Louisiana Board of Regents

AA 2.05: REQUEST FOR AUTHORITY TO OFFER A NEW DEGREE PROGRAM*

-- Including incremental credentials building up to the Degree --

** Prior to final action by the Board of Regents, no institution may initiate or publicize a new program.**

Date:

Institution: University of Louisiana at Lafayette	Requested CIP, Designation, Subject/Title: CIP 03.0199, Natural Resources Conservation and Research; Master of Science in Environmental Resource Science
Contact Person & Contact Info: Dr. Azmy Ackleh Dean, Ray P. Authement College of Sciences University of Louisiana at Lafayette (337)-482-6986 ackleh@louisiana.edu	
Date Letter of Intent was approved by Board of Regents: February 22, 2016	
Date this Proposal was approved by Governing Board:	
Planned Semester/Term & Year to Begin Offering Program: Spring 2017	

1. Program Description

Describe the program concept: (a) purpose and objectives; (b) mode of delivery (on-site/hybrid/on-line). Describe plan for developing and rolling out new courses.

(a) Purpose and Objectives

The purpose of the proposed Master's degree program in Environmental Resource Science is to produce highly-trained environmental scientists who will address challenges related to two of Louisiana's most critical environmental resources, water and soil. This Master's degree program will focus on the principles and practice of investigating and characterizing water and soil resources as well as those employed to successfully manage and remediate water and soil resources. Considerable emphasis will be dedicated to preparing students to identify and use the appropriate technologies in these areas. In addition, students will learn about the interactions of water and soil resources with biological systems. The objectives of the proposed degree program in Environmental Resource Science are as follows:

(1) To prepare and train master's level environmental scientists to specialize in water and soil resources by providing them with a state-of-the-art interdisciplinary curriculum founded on four core courses in water and soil studies.

(2) To prepare these students for a wide variety of careers in the environmental arena by providing them an interdisciplinary curriculum of elective courses as well as interdisciplinary research and training opportunities supported by faculty from multiple disciplines.

(3) To develop a highly-skilled, technically-trained, and critically-thinking workforce that will benefit the state of Louisiana by helping industries and governmental agencies manage and remediate vital water and soil resources.

The proposed degree program in Environmental Resource Science will be interdisciplinary in its focus on water and soil resources. Core courses in Environmental Science and Geology are complemented by elective courses in Biology, Civil Engineering, and Chemistry. Courses and research opportunities also will be supported by participating faculty from Biology, Chemistry, Civil Engineering, Environmental Science, and Geology.

Our curriculum is based on several foundational science domains (e.g., Physical, Earth, and Biological Sciences) specifically identified in the FIRST Louisiana report. Environmental Resource Science is both strategic for Louisiana and aligned with Louisiana's workforce needs. Louisiana's core industry, science, and technology sectors are direct reflections of the natural resources available in our state. For example, Louisiana is the third leading producer of rice in the U.S. and is a global hub for the upstream and downstream petroleum industry. These industries require

tremendous quantities of high-quality water. Our state hosts 40% of the nation's freshwater wetlands, areas that are critical to the seafood industry and serve to mitigate coastal flooding and erosion. Like water, soil resources are fundamental to agriculture and to coastal restoration efforts. Louisiana has 44 soil and water conservation districts that are dedicated to sustaining and conserving water quality and soil stability in croplands, woodlands, wetlands, and waterways throughout the state (Louisiana Department of Agriculture and Forestry website).

The focus of the proposed degree program in Environmental Resource Science is a key factor that, in combination with the Gulf-coast location of UL Lafayette and the expertise of the faculty at UL Lafayette, will make this a premier program for Louisiana and the region. The proposed program in Environmental Resource Science will further advance Louisiana as a national leader in environmental research and development.

By relying in large part on existing courses with additional capacities for enrollments that are being taught by existing faculty, we are able to effectively balance resources.

(b) Mode of Delivery

The mode of delivery for UL Lafayette's Master of Science in Environmental Resource Science is on-site (traditional face-to-face classroom instruction).

Map out the proposed curriculum, in sequence, identifying any incremental credentials and/or concentrations within the degree. Indicate which courses will be new, including those that would be offered in the new program as electives. Describe any special requirements (e.g., internships, comprehensive exam, thesis, etc.).

Total Number of SCHs Required and Estimated Time Required for Student Completion:

We propose a 35-hour curriculum with thesis and non-thesis options. The proposed degree program draws largely from existing courses in Environmental Science, Geology, and related disciplines (Biology, Civil Engineering, and Chemistry) that have the capacity to absorb higher enrollments. For example, the average enrollments over the last 3 years for ENVS 455G, ENVS 484G, ENVS 490G, GEOL 431, GEOL 440, and GEOL 470 have been 16.7, 12.0, 13.5, 10.7, 31.5, and 37.5 students, respectively. These enrollment numbers are respectively 18.3, 23.0, 21.5, 29.3, 18.5, and 32.8 students below what we estimate to be the maximum feasible enrollments for these courses (Table 1). Specifically, the proposed program relies on 47 graduate courses already in existence at UL Lafayette, thereby creating a diverse and comprehensive curriculum that, additionally, attests to established strengths at UL Lafayette in this discipline and related fields of study.

These courses are organized into the categories of (1) Water Resources, (2) Soil Resources, (3) Environmental Methods (applied to water and soil resources), and (4) Biophysical Relationships. The Water Resources, Soil Resources, and Environmental Methods courses constitute the programmatic core. The Water and Soil Resources courses will provide students with a scientific foundation for addressing challenges within the field of Environmental Resource Science. The Environmental Methods courses will provide students with an understanding of the tools used to address these challenges. The Biophysical Relationships courses are available so that students can develop a basic understanding of the interactions of soil and water resources with biological systems. In addition to this rich curriculum, we will create 5 new program-specific courses (see Table 1 below). A limited number of additional 500-level courses in the Water Resources or Soil Resources categories may be developed and added to the approved course list once the program is operational and demonstrates growth.

Substantial flexibility is built into the program regarding courses that are available to satisfy the Environmental Methods requirement and 12 hours of electives. With the exception of two required courses each in the Water and Soil Resources category, no specific sequence of additional courses will be required. This flexible curriculum structure will provide students with the opportunity to individualize their curriculum within the over-arching theme of water and soil resources. This flexible, inter- and multi-disciplinary approach to educating graduate students is important for the development of a broad-based applied science Master's degree program, but at the same time allows graduate students to gain an appreciable level of specialization that matches their individual career objectives.

Thesis Option (35 total graduate credit hours):

- Thesis = 6 hours (ERS 599)
- Seminar = 2 hours (ERS 559)
- Water Resources Required Courses = 6 hours
  1. *ENVS 484G – Watershed Science. Application of the planning process at the watershed (and larger) scale emphasizing the use of GIS and computer modeling tools.*
  2. *GEOL 470G – Groundwater. Occurrence, movement, distribution, and discussion of problems associated with supply and change in composition of ground water.*
- Soil Resources Required Courses = 6 hours
  1. *ENVS 490G – Environmental Pedology. Soil-solute interactions occurring as a result of natural and human activities.*
  2. *ENVS 580 – Fate of Pollutants in Soils and Natural Waters. Thermodynamics and surface reactions affecting the presence, distribution, and fate of pollutants.*
- Environmental Methods = 3 hours (Any of the approved Environmental Methods courses in Table 1)
- Electives = 12 hours. Any of the approved courses in Table 1 with no more than 9 hours from the Biophysical Relationships category.

Non-Thesis Option (35 total graduate credit hours):

- This curriculum will be identical to curriculum for the thesis option except that the 6 thesis hours will be divided into either: (1) 3 additional hours of electives from any of the approved courses and a final 3-credit hour capstone project; or (2) a 6-credit hour internship.

  The **Final Capstone Project (ENVS 589, 3hrs)** will be assigned by a faculty advisor and approved by a Capstone Committee comprised of graduate faculty members of the Environmental Science Program. The outcome of the project must include a 10- to 15-page written report, which must be approved by the student's faculty advisor and the Capstone Committee, who assess satisfactory completion of this comprehensive requirement.

  The **Internship (ENVS 579, 6hrs)** must include the equivalent of one semester of part-time work with an industry partner. Prior to initiation of the internship, the student will be required to develop a work plan with the company/agency and his/her graduate faculty advisor outlining the expected requirements or products of the internship. At a minimum, the student will complete a final written report and deliver a presentation of his or her work. Details regarding the length and format of the report and presentation will be developed by the student's faculty advisor and a Thesis Committee comprised of graduate faculty members of the Environmental Science Program, in consultation with the industry partner.

Degree requirements:

1. 400-level courses taken for undergraduate credit cannot be taken again for graduate credit.
2. For the Thesis option, at least 15 credit hours of 500-level courses that count toward the degree must be taken. For the Non-Thesis option, at least 18 credit hours of 500-level courses that count toward the degree must be taken. We will formally develop 5 new 500-level classes, each having a unique content, course number and course description.
3. Students who may have already completed a required course within another program of study may substitute a different course within the same category (i.e., the Water Resources or Soil Resources categories). The course substitution must be approved by the graduate committee of the Environmental Science Program and by the Dean of the Graduate School.

Table 1. Courses for MS-degree in Environmental Resource Science.

Course Level/ Number	Course Name and Department Offering Course	Max Feasible Enrollment	Who is currently qualified to teach this course?	New or Existing Course
New program-specific courses				
ERS 559	**Environmental Resources Seminar (1, 0, 1)**	100	All core faculty	New Course
ERS 569	**Special Topics (3, 0, 3).**	NA	All core faculty	New Course
ERS 579	**Internship (6hrs)**	NA	All core faculty	New Course
ERS 589	**Capstone Project (3hrs)**	NA	All core faculty	New Course
ERS 599	**Thesis hours (6hrs)**	NA	All core faculty	New Course
Water resources (existing courses)				
ENVS 445(G)	**COASTAL SCIENCES. (3, 0, 3).** Management of coastal aquatic ecosystems; emphasis on interactions with terrestrial and atmospheric systems; hydraulic and ecological modeling; and coastal restoration. Restr: Permission of instructor required.	30	Visser	Existing
ENVS 484(G) REQUIRED	**WATERSHED SCIENCE. (3, 0, 3**). Application of the planning process at the watershed (and larger) scale emphasizing the use of GIS and computer modeling tools.	35	Costigan; Borrok; Poudel	Existing
ENVS 486(G)	**WATER QUALITY. (3, 2, 4).** Design of data collection and analysis of chemical and biological properties necessary to support the planning process.	35	Poudel; Borrok; Hillman	Existing
GEOL 431(G)	**INTRODUCTION TO GEOCHEMISTRY. (3, 0, 3).** Introduction to the concepts and principles of Geochemistry	40	Schubert; Borrok	Existing
GEOL 440(G)	**OCEANOGRAPHY. (2, 2, 3).** Formation of the earth's oceans and the role they play in the global geologic, climatologic, and biologic systems.	50	Richter	Existing
GEOL 470(G) REQUIRED	**GROUND WATER. (3, 0, 3).** Occurrence, movement, distribution, and discussion of problems associated with supply and change in composition of ground water.	70	Duex; Poudel; Borrok; Costigan	Existing
GEOL 510	**ADVANCED ENVIRONMENTAL GEOLOGY. (2, 3, 3).** Content varies. May be repeated for credit. Application of Geology to problems resulting from the increasingly intense use of the earth and its resources. Restr: Permission of instructor required.	35	Duex; Schubert; Borrok; Costigan; Hillman	Existing
GEOL 509	**ADVANCED GROUND WATER HYDROLOGY. (3, 0, 3).** Discussion of case histories and examples that apply the basic principles of ground water Hydrology to specific sites and problems. A summary of current thoughts, ideas, and practical applications related to Hydrology. Prereq: GEOL 470(G) or permission of instructor required.	35	Duex; Costigan	Existing
GEOL 532	**PETROLEUM GEOCHEMISTRY. (2, 3, 3).** Concepts and principles of Geochemistry. Course includes examination of natural samples.	45	Borrok	Existing
BIOL 407(G)	**ENVIRONMENTAL TOXICOLOGY. (3, 3, 4).** Overview of occurrence of pollutants in aquatic and terrestrial environments and the atmosphere, pollutant dynamics and metabolism, and pollutant effects on biota at different organizational levels. Laboratory centers on methodology, instrumentation, and other practical aspects.	20	Biology Faculty	Existing
BIOL 441(G)	**LIMNOLOGY AND OCEANOGRAPHY. (3, 3, 4).** Origins, geology, physics, chemistry, and biological productivity of inland water bodies, estuaries, and oceans. Laboratory centers on methodology, instrumentation, and other practical aspects of freshwater and marine studies; required field trips.	25	Biology Faculty	Existing
CIVE 506	**ADVANCED HYDROLOGY. (3, 0, 3).** Quantitative approaches	20	Habib; Civil	Existing

	for modeling rainfall-runoff processes. Topics include lumped and distributed models, treatment of spatial and temporal hydrologic variability, hydrologic data quality control, and design of hydrologic networks. Restr: Permission of instructor required.		Engineering Faculty	
CIVE 546	**PROBABILISTIC METHODS IN HYDROSCIENCE. (3, 0, 3).** General review of advanced probability and statistics concepts, Monte Carlo simulation of hydro-systems, probabilistic models of observed hydrologic data, optimal estimation and interpolation of geophysical fields. Use of data-intensive computer applications is emphasized. Restr: Permission of instructor required.	20	Habib; Civil Engineering Faculty	Existing
CIVE 561	**WATER TREATMENT. (3, 0, 3).** Design of domestic and industrial water treatment facilities with emphasis on the basic scientific principles underlying the design procedures.	25	Habib; Gang	Existing
Soil Resources (existing courses)				
ENVS 490(G) REQUIRED	**ENVIRONMENTAL PEDOLOGY. (3, 0, 3).** Soil-solute interactions occurring as a result of natural and human activities.	35	Poudel; Hillman	Existing
ENVS 493(G)	**SOIL-PLANT RELATIONSHIPS. (3, 0, 3).** Chemical, biological, and physical properties of soils in relation to nutrient cycling and plant growth, including evaluation of soil supplements.	35	Visser; Poudel	Existing
ENVS 495(G)	**SOIL GENESIS AND SURVEY. (3, 0, 3).** Formation, distribution, and classification of soils as natural bodies. Restr: Non-majors, permission of instructor required.	35	Poudel; Hillman	Existing
ENVS 498(G)	**SOIL BIOLOGY. (3, 0, 3).** Role of plants, animals, and microbes in soil generation and the biochemical transformations in soil ecosystems; required for plant nutrition.	35	Hillman; Poudel	Existing
ENVS 580 REQUIRED	**FATE OF POLLUTANTS IN SOILS AND NATURAL WATERS. (3, 0, 3).** Thermodynamics and surface reactions affecting the presence, distribution, and fate of pollutants	35	Poudel; Borrok; Hillman	Existing
GEOL 433(G)	**CLAY MINERALOGY. (2, 2, 3).** Classification, identification, occurrence, and properties of clays.	50	Schubert; Poudel	Existing
CIVE 563	**SOLID AND HAZARDOUS WASTE MANAGEMENT. (3, 0, 3).** Current issues and legislation. Collection, storage and disposal. Treatment technologies including incineration and sanitary and hazardous waste landfills.	30	Civil Engineering Faculty	Existing
Environmental Methods (existing courses)				
ENVS 473(G)	**REMOTE SENSING IN GIS. (2, 2, 3).** GIS remote sensing and analysis based on aerial photography and satellite imagery, applying this technology for analyzing spatial issues. Prereq: ENVS 455(G) or GEOL 330.	30	Richter; Geology Faculty	Existing
ENVS 487(G)	**ADVANCED GIS ANALYSIS AND APPLICATIONS. (2, 2, 3).** Prereq: ENVS 464(G) and ENVS 473(G).	30	Costigan; Hillman	Existing
ENVS 455(G)	**GEOGRAPHIC INFORMATION SCIENCE 1 (3,2,2).** GIS theory and methodology, practical GIS software skills and basic scientific computing skills, map development and basic photo interpretation. Prereq. Literacy in Micro-Computers.	20	Costigan; Hillman	Existing
ENVS 464(G)	**GEOGRAPHIC INFORMATION SCIENCE 2 (3,2,2).** Emphasis on practical GIS applications, advanced GIS software skills map development and modeling. Prereq: ENVS 455(G)	20	Costigan; Hillman	Existing
GEOL 420(G)	**GEOPHYSICS I. (3, 2, 4).** Concepts, techniques, and applications. Emphasis on utility of gravity, magnetic, electrical, electromagnetic; and seismic data in the investigation of the subsurface at various depths.	50	Geology Faculty	Existing
GEOL 432(G)	**INSTRUMENTAL EXAMINATION OF EARTH MATERIALS. (2, 2, 3).** Application of x-ray diffraction, x-ray fluorescence spectroscopy, scanning electron microscopy, and light microscopy to examine minerals, rocks, soils, and scale deposits.	35	Geology Faculty	Existing
GEOL 437(G)	**COMPUTER APPLICATIONS IN GEOLOGY. (2, 2, 3).** Geological applications software. Includes GIS, CAD, and mapping	30	Geology Faculty	Existing

	routines. Prereq: One course in computer literacy or programming, and a statistics course. Restr: If prereq. not met, permission of instructor is required.			
ENVS 460(G)	**SITE ASSESSMENT AND REMEDIATION. (3, 0, 3).** Assessment and remediation of contaminated water sites and other geologic situations; includes risk and hazard analysis. Prereq or Coreq: GEOL 470 or permission of instructor.	35	Geology Faculty and adjuncts	Existing
BIOL 504	**MICROSCOPY THEORY AND APPLICATIONS. (3, 0, 3).** Includes light, electron, fluorescence, and scanning probe microscopy. Emphasis on computer-based acquisition and processing of images.	18	Biology Faculty	Existing
BIOL 427(G)	**EXPERIMENTAL DESIGN AND ANALYSIS. (3, 0, 3).** Fundamentals of designing and implementing field experiments from the initial planning stage to data analysis, interpretation, and publication.	25	Biology Faculty	Existing
BIOL 590	**ANALYTICAL TECHNIQUES. (3-6).** Training in the use of advanced research instrumentation including chromatography, fluorometry, image analysis and data interpretation. Restr: Permission of instructor required.	25	Biology Faculty	Existing
BIOL 502	**QUANTITATIVE ECOLOGY. (3, 0, 3).** Quantitative methods for analysis in Ecological studies including ecological models, model selection, maximum likelihood estimation, and mark-recapture analysis.	25	Biology Faculty	Existing
BIOL 503	**ECOLOGICAL MODELS AND DATA. (3, 0, 3).** Presents advanced statistical techniques that are a framework for comparing alternative mechanistic ecological models to empirical data. The combination of statics and models provides a quantitative basis for inferring the processes at work in an ecological system.	25	Biology Faculty	Existing
BIOL 575	**STATISTICAL ECOLOGY. (4, 0, 4).** Design, analysis, and presentation of results of ecological experiments and field studies, with emphasis on hypothesis testing and statistical modeling. Prereq: STAT 417(G) or permission of instructor required.	25	Biology Faculty	Existing
CIVE 567	**EXPERIMENTAL ANALYSIS FOR ENVIRONMENTAL ENGINEERS. (0, 6, 3).** Examination of laboratory techniques for assessing water quality and sludge contamination. Optical, electrical, gas chromatography, and x-ray methods are included.	25	Civil Engineering Faculty	Existing
CHEM 430 (G)	**INSTRUMENTAL ANALYSIS. (5, 4, 3).** Application of methodologies and sample preparation related to gas chromatography with FID and MS detection, Atomic adsorption spectroscopy, and UV-vis photospectrometry.	15	Chemistry Faculty	Existing
Biophysical Relationships (existing courses)				
BIOL 414(G)	**ORNITHOLOGY. (3, 3, 4).** Avian evolution, ecology, physiology, and behavior. Laboratories include required field trips and focus on identification, life history, and conservations of birds. Restriction: Permission of instructor required.	25	Biology Faculty	Existing
BIOL 445(G)	**ICHTHYOLOGY. (2, 4, 4).** Classification, zoogeography, and evolution of fishes. Includes ecological factors affecting fish community structure, adaptations of specialized fish fauna, including those of deep sea, epipelagic, polar, and coral reef habitats. Required field trips. Restriction: If prerequisites not met, permission of instructor required.	25	Biology Faculty	Existing
BIOL 415(G)	**BIOGEOGRAPHY. (3, 0, 3).** Integration of concepts of ecology, evolutionary biology, geology, and physical geography relative to distribution of species.	25	Biology Faculty	Existing
BIOL 580	**MARINE ECOLOGY. (3, 0, 3).** Discussions of basic principles of marine ecology, including productivity, dynamics of populations, factors affecting distribution, and interactions between organisms.	20	Biology Faculty	Existing

BIOL 542	**EVOLUTIONARY ECOLOGY. (3, 0, 3).** Ecological processes as phenomena that are subject to evolutionary change. Topics include optimality theory, predator-prey interactions, life-history strategies, sexual selection, and sociality. Prereq: A course in Statistics.	20	Biology Faculty	Existing
BIOL 412(G)	**CONSERVATION BIOLOGY AND BIODIVERSITY. (3, 0, 3).** Application of ecological and evolutionary theory to the management of rare and threatened species, communities, and ecosystems. Emphasis on human threats to wildlife species and habitats.	20	Biology Faculty	Existing
BIOL 461(G)	**AQUATIC AND WETLAND VASCULAR PLANTS. (2, 4, 4).** Identification, ecology, and adaptations of vascular aquatic and wetland plants.	20	Biology Faculty	Existing

2. Need

Outline how this program is deemed essential for the wellbeing of the state, region, or academy (e.g., how is it relevant, how does it contribute to economic development or relate to current/evolving needs).

The focus and structure of the proposed degree program is shaped to match the most recent developments associated with Louisiana's workforce needs and projected growth areas. The proposed degree program in Environmental Resource Science follows recommendations put forth in the FIRST Louisiana report and the *BOR Master Plan for Secondary Education (2011, revised 2012)*, and targets the need for a skilled interdisciplinary workforce that can address current and future challenges associated with the state's water resources and restoration activities. More recent recommendations to the Louisiana Board of Regents presented by the Master Plan Research Advisory Committee in 2014 highlight the need for new academic programs in interdisciplinary applied sciences such as the one proposed here.

The proposed degree program in Environmental Resource Science specifically addresses the following goals and objectives in the **BOR 2011 Master Plan**:

Goal 1, Objective 1.7: "*Develop a Skilled Workforce to Support an Expanding Economy*."
The proposed degree program will prepare a new generation of highly skilled workers in an important STEM field. Our graduates will support technical management and problem solving in areas associated with the environmental resources (specifically water and soil) that are critical to the State of Louisiana. Contributing to the development of a qualified labor pool in the domain of the environmental sciences will facilitate attracting new businesses and retaining existing businesses in Louisiana.

Goal 2, Objective 2.1: "*Maintain and Build Strength in Foundational Science and Technology Disciplines Identified in FIRST Louisiana."*
Physical Science is recognized by FIRST Louisiana as a key foundational science. Water resources are fundamental to 4 of the 6 transitional research domains (coastal, environmental, agricultural, energy) and fundamental to at least 3 of the 7 core industry S&T sectors (petrochemical, energy and environmental, and agriculture and wood products) in FIRST Louisiana. The high-growth target industries of coastal resilience and energy production are also underpinned by water resource management. More recent recommendations to the Louisiana Board of Regents presented by the Master Plan Research Advisory Committee in 2014 highlight the need in Louisiana for the development of new academic programs in interdisciplinary applied sciences such as the one proposed here.

"Recruit, cultivate, and retain research talent in the foundational sciences."
The addition of a Master's degree program will allow UL Lafayette to greatly expand research in water and soil resources, which will attract quality, research-active faculty and provide an incentive for the university to keep them.

"Develop and maintain cutting-edge infrastructure and facilities for fundamental science and technology research."
Although cutting-edge laboratory and field facilities are already in place, the Master's degree program will provide new opportunities to advance infrastructure. We plan to leverage the new program to secure instrumentation through grants and can rely on the more highly-capable graduate students to help operate and maintain equipment.

Goal 2, Objective 2.2: ***"Promote Multidisciplinary and Multi-Institutional Collaborative Research Efforts."***
Environmental Science, by its very nature, is the most inter- and multi-disciplinary STEM field. The proposed degree program is designed to accept qualified students with Bachelor's degrees from a variety of disciplines, including Biology, Geology, Chemistry, Environmental Science, Civil Engineering, and related fields. Moreover, the proposed curriculum includes the possibility of coursework in each of these disciplines. New collaborations among students and faculty in these different disciplines will develop through research projects and coursework. We have 7 supporting faculty members for the proposed degree program in Environmental Resource Science from outside the School of Geosciences (in Civil Engineering, Chemistry, and Biology).

"Address multi-disciplinary and multi-institutional collaborations in campus research plans."
The proposed multidisciplinary approach is consistent with strategic initiative 3 for research within the University of Louisiana at Lafayette's 2015-2020 *Strategic Plan*. This initiative will expand research programs beyond our existing strengths and take advantage of our historical, cultural, and geographic setting for research and scholarly purposes. Our proposed program greatly leverages our geographic setting for research focused on water and soil resources. Moreover, the multi-disciplinary nature of our program ties into the key performance indicator of increasing collaborations across disciplines.

Goal 2, Objective 2.3: ***"Sustain and Advance Research Commercialization and Translational Activities that Promote Economic Development in Louisiana."***
We are embracing translational research as a key focus of the proposed degree program in Environmental Resource Science. This focus includes an emphasis on hands-on training and internship opportunities. Our program is designed to remain tightly connected to industry, a significant feature of the program intended to enhance commercialization and translational research.

"Promote Multidisciplinary and Multi-Institutional Collaborative Research Efforts."
As described in Goal 2, Objective 2.2 (above), the proposed concentration areas include courses from multiple disciplines, a step that will foster joint research efforts. Many of our faculty members are already collaborating across disciplines at UL Lafayette. As an example, we recently received a multi-disciplinary BOR enhancement grant for building living wetland laboratories. This grant was led by a faculty member in our Environmental Science Program with collaborators from Geology, Biology, and Civil Engineering. All of these collaborators are listed as primary or supporting faculty for our master's program in Environmental Resource Science.

"Foster networking and strategic collaborations between higher education, government, and Louisiana's existing and prospective high-growth industry sectors."
Louisiana's high-growth industry sectors include *Energy Production* and *Coastal Resilience*. Proper understanding and management of water and soil resources are critical for these industries. We will be working with local industry in these areas via internship and research opportunities.

"Build capacity in areas of competitive advantage and target niches which align with campus and State research priorities."
As described above, our target niches are closely aligned both with the research priorities of UL Lafayette and the State of Louisiana. By filling these niches, we add value to our program for our students, our community, and society.

Economic Development and Workforce Needs:
The Louisiana Workforce Commission indicates that Environmental Science is a high-demand job for Louisiana. There are projected to be 80 annual job openings (30 new + 50 replacements) over the next decade for *Environmental Scientists and Specialists* (Table 2). There is additional demand for Environmental Scientists as *Natural Science Managers* and *Conservation Scientists,* as 30 new positions will be available in Louisiana over the next decade (Table 2).

Although some environmental science jobs are obtainable with a BS degree, there are considerable advantages for students who earn a graduate degree within an area of Environmental Science. In most areas of Environmental Science, earning a graduate degree will provide students with more career options, positions of greater responsibility and leadership, and increased pay. For example, according to federal pay scales, an entry-level environmental scientist with a BS degree would start out as a GS 5, making around $32,000 annually (depending on location). An individual holding a MS degree in the same field at the same location would start out as a GS 9, making around

$48,000 annually, amounting to a salary enhancement of 50%. To test whether these financial differences were also present in the private sector, we interviewed 5 businesses that hire environmental scientists in our region. The average starting salary difference between an environmental scientist holding only a BS degree and one additionally holding a MS degree was 26.8%, with the MS-degree holders earning the higher salaries.

Table 2. Louisiana Workforce Commission Occupational Projections

Occ. Code	Occupational Title	2012 Estimate	2022 Projected	10 Year Growth	Annual New Growth	Annual Replacement	Annual Total Openings
11-9121	Natural Sciences Managers	400	450	50	10	10	20
19-1031	Conservation Scientists	160	180	20	0	10	10
19-2041	Environmental Scientists and Specialists, Including Health	1,660	1,950	290	30	50	80

In addition, job openings in Louisiana that are predicted to be created as a result of coastal restoration activities are estimated to range from 16,341 to 22,716 new jobs per year over the next 50 years (Ryan, 2014; *The Economic Impact of Coastal Restoration and Hurricane Protection*; Tulane Institute on Water Resources Law and Policy; Table 6). Although this job growth will be spread over many sectors, it is clear that environmental scientists could fill a measurable portion of technical, skilled positions.

Describe how the program will further the mission of the institution.

The University of Louisiana at Lafayette is the largest member of the University of Louisiana System and is designated within the Carnegie classification as a Doctoral University with Higher Research Activity. The mission of the University is to offer an exceptional education informed by diverse worldviews grounded in tradition, heritage, and culture. We develop leaders and innovators who advance knowledge, cultivate aesthetic sensibility, and improve the human condition. The proposed Master's degree program in Environmental Resource Science would strengthen UL Lafayette's existing role as a developing research university and support UL Lafayette's mission by adding to our educational portfolio and developing leaders and innovators in the much-needed areas of water and soil resource management. By producing graduates in these water and soil resource management we will help to strengthen the local and regional economy, and our students will use the expertise gained to help find solutions to environmental resource challenges at the state, national, and global levels thereby improving the human condition.

The proposed MS degree program in Environmental Resource Science will contribute to the University's "environment, energy, and economics" area of excellence. The program is an institutional priority for UL Lafayette because it will provide new educational and research training opportunities for our students, increase the number of students receiving STEM degrees, and support the strategic research mission of the University. Among other key disciplines, UL Lafayette aims to become a leader in research and education focused on water resources and management. We are positioning ourselves as an institution to become leaders in translational research in this area, bridging the gap between fundamental and application-based research. Hence, the focus of the proposed Master's level degree program on water and soil resources fits perfectly within the strategic research and educational interests of our University.

Identify similar programs in the state and explain why the proposed one is needed: present an argument for a new or additional program of this type and how it will be distinct from existing offerings.

The most comparable programs include LSU's MS degree program in Renewable Natural Resources, LSU's MS degree program offered by the School of Plant, Environmental & Soil Sciences (PEMSS), and LSU's MS degree in "Environmental Science." The University of New Orleans has a program in Earth and Environmental Science at the MS level, but it is more Geoscience-focused than what is being proposed here. McNeese State University offers an MS degree program in Environmental and Chemical Science; however, this program has a CIP code of 40.0599, which places it in the Chemistry category.

We performed a quantitative assessment of the degree of overlap with our program and the most comparable programs described above. The results are summarized in Table 3 and demonstrate that the proposed degree program in Environmental Resource Science has less than a 20% overlap with any of these existing programs.

LSU's MS degree in Renewable Natural Resources includes the following five concentrations: Fisheries and Aquaculture; Forest Products; Forestry and Forest Resources; Watershed Science; and Wildlife. By contrast, UL Lafayette's proposed MS in Environmental Resource Science has a programmatic core focusing on Water Resources, Soil Resources, and Environmental Methods. There appears to be no overlap with 4 of the 5 concentrations listed for the LSU program (Table 3). Admittedly, the Forestry and Forest Resources Science concentration of the LSU program (at 20% of the programmatic concentration) could overlap with approximately 30% the proposed courses (largely Soil and GIS courses) in the UL Lafayette program. Even if the Forestry and Forest Resources concentration of the LSU program overlapped by 30% with the content of the proposed UL Lafayette program, the two programs would overlap by a maximum of 6% (i.e., 0.30 course overlap multiplied by 0.20 program concentration = 0.06 total overlap), thereby making the UL Lafayette and LSU degree programs 94% distinct (Table 3).

LSU's MS degree program in Plant, Environmental & Soil Sciences is primarily focused on agriculture and includes the following three concentrations: Agronomy, Horticulture, and Soil Science. UL Lafayette's proposed MS in Environmental Resource Science has limited overlap with the Agronomy and Soil Science concentrations (Table 3). The water resources courses in LSU's program are focused on water management associated with crop production, whereas the proposed degree program in Environmental Resource Science takes a much broader approach to water resources. The soil science courses in both the Agronomy and Soil Science concentrations of the LSU program (at 67% of the programmatic concentration) would overlap in part with the Soil Resources focus of the UL Lafayette program. Considering that the soil courses of the LSU concentrations in Agronomy and Soil Science overlap 20% and 25%, respectively, with the Soil Resources aspects of the proposed UL Lafayette program, then these two programs overlap by approximately 15% in total, making them 85% distinct (Table 3).

LSU's Environmental Science MS degree program has focus areas in (1) Biophysical Systems, (2) Environmental Planning and Management, and (3) Environmental Assessment and Analysis. Water and soil resources are addressed in the broader context of these three concentration areas. This approach contrasts with that of UL Lafayette's proposed degree program in which soil and water resources are the *primary* programmatic focus. Our proposed program will have about a 15% total overlap with LSU's Environmental Science Program (Table 3), making them 85% distinct.

UNO's Earth and Environmental Science MS degree program offers projects in the areas of Igneous Petrology, Geophysics, Aquatic Ecology, Geomorphology, Coastal Oceanography, Coastal and Marine Geology, Sedimentology, and Paleontology. Of these nine research areas, only one is not typically associated with the Geosciences. The remaining research area at UNO that clearly falls in the realm of environmental science is Aquatic Ecology. Upon evaluation of the courses available within the UNO program, we found that our proposed degree program in Environmental Resource Science may overlap with those courses by as much as 20% (Table 4), making the two programs 80% distinct.

We understand that the issue of degree program duplication is important. However, in many cases partial duplication is necessary and healthy in order to develop degree programs that serve a special niche of the student population, while not omitting fundamental concepts and skills that fall under the umbrella of an 'environmentally-oriented' degree plan. In this way, students may specialize in specific areas of environmental science but nevertheless receive comprehensive training.

Table 3. Comparison of the amount of overlap of our proposed program with existing programs in the state

Program	Concentrations	Overlap* (Yes/No)	Estimated % Overlap	Course Overlap
1. LSU Renewable Natural Resources	a. Fisheries and Aquaculture (20%)	No		
	b. Forest Products (20%)	No		
	c. Forestry and Forest Resources (20%)	Yes	30%	Soil Courses (4) GIS Courses (2)
	d. Watershed Science (20%)	No		
	e. Wildlife (20%)	No		
TOTAL OVERLAP			**6%**	
2. LSU Plant, Environment and Soil Science	a. Agronomy (33%)	Yes	20%	Soil Courses (4)
	b. Horticulture (33%)	No		
	c. Soil Science (33%)	Yes	25%	Soil Courses (5)
TOTAL OVERLAP			**15%**	
3. LSU MS in Environmental Science	a. Biophysical Systems (33%)	Yes	25%	Coastal Systems, Watershed Sci., Envir. Toxicology, Water Quality, Remote sensing
	b. Environmental Planning and Management (33%)	Yes	5%	Water Quality Management
	c. Environmental Assessment and Analysis (33%)	Yes	15%	Spatial Modeling, Field Techniques, Water Quality Modeling
TOTAL OVERLAP			**15%**	
4. UNO's Program in Earth and Environmental Science		Yes	20%	Environmental Toxicology, Field Methods, Coastal Science, Oceanography
TOTAL OVERLAP			**20%**	

*Overlap was calculated by examining the required or recommended course offerings identified on the program websites.

If approved, will the program result in the termination or phasing out of existing programs? (Is it a replacement?) Explain.

The program will not result in the termination or phasing out of existing programs, nor is it a replacement for any existing programs.

If a Graduate program, cite any pertinent studies or national/state trends indicating need for more graduates in the field. Address possibilities for cooperative programs or collaboration with other institution(s).

The need for additional graduates in this area within the state of Louisiana was discussed above in Section 2. The need for Environmental Scientists is also growing nationally. Job growth from 2014-2024 is expected to be around 11%, which is substantially faster than the national average for all jobs (Table 4). Job demand in Environmental Science is driven by "*Heightened public interest in the hazards facing the environment, as well as the increasing demands placed on the environment by population growth*" (US Bureau of Labor Statistics).

Table 4. U.S. Bureau of Labor Statistics Quick Facts about Environmental Science Jobs

2014 Median Pay	$66,250 per year $31.85 per hour
Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	None
On-the-job Training	None
Number of Jobs, 2014	94,600
Job Outlook, 2014-2024	11% (Faster than average)
Employment Change, 2014-2024	10,200

3. Students

Describe evidence of student interest. Project the source of students (e.g., from existing programs, or the prospects of students being recruited specifically for this program who might not otherwise be attracted to the institution).

We plan to recruit students on our own campus who receive BS degrees in Environmental Science, Geology, Biology, Physics, and Chemistry. It is difficult to assess demand among graduates of programs outside of Environmental Science, but the sheer number of annual graduates in all of these programs alone suggests that we will have an immediate and large demand for this program. For example, Biology, Chemistry, and Geology respectively graduate approximately 70, 15, and 10 students annually. Our proposed MS degree program in Environmental Resource Science would provide a new and compelling opportunity for these graduates.

Our current BS degree in Environmental Science is growing rapidly, and its enrollment and graduation rates provide a good example of the usefulness and appeal of this field in the region. We began with 31 students enrolled in 2011/2012, and this has quickly expanded to an enrollment of 74 in Fall 2015 (68 in Spring 2016). We are actively recruiting students for this program and, to that end, have recently developed a 2+2 relationship with South Louisiana Community College in Lafayette.

To assess demand for the Master's degree program among our current students, we used a survey. Forty students responded to the survey, including 33 juniors and seniors. Of the surveyed students, 27.5% already planned to obtain a MS degree somewhere, regardless of our new program. However, when asked if they would be interested in enrolling in a MS degree program if one were developed at UL Lafayette, 21 students (over 50%) said yes, while 17 were unsure, and only two were uninterested. When asked about their motivation for pursing a MS degree, 85% of the surveyed students indicated that the opportunity to earn a higher salary was important or very important. More than 72% of respondents suggested that the opportunity to advance more quickly in industry was important or very important.

In addition to undergraduate students in Geosciences, it is clear that the production of Bachelor's level degrees in Environmental Science in Louisiana is quite high and growing. For example, over the last 5 years Louisiana Tech University's BS degree program in Environmental Science has averaged 11.4 graduates, while LSU's BS degree program in Environmental Management Systems has averaged 11 graduates. Moreover, LSU's BS program in Coastal Environmental Science has graduated more than 10 individuals in the last 2 years (this is a relatively new program). Environmental Science BS-degree programs at private institutions in Louisiana (Tulane and Loyola University) account for another 5 to 10 graduates annually. Hence, in combination with UL Lafayette's BS degree program in Environmental Science, the production of students graduating with BS degrees in Environmental Science in Louisiana is approximately 45 to 50 students annually. These data—along with growth in majors in other environmentally-relevant programs at UL Lafayette and throughout the state in Biology, Geology, and Chemistry—will provide a rich pipeline for graduate students to join our MS degree program in Environmental Resource Science.

One of our initial recruiting strategies will be to contact all current Environmental Science programs that offer BS degrees in the Gulf Coast region as well as to use online recruitment platforms such as GradSchoolMatch.com to engage directly with prospective applicants. We also will use the GRE exam service to conduct a highly geo-targeted search to identify prospective applicants who have demonstrated graduate-level readiness through their GRE test performance and identified disciplinary interests that align with the program. Finally, these tools, along with others such as the McNair Scholars Directory, will be used to do targeted outreach to a diverse applicant pool. . In addition to these efforts, we will continue to work with the Graduate School to build a social media and web-based recruitment initiative that effectively uses search engine optimization tools to drive inquiries to the program.

Project enrollment and productivity for the first 5 years, and explain/justify the projections.

Table 5. Projected enrollments and student funding mechanisms for years 1-5.

	Students			Funding			
Year	Total Enrolled	New Students	Graduated	Industry-Funded	Self-Funded	Research-Funded	Graduate Assistantships
1	5	5	0	2	0	1	2
2	10	8	3	3	1	2	4
3	14	10	6	5	2	3	4
4	18	12	8	6	4	4	4
5	21	13	10	7	4	6	4

Based on the analysis of enrollment patterns for similar programs, the enrollment projections in Table 5 are quite conservative. The most recent MS degree program that is related to Environmental Science that was created in Louisiana (2002) is the program in "Environmental and Chemical Science" at McNeese State University. Although this program has a CIP code of 40.0599, which places it in the "Chemistry" category, it is still a reasonable comparison for enrollment because of its focus on Environmental Chemistry. Enrollments in McNeese State's MS program reached 33 students in just 3 years.

Provide enrollment/completer data for closely related programs currently offered at the institution.

UL Lafayette's undergraduate programs in Chemistry, Geology, Environmental Science, and Biology, and our MS degree program in Geology are most closely related to the proposed program in Environmental Resource Science. Enrollment statistics for these programs are compiled from 2011 through 2015 in Table 6 and graduation data are presented in Table 7. Note that UL Lafayette's undergraduate program in Environmental Science began in 2012 and the first students graduated from the program in 2014. The program has grown rapidly, reaching 73 students in Fall 2015. We expect to graduate 10 students from this program in May 2016.

Table 6. Enrollment by Semester

	SP11	**FA11**	**SP12**	**FA12**	**SP13**	**FA13**	**SP14**	**FA14**	**SP15**	**FA15**
Biology	621	793	689	779	648	791	654	784	648	812
Chemistry	149	212	159	174	152	167	143	161	130	169
Geology	56	67	63	85	80	91	89	98	90	103
Environmental Sci	NA	NA	22	31	37	52	57	66	55	73
Geology MS	44	49	49	49	49	66	64	69	72	88

Table 7. Degrees Awarded by Year

	2010/11	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**5 year Ave**
Biology	71	64	75	87	81	75.6
Chemistry	18	16	14	18	24	18
Geology	17	6	5	23	8	11.8
Environmental Sci	NA	NA	NA	2	5	NA
Geology MS	8	11	11	12	10	10.4

What preparation will be necessary for students to enter the program?

Prerequisites for acceptance into the MS Program of Environmental Resource Science include a Bachelor's degree in a related scientific or engineering field. Substitutions may apply and will be determined on a case-by-case basis by the Environmental Science graduate committee.

For admission in good standing, applicants will be expected to demonstrate proof of undergraduate degree with at least a 2.75 cumulative undergraduate GPA or a 3.0 cumulative GPA in the last 60 hours, a satisfactory GRE score, and three supportive letters of recommendation. International students must demonstrate satisfactory English proficiency.

If a Graduate program, indicate & discuss sources of financial support for students in the program.

UL Lafayette will initially support four masters-level graduate teaching assistantships for this program, which include monthly stipends as well as tuition waivers. Two assistantships will be made available for the first year of the program, and two additional assistantships will be granted for the second year, for a total of 4 assistantships henceforth. As the program grows beyond initial projections (Table 5), the additional tuition revenue may support additional assistantships.

Graduate assistantships are awarded annually by the Graduate School to individual graduate degree programs. There are a significant number of graduate assistantships awarded to Masters students (e.g., in FA2016, the Graduate School funds 286 GTA/GRA/GA positions that Masters students fill; in AY2015-16 and AY2014-15, that number was 284 and 246 respectively). Assistantship allocations vary greatly by graduate degree program, and these allocations are reviewed annually with requests to increase the number of assistantships awarded being evaluated with significant consideration given to enrollment in/decreases and, in the instance of GTA appointments, undergraduate teaching demands. Additionally, a significant number of graduate assistantships are funded by external research funding. Indeed, the Office for Research provides incentives for including graduate student funding in such proposals. In this instance, it is the University's expectation that, in addition to the graduate assistantships funded by the Graduate School (and increased as enrollment levels support), a significant percentage of the students funded as GRAs will be supported by the faculty's external research funding and industry-funded initiatives. Whatever the source of funding, the University has established a minimum stipend level for both master's-level and doctoral-level assistantship stipends and has established definitions to distinguish the difference between GTA/GRA/GA appointments. UL Lafayette is committed to supporting the growth of this new program by regularly assessing its need for additional assistantships, and providing additional resources should they become necessary to the wellbeing of the program.

Graduate assistantships are important for recruiting and retaining highly qualified students. Graduate assistantships also help to offset faculty workloads, which are expected to increase with the inception of a graduate program. The cost of the requested four assistantships will be offset by in-state and out-of-state tuition revenue from full-time students enrolled in the program as well as internship support from local industry.

In addition to the four graduate assistantships requested from UL Lafayette, many students will be funded by external research funds and by industry partners, either through the creation of company-sponsored assistantship, paid internships, or corporate funding as a business-recruiting tool for graduates. We estimate that faculty research funding will support between 1 and 6 graduate students annually. This is based on the fact that faculty in the School of Geosciences have averaged (as a group) almost $800,000 a year in external research funding over the last 5 years. Furthermore, a number of businesses and agencies have already committed to hosting internships for our students. We further estimate that paid internships will be provided to as many as 7 students annually. Organizations that have committed to providing internships include the following:

- RT Environmental Services
- Sherry Laboratories
- Hydro-Environmental Technology Inc.
- T. Baker Smith, LLC
- Icon Environmental Services
- KourCo Environmental Services
- Stokes and Spiehler Engineering and Consulting
- CH2M Hill
- Dove Environmental
- Lafayette Consolidated Government
- US Department of Agriculture – National Resources Conservation Service
- National Park Service
- Louisiana Department of Environmental Quality

- US Geological Survey National Wetlands Research Center

Finally, our experience is that some students are willing to pay out of pocket for a valuable MS degree that puts them on a path to a high-paying job, leadership positions, and/or other forms of professional advancement. Hence, through the combination of funding mechanisms, including graduate assistantships, paid internships, research assistantships, and self-funding, we can easily reach our enrollment projections (Table 5).

4. Faculty

List present faculty members who will be most directly involved in the proposed program: name, present rank; degrees; courses taught; other assignments.

Primary Faculty are listed below, all with doctoral degrees and the appropriate graduate faculty status (see Table 1 for listing of courses these faculty can/will teach within the proposed degree program)

- Dr. Durga Poudel; Professor, Environmental Science
- Dr. Jenneke Visser; Associate Professor, Environmental Science
- Dr. Katie Costigan; Assistant Professor, Environmental Science
- Dr. Aubrey Hillman; Assistant Professor, Environmental Science
- Dr. Brian Schubert; Assistant Professor, Geology
- Dr. Carl Richter; Professor, Geology
- Dr. David Borrok, Professor, Geology. Borrok is also the Director of the School of Geosciences.
- Dr. Tim Duex, Associate Professor, Geology

Supporting faculty from other disciplines with doctoral degrees and appropriate graduate faculty status

- Dr. Paul Leberg; Professor, Biology
- Dr. Mark Hester; Professor, Biology
- Dr. Paul Klerks; Professor, Biology
- Dr. Emad Habib; Professor, Civil Engineering
- Dr. Daniel Gang; Professor, Civil Engineering
- Dr. Feebe Louka; Associate Professor, Chemistry
- Dr. Radhey Srivastava, Professor, Chemistry

Adjunct Faculty: Adjuncts will help to support research, teaching, and in some cases can serve on graduate thesis committees.

- Dr. Thomas Doyle – PhD; US. Geologic Survey, National Wetlands Research Center
- Dr. Ken Krauss – PhD; US. Geologic Survey, National Wetlands Research Center

Project the number of new faculty members needed to initiate the program for each of the first five years. If it will be absorbed in whole or part by current faculty, explain how this will be done. Explain any special needs.

The program will be taught by current faculty (see previous question).

Describe involvement of faculty – present and projected – in research, extension, and other activities and the relationship of these activities to teaching load. For proposed new faculty, describe qualifications and/or strengths needed.

The School of Geosciences already has in place a highly-structured framework for teaching load decisions, as per research, extension, and other activities. All new faculty who teach at the Graduate level are required to hold a terminal degree, and must demonstrate success with their research, teaching, and service.

Scholarly activity within the School of Geosciences is high and capable of supporting multiple graduate students within this program. Over the last 5 years, the School has averaged $760,000 in new external research funding annually. The addition of 4 graduate assistants to support this program will allow us to effectively offset increased teaching loads and maintain an already high level of research productivity.

5. Library and Other Special Resources

Are present library holdings in related fields adequate to initiate the program? To meet program needs in the first 5 years, what will be needed? Do other institutions have library resources available to faculty & students for the proposed program?

Present library holdings in the related fields of Geology, Environmental Science, Biology, and Chemistry are adequate to initiate the Master of Science in Environmental Resource Science. The library supports instruction and research with collections in a variety of formats. The library provides electronic access to materials through the library's website.

Other institutions' resources are available to faculty and students for the Master of Science in Environmental Resource Science through Interlibrary Loan and LOUIS: The Louisiana Library Network. The library participates in formal arrangements in order to supplement the collections owned by the library. This includes participation in LOUIS: The Louisiana Library Network, a consortium that allows Louisiana academic libraries to share library resources, collaboratively purchase resources, and extend borrowing privileges across the state. Through the library's membership in LOUIS, students and faculty may obtain a LOUIS card and borrow materials directly at all of the colleges and universities throughout the State of Louisiana.

Indicate/estimate total expenditure for the last two fiscal years in library acquisitions for fields or departments offering or related to the proposed program.

Total Library Expenditures 2014/2015 and 2015/2016

Print and Electronic Serials Subscriptions: $563,441.75

Online Research Databases (includes LOUIS Consortium Membership): $991,478.15

Print and Electronic Books: $49,005.00

Project library expenditures needed for the first 5 years of the program.

No additional library expenditures are anticipated.

What additional special resources, other than library holdings, will be needed?

There are no anticipated additional special resources, other than library holdings, needed.

6. Facilities and Equipment

Describe *existing* facilities (classrooms, labs, offices, etc.) available for the program. Describe present utilization of these facilities that are assigned to the sponsoring department.

The MS in Environmental Resource Science will be housed within the School of Geosciences in Hamilton Hall. Seven classroom spaces, totaling almost 7,000 ft^2 and accommodating 491 students, are available for lectures in Hamilton Hall. This includes a 236-person auditorium, which can be used for large classes and our graduate seminar series. An additional 4,200 ft^2 of laboratory teaching space is available for "hands-on" laboratory-based courses. Every faculty member and instructor in the School of Geosciences has office space on the 3rd floor of Hamilton Hall. Several additional offices are available to accommodate further expansion. Laboratory research space in Hamilton Hall includes two large (>1,000 sq ft) rooms in the basement (B08/B09). These include extensive bench space, available gas, vacuum and air lines, fume hoods, and wireless internet access. Additional research laboratory space on the 2nd floor is dedicated to geochemical investigations, including isotope ratio mass spectrometry.

The School of Geosciences also manages the Ira Nelson Horticulture Center and Cade Farm, which function as off-campus research and education facilities. The UL Lafayette Research Farm at Cade is located in St. Martin Parish and consists of 600 acres of wetland research ponds, pasture lands, agricultural lands, and wetland habitat. The Welcome Center building includes a large classroom that can accommodate up to 75 people. The Ira Nelson Horticulture Center is an instructional horticulture and experimental laboratory facility designed to educate students and the community. The center consists of 16,763 sq. ft. of greenhouses, 4,668 sq. ft. of shade houses, and 7,030 sq. ft. of offices, classrooms, laboratories, and storage. In addition to these facilities, the Center for Ecology and Environmental Technology (CEET) offers greenhouse and field research space for students and faculty.

Many of the School of Geosciences' GIS courses are housed in the GIS regional application center in Abdalla Hall on the UL Lafayette Research Campus. This facility is available to support our proposed program.

The Geology Museum facility, located within the Lafayette Science Museum in downtown Lafayette, Louisiana, contains a 1,500 sq ft research space in addition to a federally-certified specimen repository. This facility will be available for students and faculty doing paleoenvironmental work with water and soils.

Describe the need for new facilities (e.g., special buildings, labs, remodeling, construction, equipment), and estimate the cost, proposed sources of funding, and estimated availability for program delivery.

No new facilities or equipment are anticipated, as the Master's degree in Environmental Resource Science will leverage such resources as they already exist.

7. Administration

In what department, division, school, college, or center/institute will the proposed program be administered? How will the new program affect the present administrative structure of the institution?

The Master's degree in Environmental Resource Science shall be administered by the School of Geosciences in the Ray P. Authement College of Sciences. The new program will have no impact on the present administrative structure of the institution.

Describe departmental strengths and/or weaknesses and how the proposed program will affect them.

The proposed program in Environmental Resource Science is closely tied to the mission of the School of Geosciences to provide maximum value to our students, our community, and society through education and research focused on Energy and the Environment. Our faculty includes world-class experts in the areas of water and soil research. The creation of this program will provide new graduate-level opportunities for our undergraduate students and will provide another avenue for research and collaboration among our faculty. This is critically important for our faculty members who are associated with our undergraduate program in Environmental Science. These faculty members will now have the opportunity to direct graduate students in the Environmental Resource Science program. The ability to work with graduate students will substantially enhance their research productivity, strengthening the School of Geosciences as a whole.

8. Accreditation

Describe plan for achieving *program* accreditation, including: name of accrediting agency, basic requirements for accreditation, how the criteria will be achieved, and projected accreditation date.

There currently is no existing program accreditation body for this discipline.

If a graduate program, describe the use of consultants in developing the proposal, and include a copy of the consultant's report as an appendix.

Consultants were not used for the development of this proposal.

9. Related Fields

Indicate subject matter fields at the institution which are related to, or will support, the proposed program; describe the relationship.

Because the proposed program in Environmental Resource Science is interdisciplinary in nature, students with undergraduate degrees in Chemistry, Biology, Civil Engineering, Environmental Science, and Geology will have the academic background necessary for admission into the program. Moreover, faculty from these various disciplines will be directly involved in our program through research, mentorship, and teaching. We plan to leverage courses that are already being routinely taught, so changes in teaching loads will be minimal. Faculty from any of these disciplines can serve as thesis advisors and/or committee members for student research projects.

In summary, the MS degree program in Environmental Resource Science will provide new and exciting educational opportunities for a large pool of students, and it will catalyze interdisciplinary collaboration and research productivity at the University of Louisiana at Lafayette.

10. Cost & Revenue

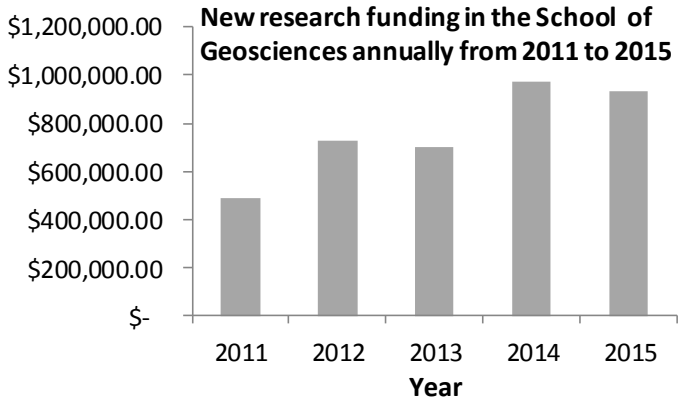
Summarize additional costs to offer the program, e.g., additional funds for research needed to support the program; additional faculty, administrative support, and/or travel; student support. How will the program affect the allocation of departmental funds?

The proposed program can be fully implemented with little new costs to UL Lafayette. This includes no new additional funds required for faculty, supplies, operating expenses, or travel. Costs incurred by graduate assistantships represent a minimal but necessary investment and will be matched by industry-supported internships and offset by tuition revenue.

*On the separate budget form, estimate *new* costs and revenues for the projected program for the first four years, indicating need for additional appropriations or investment by the institution.

Outside of revenue from tuition & fees, explain and justify any additional anticipated sources of funds, e.g., grants (in hand, promised, or in competition), institutional funds, etc.

Faculty in the School of Geosciences have averaged $760,000 in external grant/contract funding annually over the last 5 years (see graphic below). This level of funding can be split between UL Lafayette's existing MS degree program in Geology and the proposed MS-degree program in Environmental Resource Science to support a large number of graduate students.



CERTIFICATIONS:

Dr. Azmy Ackleh, Dean of the Ray P. Authement College of Sciences
Primary Administrator for Proposed Program Date: May 23, 2016

Dr. Fabrice Leroy, Assistant Vice President for Academic Programs
On behalf of Provost/Chief Academic Officer Date: May 23, 2016

_____ _____
Management Board/System Office Date

SUMMARY OF ESTIMATED ADDITIONAL COSTS/INCOME FOR INTENDED PROGRAM

Institution: **University of Louisiana at Lafayette** **Date: February 1, 2016**

Degree Program, Unit: M.S. in Environmental Resource Science, School of Geosciences, College of Science

FTE = Full Time Equivalent (use the institution's standard definition and provide that definition).

EXPENDITURES								
INDICATE ACADEMIC YEAR:	**FIRST**		**SECOND**		**THIRD**		**FOURTH**	
	AMOUNT	**FTE**	**Amount**	**FTE**	**AMOUNT**	**FTE**	**AMOUNT**	**FTE**
Faculty	$0		$0		$0		$0	
Graduate Assistants	$46,132		$92,264		$92,264		$92,264	
Support Personnel								
Fellowships and Scholarships								
SUB-TOTAL	$46,132		$92,264		$92,264		$92,264	
	AMOUNT		**AMOUNT**		**AMOUNT**		**AMOUNT**	
Facilities	$0		$0		$0		$0	
Equipment	0		0		0		0	
Travel	0		0		0		0	
Supplies	0		0		0		0	
SUB-TOTAL	$0		$0		$0		$0	
TOTAL EXPENSES	$46,132		$92,264		$92,264		$92,264	
REVENUES								
Revenue Anticipated From:	**AMOUNT**		**AMOUNT**		**AMOUNT**		**AMOUNT**	
*State Appropriations	$27,093**		$54,186**		$75,860**		$97,534	
*Federal Grants/Contracts	0		0		0		0	
*State Grants/Contracts	0		0		0		0	
*Private Grants/Contracts	0		0		0		0	
Expected Enrollment	5		10		14		18	
Tuition	$16,532		$33,063		$55,106		$77,148	
Fees	$7,201***		$14,402***		$24,003***		$33,604***	
Other (specify)								
TOTAL REVENUES	$50,826		$101,651		$154,969		$208,286	

**Used 2016-7 new formula (without OPM) to estimate state appropriations
***Undedicated fees only