Academic Program Assessment Report

Academic Year(s) Assessed: 2024-2025
College: Agriculture
Department: LRES
Department Head: Bob Peterson
Submitted by: Will Wetzel

Program(s) Assessed

List all majors (including each option), minors, and certificates that are included in this assessment – add or subtract rows as needed – please use official titles:

Majors	Minors, Options, etc.
Environmental Sciences (ENSC)	Environmental Sciences, Environmental Biology, Geospatial & Environmental Analysis, Land Rehabilitation, Soil & Water Sciences

Section 1. Past Assessment Summary.

For the last two years, our undergraduate program assessment has focused on quantitative and statistical skills and literacy. These skills are crucial to students entering the workforce and essential to being an informed member of society. They are encapsulated by the following ENSC Program Learning Outcome (PLO):

"Knowledge of the theory and practice of data analysis in environmental sciences, including statistical analysis, model building, and graphical presentation of data."

Based on those assessments, we learned that we do a strong job helping our students learn the quantitative skills they need for careers in Environmental Science. We also identified two related areas for improvement: (1) Better communication among faculty who work on and teach different types of quantitative methods. (2) More opportunities for students to learn the specialized quantitative methods for their subfield of environmental science. Based on this, we have been improving and expanding our quantitative offerings. For example, we now have two sections of ENSC 311 Fundamentals of Environmental Data Analysis. The two sections cover much of the same material, but each instructor has a different specialization and background. One instructor is an environmental biologist, while the other is a hydrologist, allowing a level of specialization.

Section 2. Institutional Assessment Data Request.

Based on the rationale on the Instructions page, please review your program learning outcomes (PLOs) and identify whether you have PLOs that address the Core Qualities. **There are no right or wrong answers.**

Identify 1-2 major-required courses that might have student assignments designed to meet these objectives at least at a surface level. If you cannot identify a course in your program that aligns with this

request, please check the appropriate box. At this juncture, this is for information gathering as we plan future institutional assessment endeavors.

Core Quality LOs are Institutional Learning Outcome (ILO)	**PLO overlaps with MSU Core Quality** Mark X if program has at least one PLO that overlaps with an ILO	**Beginning Level** e.g. CORE Courses (US, W, Q, IN, CS, IA, IH, IS, D)	**Developing Level** e.g. list one 200- or 300-level course	**Proficient Level** e.g. list one 300- or 400-level courses, Capstone, Research (R) Core courses	**Not Applicable (N/A)** No course exists in our program that addresses this Core Quality / ILO
Thinkers & Problem Solvers	X	Core classes are designed to address an introductory, foundational level of Core Qualities. Some may overlap into the developing level, but most intermediate-to-developing or proficient/mastery level courses will exist within the majors.	ENSC 210, 290R, 311, 391	ENSC 499R, 490R, 464, 461, 410R	
Effective Communicators	X		ENSC 210, 290R, 391	ENSC 499R, 490R, 410R	
Local & Global Citizen	X		ENSC 110, 210	ENSC 499R, 462	

Section 3. Actionable Research Question for Your Assessment.

Our students are required to take ENSC499R, the LRES Capstone, in their final semester before graduating. It is intended to draw upon everything each student has learned in the major and serve as a culmination of learning. For the capstone, students form into teams, based on expertise and interest, and each team prepares a presentation and written final report on an environmental science problem of societal relevance. These final reports therefore are indicative of the learning our students have done in our major. For this year's assessment, our actionable research question is how well capstone final reports score on each of our PLOs. This assessment provides an overall view of how well our major is meeting our PLOs overall, and it allows us to assess which PLOs need more attention.

Section 4. Assessment Plan, Schedule, and Data Sources.

a) Did you change the previously established Assessment Plan Schedule. If yes, how was it changed?

There was a lull in the depth of our assessment last year because the faculty member previously conducting this assessment was on sabbatical. Problems with this were raised by the reviewers of last year's assessment. In response to this, this year we are compensating for last year's lull by conducting a full and comprehensive assessment of all our Program Learning Outcomes simultaneously.

b) Please provide a multi-year assessment schedule that will show when all program learning outcomes will be assessed, and by what criteria (data). List your PLOs in full for reference. Add rows as necessary.

	ASSESSMENT PLANNING SCHEDULE CHART					
PLO#	PROGRAM LEARNING OUTCOME	2023-2024	2024-2025	2025-2026	2026-2027	Data Source*
1	An understanding of core theoretical principles and applications in evolutionary, ecological and physical environmental sciences.		X			Capstone reports (24-25)
2	Ability to access, read, and critically assess the quality and source of environmental information.		X		X	Capstone reports (24-25), Class reading assignments (26-27)
3	Knowledge of the theory and practice of data analysis in environmental sciences, including statistical analysis, model building, and graphical presentation of data.	X	X	X		None (23-24), Capstone reports (24-25) Capstone reports (25-26)
4	The ability to effectively write and present scientific material.		X			Capstone reports (24-25),
5	An understanding of the ethical implications of conducting and applying environmental science.		X			Capstone reports (24-25)

c) What are the threshold values for which your program demonstrates student achievement? Provide a rationale for your threshold values.

Threshold Values		
PROGRAM LEARNING OUTCOME	Threshold Value	Data Source
An understanding of core theoretical principles and applications in evolutionary, ecological and physical environmental sciences.	80% of assessed students to score above 2 on a 1-4 scoring rubric.	ENSC Capstone final reports
Ability to access, read, and critically assess the quality and source of environmental information.	80% of assessed students to score above 2 on a 1-4 scoring rubric.	ENSC Capstone final reports
Knowledge of the theory and practice of data analysis in environmental sciences, including statistical analysis, model building, and graphical presentation of data.	80% of assessed students to score above 2 on a 1-4 scoring rubric.	ENSC Capstone final reports
The ability to effectively write and present scientific material.	80% of assessed students to score above 2 on a 1-4 scoring rubric.	ENSC Capstone final reports
An understanding of the ethical implications of conducting and applying environmental science.	80% of assessed students to score above 2 on a 1-4 scoring rubric.	ENSC Capstone final reports

Section 5. What Was Done?

a) Self-reporting Metric (required answer): Was the completed assessment consistent with the program's assessment plan? If not, please explain the adjustments that were made.

☐ **Yes** ■ **No**

See our response to 4a above.

b) How were the data collected and analyzed and by whom? Please include method of collection and sample size.

The curriculum committee collected all the final written reports from ENSC 499R Capstone for the 2024-2025 academic year and scored each one for how well it demonstrates each of the ENSC Program Learning Outcomes using the rubric below. Below we report summary statistics for each learning outcome.

c) Please provide a rubric that demonstrates how your data were evaluated.

Program Learning Outcomes	Beginning - 1	Developing- 2	Competent- 3	Accomplished- 4
An understanding of core theoretical principles and applications in evolutionary, ecological and physical environmental sciences	Core principles and applications are mentioned but may not be the most relevant to project topic or may not be fully explained	Most relevant core principles and applications are identified	Most relevant core principles and applications are identified, explained, and synthesized with project topic	Most relevant core principles and applications are identified, explained, synthesized with project topic. Students also identify knowledge gaps when relevant
Ability to access, read, and critically assess the quality and source of environmental information	Students cite some sources in support of some of their arguments	Students cite the most relevant sources in support of their arguments	Students cite the most relevant sources in support of their arguments and explain how and why sources support their arguments	Students cite the most relevant sources in support of their arguments, explain how and why sources support their arguments, synthesize across multiple sources, and identify gaps or shortcomings in sources
Knowledge of the theory and practice of data analysis in environmental sciences, including statistical analysis, model building, and graphical presentation of data	Students demonstrate a minimal understanding of data analysis concepts and apply at least one statistical method to support their conclusions where relevant	Students apply basic statistical techniques with partial accuracy and produce graphs that convey some relevant information but lack clarity or precision	Students correctly apply appropriate statistical methods, construct meaningful models, and present data clearly through well-labeled and relevant figures	Students apply the most relevant statistical modeling methods to support their arguments and present those results through polished, insightful figures
The ability to effectively write and present scientific material	Students produce writing or presentations that are unclear, disorganized, or	Students communicate scientific ideas with basic structure and some clarity, though	Students clearly and accurately convey scientific information in a structured	Students craft well-organized, engaging, and scientifically rigorous writing or

	inaccurate, with minimal attention to scientific conventions or audience	writing or presentations may lack precision, coherence, or appropriate tone	format, using appropriate language, visuals, and conventions for the intended audience	presentations that effectively communicate complex ideas to a target audience with clarity and polish
An understanding of the ethical implications of conducting and applying environmental science	Students show some awareness of ethical considerations in environmental science, with minimal reflection on responsibility, bias, or societal impact	Students identify basic ethical issues and offer limited analysis or connection to real-world environmental science practices	Students demonstrate a clear understanding of ethical principles and apply them appropriately to scientific decisions and environmental contexts	Students thoughtfully evaluate complex ethical dimensions of environmental science, integrating considerations of equity, responsibility, and long-term impact into their analysis

Section 6. What Was Learned.

a) Based on the analysis of the data, and compared to the threshold values established, what was learned from the assessment?

Our first result is that our Capstone final reports demonstrate that our students are meeting our program learning outcomes. All the reports (100%) scored a minimum of competent for all five of our program learning outcomes. We are proud of the high quality of the work our students are capable of by the time they complete their degrees. Average scores were between Competent and Accomplished for all learning outcomes (Table 1).

Program learning outcome	Mean score (max = 4)	Standard error
1 – Core	3.6	0.13
2 – Sources	3.4	0.13
3 – Analysis	3.3	0.13
4 – Writing	3.6	0.14
5 – Ethics	3.9	0.10

b) What areas of strength in the program were identified from this assessment process?

Scores for all learning outcomes were relatively close, but capstone final reports scored highest in ethics, core understanding, and writing. Students are excelling at thinking through ethical issues surrounding environmental sciences, likely because our faculty care deeply about these issues and model their care,

concern, and deep thinking to their students. Additionally, capstone students have a strong understanding of core theoretical principles and applications in evolutionary, ecological and physical environmental sciences. This suggests that our classes are giving students the knowledge they need to be environmental scientists.

c) What areas were identified that either need improvement or could be improved in a different way from this assessment process?

Capstone reports scored the lowest for learning outcome 3 (data analysis) and learning outcome 2 (Ability to access, read, and critically assess the quality and source of environmental information). The low score for data analysis is likely because capstone final reports are often framed as literature reviews. As a result, many capstone groups, while using appropriate quantitative methods when required, choose to avoid projects with significant analysis components. This is acceptable based on the current structure of our capstone, but it could be a missed opportunity for students to take final steps in cementing their quantitative skills in their final projects as ENSC undergraduates.

The low score on use of information sources occurred because some reports cited relevant sources but failed to synthesize across sources or identify shortcomings or information gaps within the literature. This level of scholarship is difficult for all scholars. It also requires a level of confidence that takes time and support to develop. Most reports took published papers at face value without challenging their results. We plan to discuss how to continue to help our students gain this ability through more training and confidence building.

Section 7. How We Responded.

a) Describe how "What Was Learned" was communicated to the department, or program faculty. How did faculty discussions re-imagine new ways program assessment might contribute to program growth/improvement/innovation beyond the bare minimum of achieving program learning objectives through assessment activities conducted at the course level?

Discussions within the curriculum committee and eventually with the whole faculty (1) celebrate our strengths and (2) discuss the areas for improvement. Our first priority is framing the decision we have to make around whether or how to incorporate more data analysis into our capstone projects. This could be done by requiring each group to include analyses meeting certain criteria. This could fit with the current literature review format if we ask students to collect data from the papers they review and conduct a meta-analysis. Alternatively, it is common in our field for literature reviews to include an empirical case study. We could ask students to collect a small amount of data, analyze it, and include it as a case study in their literature reviews. Second, we are discussing how to help students dive deeper into the literature and gain skills in identifying knowledge gaps or shortcomings. This could be solved by incorporating more reading assignments into current classes or by introducing new literature-focused classes.

b) How are the results of this assessment informing changes to enhance student learning in the program?

See discussion above.

c) If information outside of this assessment is informing programmatic changes, please describe that.

N/A

d) What support and resources (e.g., workshops, training, etc.) might you need to make these adjustments?

Making these adjustments primarily requires a lower student to faculty ratio. Leading students through a real-world data analysis is much more intensive than simply lecturing about statistics. Instead, it requires close guidance from faculty members. Currently, our capstone classes have so many students that this is not feasible. Similarly, teaching students to read and synthesize information across many scientific papers requires small group discussions. Smaller class sizes throughout our major would make this more feasible. Given the growth we have been pursuing in our major, the support and resources we need most are additional faculty lines to reduce the student to faculty ratios in our classes.

Section 8. Closing the Loop(s).

Reflect on the program learning outcomes, how they were assessed in the previous cycle (refer to #1 of the report), and what was learned in this cycle about any actions stemming from the previous cycle.

a) Self-Reporting Metric (required answer): Based on the findings and/or faculty input, will there be any changes made (such as plans for measurable improvements, realignment of learning outcomes, curricular changes, etc.) in preparation for upcoming assessments?

Yes ■ **No** ☐

b) In reviewing the last report that assessed the PLO(s) in this assessment cycle, what changes proposed were implemented and will be measured in future assessment reports? What action will be taken to improve student learning objectives going forward?

Based on assessments from previous years and reviewer feedback on last year's report, we changed our assessment this year to make it more comprehensive and holistic. That comprehensive assessment revealed that environmental data analysis is still a continuing area for improvement. This is an area for improvement that was identified by previous assessments. And we have been working hard as a department over the last few years to improve how we teach data analysis. Indeed, we believe that the scores from this assessment show that our efforts have been paying off: while our students scored lowest in data analysis, they still scored quite highly and met our threshold for success. Regardless, this area is still our biggest area for potential improvement. We propose continuing to assess this element of our program with focused discussions on if or how we can incorporate more data analysis into our capstone.

c) Have you seen a change in student learning based on other program adjustments made in the past? Please describe the adjustments made and subsequent changes in student learning.

Please see our answer to the question above.

d) If the program sees anything emerging from this assessment cycle that it anticipates would be a factor or an item of discussion in its 7-year program review cycle, please use this space to document that for future reference.

The biggest point emerging from this assessment that is relevant for our 7-year program review cycle is that all our areas for improvement require close interactions between students and instructors. This type of close interaction is possible only for classes with low student to faculty ratios. We believe we are doing well with what we have and that meaningful improvement would require the hiring of enough faculty to bring down our student to faculty ratio.

Submit report to programassessment@montana.edu
Update Department program assessment report website.
Update PLO language in CIM if needed (Map PLOs to Course LOs)