

**Program Assessment Report**  
**B.S. in Environmental, Soil and Water Science**  
**University of Arkansas**  
**Academic Year 2022-2023**

**1. Department Name & Contact Information**

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**2. Department Mission**

The mission of the Department of Crop, Soil, and Environmental Sciences is to provide superior education programs at the undergraduate and graduate levels, conduct innovative research and extension programs in the crop, soil, and environmental sciences and provide superior service for citizens of Arkansas and the nation.

**3. Program Goals**

1. Graduates have the discipline-specific knowledge in soil, water, and environmental sciences required to perform successfully in private, government, or academic entry-level positions.
2. Graduates are able to critically analyze, synthesize, and evaluate new information to make informed decisions.
3. Graduates have the ability to solve complex, multidisciplinary problems.
4. Graduates are able to prepare and synthesize information to effectively communicate, both orally and in writing.

**4. Student Learning Outcome 1.** Students will demonstrate the discipline specific knowledge required to function as environmental, soil, and/or water science professionals.

**A. Assessment Measure for Outcome 1**

- Achievement is measured using **pre- and post-assessment**.
- This is a **direct** measure of student learning.
- Pre- and post-assessments of 20 test questions from the ESWS faculty represent essential discipline specific knowledge and skills of students completing an environmental, soil, and water science degree.
- The initial assessment was generated by ESWS faculty during the spring 2016. Following performance and feedback from students in 2016, the pre/post-test was reviewed and three questions were revised while two were deleted and replaced with new questions during 2017. Although content overlaps, questions could roughly be divided into 5 water, 7 environmental, and 8 soil science based questions. Questions were conceptual in nature or calculation based. If the calculation-based questions are separated and considered a separate category, the tests consists of 4 water, 7 environmental, and 4 soil science based and 5 calculation-based questions.
- Target populations are at least half of the incoming freshmen and half of the ESWS graduates.
- ENSC 1001L Environmental Science Laboratory (FA, SP) or CSES 1203 (FA, SP) required courses for all ESWS students are the target courses for the pre-test.

- ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4033 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population are the target courses for the post-test.
- Scores are calculated for each assessment with the range, average, and median calculated for the pre- and post-assessments to calculate the change in scores from pre- to post-assessment.

**B. Acceptable and Ideal Targets** (not required for indirect measures)

- Acceptable: We are targeting a 50% increase in the mean and/or median test scores between the two populations (incoming and graduating students).
- Ideal: We are initially targeting a 75% increase in the mean and/or median test scores between the two populations (incoming and graduating students).

**C. Summary of Findings**

- The pre- and post-assessments were not administered during 2022-2023 academic year.

**D. Recommendations**

- A couple of challenges in the ESWS degree plan are the large percentage of transfer students and the flexibility in course choice for ESWS students. Not all graduates complete the same courses. Nonetheless, the ESWS faculty should review and articulate expectations within the knowledge dimension (factual, conceptual, procedural, and metacognitive) to facilitate administration of the pre- and post-tests.

**5. Student Learning Outcome 2.** Students will demonstrate the ability to critically evaluate situations or scenarios to arrive at well thought out and supported decisions and outcomes.

**A. Assessment Measure for Outcome 2**

- Achievement will be measured using a critical thinking scenario and rated using a **critical thinking rubric**.
- This is a **direct** measure of student learning.
- ENSC 3933 Environmental Ethics (SP), ENSC 4023 Water Quality (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population, are the target courses for the critical thinking assessment.
- Assessment scenarios are generated to cover application of critical thinking in environmental, soil, water, or ecological contexts.

**B. Acceptable and Ideal Targets** (not required for indirect measures)

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

**C. Summary of Findings**

- Critical thinking was assessed on ESWS students enrolled in ENSC 3933 Environmental Ethics during the spring semester.
- Critical thinking outcomes for 17 students were assessed in 2023. Median values indicate that at least 50% of students demonstrate proficiency in all five components of critical thinking. All

students demonstrated proficiency in explanation of issues, but only 60% of students demonstrated proficiency in presenting their position, perspective, and hypothesis.

**D. Recommendations**

- Critical thinking requires analysis, synthesis, and evaluation, i.e. learning at high cognitive levels. Results from assessment in ENSC 3933 indicate acceptable target proficiency achievement; however, there is room in most categories to improve learning in order to achieve ideal levels of students learning. The ESWs faculty could review opportunities in the curriculum to reinforce critical thinking.

**6. Student Learning Outcome 3.** Students will demonstrate the ability to work through and solve complex, multidisciplinary problems.

**A. Assessment Measure for Outcome 3**

- Achievement will be measured using a problem based scenario and scored using a **problem solving rubric**.
- This is a *direct* measure of student learning.
- ENSC 4023 Water Quality (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), or CSES 4224 Soil Fertility, optional advanced courses for ESWs students that should capture at least half of the senior population, are the target courses.
- Assessment scenarios will be generated to cover application of problem solving in environmental, soil, water, or ecological contexts.

**B. Acceptable and Ideal Targets** (not required for indirect measures)

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 75% of seniors assessed will score proficient or greater.

**C. Summary of Findings**

- In 2023, only two ESWs students were evaluated during a multi-step computational and decision-making problem-solving exercise from CSES 4224 Soil Fertility. Students were assigned a complex problem where they first manipulated real-world data and then had to assess the results, explaining their rationale and justification for their interpretations. Each student was asked to justify how and why they did what they did and interpret their results in a >1-page summary. The summary is a large component of the focus for applying the assessment rubric.
- Scores for five components rated a median level of proficient and defining the problem was between proficient and mastery.

**D. Recommendations**

- While scores from a small subset of the ESWs students rated proficient in 2023, problem solving does require comprehension, application, analysis, synthesis, and evaluation, i.e. learning at high cognitive levels. In general, faculty should continue to consider and articulate where and when students have opportunities to develop (learn and repeatedly practice) those cognitive skills across the curriculum.

**7. Student Learning Outcome 4a.** Students will demonstrate the skills required to effectively communicate technical/scientific information in oral platforms.

**A. Assessment Measure for Outcome 4a**

- Achievement will be assessed using an **oral communication rubric** during oral presentations where the student has compiled and evaluated the scientific literature as part of a class project and/or completed an independent research project as part of a special problems, research project or internship class.
- This is a **direct** measure of student learning.
- CSES 3023 CSES Colloquium (FA), an upper division, professional development, communication-intensive course that should capture at least half of the senior population, is one target course for the assessment.
- CSES 4253 Soil Genesis and Classification, provides another opportunity for students to present a term paper and for the oral communication rubric to be used to evaluate communication skills.

**B. Acceptable and Ideal Targets** (not required for indirect measures).

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 75% of seniors assessed will score proficient or greater.

**C. Summary of Findings**

- CSES Colloquium is a fall course that is one of two courses that is required for ESWS students as a second communication-intensive course. Seven ESWS students enrolled in the course during the fall 2022 were evaluated during a 10-12-minute presentation that was given by each student. Students were assessed for organization, language, delivery, supporting material, and central message.
- The median score for organization, language, and central message was 3.0 or proficient for more than 50% of students assessed, meeting acceptable target levels for this student learner outcome. Median scores for delivery and supporting material were below proficient at basic level for more than 50% of students assessed.

**D. Recommendations**

- Supporting and delivering concise, unbiased, well-supported arguments with scientific data to diverse audiences presents difficult challenges. The development of these skills is critical to functioning in society and in the workforce in the applied sciences. Therefore, CSES should consider more opportunities throughout the curriculum to help students develop oral presentation skills.

**8. Student Learning Outcome 4b.** Students will demonstrate the ability to integrate, organize, and effectively present written reports of technical/scientific information.

**A. Assessment Measure for Outcome 4b**

- Achievement will be assessed using a **written communication rubric** for laboratory reports and technical/scientific proposals or term papers where the student has analyzed, synthesized and evaluated information from independent sources as part of a class project and/or completed an independent research project as part of a special problems, research project or internship class.
- CSES 462V Internship, Special Problems, and Honors thesis research provide opportunities where students have completed independent research projects. Students enrolled in ENSC 3263

have to write papers in which they organize data and information they have analyzed, synthesized and evaluated to clearly and fluently convey a message.

- This is a **direct** measure of student learning.

**B. Acceptable and Ideal Targets** (not required for indirect measures).

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 75% of seniors assessed will score proficient or greater.

**C. Summary of Findings**

**D.** Between internship and ENSC 3263, writing skills for 21 students were evaluated during the 2022-2023 year.

**E.** Proficiency was achieved by 57-90% of students across the five components evaluated. One student was unprepared to meet three of the components within writing. Average scores of basic and between basic and proficient also indicate that there is room for improvement in students' writing skill development.

**F. Recommendations**

- The acceptable level for proficiency was achieved. Despite reaching acceptable targets, writing skills tend to indicate a portion of the student population would benefit from more writing throughout the curriculum.
- Writing skills assessment will continue in order to establish longer-term assessment results. If future assessment data indicate areas that would benefit from increases in student development, this could be an important area to target revisions in curriculum to include more opportunities for development of writing skills.

**9. Results of Analysis of Assessment of Student Learning Outcome, including General Education student learning outcome 6.1**

The Environmental, Soil, and Water Science (ESWS) degree-seeking students were evaluated for problem solving, critical thinking, oral communication, and writing skills during the 2022-2023 academic year. Environmental, Soil, and Water Science faculty have assessed knowledge, critical thinking, problem solving, oral and written communication skills throughout the past six years. An acceptable proportion of the student population is meeting standards for proficiency in problem solving, critical thinking, written communication, and some of the competencies within oral communication.

CSES 3023 CSES Colloquium is the course that meets General Education student learner outcome 6.1., to "gain the ability to synthesize, integrate, and apply knowledge developed throughout the undergraduate years". As a required project in CSES 3023, students create a professional portfolio throughout the semester that contains work related to projects, their career development, and reflections of their self-learning and development. Students build their portfolio knowing that it is documentation to demonstrate achievement of student learner outcomes.

Upon course completion and reaching goals embodied in outcome 6.1, students write a 1250-word essay reflecting upon how the years of being an undergraduate student has prepared them to develop and use written, oral, and/or multimodal communication abilities; quantitative literacy; and critical thinking and/or ethical reasoning skills and abilities. Eight ESWS students in CSES 3023 during the fall 2022 semester completed the e-portfolio and essay assignments, with 75% of the students demonstrating proficiency or mastery in student learner outcome 6.1.

**10. Any Changes to Degree/Certificate Planned or Made on the Basis of the Assessment and Analysis**

Data indicating that not all students are achieving proficiency in writing skills or all the oral communication competencies may be a consideration to targeted improvements within the ESWS curriculum. The lack of students achieving ideal targets means either that target levels are too high or that these outcomes need continued and perhaps additional emphasis in the curriculum. One suggestion may be to emphasize more writing assignments throughout the curriculum while continuing assessment in future years.

**11. Any Changes to the Assessment Process Made or Planned**

Environmental, Soil, and Water Science faculty have been assessing critical thinking, problem solving, oral and written communication skills throughout the past several years. Faculty may want to revitalize pre- and post-tests. In particular, it may be helpful for faculty to revisit what areas are fundamental to the Environmental, Soil, and Water Science degree and if the pre- and post-tests are covering those knowledge areas in current assessment questions.

**12. Supporting Attachments**

- Critical thinking rubric adapted from Association of American Colleges and Universities
- Problem solving rubric adapted from Association of American Colleges and Universities
- Oral communication skills rubric adapted from Association of American Colleges and Universities
- Written communication skills rubric adapted from Association of American Colleges and Universities