March 6, 2020

AY 2018-2019 Annual Student Assessment Report

Bachelor of Science in Environmental Science
Bachelor of Science in Geography and Environmental Resources

1. Program Overview

Faculty:

Eran Hood, Professor of Environmental Science
Lisa Hoferkamp, Professor of Chemistry
Sanjay Pyare, Associate Professor of Environmental Science
Jason Amundson, Associate Professor of Geophysics
Sonia Nagorski, Assistant Professor of Geology
Allison Bidlack, Associate Research Professor of Environmental Science
Jason Fellman, Assistant Research Professor of Environmental Science
Christian Kienholz, Assistant Research Professor of Environmental Science

The B.S. Environmental Science (ENVS) and the B.S. Geography and Environmental Resources (ENRE) provide students with rigorous interdisciplinary training in Earth science, chemistry, and ecology. Program graduates are well-prepared (i) for entry-level employment in resource agencies such as the Department of Environmental Conservation, the Department of Natural Resources, and the US Geological Survey and (ii) to enter graduate programs in Earth sciences and ecology. The degrees use the natural laboratory available to students in Southeast Alaska both through laboratories and hands-on field exercises and through guided research projects with program faculty. All ENVS students are required to complete either an internship or an individual research project within their degree, and ENRE students are highly encouraged to do the same.

The ENVS and ENRE degrees share a number of required courses, primarily in Earth sciences and geographic information systems. However, the two degrees are fundamentally different in their aims. The ENVS degree is focused on developing a rigorous, quantitative understanding of the physical, chemical, and ecological processes in Earth's surface and near-surface environments. This entails course work in chemistry, physics, Earth science (e.g. hydrology and physical geology), and biology. In contrast, the ENRE degree is focused on understanding the Earth from a geographic and resource management perspective.

2. Program Student Learning Outcomes (SLOs)

By the time that they have completed their degree, students in the ENVS and ENRE program can:

1. Describe the fundamental Earth system components, their organization, and how they interrelate,
2. Collect and quantitatively analyze environmental data,
3. Convey technical concepts in environmental science to other scientists and the public,
4. Explain how environmental science is incorporated into different professional fields,
5. Relate environmental science to broader societal issues and solutions, and
6. Conduct research in an environmental field and/or provide support for environmental resource management.

3. Assessment Strategy

Students are assessed on the first five learning outcomes based on specific assignments completed in classes that are required for the ENVS and ENRE degrees. Assessment of the sixth learning outcome is based on the number of ENVS students who successfully complete research and internship opportunities in a field related to their major. For learning outcomes 1-5, the specific assignments that are assessed for program students are detailed in the table below. Student performance for each learning outcome is rated by program faculty on a scale of 1-6. There are three categories within this range: 1-2 represents "Does Not Meet Expectations", 3-4 represents "Meets Expectations", and 5-6 represents "Exceeds Expectations". The sixth learning outcome is evaluated both quantitatively and qualitatively based on the number and type of student research and internship experiences in a given academic year.

		UAS Competencies								
Conceptual Basis for SLO	*SLO*	*Communication*	*Quantitative Skills*	*Information Literacy*	*Computer Literacy*	*Professional Behavior*	*Critical Thinking*	*Assessment Tool*	*Assessment Method*	*Course*
Knowledge	#1		X	X	X			Modeling Exercises	Evaluation of student comprehension of model outcomes relevant to Earth system processes	Earth's Climate System (ENVS S422) / Glaciology (ENVS S302)
Analysis	#2		X				X	Hydrology Lab	Evaluation of accuracy of data collection and depth of analysis	Hydrology (GEOL S302)
Communication	#3	X		X	X	X		GIS Research Project/Poster	Evaluation of how results of GIS analyses were presented and visualized	Intro. GIS (ENVS S338)
Application	#4	X				X		Presentations	Evaluation of student comprehension of presentations from practitioners	ENVS Seminar (ENVS S492)
Consequences	#5			X			X	Case Study	Evaluation of geoscience principles of natural hazards/resources; Grade distribution	Natural Hazards (ENVS S213) / Geological Resources and the Environment (ENVS S320)

4. Data Collected for Program Assessment During AY2017-18

Assessment of SLO #'s 1–5: Average score of students in courses listed in the table above over the past three years; AY17 was the first year that this scoring rubric was applied.

Student Learning Outcome	Average Student Score		
	AY17	AY18	AY19
#1	3.12	N/A*	4.34
#2	3.81	3.83	3.0
#3	4.57	3.89	N/A**
#4	2.45	3.64	4.57
#5	4.08	3.92	4.12

*Based on performance in ENVS S302/S422, neither of which were offered in AY18 due to sabbatical leave.

**Based on performance in ENVS S338, which was taught by an adjunct during AY19 due to sabbatical leave and therefore not evaluated.

Student learning outcome 6 reflects a central tenant of the ENVS Program, which is to involve program students in hands-on research through faculty research projects and internships at local resource agencies.

Assessment of SLO #6: Headcount of students enrolled in internship and directed research courses. Credits received during summer are counted toward the following academic year.

SLO #6	AY15	AY16	AY17	AY18	AY19
ENVS S491 (internship)	2	3	1	4	5
ENVS S498 (research)	6	2	2	5	6

ENVS and ENRE students continue to be involved in a wide variety of local research projects and internships and student participation rates in these opportunities has grown in recent years. Student projects with program faculty covered a wide variety of topics and developed skills that will benefit students looking to attend graduate school and get jobs in environmental science and resources. Student projects included: modeling the impacts of glacier recession and vegetation succession on streamflow (Evan Carnahan[1]), stream chemistry monitoring (Mollie Dwyer, Connor Johnson, and Breanna Walker), reconstruction of large magnitude avalanches in the Juneau area using dendrochronology (McKenzie Wilson), evaluation of black carbon on the Juneau Icefield and microplastics in Juneau streams and beaches (Abby Nathlich), UAV surveys of Suicide Basin (Skye Hart[2]: http://acrc.alaska.edu/blog/skyehart-blog-1.html), a forestry internship (Eva Bingham), landslide ecology projects (Kelly Gerlach and Liam Bogardus), shellfish PST monitoring (Elizabeth Bryson and Sam Eames), and assessment of PFAS in Arctic biota and sediment (Sarah Novell-Lane[3]).

These projects are largely supported by faculty grants as well as through UAS URECA awards. ENVS faculty continue to be successful in bringing in external funds from a variety of state and federal agencies so we expect that students will continue to have ample opportunities to participate in research.

[1]Lead author on a peer-reviewed publication.
[2]Co-author on a peer-reviewed publication.
[3]Presented results at two conferences.

5. Evaluation of Data Collected During AY2017-18

ENVS and ENRE students "meet expectations" in all student learning objectives.

Scores for student learning outcome #2 ("Evaluation of accuracy of data collection and depth of analysis") decreased significantly from previous years. However, the the course had a small cohort and one of the students did very poorly in lab, which dragged down the average score. The average among the other three students was 3.67, which is on par with previous year. A new lab exercised focused on data analysis will be developed for AY2019-20.

In contrast, scores from student learning outcomes #1 and #4 increased significantly. Outcome #1 evaluates student comprehension of modeling; the improved scores there likely reflect the increased emphasis that has been placed on understanding the utility and limitations of models, particularly in Glaciology (ENVS S302) and Earth's Climate System (ENVS 422). Outcome #4 evaluates student communication and professionalism within the Environmental Science Seminar (ENVS S492). The focus of ENVS S492 is to survey environmental career options and help students to refine their own interests within the field. Students were motivated and acted in a professional manner when interacting with environmental professionals who visited the class. The high scores in this area reflect that students in the ENVS program are required to complete internships or directed research opportunities (many students do both), which provide exposure to expectations regarding professional behavior in the workplace.

6. Future Plans to Improve Student Learning

Many graduates of the ENVS and ENRE program pursue technical careers that involve field work and analysis of field data. To provide students with more hands on learning experiences and better prepare them for future employment, we have started offering more field-oriented courses. We offered two such courses in Spring 2019: an intensive geology field course in Death Valley National Park and a UAV (umanned aerial vehicle) surveying course in Juneau. Both courses were very successful, and therefore we plan to continue offering them while also developing other options.

The Death Valley course filled up on the first day of registration. This course was comprised of 5 meetings during the semester and a weeklong intensive field trip to Death Valley National Park, and vicinities, in California. Students had a fantastic experience, rated the course as excellent across the board, and highly recommended that it be offered again. It provided students, who are primarily from Alaska, a rare opportunity to visit the deserts of the southwestern US to explore a totally different landscape and to see geologic processes and features that are largely not possible to find in Alaska. The class was also excellent for building community among students, and several students switched their majors or minors to Environmental Science after taking this class.

The UAV surveying course was also quite popular. The course met a few times during the semester, and then during a weeklong "Maymester" course immediately after finals week. Students learned how to collect imagery with UAVs, orthorectify the images, and create digital elevation models (topographic maps). UAVs are rapidly becoming very useful tools for environmental monitoring, and therefore this course provided students with cutting edge tools that they can apply to a variety of environmental topics in their careers. The course was rated very highly.

The program benefitted greatly this year from the help of Pat Dryer and Croix Fylpaa, who served as lab managers in the fall and spring, respectively. They were primarily tasked with ensuring that laboratory equipment was functioning. Inconsistency in support for this position has plagued us in previous years. Going forward, we hope to develop this position into something that includes more program support than it has in the past, such as homework tutoring (which is currently lacking in our program), and coordination of program gatherings and outreach activities to build program camaraderie.

The major challenge with the ENVS and ENRE program continues to be enrollment, particularly in upper division classes, although encouragingly we have seen modest growth in recent years. We are working on a variety of marketing efforts including improving our website and contributing content to the A&S research website. The departure of Brian Buma also presents a challenge for delivering forest-oriented classes to ENVS students. We are planning to employ adjuncts to cover only the classes that are critical for majors in the "Forests and Ecosystems" emphasis of the ENVS degree.

Enrollment in the ENRE degree is consistently lower than enrollment in the ENVS degree. In order to make the degree more attractive, build a stronger cohort of students, and simplify recruitment and program coordination, we will propose a number of changes to the ENRE degree in order to build on the strengths of the ENVS degree while simultaneously clarifying the similarities and differences between the degrees. These include:

1. Simplifying the degree name to "Environmental Resources"
2. Requiring students to take directed research and/or internship credits.
3. Switching to the ENVS designator for all cross-listed courses.
4. Moving GEOL S320 (Geological Resources and the Environment) into major requirements.

7. Additional Program Information

Exit Interview Information

We sent out surveys to our program graduates but did not receive any feedback. We need to develop a better strategy for soliciting feedback going forward. We propose to do this through the Environmental Science Seminar (ENVS S492), which is offered every spring and typically taken by students that are near completion.

Faculty productivity

Program faculty have had success procuring external funding and publishing peer-reviewed manuscripts, having been awarded $425k in research grants and publishing 10 peer-reviewed manuscripts in 2018. In addition, faculty were involved in a variety of service activities, including:

- Dr. Hood was the UAS representative to the UA Statewide Research Council, the Office of Intellectual Property and Commercialization, and was on the steering committee for the NSF-funded Coastal Margins Research Coordination Network.
- Dr. Hood was awarded UAS Outstanding Faculty Advisor for the 2018-2019 academic year.
- Drs. Kienholz, Hood, and Amundson collaborated with staff from the National Weather Service, the US Geological Survey, the USFS, and the City and Borough of Juneau to coordinate monitoring efforts on the glacier lake outburst flood on Mendenhall River.

- Dr. Kienholz made several school visits at middle and high schools in Juneau, two computational thinking workshops with the Juneau STEM Coalition, presented a Naturalist Training at Glacier Bay National Park, and presented at Fireside Lecture at the Mendenhall Glacier Visitor Center.
- Dr. Amundson served as the UAS representative for the Alaska Space Grant Program.
- Dr. Hoferkamp served on the UA-INBRE II & III Steering Committee and Management Advisory Committees, and has done so since 2013.
- Dr. Nagorski served as faculty senator for the Department of Natural Sciences, chaired the faculty Sustainability Committee, worked as key member of the Transboundary Rivers Scientific Advisory Committee, led a geology training for staff at the Mendenhall Glacier Visitor Center, and gave multiple presentations to various public groups, including BRIGHT girls, elementary school classes, the Alaska State Museum.
- Dr. Hood serves as the UAS representative for the Alaska Climate Adaptation Science Center.
- ENVS faculty regularly review manuscripts and NSF proposals.