

**Institutional Effectiveness
2020-2021**

Program: Environmental Informatics PSM

College and Department: College of Interdisciplinary Studies – School of Environmental Studies

Contact: Dr. Steve Sharp

Mission: The School of Environmental Studies (SOES) will foster in students the desire to lead purposeful professional lives through the application of scientific principles to environmental issues within the social, political, and economic framework of our society.

Professional Science Master's with a Concentration in Environmental Informatics Program: The PSM-EI program, started in Fall 2013, focuses on analytical and computer-based methods in the study and management of natural resources and the environment. The degree program provides students with a business background and concepts that are applicable across fields as diverse as sociology, public policy analysis, business, sustainable systems, and terrestrial/aquatic ecosystem management. The program provides connections to potential employers through internships and allows professionals the flexibility to earn their degree while working full-time. In 2017–2018 we received approval to offer the program fully online, while retaining the option of completing some or most courses on ground.

Program Goals:

1. Prepare students who possess the mathematical and scientific knowledge to analyze and manage spatially distributed data needed to obtain sustainable solutions for complex, real-world environmental problems.
2. Prepare students who have the business fundamentals, project management and communication skills necessary to become leaders in their chosen fields.

Student Learning Outcomes:

- 1.1. Students will have the ability to apply GIS and statistical tools to manage spatially distributed environmental data to aid in decision making.
- 1.2. Students will demonstrate the skills to understand, analyze, and interpret data independently.
- 2.1. Students will demonstrate the ability to integrate business management concepts with environmental information to manage environmental systems.
- 2.2. Students will communicate effectively in oral and written formats.

A departmentally developed curriculum map can be found in Appendix 1 that shows the connections between courses and student learning outcomes.

Assessment Methods:

1. **Internship Written Report by Student:** During the internship, students will be working in an industry, utilizing knowledge and concepts learned from the curriculum to produce deliverables, which will be presented in writing and during an oral examination. The oral examination and written report will be evaluated by the graduate student's advisory committee to assess whether the student has mastered program and concentration learning outcomes.

The student will develop better communication skills and will be encouraged to integrate all aspects of the program's core areas (GIS, statistics, business) by writing an internship project report. The report will be evaluated by the industry employer and the student's graduate advisory committee to ensure that it meets satisfactory standards as judged by the committee.

2. **Internship Supervisor Evaluation:** Internship employers will provide a written evaluation of respective intern's performance in achieving designated deliverables.

The evaluation of student and program performance will be aided by external industry reports on student activities during the internship. The industry supervisor evaluation will be reviewed by the student's major professor (who is also the instructor for the ESS 6910 internship course) and also by the PSM Program Director.

Results:

As of Fall 2021, 16 students are enrolled and a grand total of 25 students have graduated from the program (Table 1).

Table 1. Enrollment and graduation data for the PSM-Environmental Informatics degree program from 2013–2020.

Enrollment data		Graduation data	
Fall semester	Number enrolled	Academic year	Degrees conferred
2013	3	2013–2014	2
2014	5	2014–2015	0
2015	9	2015–2016	3
2016	7	2016–2017	5
2017	8	2017–2018	2
2018	13	2018–2019	4
2019	18	2019–2020	5
2020	19	2020–2021	4
2021	16		

Four students completed internship projects and graduated from the PSM-EI program in 2020-2021. The titles of the internship reports are given in Table 2, along with the industry or agency that sponsored/hosted the internship project. Industry supervisor evaluations were received for all four graduating students enrolled in the capstone internship. A summary of the evaluations is provided in Table 3.

Table 2. Titles of internship reports from PSM-Environmental Informatics students who completed internship capstone projects during academic year 2020-2021.

Internship Report Title	Industry Sponsor/Host
Visitation study for the 2020 recreation season	U.S. Army Corps of Engineers
Mapping studies for Keep Putnam County Clean Commission, illegal mining sites, and customer service surveys	Tennessee Department of Environment and Conservation
A conservation mapping tool for the endangered Bluemask Darter, <i>Etheostoma akatulo</i>	U.S. Fish and Wildlife Service
Using a GIS model and Microsoft Excel to calculate stream power and sediment transport of a Tennessee stream for the estimation of duration in NRDA calculations	Tennessee Department of Environment and Conservation

Table 3. Summary of industry supervisor evaluations for four PSM-Environmental Informatics students who completed their capstone internships during the 2020-2021 academic year.

Intern attribute	Number of ratings per category (out of four students)				
	Excellent	Very good	Average	Below average	Very poor
Attitude	3	1			
Initiative	4				
Maturity and poise	2	2			
Ability to learn	4				
Quality of work	4				
Quantity of work	4				
Dependability	4				
Relations with others	3	1			
Judgment	3	1			
Attendance	4				
Punctuality	4				
Overall performance	4				

For all the intern attributes, their supervisors gave them ratings in the top two categories. Some attributes relate directly to student learning outcomes. For example, intern “relations with others” depend upon effective written and oral communication, Student Learning Outcome 2.2, and the “quality of work” readily connects with outcomes 1.1 and 1.2. In addition, the supervisors provided written comments to lend insight into our progress on student learning outcomes. Examples are provided for each student learning outcome below.

Outcome 1.1 (use GIS and statistical tools to manage spatially distributed environmental data): The industry supervisor evaluations generally indicated good student mastery of GIS and statistical tools. For example, one

evaluation stated that the student took the initiative “to sign up for additional trainings to learn more technical skills to complete [their] project” and another supervisor stated that the student was “technically proficient”.

Outcome 1.2 (analyze and interpret data independently): Supervisor evaluations indicated that the students were able to work independently. One supervisor wrote that the student showed a “strong ability to grasp concepts quickly [and] interpret data” with “excellent research and analytical skills”. One question on the evaluation asked supervisors to rate their level of agreement on a series of statements regarding student performance. For the following statement, “Demonstrate an ability to work independently,” three supervisors strongly agreed and one agreed. For example, one supervisor stated that the student “takes direction well and works well independently.” In the ratings provided in Table 3, all four supervisors described their interns as having excellent initiative and able to proceed well on his/her own, a pattern mirroring the previous year when five of five supervisors rated student initiative as excellent. These past two years represent a higher percentage compared to the preceding two years, when only four of six supervisors rated student initiative as excellent.

Outcome 2.1 (integrate business management concepts with environmental information): One student studied visitation patterns for U.S. Army Corps of Engineers sites. The supervisor commented that the student “demonstrated a critical skill in effective communication with working with both internal and external customers.” The students’ advisory committees were glad to see that the students involved business components to the internship projects, which is a required component of the final report and capstone presentation to which all students must adhere.

Outcome 2.2 (effective oral and written communication skills): The four graduating students defended and presented their internship projects to their graduate advisory committees and other stakeholders, including internship supervisors and other personnel from the internship agencies. The students also completed written internship project reports. All students passed their internship “defenses” and their committees approved their project reports, generally indicating successful communication skills. One supervisor commented about the intern, “[Their] best trait portrayed amongst [their] time here was [their] effective communication skills.” Supervisors were also asked to rate their level of agreement regarding intern performance on the following two statements, “Produce effective written communications” and “Deliver effective oral presentations”. For written communications, all four supervisors strongly agreed, representing an improvement compared to the previous three years when seven of 11 supervisors strongly agreed, two agreed, and two were neutral. For oral presentations, two strongly agreed, one agreed, and one was unknown, which was a similar pattern to that shown in previous years. One supervisor commented that the intern was an “excellent public speaker”.

Modifications and Continuing Improvement

Improvements in supervisor ratings on written communication skills have continued to improve. EVS 7900 Scientific Writing and Grantsmanship course continues to be an offered elective, and PSM-EI students are actively enrolling in the class. We will continue to emphasize the importance of written and oral communication skills to the students in the capstone internship course, and by encouraging them in advising sessions to take EVS 7900 if their writing skills are in need of improvement.

Appendices

1. Curriculum Map

Appendix 1: Curriculum Map

PSM-EI course alignment with student learning outcomes. Courses are listed alphabetically by subject rather than chronologically.

Course	Title	1.1 GIS and statistical tools to manage environ. data	1.2 Skills to independently analyze and interpret data	2.1 Integrate business mgmt. with environ- mental info.	2.2 Communicate effectively in written and oral formats
ACCT 6010	Accounting Information for Management Decisions			x	
BMGT 6200	Organizational Leadership			x	x
ESS 6510	Programming GIS	x			
ESS 6910	Internship	x	x	x	x
EVSS 6010	Environmental Social Policy				x
GEOG 5410	Remote Sensing	x			
GEOG 5650	Environmental Applications of GIS	x			
MATH 6070	Applied Linear Statistical Methods I	x	x		
MATH 6470	Environmental Statistics	x	x		
MKT 6100	Strategic Marketing			x	x
Electives		x	x	x	x