

STATE BOARD OF EDUCATION – ACADEMIC FULL PROPOSAL

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Submitted by:
University of Idaho

College of Letters and Science

Environmental Science Program

A New, Expanded, Cooperative, Contract, or Off-Campus Instructional Program or Administrative/Research Unit

Leading to:

Ph.D. in Environmental Science

Beginning Fall 2002

Abstract

In order to maintain an acceptable level of environmental quality in the U.S., scientists need strong academic training in the management of natural resources. The director of the National Science Foundation has stated, "For the twenty-first century, our goal must be to understand, and learn to keep in balance, the bio-complexity of all of Earth's ecosystems." This charge will require scientists trained both in disciplinary fields and in inter- and multi-disciplinary areas such as environmental science. There is an on-going need to provide students with an understanding of the complexity of environmental problems, and an integrated and coherent approach to solving them.

The UI Environmental Science program has been extremely successful since its inception in 1993. Since the first graduates in 1996, 43 M.S. degrees and 185 B.S. degrees have been awarded. In Moscow, the M.S. program has 43 students; the B.S. program has 140 students. In Idaho Falls (where the program has been offered since 1996), 21 students are seeking the M.S. and 7 are seeking the B.S. degree. Of those graduated, 94% are employed or chose to continue their education. The University of Idaho has also offered both B.S. and an M.S. degrees statewide in Environmental Science since January, 2001, using live instruction, compressed video, and the Internet.

This proposal is for the implementation of a Ph.D. degree in Environmental Science at the University of Idaho. The proposed degree will blend well with the existing B.S. and M.S. programs and provide continuity of educational opportunities in the environmental area in Idaho. Cooperation with WSU, ISU, and BSU will ensure that courses do not overlap in regional offerings.

The proposed Ph.D. in Environmental Science will offer students the opportunity to combine studies in several disciplines and professional fields in order to gain an understanding of the complex nature of environmental problems. In addition to understanding relationships between traditional disciplines, the program will foster an integrated, interdisciplinary, and coherent approach to environmental problem solving. To meet these objectives, the curriculum includes courses in many disciplines as well as in specific areas of environmental science. Courses in biology, chemistry, math, forestry, geology, geography, political science, economics and soils are combined into six emphasis areas for the degree. Existing faculty and curricular resources will be re-allocated to support the new degree program.

The nature of the request

Key program elements and faculty are currently in place at the University of Idaho. Faculty from all nine colleges - Agriculture, Art and Architecture, Business and Economics, Education, Engineering, Law, Letters and Science, Mining and Earth Resources, and Natural Resources - participate in the Environmental Science program. Course work, and the faculty to teach the courses, are offered by all colleges. In addition, course work, some of which is cross-listed with the University of Idaho, is also available in several areas of environmental science at Washington State University, Idaho State University, and Boise State University. On-going research in environmental science at UI includes subsurface science, bioremediation, hazardous waste treatment, advanced oxidation processes, risk assessment, site characterization, environmental policy and law, and air pollution control. Only .2 FTE is requested to implement the program initially; re-allocation of existing faculty workload and utilization of affiliate faculty will meet the other needs of the program. An additional full time faculty position may be needed as the program matures. Qualifications for additional faculty members will be an earned doctorate in science, engineering, or other discipline, with emphasis in environmental science. Additionally, the ability to advise students on curricular matters and to conduct research will be required.

Although no accrediting agencies for Environmental Science exist, many of the 26 participating departments (including all the departments in the College of Engineering), have accrediting agencies and are fully accredited

Faculty broadly representative of the physical, biological, and social sciences have developed the B.S. and M.S. degree programs in Environmental Science at the University of Idaho, have successfully implemented those programs, and have developed this proposal. The Environmental Science Curriculum Committee, the full Environmental Science faculty, the Letters and Science Curriculum Committee, the University Graduate Council, and the University Curriculum Committee have reviewed and approved this proposal.

Minimum admission requirements include a master's degree in an environmentally related field, a graduate GPA of at least 3.30 on a 4.0 scale, and satisfactory scores on the Graduate Record Exam. In addition, students are required to have an appropriate background in math, biology, chemistry, environmental science, economics, statistics, and either geology or geography. Students lacking any of the relevant course work may be required to take prerequisite courses.

The 90 faculty for the EnvS Program hold primary appointments in one of 26 departments in all 9 colleges at the UI. All participating faculty have active research programs in the environmental area, ranging from bioremediation to political science. Since 1993, this group has collectively supervised the graduate work of 107 master's candidates in the EnvS Program and 100s of Ph.D. and M.S. candidates in their primary departments.

Faculty involvement will consist of teaching Environmental Science courses, supervising student research, and serving on the graduate committees of students in the program. Each active EnvS faculty member will commit approximately 0.1 FTE to the program. The EnvS faculty collaborate in numerous ways; the following examples are not comprehensive but do illustrate the interactions among faculty members from a variety of colleges:

The Ph.D. in Environmental Science will provide a terminal environmental science degree. Students will be admitted through a rigorous, competitive process involving a review of their academic history, GRE scores, references and research objectives. The Ph.D. students will primarily be from Idaho and from surrounding states although we have had success attracting international students to our M.S. program in recent years. The students will typically have an undergraduate degree in environmental science or a related area such as biology, chemistry, ecology, geology, or engineering. Many of the students will already have a M.S. degree in environmental science or a related field. It is anticipated that this degree will serve existing UI students as well as attract students new to the university since no similar opportunity exists in the state. The students will include environmental professionals, consultants, attorneys, regulatory professionals, state and local government employees (e.g., public works employees), as well as representatives from agricultural, food processing, mining, and timber industries. Because EnvS is interdisciplinary, the program will attract a cross-section of professionals from these fields, working together in the classroom - as they must in their professions - to solve complex multi-dimensional problems. The distribution of students regarding gender, minority status and age will be similar to those enrolled in the B.S. and M.S. environmental science programs. Currently our graduates of the M.S. program are 50% female and 50% male. Eight (8) international students have graduated from the program and 14 are now enrolled.

Existing staff and facilities in the Environmental Science program and in the supporting departments will support this program. One faculty member, the Director of the EnvS Program, will administer the program. A 0.2 FTE faculty position and 0.5 FTE staff position are requested. Students will be advised by current members of the graduate EnvS faculty. Because the courses in the proposed curriculum already exist, reliance is on existing faculty. In FY03, 3 new teaching assistants will be assigned to the program. No new equipment will be required. The supporting colleges and departments have a full-range of analytical laboratories, shops, computers, and instrumentation and experimental equipment necessary. The UI Library System already purchases the journals, proceedings and books needed for this program. Institutes on campus with significant research efforts in the area of environmental science include the Center for Hazardous Waste Remediation Research, Idaho Water Resources Research Institute, Aquaculture Research Institute, Center for Sustainable Aquaculture, Policy Analysis Group, and the Environmental Research Institute. In Idaho Falls, collaborative efforts with the INEEL will be developed to leverage resources and facilities to support student research and to solve current problems.

The use and development of distance education technologies will continue to link locations for the full utilization of resources, faculty, and course work. Future collaborations with WSU, ISU and BSU will ensure that the UI Ph.D. program in EnvS will complement their course offerings and areas of expertise.

The Idaho National Engineering and Environmental Laboratory (INEEL) will be a key partner in the success of this program. It is anticipated that a number of the students, particularly at the Idaho Falls campus, will be INEEL employees and that their research will focus on issues pertaining to current and future INEEL problems. This program has the support of DOE-ID, the INEEL Contractor BBWI, the Inland Northwest Research Alliance, and the Mayor of Idaho Falls, Linda Milam. Since the program's inception the following businesses, industries, and agencies have provided internships to environmental science students throughout Idaho and the west:

According to *Peterson's Guide to Graduate Programs 2000*, 63 universities in the U.S. offer a Ph.D. in the general area of Environmental Science and 29 in the general area of Environmental Policy and Resource Management. Based on degree programs with "environmental" in the title, or with a strong interdisciplinary environmental emphasis, and excluding those programs focusing on engineering or environmental health, data from universities in five states neighboring Idaho were compiled. In state: No Ph.D. in environmental science is offered in Idaho. The University of Idaho offers a number of Ph.D.s in environmentally related fields including botany; chemistry; engineering; entomology; forestry, wildlife and range sciences; geology; microbiology, molecular biology, and biochemistry; plant science; soil science; and zoology. This interdisciplinary degree is intended to integrate with, and complement, the disciplinary degrees that exist.

The missions of the University of Idaho include teaching, research and service. The broad objectives relating to these functions are: (a) to offer undergraduate and graduate academic programs of excellent quality in the liberal arts, the sciences and many professional disciplines; (b) to add knowledge through research, scholarship, and creative activities in both fundamental and applied fields; and (c) to make readily available to all people of the State the results of research, including that in the arts and sciences.

The University of Idaho historically has had certain unique functions. Specifically, the University has had the responsibility to serve as (a) the land-grant institution for the State of Idaho, with responsibility for instruction, research and extension, and public service in the fields of agriculture, forestry, mining, and engineering; (b) the graduate and research center and a center for professional education for the State; and (c) the center for comprehensive graduate programs leading to the degree of Doctor of Philosophy. The proposed program is consistent with the role and mission of the University of Idaho and specifically addresses the University's responsibilities as a land-grant institution.

The proposed program satisfies the Board's Statewide Plan for Higher Education by meeting the following goals and strategies as stated in Directions for Higher Education in Idaho: (1) it encourages expanded curricular response to the technologies; (2) maintains strong graduate education; and (3) continues to avoid unnecessary duplication of effort by utilizing existing course work in current programs. It also develops a broad range of cooperative ventures and encourages maximum use of technology. It promotes Idaho's economic revitalization through technology transfer by supporting basic and applied research that results in the timely application of new knowledge.

The UI goal for graduate education and research is to be a globally competitive center for high-quality graduate, professional, and research programs. To help accomplish this goal, the July 1998 Strategic Plan selected environmental science and technology to be one of five areas on which to focus strengthening our national leadership. As such, it is one of the areas included in the multi-year \$64 Million Advantage Idaho campaign. Another UI objective is to expand research partnerships with business and industry, communities, and public and private institutions. The Ph.D. EnvS will raise our level of national and international competitiveness, will use our existing partnerships with other educational institutions, and will build new stronger relations with partners such as the INEEL.

The proposed Ph.D. in EnvS provides an excellent opportunity for graduate students in other programs to continue their research and scholarship at an advanced level. For example, the Department of Landscape Architecture at the University of Idaho offers a Master of Science, Landscape Architecture (MSLA) degree in collaboration with Washington State University, but does not offer the Ph.D. The Ph.D. in Environmental Science would also be a highly valued advanced degree for a landscape architecture graduate applying for an academic position in landscape architecture.

The well-being of the citizens of Idaho, as well as the economy of Idaho and the U.S. depends on a healthy environment. American businesses, government agencies and individuals spend between \$100 - 200 billion per year on environmental protection and cleanup. Even the low end of this widely ranging estimate represents 2% of the gross national product.

Demand for scientists trained in environmental science and for science Ph.D.s in general remains strong. According to *Career World* in April/May of 1999, "National and international concern about threats to our environment and the future of the planet will continue to create demand for people to work in this field." *Physics Today* reported in October of 1998 that unemployment among recent Ph.D.s in the sciences remains far below the overall national average. The December 1998 issue of *US News and World Reports* listed environmental science degrees as "highly marketable." In addition, the *Environmental Business Journal* projected that a third of all corporations would increase their environmental budgets over the next several years. Currently, the University of Idaho receives many more external requests for student interns and graduates from environmental science than it can meet.

According to the National Science Board of the National Science Foundation (February 2000), "Within the broad portfolio of science and engineering for the new century, the environment is emerging as a vigorous, essential, and central focus." They also recommend substantially increased funding in the environmental area: "We recommend that support for environmental research, education, and scientific assessment at NSF be increased by an additional \$1 billion, phased in over the next 5 years, to reach an annual expenditure of approximately \$1.6 billion." In addition, they are strongly supportive of interdisciplinary programs, stating,

Locally, the demand for advanced training in environmental science is growing. In spring 2000, the Idaho Legislature elevated the Division of Environmental Quality to departmental status. The INEEL is also building its emphasis on environmental science and technology and on advanced science and engineering degrees. In 1996, the laboratory changed its name to the Idaho National Engineering and Environmental Laboratory to reflect redefinition of its mission. The Inland Northwest Research Alliance (INRA), a member of the management team of the INEEL, recently announced a Call for Proposals for Ph.D. and/or Postdoctoral Research in Subsurface Science and Engineering in collaboration with the INEEL. The call states "(t)he INEEL is in need of a more highly educated workforce that can lead its programs in the new century." A comparison of the INEEL to other national laboratories points out the lack of Ph.D.s in Idaho:

To be credible as a national laboratory, INRA states that the INEEL must approach the percentages of Ph.D. researchers that populate other national laboratories. Demonstrating their demand for employees with the advanced degree, INEEL has a new fellowship program to support employees pursuing the Ph.D. degree which is further described in section 5b below.

The EnvS M.S. Program has grown from 4 students in 1993 to 64 students in 2001. This includes an 18% increase in students from the 2000 to the 2001 school year. These numbers demonstrate the tremendous interest in and demand for advanced environmental science graduate degrees. Prospective candidates include current UI students completing an M.S. in Environmental Science and related disciplines. Some of these students may choose to continue their education immediately, most likely as full time students. Another pool of applicants would include those from the surrounding region, and other parts of the U.S. and the world. These students will be new to the University of Idaho and will likely pursue their degrees in Moscow as full time students.

The UI currently has a Presidential Doctoral Research Fellowship (PDRF) competition for a three- year fellowship worth \$25,000 each year. This fellowship will be used as a strong tool to attract and keep well-qualified Ph.D. candidates. Another likely source of students to the program will be current INEEL employees, from both DOE and BBWI, and the employees of INEEL subcontractors in Idaho Falls. INEEL has developed a Subsurface Systems Management Fellowship program for advanced degrees to help Ph.D. students expand their capacity to do subsurface clean-up at the site. The fellowship allows employees to work 20 hours per week while attending a university as a full-time graduate student. It is anticipated that most of these students will elect to remain in the Idaho Falls area and will receive their education there. Since the change in contractors at the INEEL, inquiries about an environmental Ph.D. have been received at the UI EnvS program office at the rate of 2-3 per month. It is anticipated that the number of Idaho Falls students applying for the program in its first year will be much greater than those that can be accepted.

This proposal, to establish the Ph.D. EnvS, would ensure that an Idaho institution will be integrally involved in education and research in environmental science and will help provide the scientific workforce for Idaho in the new century.

FY03 Need \$36,120 FY04 Need \$37,468 FY05 Need \$38,854 FY06 Need \$40,291