PROFESSIONAL SCIENCE MASTER’S IN ENVIRONMENTAL SCIENCE
(Name Change)

Name of Institution: Oregon State University
Name of Proposing College: Science
Name of Proposing Program: Environmental Science
Date of Proposal: 29 June 2011
Proposed Effective Term: Fall 2011

A. Title of the proposed instructional, research, or public service unit. For name changes, give both the current and proposed names. Describe the reason(s) for the proposed change.

Current name: MS in Environmental Science (non-thesis option)
Proposed name: Professional Science Master’s in Environmental Science

This program has been offered as a non-thesis Professional Science Master’s (PSM) program since 2003. The PSM is a unique program that combines graduate-level education in Science, Technology, Engineering, or Mathematics (STEM) with training in business management, communication, research ethics, and other employer-relevant skills (http://psm.science.oregonstate.edu). Students complete an internship in lieu of thesis research, giving them practical experience in the workplace. There are now over 238 PSM programs offered by 110 institutions across the U.S. (http://scienecmasters.com/). There is a statewide PSM program development project underway involving multiple campuses in the OUS (http://oregonpsm.org). The Oregon University System (OUS) Provosts’ Council and State Board of Higher Education approved the “PSM” as a new degree option in Oregon (http://www.ous.edu/sites/default/files/about/polipro/files/ORPSMGuidelinesNov2010.pdf) on 24 February 2011. Changing the name of the degree will help us brand and promote these unique programs to employer groups, prospective students, and will recognize graduates who’ve completed this education, designed to provide depth of knowledge in STEM disciplines as well as breadth of training in management.

B. Location within the institution’s organizational structure. Include “before” and “after” organizational charts (show reporting lines all the way up to the Provost).

There will be no change in location within OSU’s organizational structure. This degree will offered as an option through the existing Environmental Science (ENSC) Program, which is an interdisciplinary program residing in the College of Science and the Graduate School.

C. Objectives, functions (e.g., instruction, research, public service), and activities of the proposed unit.

1. Explain how the program’s current objectives, functions, and/or activities will be changed. Where applicable, address issues such as course offerings, program requirements, admission requirements, student learning outcomes and experiences, and advising structure and availability. How will the reorganized program be stronger than the existing program?
The existing degree options in the ENSC Program will remain the same; however, a PSM in Environmental Science will now be recognized as a separate degree instead of simply a non-thesis MS option within the program.

Environmental professionals who can create partnerships for research, policy, and public outreach initiatives are needed by a variety of employment sectors. The objective of the PSM in Environmental Science is to train students to be able to function effectively in non-governmental organization, consulting, government agency, and non-profit settings. The PSM program can usually be completed in two years, based on full-time study and at least 54 credit hours.  [http://psm.science.oregonstate.edu/program-curriculum-m-s-environmental-sciences](http://psm.science.oregonstate.edu/program-curriculum-m-s-environmental-sciences)

Comparison between the ENSC non-thesis MS and PSM in Environmental Science:

<table>
<thead>
<tr>
<th>MS in Environmental Science</th>
<th>PSM in Environmental Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core courses (10 credits)</td>
<td>Core courses (10 credits)</td>
</tr>
<tr>
<td>Electives (5 credits)</td>
<td>Electives in focal area (16 credits)</td>
</tr>
<tr>
<td>Numerical skills (6 credits)</td>
<td>Numerical skills (4 credits)</td>
</tr>
<tr>
<td>Science focal area (15 credits)</td>
<td>Professional courses (18 credits)</td>
</tr>
<tr>
<td>Research/thesis (ENSC 501; 9 credits)</td>
<td>Internship (ENSC 510; 6-12 credits)</td>
</tr>
<tr>
<td>Total: minimum 45 credits</td>
<td>Total: minimum 54 credits</td>
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</tbody>
</table>

Actual credit requirements for each category vary among different areas of concentration for the MS in Environmental Science ([http://envsci.science.oregonstate.edu/node/333](http://envsci.science.oregonstate.edu/node/333)). Core lecture courses form the foundation of this program by providing students with basic skills in environmental research methods and analysis. The core courses are the same for both programs:

**ENSC 515. ENVIRONMENTAL PERSPECTIVES AND METHODS** (3).
Unique perspective or method each quarter. Possibilities include: remote sensing, modeling over a range of scales in time, space, and levels of system organization; and risk analysis.

**ENSC 520. ENVIRONMENTAL ANALYSIS** (3).
Develop analytical thinking, explore analytical approaches, enhance writing skills, and gain experience in oral communication about environmental issues.

**ENSC 508. WORKSHOP** (1-16).
This course is repeatable for a maximum of 16 credits.

**Elective** from the Approved Core Course List provided for individual areas of concentration (3).

Electives for the PSM in Environmental Science are chosen from the lists of approved core and emphasis courses provided for each area of concentration, and students normally complete at least two numerical skills courses. This coursework gives focus and identity to each student's curriculum and allows for flexibility in response to changing employment demands. Eight areas of concentration are currently available: Biogeochemistry, Ecology, Environmental Education, Quantitative Analysis, Social Science, Natural Resources, Water Resources and Sustainable Natural Resources. Students choose courses to develop their program with relevance to one of these areas of concentration but are free to take additional
courses based on career objectives. For example, many PSM in Environmental Science students also complete the Graduate Certificate in Geographic Information Systems.

Numerical skills courses expose students to research design, statistical analysis, modeling, survey design, or other quantitative and qualitative techniques. Example courses include Methods of Data Analysis (ST 511), Design and Analysis of Planned Experiments (ST 515), Quantitative Ecology (ST 535), and Community Structure Analysis (BI 570).

The required professional courses are designed to be taken in sequence during the first academic year and include:

**COMM 550. COMMUNICATION AND THE PRACTICE OF SCIENCE** (3). [Pending approval #79896] Course develops a broad range of skills encompassing verbal, written, and visual media styles of communication. Topics include: working in teams and collaborative decision-making; interpersonal and organization communication; writing and making presentations to diverse audiences; negotiation and consensus building; and persuasion and influence in communication.

**PHL 547. RESEARCH ETHICS** (3). An examination of the interrelationship between ethical values and scientific practice. Topics include professionalism in science; scientific integrity, misconduct, and whistleblowing; the ethics of authorship; conflicts of interest between academic science and commercial science, and social responsibilities in science. Guidelines relating to patent, trademark, copyright, and authorship issues are covered as well.

**PSM 513. PROFESSIONAL SKILLS** (3). Students work in teams with off-campus mentors to address a contemporary problem in a scientific field within the context of an existing business. This collaborative project will provide students with opportunities to integrate and apply their collective knowledge of business management, communication, and science to create innovative solutions. Project management, team skills, and leadership styles are also covered, and a final report and presentation are usually required. **PREREQS:** COMM 550 and PHL 547 and PSM 565 and PSM 566 and concurrent enrollment in PSM 567.

**PSM 565. ACCOUNTING AND FINANCE FOR SCIENTISTS** (3). Students develop business management skills by learning principles of managerial and financial accounting and understanding profit and loss statements, cost analysis, and investment risks. Individuals utilize basic financial tools needed to develop business proposals and successful manage scientific projects in public and private work sectors.

**PSM 566. PROJECT MANAGEMENT AND MARKETING SCIENTIFIC TECHNOLOGIES** (3). Students gain an understanding of marketing principles and global markets with a focus on scientific technologies. Project management skills needed to effectively manage diversity, conflict and change in corporate, government and nonprofit environments as well as entrepreneurial ventures will be emphasized. **PREREQS:** PSM 565

**PSM 567. INNOVATION MANAGEMENT** (3). Students learn about different types of innovation, development and implementation of new technologies, and intellectual property. Student teams develop and present business plans as term projects. Structuring small business enterprises, project planning and management, and commercialization of new
products and services prepare individuals for leadership roles in the innovation process.

PREREQS: PSM 565 AND PSM 566

Students are required to complete a 3 to 6 month internship (6-12 credits) in lieu of thesis research. Guidelines for development of an internship proposal, evaluation of performance, and final report requirements are available online and help ensure that the internship is a meaningful educational experience (http://psm.science.oregonstate.edu/internships). Students have been hired by a variety of companies as interns, including ATI Wah Chang, Environmental Protection Agency, Bureau of Land Management, National Oceanic and Atmospheric Administration, The Nature Conservancy, Oregon Watershed Councils, Pacific Habitat Services, Inc., Yakima Nation Wildlife, and others. Opportunities are posted online (http://oregonpsm.org/internships-and-jobs), and the Oregon PSM Internship Coordinator facilitates placement of students.

Admission requirements are similar to those for other ENSC graduate programs and include a minimum GPA of 3.0 on the last 90 quarter credit hours, completion of a 4-year undergraduate degree in math, science or engineering (equivalent to one academic year of biology, chemistry, and physics, as well as some math, statistics, and environmental science courses such as ecology, water resources or geology), GRE scores of at least 1,100 combined verbal and analytical, TOEFL scores for international applicants (minimum of 550), a statement of interest, and three letters of recommendation (http://psm.science.oregonstate.edu/admission-environmental-sciences-psm-program).

Graduates from the PSM in Environmental Science will be able to analyze and understand environmental systems, predict environmental change, and participate in the management of the environment. They will also have a basic understanding of business principles, as well as project management and oral and written communication skills, to help them apply their science in a variety of positions. Upon completing their PSM degree, graduates may find careers in federal, state, and local government agencies that are charged with managing natural resources, and they will also find employment in the private sector with productive careers in industry and consulting firms.

Students in this PSM program belong to two cohorts, which enhances their graduate experience: 1) classmates enrolled in the ENSC graduate program, and 2) the PSM collective cohort comprised of students from other STEM disciplines (e.g., botany, physics, and biotechnology). The PSM cohort engages in a variety of activities to help develop group cohesion and increase retention:

- A 5-day workshop the week prior to the start of fall term is held at an off-campus facility, and important topics not included elsewhere in the curriculum are covered. Some of these topics include project collaboration in the virtual environment, networking and dining etiquette, and interview and time management skills.
- All students complete the 18 credits of professional coursework together during the first academic year (two courses per term).
- Social events are regularly scheduled and include a fall gathering event at the beginning of fall term, a student mentorship program, an industry luncheon in early December, monthly seminars featuring off-campus speakers, 1st Friday happy hour gatherings, and an end-of-the-year barbecue picnic with industry representatives.

Students are initially advised by Dr. Ursula Bechert, Director of Off-Campus Programs, Dr. Andrew Blaustein, Director of the Environmental Science Graduate Program, and Dr. Kirstin Carroll, PSM Coordinator, and these individuals continue to provide general
administrative support to each student enrolled in the program. Like other graduate students, a graduate committee consisting of a major professor and minimum of three members is required for each PSM student (http://psm.science.oregonstate.edu/faculty). These individuals provide advice regarding coursework and approve a Program of Study form, mentor students within their profession, facilitate research experiences, provide feedback on and final approval of an internship proposal, check on progress made during the internship, and grade the internship based on review of the student’s internship journal, the employer’s formal review (http://psm.science.oregonstate.edu/internship_evaluation_form), and the final report in lieu of student’s thesis. The internship supervisor provides on-the-job training based on learning outcomes described in the internship proposal.

2. Explain how outcomes in the newly organized program will be assessed.

Student learning is assessed by traditional measures (e.g., performance on written tests and in oral presentations), the internship evaluation, and students are required to undergo a final oral examination to receive their degree. An exit interview is conducted once a student has passed the oral examination to assess the PSM program and student’s perception of learning outcomes. All alumni from the program are tracked to assess post-graduation employment history (http://psm.science.oregonstate.edu/alumni-profiles). There are 24 alumni of the PSM in Environmental Science program, 13 students are currently enrolled, and another six will be joining the program this fall.

The National Governors Association Center for Best Practices report entitled Degrees for What Jobs? Raising Expectations for Universities and College in a Global Economy (March 2011; http://www.nga.org/Files/pdf/1103DEGREESJOBS.PDF) states, “A growing number of governors and state policymakers have come to recognize that higher education, including community colleges, four-year colleges, and research universities, cannot help drive economic growth in their states unless students’ academic success is linked to the needs of the marketplace.” The report emphasized the importance of encouraging employers’ input in higher education, and the PSM in Environmental Science at OSU has attempted to do this starting with a joint industry-faculty workshop in June 2001. Approximately 58% of this program’s PSM graduates find employment in Oregon after graduation, and 75% remain in the Pacific Northwest, demonstrating how the program contributes to regional economic development.

D. Resources needed, if any: personnel, FTE academic, FTE classified, facilities and equipment.

No additional resources are needed.

E. Funding sources: state sources (institutional funds – state general fund, tuition and fees, indirect cost recoveries), federal funds, other funds as specified.

Funding sources will remain the same.

F. Relationship of the proposed unit to the institutional mission.

The PSM in Environmental Science builds on existing faculty expertise in several colleges across campus including the Colleges of Science, Forestry, Agricultural Sciences, Oceanic and Atmospheric Sciences, and others (http://envsci.science.oregonstate.edu/people/faculty).
This program fits in OSU’s Signature Area of Distinction: Advancing the Science of Sustainable Earth Ecosystems.

Environmental sciences are central to the economy of the Pacific Northwest; the countries of the Pacific Rim are anticipated to generate more than $600 billion in environmental risk assessment, monitoring, and ecotoxicology services over the next few decades. Recognized as a Land, Forestry, Sea, and Space Grant institution, OSU has exceptional strengths in many of the disciplines needed to provide high-quality interdisciplinary education and satisfy the growing demand for trained environmental professionals. In addition, several federal research laboratories are located in the Corvallis region, including the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, the U.S. Forest Service, and the Bureau of Land Management (BLM). This PSM program was created with the help of professional affiliates employed in leadership roles in industry and agencies concerned with the environment. Current OSU PSM Advisory Board members representing the environmental science industry in Oregon include: Chris Beatty, President of Trillium FiberFuels, Inc., Steve Anderson, Owner of Anderson Risk Analysis, Inc., John Dummer, Principal Engineer for Clean Water Services, John Ledger, Vice President of External Affairs for Associated Oregon Industries, Shelly Miller, Project Leader for the Oregon Department of Fish and Wildlife Research Laboratory, Pat Ormsbee, Bat Specialist for the U.S. Forest Service and BLM, and Bill Otani, retired Regional Wildlife Program Leader for the U.S. Forest Service.

G.  Long-range goals and plans for the unit (including a statement as to anticipated funding sources for any projected growth in funding needs).

n/a

H.  Relationship of the proposed unit to programs at other institutions in the state.

n/a

I.  If the program is professionally accredited, identify the accrediting body and discuss how the proposed change may affect accreditation.

n/a

Appendices:
• Transmittal sheet
• Budget table n/a
• Library evaluation n/a
• Liaison