

Assessment of Student Learning Plan: **Environmental Science**

Review of 2012-13 Academic Year

University of Southern Maine

A. College, Department or Program, Date

College CSTH
Department or Program Environmental Science
Date May 29, 2013

B. Department or Program Chair: Robert Sanford

**(person responsible for completing this form)*

C. Degree or other Program: **BA Environmental Planning & Policy,**

BS Environmental Science

D. Assessment of Student Learning

1: Has your department identified any Student Learning Outcomes? (What are students able to do by the end of your program?)

- a. *List the most important student learning outcomes (3-5) that have been agreed upon in your department. Then, identify which student learning outcome (1-2) was assessed this past year.*

Environmental science courses and their primary outcomes for student learning (from
DES *Academic Program Review Self-study*, March, 2013)

Freshmen level

Entering freshmen are immediately immersed in the major, with the opportunity to do community service, and group activities in courses and outside of courses. From the freshman level onward, students are provide opportunity to participate in research and to present the results at “Thinking Matters” (USM student research symposium), “Civic Matters,” Maine Water Conference, and other venues.

Course	Outcome
ESP 101 Fundamentals of Environmental Science (Lecture)	<ol style="list-style-type: none"> 1. Meet course science requirement 2. Introduce the major—basic environmental literacy
ESP 102 Fundamentals of Environmental Science (Laboratory)	<ol style="list-style-type: none"> 1. Be able to design and carry out a science experiment 2. Be able to gather environmental information from the field 3. Be able to write a professional environmental report on a lab experiment or field investigation.
ESP 108/GEO 108 Introduction to ArcGIS	Basic familiarity with a GIS mapping and analysis tool
ESP 150 Field Immersion	<ol style="list-style-type: none"> 1. Be able to use a map and compass in the field 2. Be able to use a dichotomous key to identify a tree or water plant. 3. Be able to work as a group in the field 4. Be able to use a canoe to take water samples 5. Know your advisor and the Student Success Center
ESP 125 Introduction to Environmental Ecology (Lecture)	<ol style="list-style-type: none"> 1. Be able to describe interactions of organisms with their environment from an evolutionary and physiological perspective. 2. Be able to demonstrate fundamental understanding of ecological principles and concepts as they relate environmental science, Systems Ecology, Population Ecology, Landscape Ecology, and Urban & Industrial Ecology. 3. Write a literature review on a topic in environmental ecology.
ESP 126 Introduction to Environmental Ecology (Lab)	<p>Be able to demonstrate knowledge, skills, and abilities to conduct basic ecological research and interpret ecological data including:</p> <ol style="list-style-type: none"> 1. Demonstrate a working knowledge of descriptive statistics and their use in ecological studies. 2. Write a formal scientific report. 3. Characterize habitat and community types and assign a rarity ranking. 4. Estimate population density and characterize distribution 5. Calculate community diversity using Shannon and Simpson’s indices

	6. Measure tolerance and toxicity in daphnia 7. Conduct preliminary biomonitoring analysis of heavy metals using lichen 8. Measure community diversity of macro fauna in soils and leaf litter. 9. Collect and interpret water quality data using common field technologies employed by ecologists and environmental scientists.
ESP 197 Research Skills Lab (1 credit) New course to be taught by library personnel	10-week, lab style course designed to develop students' study and research skills. Topics include literature searching, website evaluation, peer review, critical thinking, finding articles and books, plagiarism, proper citation, primary and secondary sources, and the writing process. Final project is a written literature review on a selected environmental topic. Prepares students for ESP 203.
ESP 199 Roof Top Energy	This experimental course introduced renewable energy concepts and allowed DES to try out a course for potential offering in the future energy curricula
ESP 199 Environmental Entomology	This experimental course introduced entomology from an ecosystem, applied perspective that addressed the practicality of invasive species management. It formed the basis for the future offering of entomology as a senior seminar or other regular course offering
Sophomore level At the sophomore level students continue content-based instruction in the major. Students are expected to be able to do guided research and receive course instruction to help them meet this expectation.	
Course	Outcome
ESP 200 Environmental Planning	1. Meets Core ethical Inquiry requirement 2. first planning course—basic terminology. Ability to write an environmental plan for managing a tract of land. 3. Ability to use comprehensive planning, zoning, and regulations to evaluate local planning decisions.
ESP 203 Environmental Communication	Students will be able to: <ul style="list-style-type: none"> - <i>Demonstrate</i> how basic environmental communication theory and its application shape the definition of environmental problems. - <i>Identify</i> the influence of scientific, socio-economic, and political factors and the mass media in shaping the social construction of environmental problems. - <i>Explain</i> how communication is used to persuade/dissuade audiences regarding environment problems and how the environment is used to manipulate audience perception. - <i>Conduct</i> basic social science research within Environmental Communication to

	<p>study an environmental problem of interest.</p> <ul style="list-style-type: none"> - <i>Develop</i> a news literacy.
<p>ESP 207/GEO 207 Atmosphere: Science, Climate, and Change</p> <p>(Cross-listed from Geosciences Department)</p>	<ol style="list-style-type: none"> 1. Become a better consumer of scientific information about climate and atmosphere 2. Be able to participate in effective decision-making in government and public policy on environmental change.
<p>ESP 212/PHI 212 Environmental Ethics</p> <p>(Cross-listed from Philosophy department)</p>	
<p>ESP 220 Introduction to Environmental Policy</p>	<p>Upon successful completion of this course, students will be able to:</p> <p><i>Define</i> an environmental problem.</p> <p><i>Model</i> the symptoms and causes of an environmental problem.</p> <p><i>Demonstrate</i> competency in conducting policy research to accurately define and solve an environmental problem using empirical data.</p> <p><i>Develop</i> the ability to critically analyze the formulation, construction, development, and implementation of environmental policies.</p>
<p>ESP 223/REC 223 Nature-based Tourism</p>	<p>Cross-listed with Recreation department</p>
<p>ESP 233STEM Learning Community</p>	<p>Basic science and study skills and support for college learning success</p>
<p>ESP 250 Soils & Land Use</p>	<ol style="list-style-type: none"> 1. Describe soils in the field 2. Analyze soils for basic properties 3. read a soils map & use data to formulate land use recommendations
<p>ESP 260 Soil and Water Conservation Engineering</p>	<ol style="list-style-type: none"> 1. To familiarize the student with techniques of estimation, remediation, and design used in soil and water conservation. 2. Provide the student with a broad appreciation of the natural forces at work and man's effect in the context of historical and geographical determinates. 3. Complete a group design project to scale; using a maximum of two-foot contours, geo-referenced with all reasonable mapping symbols, using predictive means design remediation with Best Management Practices (BMP's) that meet state and local conservation standards.
<p>ESP 270 Solid Waste Planning and Policy</p>	<ul style="list-style-type: none"> • <i>Demonstrate</i> understanding of the integrated management strategy for solid waste • <i>Develop</i> a plan to manage solid waste in accordance with the integrated solid waste management strategy • <i>Demonstrate</i> policy and planning competency for managing solid waste by incorporating the waste management hierarchy
<p>ESP 275 Energy Use and Societal Adaptation</p>	<ul style="list-style-type: none"> • an understanding of traditional, modern, and future energy sources

(An online course)	<ul style="list-style-type: none"> • an understanding of energy consumption sectors in modern economies • an understanding of energy technologies and environmental and social development impacts • an acquired knowledge of functional and useful skills necessary for processing energy statistics and reports
ESP 280 Research and Analytical Methods	<ol style="list-style-type: none"> 1. <i>Define</i> an environmental problem suitable for research. 2. <i>Construct</i> a testable hypothesis/research question. 3. <i>Prepare</i> a literature review on a selected environmental problem 4. <i>Design</i> a valid method to test a hypothesis or answer a research question. 5. <i>Conduct</i> research using the scientific method to test a hypothesis or answer a research question. 6. <i>Develop</i> a research sufficient literacy to understand and explain peer-reviewed research articles. 7. <i>Demonstrate</i> basic competency with lab and field-based analytical methods. 8. <i>Poster</i>: Be able to create a conference-ready poster or scientific paper on an environmental research topic.
<p>Junior level</p> <p>By the junior level we expect students to begin functioning as entering professionals, This is when they are encouraged to do their internship and continue work on career planning. Many juniors already have a year or more experience working in a professor's laboratory.</p>	
Course	Outcome
ESP 303 Wetlands Ecology	<p>At the end of this course you should be able to:</p> <ol style="list-style-type: none"> 1. Understand the fundamental and interdependent roles of hydrology, biology and biochemical processes in shaping wetlands 2. Distinguish wetlands from other land forms in terms of their ecosystem function 3. Describe wetland types and classifications used throughout the world 4. Speak intelligently about Maine wetlands and wetland issues, such as Maine DOT's new wetlands mitigation bank and recent wetlands legislation 5. Relate a basic understanding of the art and science of wetland restoration and creation 6. Find and use online wetlands resources
ESP 305 Community Plan Workshop (An online course)	<p>Be able to design and carry out an independent environmental planning project that meets a public need. Examples include a revised land use plan, energy plan, playground design, housing project, new road, public park, nature trail. Be able to participate in an online peer community.</p>
ESP 308 Global Environmental Problems and Sustainability	<ol style="list-style-type: none"> 1. <i>Summarize</i> the major global environmental problems and their impact

	<p>on a sustainable future.</p> <ol style="list-style-type: none"> 2. <i>Compare</i> the traditional approach to solving environmental problems to the sustainability approach. 3. <i>Select</i> the appropriate tools of sustainability to solve a problem. 4. <i>Evaluate</i> the commitment of other nations toward a goal of sustainability. 5. <i>Design</i> a project to promote sustainability on the USM Gorham Campus, which encompasses the three pillars of sustainability.
ESP 311 Energy Efficiency I	The student will master basic principles of energy efficiency
ESP 313 Renewable Energy Technologies	Conduct realistic experiments in thermal imaging, particulate sampling, electricity consumption auditing. working with various renewable energy technologies, including solar PV cells, wind turbines, biofuels, hydro turbines, and geothermal heating systems. Students work in teams to analyze data and evaluate technologies under different conditions. Students are expected to analyze data, draw conclusions, and make relevant recommendations.
ESP 326/ECO 326 Environmental Economics (Cross-listed from the Economics department)	Be able to apply economic theory to current environmental problems.
ESP 327/ECO 327 Natural Resource Economics (Cross-listed from the Economics department)	
ESP 341 Limnology	<ul style="list-style-type: none"> • Understand properties of water and how they affect aquatic organisms • Demonstrate the process of lake stratification • Illustrate basic nutrient cycling in lakes • Identify common freshwater aquatic organisms (plants, insects, fish, zooplankton) • Explain and assess the basic components of lake and stream food webs • Understand feedbacks between physical, chemical and biological components • Assess lake trophic status based on lake characteristics • Design, conduct, analyze and report on an aquatic-based study • Identify important sources of information for aquatic systems
ESH 341 (ESP 340) Environmental Regulations (An online course)	<ol style="list-style-type: none"> 1. <i>Outline</i> the major regulatory requirements for environmental quality and public health. 2. <i>Demonstrate</i> competency in research by locating and citing state and federal rules and regulations. 3. <i>Develop</i> a written analysis of the application of a federal and/or state rule or regulation to a particular circumstance.
ESP 360 Water Quality Assessment and Control	<ul style="list-style-type: none"> • Understand the connections between water

	<p>quality and aquatic ecosystem function</p> <ul style="list-style-type: none"> • Understand the requirements of the Clean Water Act and how they apply to water districts and water users • Understand how the Maine Dept of Environmental Protection regulates and monitors water quality • Understand the chemistry and biological significance behind commonly used water quality tests • Practice good laboratory and field techniques, including quality control and record keeping • Practice thinking!
ESP 375 Environmental Risk Assessment and Management	<ol style="list-style-type: none"> 1. <i>Comprehend</i> and use the recognized framework for assessing risk of exposure to pollutants and contaminants for human health. 2. <i>Prepare</i> a quantitative human health risk assessment using Microsoft Excel. 3. <i>Demonstrate</i> basic competency with regards to understanding risk from natural hazards. 4. <i>Demonstrate</i> ability to assess community public health risks from environmental exposure. 5. <i>Demonstrate</i> understanding of the scientific, political, social, ethical, and economic dimensions of perceiving, communicating, and managing risk.
<p>Senior level</p> <p>Seniors take a seminar (ESP 475) in which they focus on a content-based subject and also work on career-related aspects of professional development. They also take a capstone course, ESP 401, in which they apply various previous courses to a large group project with multiple facets of content, writing, map and field work, analysis, & synthesis.</p>	
Course	Outcome
ESP 400 Internship	Complete a professional experience related to a student's chosen option within the major. In addition to satisfactory work experience, provide an oral presentation and written report.
ESP 401 Environmental Impact Assessment & Lab	Be able to explain the EIA process and use it to promote more effective environmental projects. Be able to work as a team in preparing an environmental assessment and communicating the results orally and in writing a Phase I report.
ESP 403 Bioremediation and Phytoremediation	be able to discuss the fates of contaminants found in surface and subsurface environments, and make decisions regarding proper remediation techniques.
ESP 406/POS 406 Research in the European Union (Cross-listed from the Political Science department)	<ol style="list-style-type: none"> 1) Students will explore the origins of the European integration construction 2) Students will understand the evolution and functioning of the different European Union institutions 3) Students will be exposed to the complexity of

	<p>organizational planning in a multicultural setting</p> <p>4) Students will learn of the many different current policy issues within the EU</p> <p>5) Students will observe how international organizations like NATO or the International Criminal Court work and will interact with officials from different areas and professional backgrounds to understand their role in the organizations visited during the course.</p>
ESP 412 Field Ecosystem	<p>Course Learning Objectives are:</p> <ol style="list-style-type: none"> 1. Describe and interpret the consequences of the flow of materials and energy through organisms and the physical environment. 2. Manipulate, graph and interpret large ecological data sets. 3. View and analyze problems from a systems thinking perspective
ESP 413 Forest Ecosystems	<ol style="list-style-type: none"> 1. Understand & describe the forest as an ecosystem 2. gain practical experience in collecting forest ecosystem data & present in forest management plan
ESP 417 Site Planning and Assessment	<p>Practical experience in creating a site plan, and designing solutions one or more particular site problems such as drainage, parking, lighting, landscaping.</p>
ESP 421 Natural Resource Policy	<p><i>Define</i> a natural resource problem.</p> <p><i>Model</i> the symptoms and causes of a natural resource problem.</p> <p><i>Demonstrate</i> competency in conducting policy research to accurately define and solve a natural resource problem using empirical data.</p> <p><i>Develop</i> the ability to critically analyze the formulation, construction, development, and implementation of natural resource policies.</p>
ESP 445 Environmental Education and Interpretation	<ol style="list-style-type: none"> 1. Be able to explain and design lessons demonstrating an understanding of coastal environmental education and interpretation principles and concepts. 2. The student will be able to use dichotomous keys and field guides to identify flora and fauna common to the coastal environments of Southern Maine. 3. The student will demonstrate an understanding of how basic ecological and environmental science concepts apply to the creation and teaching of environmental education materials and their connection to the Maine Learning Results (http://www.maine.gov/education/lres/). 4. The student will be able to design technology enhanced environmental activities and curriculum that provide equitable learning opportunities for all students.
ESP 450 Research Practicum	<p>Gain practical, hands-on skills by participating in an on-going faculty research project.</p>
ESP 475 Topics in Environmental Science/Senior Seminar	<ul style="list-style-type: none"> • Learn to appreciate and integrate often competing approaches to environmental science.

	<ul style="list-style-type: none"> • Enhance your abilities in critical and creative thinking, communication, and collaboration • Hear from a wide variety of environmental leaders who will share their own perspective – from their own unique life stories on environmental leadership. • How to conduct research through the case study approach <p>Career Skills Development</p> <ul style="list-style-type: none"> • Prepare a professional resume • Write a cover letter in response to a specific job advertisement • Prepare for and participate in a mock interview

b. *If your department/program does NOT have any student learning outcome statements yet, please check here_____.*

2: How and When will the Learning Outcomes be assessed?

a. *Briefly describe the forms of evidence that were utilized this past year to demonstrate students' accomplishment of the learning outcome(s) selected, and when you implemented the assessment.*

All but four courses have learning outcomes specified and we are developing outcomes for those remaining courses. As a field-based interdisciplinary department, we commonly use multiple forms of assessments. Reports, exams, demonstrated field proficiency, observation, notebook/journaling, oral presentations, and mixed media presentations are common forms of summative and formative assessments. Sample syllabi are provided in our self-study.

b. *If your department/program did NOT assess any outcomes in the past year, please check here_____.*

3: How did you use the Assessment results to Improve Student Learning?

a. *Briefly describe your unit's process for using the assessment data to improve student learning, and state what improvements or changes are being planned based upon the assessment results.*

Our attached self-study provides examples of our thinking and actions in this regard. Our annual curriculum retreat held in May 2013 developed additional ideas for assessment and outcome goals in ESP 150 (build community among students, prepare students for other DES courses) , ESP 203 (improved writing/literacy performance/capability), ESP 280 (be able to design a basic research project to test a hypothesis in environmental science, be able to do a literature review).

- b. *If your department has NOT reviewed any assessment results in the past year, please check here_____.*