2019-2020 Yearly Assessment Report for the Bachelor of Science in Environmental Science & Minor in Environmental Science

Name of Program: B.S. in Environmental Science

Type of Program: Major & Minor

College of Arts and Sciences

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This report is an aggregate report for the BS in Environmental Science and the Minor in Environmental Science

Mission Statement for the BS in ENVS

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 is unchanged and was approved by the department in a general meeting on 24 April 2015.

Mission Statement for the Minor in ENVS

A minor in Environmental Science provides a science-based interdisciplinary introduction to the field of Environmental Science. Students will gain an understanding of environmental systems and will be able to apply this knowledge to promote sustainability and social justice.

This mission statement is unchanged and was approved by the department in a general meeting on 4 October 2019.

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 are unchanged and were approved by the department in a general meeting on 24 April 2015.

Program Learning Outcomes for BS in ENVS

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 are unchanged and were approved by the department in a general meeting on 24 April 2015.

Program Learning Outcomes for Minor in ENVS

Students who complete the Minor in ENVS requirements will be able to:

- PLO 1 – Demonstrate and communicate an understanding of basic concepts in Environmental Science.
- PLO 2 – Demonstrate knowledge of the interdisciplinary nature and complexities of key environmental issues.
- PLO 3 – Develop skills in applying the scientific method to environmental issues.

These program learning outcomes for the minor in ENVS were approved by the department in a general meeting on 4 October 2019.

Curricular Maps for the BS in ENVS

The curricular maps (Table 1 & Table 2) for the BS in Environmental Science are unchanged and were approved by the department on 25 April 2015.

Curricular Map for the Minor in ENVS

The curricular map (Table 3Table 1) for the minor in Environmental Science is unchanged and was approved by the department on 4 October 2019.

Methods

As a result of the COVID-19 Pandemic and the unplanned switch to remote instruction and learning during the spring semester 2020, the Department of Environmental Science chose to complete our annual assessment report using the Remote/Distance Learning option. Each question posed in the template provided by the College of Arts & Sciences is addressed below.

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 ENVS degree, approved by the department on 24 April 2015. I = Introduced, D = Developed, M = Mastered

Program Learning Outcomes / Course	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.
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 ENVS degree maps onto the Institutional Learning Outcomes (ILOs) for the University of San Francisco, approved by the department on 24 April 2015.

Program Learning Outcomes / Institutional Learning Outcomes	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.				✓

Curriculum Map 3

Table 3: 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 Minor in ENVS, approved by the department on 4 October 2019. I = Introduced, D = Developed, M = Mastered

Program Learning Outcomes / Course	PLO 1 - Demonstrate and communicate an understanding of basic concepts in Environmental Science	PLO 2 - Demonstrate knowledge of the interdisciplinary nature and complexities of key environmental issues	PLO 3 - Develop skills in applying the scientific method to environmental issues
ENVS-100 Understanding our Environment w/Lab (Core B2)	**I**	**I**	**I**
ENVS-110 Intro to Environmental Science w/Lab (Core B2)	**I**	**I**	**I**
ENVS-195 First Year Seminar w/Lab (Core B2)	**I**	**I**	**I**
ENVS-210 Ecology & Human Impacts w/Lab	**D**	**D**	**D**
ENVS-212 Air & Water w/Lab	**D**	**D**	**I**
ENVS-250 Environmental Data Analysis (Core B1)	**I**	**I**	**I**
ENVS-311 Environmental Chemistry	**D**	**D**	
ENVS-315 Hydrology w/Lab	**D**	**D**	**D**
ENVS-320 Restoration Ecology w/Lab	**D**	**D**	**D**
ENVS-321 Wetland Ecology w/Lab	**D**	**D**	**D**
ENVS-325 Field Botany w/Lab	**D**	**D**	**D**
ENVS-330 Environment & Ecosystem Health	**M**	**D**	**I**
ENVS-335 Marine Environments	**D**	**D**	**D**
ENVS-340 Environmental Geology w/Lab	**D**	**D**	**D**
ENVS-350 Energy & Environment	**D**	**D**	**D**
ENVS-360 Climate Change: Science & Policy	**D**	**D**	**D**
ENVS-366 Environmental Policy	**D**	**M**	**D**
ENVS-370 Intro to Landscape Ecology & GIS w/Lab	**D**	**D**	**D**
ENVS-371 Fundamentals of Ecosystem Science	**D**	**D**	**D**

ENVS-375 Intro to Geospatial Technology w/Lab	**D**	**D**	**D**
ENVS-380 Environmental Engineering	**D**	**D**	**D**
ENVS-390 Undergraduate Special Topics w/Lab	**D**	**D**	**D**
ENVS-392 Undergraduate Special Topics	**D**	**D**	**D**
ENVS-410 Methods of Environmental Monitoring w/Lab	**M**	**M**	**M**
Natural Science Electives ∞	**I**	**I**	**I**
Interdisciplinary Electives ☯		**D**	

∞ Natural Science Electives include: BIOL-100, Science of Life, BIOL-105, General Biology-I, BIOL-106, General Biology II, CHEM-111 & 112, General chemistry I w/ Lab, CHEM-113 & 114, General CHEM II w/ Lab, PHYS 100, Introductory Phys. I

☯ Interdisciplinary Electives include: ARCD-312 Environmental Control Systems, ARCD-320 Sustainable Design, ECON-230 Environmental Economics, ENVA-363 Environmental Law, ENVS-366 Environmental Policy, ENVA-367 Environmental Justice, ENVA-109 Environment and Society, ENVA-310 Commons: Land, Water and Air, ENVA-319 Health and Environment, BIAS-360/POLS-360 Global Environmental Politics, ENVA-396 Community Internships, PHIL-244 Environmental Ethics, THRS-404 Environmental Ethics, THRS-361 Religion and the Environment, MS-301 Green Media, MS-302 Communication for Change, COMS-344 Environmental Communication.

Results

The environmental science faculty met on 9 October 2020 to review the questions posed. Breakout rooms were utilized to promote interaction and brainstorming with each group attacking a different question posed. Following the breakout groups, the entire faculty met to share their discussions and to provide the answers listed here.

Question 1 - What elements of the program were adaptable to a remote/distance learning environment?

The environmental science faculty provided the following list of the aspects of remote/distance learning environment that were adaptable to ENVS courses and our program.

- GIS classes and other tech/computer-based classes seemed to translate over easily to remote/distance learning strategies.
- Office hours and student meetings were easier, more casual and less intimidating for students.
    - This resulted in more students coming to office hours than ever before.
    - Alternative meeting times are more easily available.
- More and easier availability of guest speakers/lecturers over Zoom.
- More time to review scientific articles and data analysis.
- Ability to read more articles with undergrads than usual.
- Demonstrating Excel work was more effective remotely than in person.
- Lectures and writing assignments tended to work well.

- Lectures involved more conversation in the remote environment.
- Instructors had to manage teaching pace for online format, which helped students and lectures overall.
- Zoom breakout rooms helpful to allow students who talk who wouldn't speak in the larger group.
- Recorded lectures available for student review.

Question 2 - What elements of the program were not adaptable to a remote/distance learning environment?

In answering this question, we phrased it to be, what aspects of remote/distance learning were most challenging. The answers included:

- Creating sense of community among students took much more effort.
- Lack of peer-to-peer learning/informal networks:
    - Observed that students are often working quietly/individually in breakout rooms in Zoom, rather than working together.
    - Some students do not like breakout rooms in Zoom.
    - Shyer students were harder to engage.
- Hands-on experiences suffered.
- Lack of experiential learning.
- Whiteboarding and other technology can be unreliable, hard to troubleshoot.
- Issue with students taking quizzes in groups
    - Canvas records when quiz is taken, so can detect when students are taking asynchronous quiz together. One instructor provided class time for students to take quizzes in order to prevent this issue. Another instructor gave up on trying to catch cheating and instead made them opportunities to work together, used projects for assessment instead of quizzes/exams.
    - Lockdown browser works fine but it is puzzling to see one student finishing in 5 minutes when other students are taking 20 minutes -- don't want to accuse students of cheating without sufficient proof.
    - 2nd component of quiz security system actually analyzes how many times students look away from the screen, but faculty who tried this out found it to not be reliable.

Question 3 - What was the average proportion of synchronous versus asynchronous learning for your program or parts thereof? A rough estimate would suffice.

All environmental science courses were offered synchronously; however, for those students in widely varying time zones, asynchronous options were offered. In most cases, less than 10% of students chose to take the courses asynchronously with the number being higher for the Core courses designed for non-majors, i.e., ENVS-100, Understanding our Environment.

Question 4 - For what aspects of learning is synchronous instruction effective and for which ones is asynchronous instruction more effective?

Asynchronous learning was most effective for students in wildly varying time zones. For those students who were in near time zones, ENVS faculty felt that synchronous instruction worked most effectively.

- In master's programs or programs with students in different time zones, async teaching makes a lot of sense.
- May make more sense to do async and then live office hours, depending on the cohort, dynamics of the class. Some instructors plan on keeping office hours online one pandemic subsides.

Question 5 - As remote/distance learning continues in the current environment, what changes has the program instituted based on experiences with remote instruction?

- Zoom-based office hours work very well.
- Video training materials to supplement class time, quick demonstration videos.
- Making more use of discussion boards on Canvas (formal) and Discord (informal).
- The program plans to give students something to look forward to when they return to campus: one important example will be to develop and deliver short course experiential learning at no cost to students, probably using weekend excursions.
- Remote learning offers extra flexibility of schedule, allows for supplementing in person learning with async materials as necessary:
    - especially around holidays or times when students are often away from campus
    - supplement in-person instruction during fire season
- Increased access to other professionals via Zoom, Zoom-based speaking engagements should continue.

Response to Previous Report Suggestions/Feedback

The Department of Environmental Science reviewed the suggestions from our previous year's feedback from Professor Alexandra Amati. We want to thank her for her detailed and thoughtful review. Her suggestions will require considerable thought by the department and perhaps reevaluating how we review PLO #4. We think the suggestions are quite good and greatly appreciate the critique by a non-scientist who clearly has a substantial understanding of how we might want to evaluate this "squishy" PLO. Thanks Alexandra!