

# 2015-2016 Yearly Assessment Report for the Bachelor of Science in Environmental Science

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*Name of Program: B.S. in Environmental Science*

*Type of Program: Major*

*College of Arts and Sciences*

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## Mission Statement

The mission of the Department of Environmental Science is to provide an interdisciplinary and integrated science curriculum in order to develop skills for solving environmental problems in a socially just manner. The program prepares students for careers and graduate study and to be good stewards of the environment.

This mission statement was approved by the department in a general meeting on 24 April 2015.

## Program Goals

- Provide an interdisciplinary and integrated science curriculum to develop skills for solving environmental problems.
- Prepare students for careers and graduate study in environmental fields.
- Ground our students in social justice to be good stewards of the environment for future generations.

These program goals were approved by the department in a general meeting on 24 April 2015.

## Program Learning Outcomes

Students who complete the degree requirements will be able to:

- PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues.
- PLO 2 – Apply the scientific method to environmental issues.
- PLO 3 – Skillfully communicate knowledge of environmental science.
- PLO 4 – Demonstrate knowledge of environmental conditions so as to promote active participation and social justice.

These program learning outcomes were approved by the department in a general meeting on 24 April 2015.

## Brief Summary of Most Recent Program Assessment Plan

The most recent assessment plan was submitted to the Associate Dean for Academic Effectiveness on 2 December 2015. At that point in time, the department planned the following assessment.

- The department will focus on developing a new assessment plan and implementing the plan within the BS in Environmental Science degree.
- Specifically, during the 2015-2016 academic year the department will focus their efforts on starting to assess learning. Two courses will be selected for this initial process; they are Air & Water w/Lab (ENVS-212 & ENVS-212L) and Methods of Environmental Monitoring (ENVS-410 & ENVS-410L).

The plan went on to state...

- The Department Chair and appointed committee will grade exam questions and evaluate final reports and laboratory notebooks for outcomes assessment. This assessment was not completed during the past academic year.
- Final presentations in the form of oral or poster format will be evaluated by course instructors as well as invited faculty using standardized rubrics for assessing progress relative to the program learning outcomes addressed by the specific course.

## Academic Program Review

The most recent academic program review of the B.S. in Environmental Science and the Department of Environmental Science was conducted during the 2012-2013 academic year.

The plan during the 2013-2014 academic year was for the departmental Academic Program Review to serve as a “reboot” for the department’s assessment activities. Academic review team members were specifically asked to provide advice and guidance regarding good assessment strategies and methodologies for Environmental Science. Reviewers recommended that the department needed to pay more attention to assessment of student learning, however they did not provide any useful feedback about best practices for this activity. Assessment at the university level was undergoing rapid change and development under the leadership of Associate Dean Shirley McGuire and it was the goal of our department to obtain assistance from her to revise our assessment plan and align our program learning outcomes with measurable assessment tools.

During the 2014-2015 academic year, reboot efforts continued with little concrete success until faculty director for assessment in the sciences was brought onboard to help. Under the guidance of faculty director, the Department revised both mission statement and program learning outcomes in the spring semester.

## Methods

As discussed in our recent assessment plan, final presentations in the form of oral or poster formats were evaluated by course instructors as well as several faculty within the department using standardized rubrics for assessing progress relative to program learning outcomes addressed by the specific course. The courses in which assessment was performed were Air & Water w/Lab (ENVS-212 & ENVS-212L) and Methods of Environmental Monitoring (ENVS-410 & ENVS-410L). These courses were chosen because the former is typically taken by students during the fall semester of their second year and the latter is the senior capstone course taken during spring semester of the final year of study. By selecting these two courses we expect to be able evaluate progress to program learning outcomes as the degree progresses and also at its culmination.

Three program learning outcomes are addressed in these two courses, PLO1, PLO2, and PLO3 were the PLOs evaluated in this analysis. Since this was an evaluation by faculty as students presented their work, it was a direct assessment of student capabilities. As defined by the curricular map, Table 1, PLO1 and PLO2 were expected to be developing upon completion of the Air & Water course, ENVS-212, and PLO3 was expected to be at the introductory level upon completion of the course. All three PLOs were expected to be mastered upon completion of the degree as measured by the senior capstone course, Methods of Environmental Monitoring, ENVS-410.

## Curriculum Map 1

Table 1 - The curricular map below describes when and how each learning outcome is introduced, developed, or mastered as a student progresses through various courses within the B.S. in ENV S degree. I = Introduced, D = Developed, M = Mastered

<b>Program Learning Outcomes / Course</b>	<b>PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues.</b>	<b>PLO 2 – Apply the scientific method to environmental issues.</b>	<b>PLO 3 – Skillfully communicate knowledge of environmental science.</b>	<b>PLO 4 – Demonstrate knowledge of environmental conditions so as to promote active participation and social justice.</b>
110 Introduction to Environmental Science (LAB)	I	I	I	I
210 Ecology & Human Impacts (LAB)	D	D	I	I
212 Air & Water (LAB)	D	D	I	
250 Environmental Data Analysis	I	D	I	
410 Methods of Environmental Monitoring (FIELD/LAB)	M	M	M	M
311 Environmental Chemistry	D		D	
320 Restoration Ecology (FIELD/LAB)	D	D	D	I
321 Wetland Ecology (FIELD/LAB)	D	D	D	I
325 California Ecosystems (LAB)	D	D	D	D
330 Environment & Ecosystem Health	M		M	I
335 Marine Environments (LAB)	D	D	D	
350 Energy & Environment	D	D	D	D
360 Climate Change: Science & Policy	D	D	D	D
366 Environmental Policy	M	D	D	D
370 Intro to Landscape Ecology & GIS	D	D	M	D
380 Environmental Engineering	I		D	

## Curriculum Map 2

Table 2 - The curricular map below describes when and how each program learning outcomes (PLOs) for the B.S. in ENV/S degree maps onto the Institutional Learning Outcomes (ILOs) for the University of San Francisco.

<b>Program Learning Outcomes / Institutional Learning Outcomes</b>	PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues.	PLO 2 – Apply the scientific method to environmental issues.	PLO 3 – Skillfully communicate knowledge of environmental science.	PLO 4 – Demonstrate knowledge of environmental conditions so as to promote active participation and social justice.
ILO 1 – Students reflect on and analyze their attitudes, beliefs, values, and assumptions about diverse communities and cultures and contribute to the common good.				✓
ILO 2 – Students explain and apply disciplinary concepts, practices, and ethics of their chosen academic discipline in diverse communities.	✓	✓		✓
ILO 3 – Students construct, interpret, analyze, and evaluate information and ideas derived from a multitude of sources.	✓	✓		
ILO 4 – Students communicate effectively in written and oral forms to interact within their personal and professional communities.			✓	
ILO 5 – Students use technology to access and communicate information in their personal and professional lives.			✓	
ILO 6 – Students use multiple methods of inquiry and research processes to answer questions and solve problems.		✓		
ILO 7 – Students describe, analyze, and evaluate global interconnectedness in social, economic, environmental and political systems that shape diverse groups within the San Francisco Bay Area and the world.				✓

## Results

Program learning outcomes 1-3 were evaluated at the completion of ENV5-212, Air & Water, and ENV5-410, Methods of Environmental Monitoring. These PLOs were evaluated by department faculty observing presentations of posters in ENV5-212 and oral (conference-style) presentations in ENV5-410. In each case, all departmental faculty were invited to attend and evaluate student efforts and many were able to attend at least some of the student presentations. A total of seven different faculty evaluated some or all of the student presentations for each course.

The results of this direct evaluation are shown in Figure 1. The values presented were defined in a grading rubric that was identical for both courses ranging from a score of 1 (Inadequate Knowledge) to a score of 4 (Mastery of Knowledge), as defined in Table 3. Faculty were instructed to assess student performance on their presentations by giving them a score for each learning outcome listed as described within the rubric. Faculty were further instructed to compare the students' level of knowledge with what would be expected of that student upon graduation with a B.S. in Environmental Science.

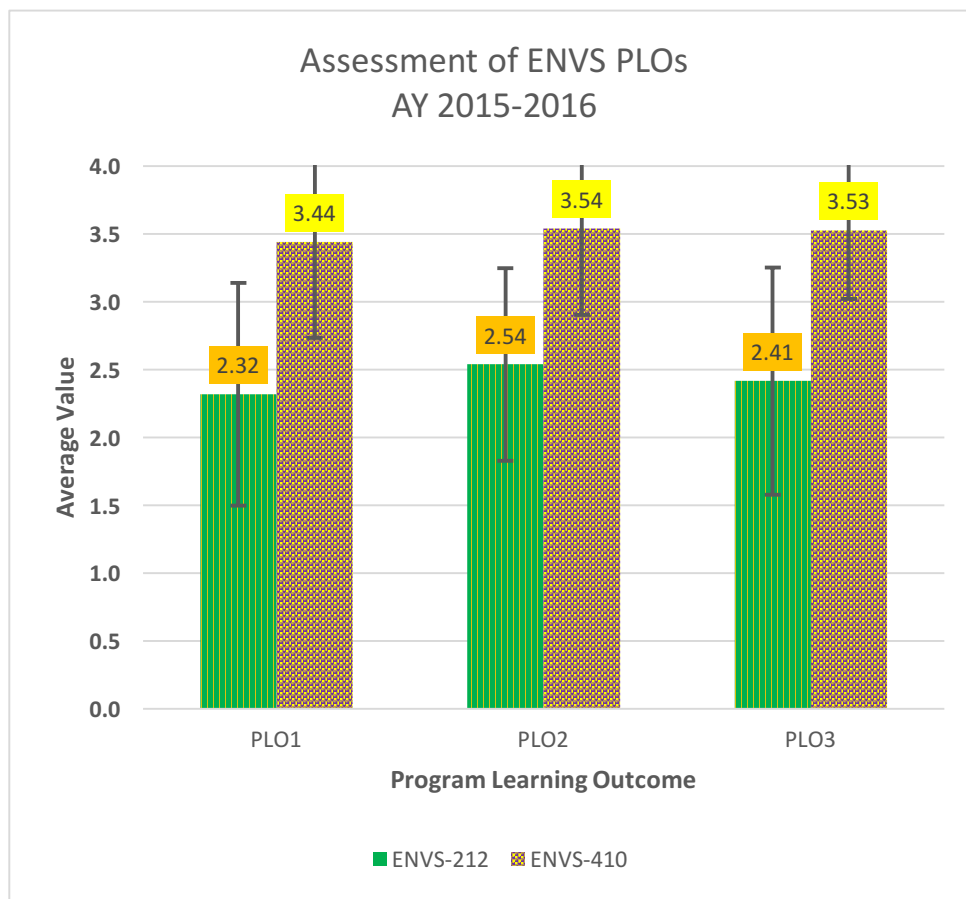


Figure 1 - Graphical representation of average values showing the results of faculty evaluation of the progress toward mastering three program learning outcomes, PLO1, PLO2 and PLO3 upon completion of ENV5-212, Air & Water, and ENV5-410, Methods of Environmental Monitoring. Error bars represent plus or minus one standard deviation of the data.

Table 3 - Scoring rubric used to evaluate student progress towards mastering various PLOs.

<b>Program Learning Outcome</b>	<b>Mastery of Knowledge</b>  Score = 4	<b>Developing Knowledge</b>  Score = 3	<b>Introductory Knowledge</b>  Score = 2	<b>Inadequate Knowledge</b>  Score = 1
<b>PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues</b>	Relationship between the study conducted and complexities of environmental issues are well explained. Student uses anecdotal evidence & examples in a robust and meaningful way.	Student has a solid understanding of the complexities of environmental issues. Explanations of interdisciplinary connections are at a basic level and are relevant to the topic.	Student has a limited understanding of how their topic relates to other environmental issues. They are not able to describe meaningful interdisciplinary connections.	Student has a little to no understanding of how their topic relates to other environmental issues. When asked how their presentation relates to other environmental topics they are not able to respond.
<b>PLO 2 – Apply the scientific method to environmental issues</b>	Student utilizes the scientific method associated with their presentation in a clear and logical fashion.	Student correctly utilizes the scientific method at a basic level or higher. Explains aspects of the scientific method that relate to the project.	Understands the elements associated with the scientific method and a rudimentary understanding of how those elements are connected.	Understands some but not all of the elements associated with the scientific method and lacks a rudimentary understanding of how those elements are connected.
<b>PLO 3 – Skillfully communicate knowledge of environmental science</b>	Student fully understands the scientific context and implications of the material presented. They are able to highlight examples of their project with anecdotal evidence & examples in a robust and meaningful way.	Student presents a problem statement and solution. Knowledge expands upon the information in the presentation with multiple external examples. Level of knowledge exceeds a basic level.	Student presents a problem statement and solution. Knowledge is limited to the information in the presentation with few external examples and in limited context. Level of knowledge exceeds a basic level.	Student fails to clearly present a problem statement and result. Knowledge is limited and some information presented is not understood.

The results clearly demonstrate with scientific validity that students completing ENV5-212, Air & Water, have introductory to developing knowledge of program learning outcomes 1-3. Similarly, the results demonstrate that upon completion of ENV5-410, Methods of Environmental Monitoring, students have between developing and mastery of all three program learning outcomes. These results align with the expectations of our curricular map, Table 1, for each of these two courses. Moreover, given that mastery of each program learning outcome measured falls within one standard deviation of the average of our data, we can conclude that graduating seniors do master program learning outcomes 1-3 upon completion of the senior capstone course.

One concern about the evaluation system is that our departmental faculty are not experienced at comparing a student's progress to a learning outcome. So, upon reflection and discussion following the evaluations, it became clear that many were effectively grading the presentations rather than comparing the student's progress to what would be expected to issue that student a bachelor of science degree. This effect could potentially lower the overall score for students. This matter will need further discussion and reflection by the faculty and will be planned during department meetings during the next academic year.

## Closing the Loop

Based on the results of this year's assessment, the faculty of environmental science will review the results and further discuss them. Given this is the first direct assessment of our program since 2009, we will repeat the same assessment process annually until we can determine if program learning outcomes or curriculum should be revised. That said, modifications to our assessment rubric and perhaps rewording of what is meant by mastery would be appropriate as some faculty are of the view that no student could actually master any of our learning outcome at the undergraduate level. For example, a small number of faculty were comparing our student's performance during presentations to what they would expect to see at professional conferences where the presentations are by graduate students, working professionals, or experienced faculty. Clearly that is not what is intended for a student obtaining a bachelor of science degree and any assessment should not expect that level of experience or expertise.