organization Type: Academic Institution **Organization Location:** Puerto Rico

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution: University faculty José Juan Terrasa Soler is contributing his e
green infrastructure.

Puerto Rico Department of Environment and Natural Resources

Organization Type: State or Local Government **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support

More Detail on Partner and Contribution:

Puerto Rico Tourism Office

Organization Type: State or Local Government **Organization Location:** Puerto Rico

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

REU in Tropical Ecology and Evolution

Organization Type: Academic Institution **Organization Location:** Puerto Rico

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution: ULTRA Senior Personnel, Alonso Ramirez and Elvia Melende
part of ULTRA-Ex projects.

Rio Piedras Urban Action Center

Organization Type: Academic Institution **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support Facilities Personnel Exchanges

More Detail on Partner and Contribution: The Rio Piedras Urban Action Center of CAUCE (Centro de A
Rico-Rio Piedras Campus that promotes university-community interaction in the Rio Piedras Urban Center
groups with the community, and computer space for website training workshops.

Rutgers University

Organization Type: Academic Institution **Organization Location:** United States

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

Río Piedras Botanical Gardens

Organization Type: Academic Institution **Organization Location:** Rio PIedras

Partner's Contribution to the Project: In-Kind Support Facilities

More Detail on Partner and Contribution:

San Juan Bay Estuary Program

Organization Type: Other Nonprofits **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support

More Detail on Partner and Contribution:

San Juan Municipality, Department of Urban Planning

Organization Type: State or Local Government **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support Facilities Collaborative Research

More Detail on Partner and Contribution:

SustainaMetrix

Organization Type: Other Nonprofits **Organization Location:** USA

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

Trina Padilla de Sanz High School

Organization Type: School or School Systems **Organization Location:** San Juan

Partner's Contribution to the Project: Other: Participation in education activities and participatory mapp

More Detail on Partner and Contribution:

USFS Northern Research Station

Organization Type: State or Local Government **Organization Location:** United States

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

USFS State and Private Programs

Organization Type: State or Local Government **Organization Location:** United States

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

Univeristy of Puerto Rico

Organization Type: Academic Institution **Organization Location:** Puerto Rico

Partner's Contribution to the Project: In-Kind Support Facilities Collaborative Research Personne

More Detail on Partner and Contribution:

University of California

Organization Type: Academic Institution **Organization Location:** Los Angeles, California

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

University of New Hampshire

Organization Type: Academic Institution **Organization Location:** New Hampshire

Partner's Contribution to the Project: Collaborative Research

More Detail on Partner and Contribution:

University of Wisconsin

Organization Type: Academic Institution **Organization Location:** Madison, Wisconsin

Partner's Contribution to the Project: In-Kind Support Facilities Collaborative Research Personne

More Detail on Partner and Contribution:

Have other collaborators or contacts been involved? No

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Impacts

What is the impact on the development of the principal discipline(s) of the project?

With 25 scientific publications (11 of which are part of a Special Issue in the journal *Ecology and Society*), and over 50 presentations to scientific and public audiences, the results of San Juan ULTRA will likely have an impact on the scientific study of cities as social-ecological systems, particularly in the urban tropics.

Other contributions previously reported but that are likely to continue having an impact to the field of urban social-ecological systems include:

(1) Design of a transdisciplinary research approach that included the participation of multiple scientists and stakeholders in various pahses of the research process, including setting the research agenda, product review, and collection of multiple types of expertise (e.g. local, planning, etc.). Engagement methods included: a Stakeholder Needs Assessment Survey; individual and group meetings with a variety of stakeholders; synthetic workshops; watershed field trips; participatory mapping workshops; and focal groups.

(2) Development of a Social-Ecological System (SES) Sampling network that incroporates both ecological and social sampling criteria and that serves as the backbone for the collaborative data collection throughout the watershed.

(3) A inked household and vegetation survey that was developed, tested, and applied jointly by ecologists and social scientists.

(4) Design and implementation of digital methodologies for green area and green cover loss estimation and visualization for suburban neighborhoods over time.

(5) Development of an integrated framework, the knowledge-action systems analysis (KASA), to assess and evaluate existing knowledge and decision-makign dynamics and inform way to effectively link the knowledge outcomes of the project with stakeholder needs and policy priorities.

What is the impact on other disciplines?

The formation of the San Juan ULTRA research collaborative network is a new initiative in the academic context of Puerto Rico and thus has had a large impact in research and educational activities. This year we have expanded this network to including more collaborators from the social sciences, as well as from the fields of landscape architecture, humanities and art. We have created unprecedented cross-disciplinary and cross-departamental curriculum development in the University of Puerto Rico, Río Piedras, that combines fields and professors from geography, planing, pubic health, and environmental sciences for undergraduate and graduate students is likely to have an impact on these disciplines. We are also now initiating a collaboration among scientists and artists through the art intervention project, Puente A Puente.

Importantly,the involvement of San Juan ULTRA in national and international urban networks, such as the NSF RCN in Urban Sustainability and the Forest Service Urban Field Stations, have provided local scientists opportunities to interact, share research, and collaborate with urban social-ecological scientists in cities across the nationa and abroad. This expansion of the network will likely have an impact on individual researcher careers locally and their respective disciplines.

What is the impact on the development of human resources?

San Juan ULTRA-Ex has produced 2 doctoral dissertations and a number of master's and senior theses. We have also trained and mentored to close to 50 undergraduate students and 40 graduate students (including NSF IGERT doctoral students at the University of Puerto Rico, Río Piedras. Our students have been successful in developing their careers in professional positions and doctoral studies. In particular, as a result of ULTRA, more local students are gaining greater access to education and professional opportunities to further interdisciplinary research through national programs, such as SESYNC. They have also been engaged in the development of interdisciplinary proposal development, such as NSF programs.

What is the impact on physical resources that form infrastructure?

Nothing to report.

What is the impact on institutional resources that form infrastructure?

As a result of ULTRA, interdisciplinary collaborations among social and ecological sciences have become more common place within and across academic institutions in San Juan. Our researchers span mutliple institutions, including various campuses of the University of Puerto Rico, multiple academic institutions in the US, and research institutes such as the Forest Service International institute of Tropical Forestry. While institutional obstacles are still present, our research network has been able to collaborate regularly and be very productive in producing interdisciplinary knowledge about the social-ecology of the city. We have also been able to span the academic-policy boundary and engaged a solid group of pratitioners and community leaders to

share knowledge and apply actions.

What is the impact on information resources that form infrastructure?

We have developed numerous databases and tools on a wide of social and ecological aspects of the city and its urban watershed for the use of land managers, planners, decision-makers, and the public, accesible through our website.

10. Close to 30 new databases containing a wide range of ecological, biophysical, and socio-economic data about the RPRW and the City of San Juan, generated by San Juan ULTRA-Ex are being finalized and will be made publicly available through out website.

11. Close to 60 existing databases from public agencies and NGO's are already available to the public through our website data catalog and some of these can be visually displayed through our web GIS interface (http://sanjuanultra.org/wp-content/shares/sjultra/catalogo.html).

12. Developing sophisticated mapping techniques in collaboration with the University Wisconsin Madison for the processing of high-resolution imagery, classification of urban land cover classes, and analysis of green infrastructure connectivity.

13. A web-based social and ecological data infrastructure that can be accessed by the public and visualized using Google Earth maps:http://sanjuanultra.org/wp-content/shares/sjultra/catalogo.html.

5. A Participatory Green Infrastructure Mapping Tool for users to register sites along the watershed and enter local knowledge on its use, condition, values, services, etc. to assist land managerms. http://thinkamap.org/wp-content/share/bda/datosmap/sjultra/registro.php

2. A network of educational signposts throughout the RPRW, allowing the public to access data, information and activities using smartphones, tablets or similar devices. http://sanjuanultra.org/recurso/registro-mi-cuenca/

2. Access to our scientific and education publications, http://sanjuanultra.org/engagement/

What is the impact on technology transfer?

Our website serves as the hub of the datasets, technical and participatory tools related to the Rio Piedras River Watershed and San Juan area in general. Our Data Catalog includes datasets developed by other governmental and non-governmental entities thus serving as an information portal for land managers and the public to access information that is usually fragmented or difficult to access through other means.

What is the impact on society beyond science and technology?

Scientific findings from San Juan ULTRA have had an impact on planning and public policy in several ways. First, through the engagement of close to 30 different governmental, non-governmental, business, and community organizations in research and educational activities, San Juan ULTRA has raised awareness of the value of the Rio Piedras River Watershed for the city and the importance of undestanding urbanization from a social-ecological perspective. This is reflected in the invitation from the Municipality of San Juan in creating a Special Commission to faciliate knowledge transfer, and the use of ULTRA results by various organizations in the city for their proposals and management plans. We also served as consultants for the Municipality in their succesful grant proposal to develop workshops around the theme of urban flood control.

In addition, as as a result of the ULTRA science and education activities, various ULTRA researchers have been invited to participate in various local and state efforts to improve green infrastructure across the city, including an effort by the State's Office of Gubernmental Ethics to restore a creek in the city (Querada Mongil) and a community group interested in greening a space that is planned for development and they are trying to revitalized with green infrastructure (e.g. El Pedregal).

Finally, through our education and community outreach programs we have raised public awareness and helped put the rio Piedras 'on the map. In 2013-2014 alone, we have engaged more than 1,000 people, including school children, elderly, and other members of the general public, in reforestation, educational, and artistic activities.

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APPENDIX 13

Faculty Recruitment Plan

Departamento de Ciencias Ambientales
Facultad de Ciencias Naturales
Universidad de Puerto Rico
Recinto de Río Piedras

Propuesta de reclutamiento de personal docente
Versión final sometida el 23 de octubre de 2015 al Decano de Ciencias Naturales

Este informe es en respuesta a la carta de la Decana de Asuntos Académicos del Recinto de Rio Piedras, la doctora Palmira Rios fechada el 22 de septiembre de 2015 donde se solicitan propuestas para la creación de plazas docentes en el Recinto de Río Piedras. Las propuestas deben enfocarse en cinco aspectos: necesidad, misión, alcance nacional, objetivos institucionales y unidicidad. Luego de un proceso de consulta interna con los miembros de la facultad del Departamento de Ciencias Ambientales, sometemos para su evaluación una propuesta para la creación de cuatro plazas:

- Una plaza docente en las ciencias terrestres.
- Media plaza docente en sociología ambiental a ser compartida con la Facultad de Ciencias Sociales.
- Una plaza docente en toxicología o neurociencia ambiental.
- Una plaza docente en estadísticas bayesianas.

I. Necesidad. Relación de estudiantes a docentes (tiempo completo y tiempo parcial) y los créditos asignados a tareas de investigación, avalúo, consejería estudiantil y otras funciones administrativas.

Recursos docentes disponibles. Las tablas 1 y 2 muestran la facultad del Departamento de Ciencias Ambientales con contratos permanentes y temporeros, respectivamente. Actualmente, esta facultad consta de 13 profesores con contratos permanentes y tres profesores con contratos temporeros. De los 13 profesores con contratos permanentes, 12 son investigadores con cartas contractuales que estipulan descargas de investigación de nueve créditos y tres de enseñanza. Ocho de estos 12, estaban afiliados al Instituto para el Estudio de Ecosistemas Tropicales, un instituto de investigación que en el 2012 se integró al Departamento de Ciencias Ambientales. Cuatro de los doce profesores (Rios, Roberson, Gao, Louime) fueron reclutados entre 2007 y 2013. De los 13 profesores con permanencia, solo el profesor Molinelli posee 12 créditos dedicados exclusivamente a tareas de enseñanza.

Tabla 1. Profesores del Departamento de Ciencias Ambientales con contratos permanentes o ”tenure track”. S = subgraduado; G = graduado.

Nombre	Créditos-tarea	Especialidad
1. José Molinelli, S	12-enseñanza	Geomorfología
2. Rafael Ríos, S, G	9-investigación; 3-enseñanza	Ingeniería ambiental y sanitaria, sistemas comunitarios de agua potable.
3. Nick Brokaw, S, G	9-investigación; 3-enseñanza	Dinámica de plantas y bosques tropicales
4. Xiaoming Zou, S, G	9-investigación; 3-enseñanza	Biogeoquímica de suelos
5. Jess Zimmerman, G	9-investigación; 3-enseñanza	Dinámica de bosques naturales y forestas urbanas
6. Elvia Meléndez, S, G	9-investigación; 3-enseñanza	Conservación de biodiversidad, ecología urbana
7. Olga Mayol, S, G	9-investigación; 3-enseñanza	Química atmosférica
8. Alonso Ramírez, G	9-investigación; 3-enseñanza	Ecología acuática
9. Jorge Ortiz S, G	9-investigación; 3-enseñanza	Limnología, manejo de recursos de agua
10. Clifford Louime, S, G	9-investigación; 3-enseñanza	Biocombustibles
11. Loretta Roberson, S, G	9-investigación; 3-enseñanza	Ecología fisiológica de algas marinas
12. Mei Yu, G	9-investigación; 3-enseñanza	Ecología del paisaje
13. Qiong Gao, G	9-investigación; 3-enseñanza	Modelaje de ecosistemas y del ambiente

Tabla 2. Profesores del Departamento de Ciencias Ambientales con contratos temporeros a tarea completa.

Nombre	Créditos-tareas	Especialidad
1. María del Pilar Angulo	6-Enseñanza subgraduada; 3-coordinación programa de avalúo de la FCN, 12-dirección auxiliar del STEM-CRES.	Ecología y Sustentabilidad
2. Gary Gervais	6-Enseñanza subgraduada y graduada; 6-coordinación del Programa Graduado.	Microbiología ambiental
3. Ángel Torres	6- Enseñanza subgraduada; 6-asesoría académica subgraduado.	Climatología

Parte de la demanda de cursos en Ciencias Ambientales es atendida por profesores a tarea parcial bajo contratos. La Tabla 3 muestra los nombres de los nueve profesores que aparecen en la oferta académica para el semestre B52 (enero-mayo 2016).

Tabla 3. Profesores con contratos a tarea parcial para enseñanza de cursos en el del Departamento de Ciencias Ambientales según la oferta académica B52. Los créditos están en paréntesis. S = subgraduado; G = graduado.

Nombre	Especialidad
1. José Longo (2) S	Geografía humana
2. José Martínez Oquendo (2) S	Leyes ambientales
3. Jorge Ramos (3) S	Reglamentación ambiental, manejo de emergencias ambientales.
4. Glenda Román (6) S	Sistemas de información geográfica
5. Gabriel Moreno (3) S, G	Ecología urbana
6. Edwin Hernández (3) G	Ecología de corales
7. Jennifer Santos (2) G	Sociología ambiental
8. Catherine Abreu (2) G	Comunicación ambiental
9. María del L. Lara (2) G	Ética ambiental

Población estudiantil servida. Datos provistos por el Decanato de Asuntos Estudiantiles de la Facultad de Ciencias Naturales para el año académico 2014-15, establecen que existen **295 estudiantes subgraduados** oficialmente adscritos al Departamento de Ciencias Ambientales. Sin embargo, a través de nuestros cursos, nuestro departamento atiente una población mayor. Para ese mismo año académico, nuestro departamento presentó una oferta de 20 cursos subgraduados, en 34 secciones, con un total de **824 estudiantes matriculados**. Estos estudiantes provienen de diferentes facultades del Recinto de Rio Piedras (Ciencias Sociales, Educación, Ciencias Naturales, entre otras).

En términos de estudiantes graduados, el Decanato de Estudios Graduados e Investigación (DEGI) reporta que nuestro programa graduado en Ciencias Ambientales, contaba con 62 estudiantes graduados durante el año académico 2014-15 (17 de maestría y 45 doctorales). Sin embargo, en agosto 2015, ingresaron nueve estudiantes adicionales, por lo que el **número total es de estudiantes graduados es 71**.

Relación de estudiantes a docentes.

La relación de estudiantes a docentes **para el Programa Subgraduado es de 17.3** cuando se incluyen los 295 estudiantes de CIAM y los 17 profesores a tarea completa y parcial que apoyan este programa. Esta relación **aumenta a 48.5 cuando se añaden los estudiantes de otros programas** que toman nuestros cursos.

Para el Programa Graduado, la relación de estudiantes a docentes es de 5.9. Esta proporción se basa en los 12 profesores a tiempo completo de CIAM que pueden dirigir proyectos de tesis.

II. Misión. Plan de desarrollo académico y reclutamiento docente actualizado.

El Departamento de Ciencias Ambientales fue creado en el 2012. Este nuevo departamento integró un nuevo programa graduado en Ciencias Ambientales creado en el 2009 con el existente programa subgraduado creado en 1976. El nuevo Departamento se creó mediante la fusión del Instituto para Estudios de Ecosistemas Tropicales (IEET) con los programas subgraduados y graduados en Ciencias Ambientales. Esta fusión permitió que ocho investigadores del IEET se unieran a Qiong Gao, Rafael Rios y José Molinelli) para formar la facultad del Departamento. Mediantes subvenciones importantes de la Fundación Nacional de Ciencias que permitieron reclutar nueva facultad (Roberson y Louime). De manera que actualmente, el Departamento consta de 13 profesores con plazas permanentes o potencialmente permanentes ("tenure track") (Tabla 1). El desarrollo del Departamento de Ciencias Ambientales ha sido rápido y vertiginoso. Actualmente, administra más de $12.5M en subvenciones federales (NASA, NSF, DOE) para proyectos de investigación, posee 71 estudiantes graduados y cerca de 300 subgraduados.

Para identificar las necesidades de plazas, hemos revisado los esfuerzos anteriores para explorar cuales necesidades han sido atendidas y cuales aun han quedan pendientes. Estos esfuerzos están asociados a la revisión del bachillerato y a la creación del programa graduado y a un plan de desarrollo desarrollado en marzo del 2015. Para referencia, las tablas 1, 2 y 3 muestran las áreas de especialidad de la facultad existente en el Departamento de Ciencias Ambientales.

1. *Programa Subgraduado.* Las necesidades de plazas docentes en el Departamento de Ciencias Ambientales fueron analizadas durante el proceso de revisión del bachillerato concluido en mayo 2009 con la Certificación 75 del Senado Académico (Anejo1). En ese documento, se propuso reclutar tres

profesores nuevos a nivel de catedrático auxiliar para el año académico 2009-10. En aquel momento se esperaba reclutar personas con PhD en ciencias ambientales y especialidades en modelaje de calidad de aire, hidrología de aguas subterráneas y recursos marinos. Actualmente, el área de modelaje de calidad de aire es parcialmente cubierta por la Dra. Olga Mayol y la de recursos marinos por la Dra. Loretta Roberson. Queda pendiente el área de hidrología de aguas subterráneas.

2. *Programa Graduado.* Aproximadamente en el año 2009, la facultad de Ciencias Naturales aprobó el "Plan Estratégico para el Fortalecimiento del Programa de Maestría y Doctorado en Ciencias Ambientales (2002-2008)" (Anejo 2). El mismo propuso la creación de seis plazas docentes en las siguientes áreas: hidrología ambiental, geología ambiental, meteorología ambiental, análisis espacial del ambiente, modelaje ambiental y recursos costeros. Actualmente, las plazas en las áreas de hidrología ambiental, análisis espacial, modelaje ambiental y recursos costeros están atendidas por facultad del IEET (Jorge Ortiz) y nueva facultad que ha sido reclutada (Mei Yu, Qiong Gao y Loretta Roberson, respectivamente). Quedan pendientes, sin embargo, reclutar profesores en el área de meteorología ambiental y geología ambiental.

3. *Plan de Desarrollo de 2015 (Anejo 3)*. En marzo 2015, se desarrolló un borrador de un Plan de Desarrollo para el Departamento de Ciencias Ambientales para el periodo 2013-2016. En el área de reclutamiento este plan establece:

> *Reclutar al menos dos (2) miembros docentes al Departamento, uno para el desarrollo de cursos nuevos, realizar investigación educativa y coordinar la oferta académica subgraduada, y el otro para desarrollar un programa de investigación y escribir propuestas para fondos externos en el área de ciencias terrestres.*

Así, luego de un análisis de las necesidades identificadas durante el proceso de revisión del bachillerato y del Programa Graduado, es evidente que el **área de las ciencias terrestres todavía necesita ser fortalecida particularmente en las áreas de meteorología ambiental, geología ambiental e hidrología de aguas subterráneas**. Debido al cambio climático, entendemos que este tipo de especialistas ayudarán en la preparación de los futuros profesionales que estarán a cargo de desarrollar estrategias de adaptación. Algunos miembros de la facultad han sugerido que esta plaza podría ser asociada al compromiso que hiciera la UPR de e el 2015 de crear una posición de director asociado del LTER.

Actualmente el Departamento de Ciencias Ambientales está desarrollando un autoestudio del Programa Graduado. Este proceso, se realiza seis años después de iniciado el programa graduado en el 2009. Una vez concluido, este proceso permitirá revisar el plan de desarrollo académico del Programa Graduado y permitirá definir las áreas de énfasis que el Programa Graduado podrá ofrecer a sus estudiantes. Como parte de este esfuerzo, hemos preliminarmente identificado nuevas necesidades de

facultad en las áreas de sociología ambiental, toxicología o neurociencia ambiental y estadísticas.

A. *Sociología Ambiental*. La misión de nuestro programa graduado enfatiza la preparación de estudiantes en áreas relacionadas al desarrollo sustentable lo que requiere exponer a estudiantes a materias que fomenten la integración de los temas sociales, económicos y ecológicos asociados a la solución de problemas ambientales. El programa graduado atendió esta necesidad en el pasado gracias a la propuesta NSF-IGERT (subvencionado hasta el 2015) que logró la descripción e implementación de cursos interdisciplinarios que atendían esta necesidad. El éxito de la estrategia está reflejado en el entrenamiento de al menos 28 estudiantes que están integrando estos aspectos en sus investigaciones graduadas. En el pasado, los cursos de preparación interdisciplinaria en nuestro programa fueron atendidos a través de contrataciones subvencionadas por la propuesta NSF pero una vez acabada la propuesta, estamos comprometidos a continuarlos. El Programa IGERT, produjo un currículo interdisciplinario en el Programa Graduado que ha sido muy exitoso. Este currículo incluye cursos nuevos como CIAM 8115 (Dimensiones Humanas del Cambio Ambiental, C IAM 8119 (Economía Ecológica), CIAM 8120 (Comunicación Ambiental). Nuestro profesorado entiende que estos cursos son fundamentales a la misión del programa graduado y que deben mantenerse sino que son únicos en nuestra facultad y al sistema UPR. La gran mayoría de nuestros estudiantes graduados han optado por la opción interdisciplinaria dentro de las tres opciones disponibles. Actualmente, estamos estableciendo acuerdos interdepartamentales para aumentar nuestra oferta de cursos con el Programa Graduado de Planificación y Psicología Social Comunitaria. El auge del área de **sociología ambiental** nos sugiere que debemos fortalecer nuestra facultad con especialistas en esta área. El Centro de Investigaciones Sociales nos ha propuesto crear una plaza compartida para reclutar a un sociólogo ambiental especialista en riesgos ambientales. Hemos en principio avalado esta propuesta para que se elija a un especialista mediante una competencia abierta porque en momentos de restricción fiscal, nos permite maximizar los recursos existentes fortaleciendo nuestro programa académico de forma eficiente.

B. *Toxicología o neurociencia ambiental***.** La expansión urbana en el trópico y la proliferación de problemas de contaminación ambiental requiere de pericia en campos transdisciplinarios como la toxicología o neurobiología ambiental. Estudios asociados al Laboratorio de Limnología Tropical de la UPRRP y del Puerto Rico Center for Environmental Neuroscience (PRCEN) de la UPRRP han demostrado la presencia de compuestos estrogénicos en aguas interiores y en ecosistemas costeros. Los impactos de esta contaminación no se entienden del todo así que concebimos que hará falta investigación en este campo. El Vice Presidente de Investigación de la UPR ha apoyado el concepto de una plaza compartida en el campo de **toxicología o**

neurociencia ambiental entre Ciencias Ambientales y Instituto de Neurobiología como apoyo a la eventual renovación del proyecto del Center for Reneawable Energy and Sustainability (CRES). Este mecanismo podría proveernos los recursos para crear esta plaza.

C. *Estadísticas*. Finalmente, en el contexto de cambio climático, el estudio del medio ambiente tropical requiere ahora más que nunca de especialistas en el campo de estadísticas bayesianas ya que se ha comprobado que estas son más aptas para entender la naturaleza estocástica de los procesos naturales. Nuestros estudiantes subgraduados y graduados carecen de destrezas adecuadas para diseñar experimentos o analizar datos estadísticamente. Esto los atrasa grandemente en sus proyectos de investigación. Por tal razón, hemos identificado la necesidad de reclutar a un **estadístico ambiental bayesiano** que pueda fortalecer las destrezas de nuestros estudiantes en análisis cuantitativos y en diseño experimental.

III. Alcance Nacional. Contribución de plazas solicitadas al fortalecimiento o creación de áreas neurálgicas para el desarrollo del país.

Las plazas solicitadas complementarán las fortalezas existentes en el Departamento y redundarán en beneficio de Puerto Rico y del mundo. **El desarrollo sustentable de Puerto Rico** requerirá del desarrollo de nuevas tecnologías que aumentan nuestra eficiencia energética y propicien la revitalización de las ciudades existentes mientras se conservan terrenos agrícolas para aumentar nuestra seguridad alimentaria y se preservan espacios de alto valor ecológico para la protección de la biodiversidad y mantenimiento de servicios ecosistémicos de los cuales depende la sociedad puertorriqueña. Estos retos son hoy en día neurálgicos debido al efecto del cambio climático que amenaza el equilibrio ambiental existente con eventos climáticos más extremos (sequías y huracanes más intensos) y aumentos en el nivel del mar que alterarán la infraestructura de nuestras poblaciones costeras.

A nivel mundial, nuestro programa también contribuye con la formación de científicos de países caribeños, suramericanos y asiáticos pues cuenta con cerca de 13 estudiantes internacionales. De manera que además de contribuir al desarrollo sustentable nacional, nuestro programa también está contribuyendo al desarrollo de profesionales a nivel internacional.

La plaza en ciencias terrestres nos ayudará en el balance de nuestra oferta académica ya que permitirá el desarrollo de programas de investigación en el estudio de la Biosfera. La búsqueda de este nuevo facultativo será amplia de manera que podamos atraer el mejor talento a nuestro Departamento.

La media plaza en el campo de la sociología ambiental nos permite desarrollar el campo de investigación en manejo de riesgos costeros que por el cambio climático ya es reconocida por las autoridades gubernamentales como un área de prioridad en Puerto Rico. Además, nos permite apoyar proyectos de restauración en el campo de

la ecología urbana ya que nos da herramientas sociales para lidiar responsablemente con las poblaciones humanas implicadas en futuros proyectos de intervención.

IV. Objetivos Institucionales. Contribución de plazas a la internacionalización, al desarrollo de programas interdisciplinarios y al servicio social y comunitario.

La propuesta de crear una media plaza en conjunto con la Facultad de Ciencias Sociales en el campo de la sociología ambiental atiende directamente el interés institucional al desarrollo de programas interdisciplinarios y al servicio social y comunitario.

Como mencionamos anteriormente, nuestro programa está inmerso en la internacionalización del Recinto ya que contamos con cerca de 13 estudiantes internacionales. Las 1.5 plazas que solicitamos, nos permitirán continuar atrayendo esta población internacional ya que fortalecerán el desarrollo de destrezas de investigación ambiental necesarias en el mundo globalizado..

V. Unicidad. Explicar que características hacen el programa una alternativa de estudio distinguible y valiosa de la unidad en el Sistema de la UPR y como compara con otras instituciones del país.

La misión del Departamento de Ciencias Ambientales de la Universidad de Puerto Rico en Río Piedras es avanzar la investigación sobre la estructura y función de los ecosistemas, sustentabilidad ambiental, recursos naturales y las ciencias terrestres, y adiestrar científicos con un conocimiento profundo e integrado del ambiente. El Departamento se esfuerza en utilizar las ciencias naturales y sociales para integrar la investigación y la enseñanza altamente interdisciplinaria, con un énfasis vigoroso en investigación, escolaridad y participación comunitaria. El Departamento preparará estudiantes para que puedan identificar, analizar y generar soluciones para los complejos problemas ambientales del presente y del futuro, de la escala local a la escala global, y a través de los niveles jerárquicos de la organización ecológica en las diferentes partes de nuestra Biosfera.

En Puerto Rico, solo cuatro instituciones académicas privadas ofrecen programas graduados en Ciencias Ambientales (Pontificia Universidad Católica, Universidad del Turabo Universidad Metropolitana, Universidad Interamericana). Sin embargo, el Departamento de Ciencias Ambientales de la Universidad Puerto Rico en Rio Piedras posee el más completo programa académico de investigación ambiental en Puerto Rico con sobre $12M de fondos externos para la investigación. Nuestras facilidades de investigación son únicas en Puerto Rico ya que incluyen nueve laboratorios de investigación, dos salones para la enseñanza de cursos en análisis espacial, una estación de campo en El Verde, dos observatorios de química atmosférica uno en las Cabezas de San Juan de Fajardo y el otro en el Pico del Este (El Yunque) y un área de investigación sobre ecología de bosques urbanos en Toa Baja. Además, poseemos

acuerdos colaborativos con comunidades como Capetillo en Rio Piedras y el Corredor del Yaguazo en Cataño.

Finalmente, tenemos tres proyectos emblemáticos que nos dan un alcance internacional: el Luquillo Long Term Ecological Research Program (Luq-LTER), el Center for Renewable Energy and Sustainability (CRES) y el Puerto Rico Center for Environmental Neuroscience (PRCEN). El **LTER** que comenzó en el 1989 y ya va por su quinto ciclo de subvención por NSF, es un núcleo de mucha actividad creativa con lazos colaborativos internacionales que lo reconocen como uno de los programas en ecología tropical más importantes del mundo. En su quinto ciclo, este programa ha recibido la promesa de fondos por la UPRRP para crear una nueva posición como director asociado del LTER. Esta plaza podría ser ocupada por un especialista en cualquiera de las cuatro áreas de necesidad identificadas. Por otro lado, el **CRES** nos ha dado recientemente una fortaleza en el campo de la energía renovable que nos coloca en la vanguardia de la investigación sobre el desarrollo de tecnologías para el uso de biocombustibles basados en algas marinas. Finalmente, el **PRCEN** ha establecido un nievo campo de investigación combinando la fortaleza del Instituto de Neurobiología de la UPR con las del Departamento de Ciencias Ambientales. El PRCEN integra la ecología, biología, y la química en el estudio de cuatro ecosistemas de Puerto Rico (marino, estuario, terrestre, y agua dulce) aplicando modernas técnicas moleculares/celulares de la neurobiología de organismos habitantes de estos ambientes.

APPENDIX 14

Environmental Sciences Development Plan

BORRADOR

Universidad de Puerto Rico
Recinto de Río Piedras
Facultad de Ciencias Naturales
Departamento de Ciencias Ambientales

Plan de desarrollo
Año 2013 al 2016

Programa: **CIAM**

Áreas de prioridad:

1. **Currículo**

a. a. creación de nuevos cursos subgraduados que permitan adiestrar a los estudiantes para el fortalecimiento de destrezas aplicables a la práctica profesional de las ciencias ambientales.

b. b. inscripcion permanente de cursos que actualmente se ofrecen bajo las sombrillas de CINA 4995 y CINA 5990

c. continuación del Plan de Avalúo del Aprendizaje Estudiantil META 2 Obj 2.2

d. revisión del Programa Graduado

2. Estudiantes

a. evaluación de la retención en el Departamento en particular considerando los estudiantes que entran al Departamento con la intención de cambiarse a otros departamentos.

b. análisis de la contribución a la retención y tasa de graduación de la Facultad de Ciencias Naturales

c. estudio de egresados

3. **Reclutamiento META 3**

a. Reclutar al menos dos (2) miembros docentes al Departamento, uno para el desarrollo de cursos nuevos, realizar investigación educativa y coordinar la oferta académica subgraduada, y el otro para desarrollar un programa de investigación y escribir propuestas para fondos externos en el área de ciencias terrestres.

b. Reclutar un auxiliar administrativo para el Departamento y un conserje para la Estacion de Campo de El Verde

4. Facilidades META 8

a. ampliación de las facilidades de investigación a todos los niveles

Meta 1 **¿Dónde me propongo estar con respecto a esta área de prioridad?** **Haber logrado la creación de cursos nuevos y la inscripcion de cursos ofrecidos bajo denominaciones sombrilla, la continuación del Plan de Avalúo del Aprendizaje Estudiantil y la revision del Programa Graduado**					
Objetivo ***¿Qué deseo lograr específicamente para alcanzar la meta propuesta?***	**Estrategia/ Actividad** ***¿Qué voy a hacer para lograr este objetivo?***	**Fecha límite** ***¿En qué fecha se proyecta cumplir con este objetivo?***	**Personal responsable** ***¿Quiénes son los recursos o las unidades a cargo?***	**Recursos necesarios** ***¿Qué se requiere para lograr el objetivo a través de esta estrategia o actividad?***	**Indicador de progreso** ***¿Qué me dice que alcancé lo propuesto?***
a. Creación de nuevos cursos subgraduados que permitan adiestrar a los estudiantes para el fortalecimiento de destrezas aplicables a la práctica profesional de las ciencias ambientales.	**1. Crear cursos.** **2. Someter cursos al Comité de Asuntos Académicos de la Facultad** **3. Lograr la codificación de los cursos.**	1. **Agosto 2013-Mayo 2014** 2. **Agosto 2014-Mayo 2015** 3. **Diciembre 2015**	**1. Director/a CIAM** **2. Director/a CIAM o representante al CAA** **3. Vicepresidencia de Asuntos Académicos, Administración Central UPR**	**Distribución adecuada del tiempo.** **Reuniones con el comité CAA**	**Codificación de cursos**
b. inscripcion permanente de cursos que actualmente se ofrecen bajo las sombrillas de CINA 4995 y CINA 5990	**1. Someter cursos al Comité de Asuntos Académicos de la Facultad** **2. Lograr la codificación de los cursos**	**1. Agosto 2014-Mayo 2015** **2. Diciembre 2015**	**1. Director/a CIAM o representante al CAA** **2. Vicepresidencia de Asuntos Académicos,**	**Distribución adecuada del tiempo.** **Reuniones con el comité CAA**	**Codificación de cursos**

			Administración Central UPR		
c. continuacion del Plan de Avaluo del Aprendizaje Estudiantil	**1. Recopilación de los datos requeridos para el avalúo de las destrezas identificadas en el Plan.**	**2013-2016**	**Coordinador de avalúo del CIAM**	**Acceso a base de datos del Recinto.**	**Recopilación y análisis de datos. Generación de informes para la OEAE**
d. revision del Programa Graduado	**Coordinar con la evaluacion de los programas graduados que lleva a cabo el DEGI**	**Enero 2014-Enero 2016**	**Coordinador/ra graduado de CIAM, DEGI**	**Distribución adecuada del tiempo.**	**Generacion de informe de autoestudio, generacion de informe de revision del Programa Graduado**

Meta 2 **¿Dónde me propongo estar con respecto a esta área de prioridad?** **Haber evaluado las tasas de retención y graduación en el Departamento y en la Facultad de Ciencias Naturales además de realizar un estudio de egresados.**					
Objetivo ***¿Qué deseo lograr específicamente para alcanzar la meta propuesta?***	**Estrategia/ Actividad** ***¿Qué voy a hacer para lograr este objetivo?***	**Fecha límite** ***¿En qué fecha se proyecta cumplir con este objetivo?***	**Personal responsable** ***¿Quiénes son los recursos o las unidades a cargo?***	**Recursos necesarios** ***¿Qué se requiere para lograr el objetivo a través de esta estrategia o actividad?***	**Indicador de progreso** ***¿Qué me dice que alcancé lo propuesto?***

Meta 3 **¿Dónde me propongo estar con respecto a esta área de prioridad?** **Lograr la asignación de al menos dos (2) plazas docentes y dos(2) no docentes adicionales al Departamento.**					
Objetivo ***¿Qué deseo lograr específicamente para alcanzar la meta propuesta?***	**Estrategia/ Actividad** ***¿Qué voy a hacer para lograr este objetivo?***	**Fecha límite** ***¿En qué fecha se proyecta cumplir con este objetivo?***	**Personal responsable** ***¿Quiénes son los recursos o las unidades a cargo?***	**Recursos necesarios** ***¿Qué se requiere para lograr el objetivo a través de esta estrategia o actividad?***	**Indicador de progreso** ***¿Qué me dice que alcancé lo propuesto?***
Lograr la asignación de al menos dos (2)	**Presentar la necesidad de apoyo docente a las**	**2013**	**Oficina de Presupuesto, Recursos**	**Solicitud de autorización para iniciar el proceso de**	**Reclutamiento.**

miembros docentes y dos(2) no docentes adicionales al CIAM.	**instancias pertinentes en el Recinto.** **Dar seguimiento a la asignación de personal docente.**	**2013-2015**	**Humanos y Rector del Recinto.**	**reclutamiento o transferencia de plaza.** **Autorización del reclutamiento o transferencia de plaza.**	

Nota: *De ser necesario puede añadir una columna para presentar observaciones o recomendaciones que desea destacar por objetivo o estrategia/actividad. Si sus observaciones van dirigidas a la meta, puede optar por añadir sus comentarios en la parte inferior de la tabla.*

Meta 4 **¿Dónde me propongo estar con respecto a esta área de prioridad?** **Ampliación de las facilidades de investigación a todos los niveles**					
Objetivo *¿Qué deseo lograr específicamente para alcanzar la meta propuesta?*	**Estrategia/ Actividad** *¿Qué voy a hacer para lograr este objetivo?*	**Fecha límite** *¿En qué fecha se proyecta cumplir con este objetivo?*	**Personal responsable** *¿Quiénes son los recursos o las unidades a cargo?*	**Recursos necesarios** *¿Qué se requiere para lograr el objetivo a través de esta estrategia o actividad?*	**Indicador de progreso** *¿Qué me dice que alcancé lo propuesto?*
	Presentar la necesidad de apoyo docente a las instancias pertinentes en el Recinto. **Dar seguimiento a la asignación de personal docente.**	**2013** **2013-2015**	**Oficina de Presupuesto, Recursos Humanos y Rector del Recinto.**	**Solicitud de autorización para iniciar el proceso de reclutamiento o transferencia de plaza.** **Autorización del reclutamiento o transferencia de plaza.**	**Reclutamiento.**
