Name of Program/Department:	**Environmental Science / Department of Biology**
Year:	**2024 - 2025**
Name of Preparer:	**Jason Doll, Ph.D.**

Environmental Science Mission

The mission of the Environmental Science program is to produce scientifically literate graduates who display robust knowledge of environmental science principles from an interdisciplinary nature. The Environmental Science program seeks to educate and train the next generation of environmental professionals. By using critical thinking skills and understanding environmental issues from an interdisciplinary perspective, students learn how to understand and solve current and future environmental challenges. We are committed to experiential learning including laboratory, field, and research experiences. Students graduating from this program will be well prepared for a variety of professional careers or entry into graduate school programs. The Bachelor of Science degree in Environmental Science is for students wishing to pursue careers in conservation biology, environmental science, natural resource management and related fields.

Program Learning Outcomes:

The Environmental Science program prepares students who:

1. describe the interdisciplinary nature and complexities of environmental issues.
2. think critically and use the scientific approach to reach conclusions about environmental issues.
3. demonstrate knowledge of environmental conditions to promote active participation and social justice in environmental issues.
4. communicate cogently about environmental issues.

Student Learning Outcomes

SLO 1.0: Environmental Science majors will identify key concepts in the core areas of biological processes, physical processes, sustainability, environmental chemistry, environmental law, and environmental economics.

SLO 2.0: Environmental Science majors will demonstrate mastery of core social science concepts and methods as they pertain to environmental problem-solving and social justice.

SLO 3.0: Environmental Science majors will explain and demonstrate how to 1) ask a question, 2) generate a credible literature review, 3) generate hypotheses, 4) execute hypothesis testing procedures, 5) organize and analyze data or information, 6) draw conclusions, and 7) produce a report, poster, or oral report to cogently communicate results.

SLO 4.0: Environmental Science majors will demonstrate critical thinking and communicate cogently about environmental science in courses, Research and Exhibition Day poster presentations and PURE symposium talks.

Assessment Methods

The first Environmental Science students graduated in December 2024. Thus, there are no data to include in this report for prior years. The purpose of this report is to report the results of the first four graduates of the Environmental Science program. All baseline, benchmarks, and target estimates are set based on similar assessments in the Biology Department Exit Exam.

Student Learning Outcomes 1, and 2:

SLO 1.0: Environmental Science majors will identify key concepts in the core areas of biological processes, physical processes, sustainability, environmental chemistry, environmental law, and environmental economics at an overall average as evaluated by the Environmental Science Exit Exam of:

-Baseline of 65%,
-Benchmark of 67.0%,
-Target of 69.0%.

SLO 2.0: Environmental Science majors will demonstrate mastery of core social science concepts and methods as they pertain to environmental problem-solving and social justice at an overall average as evaluated by the Environmental Science Exit Exam of:

-Baseline of 65%,
-Benchmark of 67.0%,
-Target of 69.0%.

Direct Assessment

Performance on student learning outcomes 1 and 2 used a cumulative exam (50 question multiple-choice format) that was administered via Blackboard. The exam was administered in the Capstone Seminar class. However, this class can be taken by Juniors and Seniors. Since the exit exam will only be taken by Environmental Science majors in the semester they are graduating, students that have previously taken Capstone Seminar were added to the course Blackboard site. The cumulative exit exam consists of multiple-choice questions submitted by faculty teaching in each of the required courses for an Environmental Science major. Course content included in the assessment include:

- ENVR 101
- ENVR 102
- ENVR 201
- ENVR 250
- ECON 203
- ECON 340
- GEOG 215
- BIOL 210
- BIOL105/107
- BIOL106/108
- CHEM 203
- CHEM 313

For security the Environmental Science Exit Exam is not provided in the appendix. Copies are available upon request to the department.

Student Learning Outcome 3 and 4:

> SLO 3.0: Environmental Science students will explain and demonstrate how to 1) ask a question, 2) generate a credible literature review, 3) generate hypotheses, 4) execute hypothesis testing procedures, 5) organize and analyze data or information, 6) draw conclusions, and 7) produce a report, poster, or oral report to cogently communicate results as evaluated by our faculty using a scoring rubric (questions 1-11 on Scoring Rubric). We expect each question average to be at or above a score of 3.5 out of 4.0 on our rubric. Our current benchmark is for 9/11 questions to receive average scores of 3.5 or higher assessed separately across events (i.e., RED, and PURE data will not be averaged together). Our three-year target will be to improve these scores such that 11/11 questions receive average scores of 3.6 or higher.
>
> SLO 4.0: Environmental Science students will demonstrate critical thinking and communicate cogently about environmental science at or above a score of 3.5 in courses, Research and Exhibition Day poster presentations and PURE symposium talks as measured by questions on a rubric used to evaluate reports and presentations. Our current benchmark is for 9/11 questions to receive average scores of 3.5 or higher assessed separately across events (i.e., RED, and PURE data will not be averaged together). Our three-year target will be to improve these scores such that 11/11 questions receive average scores of 3.6 or higher.

Direct Assessment

Students apply the process of science (SLO 3) and build communication skills (SLO 4) in courses in our Environmental Science curriculum. There are opportunities to apply the process of science and to build communication skills with assignments and exercises in the laboratory portions of courses and through research projects outside of class. Students may complete independent research projects and receive credit (e.g., Bio 497, Honor's Thesis) or they may take part in projects and not receive credit but receive a stipend (e.g., Biology Research Experience Program Fellows (BREP) and Ready to Experience Applied Learning (REAL)).

After completing their project students may write a report, a thesis, or a paper on their work or they may produce a poster or do an oral presentation (SLO 3 & 4). FMU has two venues on campus for presentations. One is PURE, the Biology Department's research symposium held once per semester. Another is the campus-wide Research and Exhibition Day held every spring.

The Biology Department will evaluate Environmental Science student competence in application and communication of the scientific approach (SLO 3 & 4) in two ways: 1) evaluating laboratory reports and 2) evaluating presentations.

The assessment rubric below (Scoring Criteria) was used to evaluate both the laboratory reports and presentations. The rubric was initially developed to assess a self-selecting group of research students and is now being more broadly applied to laboratory reports that more students will be subject to.

Scoring Criteria:

1. The student clearly states a thoughtful question.
2. The student clearly states a research hypothesis or question.
3. The significance of the research is clearly framed in terms of the 'big picture'.
4. The method of the investigation is appropriate to the problem.
5. All data are sufficiently documented.
6. The student collected sufficient data to justify conclusions made.
7. The data were analyzed in a way that justifies the conclusions made.
8. The student's own work is clearly reflected in the work.
9. The work represents a complete story or concept.
10. The work is self-explanatory (mostly in relation to reports or poster presentations).
11. Charts, figures, and diagrams aid in the understanding of the project.
12. The works cited is sufficiently robust.

To evaluate laboratory reports faculty will be surveyed for a random selection of laboratory reports completed by students as a typical part of course-work academic year. We will ask for laboratory reports relating to authentic research in the classroom. In this case, authentic refers to hypothesis generating, hypothesis testing, data gathering, and analysis in a dynamic system without a predetermined outcome (a so called ‘cookbook’ laboratory). Laboratory reports will be drawn from all academic levels. Submitted laboratory reports fulfilling the specified criteria will be de-identified and sent to three biology faculty volunteers who will rate the reports for criteria meant to assess specific learning outcomes of the program. These questions are taken directly from, or adapted from, the rubric used to assess student oral or poster presentations at various events (see Scoring Criteria listed above). Scoring Criteria are scored on a Likert scale with a score of 1 strongly disagreeing with the question and a score of 4 strongly agreeing. Averages and standard deviations will be generated for 1) each laboratory report and 2) each criterion (1 – 12). The scoring of these laboratory reports using these methods does not necessarily reflect the grade the student received on the same piece of work in a classroom setting.

Baseline: 65%
Benchmark: 75%
Target: 90%.

To evaluate presentations, we will use a more objective “direct measure” of Environmental Science majors’ competence in the application and communication of the scientific approach in student projects presented as posters at the campus-wide virtual Research and Exhibition Day. Biology Department faculty not involved with the research will independently evaluate each RED presentation utilizing the Scoring Criteria. The Scoring Criteria will be scored on a Likert scale with a score of 1 strongly disagreeing with the question and a score of 4 strongly agreeing was used.

SLO 1, 2, 3, and 4

Indirect Assessment: Attitude Survey

We will administer a survey of student attitudes to indirectly assess our five SLO's to graduating seniors. The questions will be answered on a Likert scale with a score of 1 = strongly disagreeing with the statement and a score of 5 = strongly agreeing. The survey will be administered via Blackboard. In addition to offering indirect assessment of our SLO's, survey results will provide data about our courses and program.

The number of questions answered "strongly agree" and "agree" at 80% or greater:

-Baseline (average of past 2 year's results) 12/15 questions,
-Benchmark of 13/15 questions,
-Target (5 year) of 14/15 questions.

Assessment results

Direct Assessment

Between Fall 2024 and Spring 2025, there were four Environmental Science graduates. The overall average score for the exit exam was 69% which exceeds the Benchmark for SLO1 and SLO2 (67%). Broken down by individual SLO, the average score for questions evaluating SLO1 was 66% and the average score for SLO2 was 78%. Thus, outcomes exceeded the baseline for SLO1 (65%) but did not reach the benchmark of 67%. The score SLO2 exceeded the benchmark (67%) and target (69%).

Two Environmental Science students participated in RED or PURE during the 2024-2025 academic year. One poster presented the experience of an internship with the City of Florence Compliance division. This poster is not a traditional research poster and was not evaluated following the developed rubric. However, this poster was the runner-up poster in this year's RED event. The one poster presented by an Environmental Science student scored an overall average of 3.7 on a 4.0 scale. Nine out of eleven questions on the rubric scored 3.5 or higher, which meets the benchmark set for SLO 3 and 4.

An attitude survey was not administered during the 2024-2025 academic year.

Action Items

- Encourage Environmental Science students to participate in research and present at RED and PURE.
- Develop and administer an attitude survey for graduates in the 2025-2026 academic year.
- Continue to collect data from exit exam to assess program outcomes.