

**College of Science and Mathematics**

**Department of Earth and Environmental Sciences**

**Bachelor of Sciences, Environmental Science Program**

**Student Outcomes Assessment Plan (SOAP)**

**I. Mission Statement**

The Department of Earth & Environmental Sciences prepares students to pursue a broad range of careers in academia, industry, government, and teaching by providing them with educational training and opportunities to obtain a solid foundation in the Earth and Environmental Sciences. Earth and Environmental Sciences are interdisciplinary, integrating principles of physics, chemistry, biology, and mathematics, as well as quantitative and critical thinking skills, to address geological and environmental issues related to the solid earth, the oceans, and the atmosphere. To this end, the Department's programs and courses are designed to encompass a broad spectrum of basic scientific disciplines.

**II. Goals and Student Learning Outcomes for all options**

***Goal 1 – Students will develop a strong foundation in the Sciences and in supporting disciplines (Environmental Science specific goal).***

Graduates from this degree program should be able to:

- A. Synthesize and integrate a wide variety of knowledge and skills that form the basic components of the Environmental Sciences. The skills will allow the student to orient themselves in a variety of study sites and environments where environmental research occurs.

***Goal 2 – Students will be educated in the basic methods and philosophy used to conduct scientific research in the Environmental Sciences (WASC Core Competencies: Critical Thinking & Quantitative Reasoning).***

Graduates from this degree program should be able to:

- B. Use the scientific method to study natural systems as well as understand current human influences and impacts. The student will be able to organize and conduct research, and apply quantitative methods to solve problems, analyze data and formulate models, either independently or collaboratively.

**Goal 3 – Students will develop effective oral and written communication skills (WASC Core Competencies: Oral Communication & Written Communication).**

Graduates from this degree should be able to:

- C. Effectively understand and disseminate scientific material along with scientific conclusions by means of written and oral communication in class, meetings and other professional gatherings.

**Goal 4 – Students will develop intellectual independence and academic skills that will assist them in completing an independent project(s) (WASC Core Competency: Information Literacy & Written Communication).**

Graduates from this degree should be able to:

- D. Integrate Scientific knowledge and use skills acquired throughout the curriculum to develop and complete independent projects.

### III. Curriculum Map (Matrix of Courses and Learning Outcomes)

This table provides information regarding how the outlined student learning outcomes are introduced (I), developed (D), and mastered (M) as students' progress through the curriculum.

	Goal 1	Goal 2	Goal 3	Goal 4
EES 1. Natural Disasters and Earth Resources	I	I	I	
EES 4. Environmental Science	I	I	I	
EES12 Mineralogy	I	I	I	I
EES 30. Introductory Field Methods	I	I	I	I
BIOL 101. General	I	I	I	

	Goal 1	Goal 2	Goal 3	Goal 4
Ecology				
CHEM 8. Organic Chemistry	D	D		
EES 102. Sedimentology	D		D	
EES 105. Geomorphology	D		D	
EES 108. Soils	D			
EES 109 Atmospheric Processes	D			
EES 110 Invertebrate Paleontology	D			
EES 113 Stream Habitat Restoration		D	D	D
EES 114 Engineering Geology	I		D	
EES 117. Hydrogeology	D	D		D
EES 124. Geochemistry	D	D		
EES 125 Global Paleoclimates	D	D	D	
EES 186. Environmental GIS	D	D		D
EES 199. Undergraduate Thesis	M	M	M	M

#### IV. Assessment Methods

##### Direct Measures

To better assess the students' progress, the EES department requires that all undergraduate students submit a portfolio prior to graduation. The portfolio will not be graded and will not be used to determine whether a student will graduate from the program or not. The portfolio will be used to

determine whether our departmental efforts are sufficiently coordinated to allow for the maximum growth in the above identified areas.

### **Mechanics of the portfolio**

The contents of the portfolios will allow to view students' progress as they traverse our degree programs. For this reason, the faculty decided that the portfolio contains samples of “early” and “later” works. By “early”, we mean assignments performed when students formally enter the major at CSUF (assessment examples will be derived from EES 12 or 30). By “later” works, we mean works from courses that are normally taken near the end of the program, just prior to graduation, such as EES 107 and 199 (senior thesis).

**Outcome A:** Students will synthesize and integrate knowledge and skills in the basic components of the Environmental Sciences, and develop a command of map skills, including reading and interpretation of geologic, topographic, and other maps.

**Method:** Students will submit a map from EES 30 and EES 107 (“early” work and “later” work, respectively). These can be hand drawn or drafted on a computer. The means by which the map was drawn is not important; faculty look for growth in the areas of accuracy and interpretation.

**Outcome B:** Use the scientific method to organize and conduct research, and apply quantitative methods to solve problems, analyze data and formulate models, either independently or collaboratively.

**Method:** A rubric on a student homework or laboratory assignment that involves mathematical reasoning, from EES 12 (“early” work) and then another such assignment from EES 124, or 186 (“later” work), depending upon which electives they have chosen. Students will be free to choose the best examples of such work, i.e., select assignments that seem particularly challenging to them, and on which they feel to have performed well. Faculty will compare the assignments to discover whether their qualitative reasoning ability has improved.

For each outcome evaluated on the rubric, a score of 3 on a 5 point scale will define having met the learning outcome. The department expects a mean score for each outcome  $>3.0$  when all student scores are averaged.

**Outcome C:** Effectively disseminate technical findings and conclusions by means of written reports, and organize and give professional oral presentations.

**Method:** A rubric on a student writing sample from EES 12 (usually a review of a peer-review journal article) and from EES 108 or 109 (class report); students may submit their best drafts from both classes. Faculty will compare the best work from each student to

discover whether their writing ability has improved.

For each outcome evaluated on the rubric, a score of 3 on a 5 point scale will define having met the learning outcome. The department expects a mean score for each outcome  $>3.0$  when all student scores are averaged.

**Outcome D:** Students will integrate knowledge and skills previously acquired throughout the curriculum into independent projects.

**Method:** A rubric on a student poster presentation or a reduced format version of a PowerPoint presentation. For this type of outcome there is no “early” version of this sort of work; rather, faculty will use these samples, and our evaluations of the students' oral presentation, to evaluate the extent to which they have appropriately mastered presentation and research skills.

For each outcome evaluated on the rubric, a score of 3 on a 5 point scale will define having met the learning outcome. The department expects a mean score for each outcome  $>3.0$  when all student scores are averaged.

### **Indirect Measures**

#### **A. Alumni survey**

The Department of Earth & Environmental Sciences will contact alumni to solicit their comments on the Environmental Science undergraduate program's strengths and weaknesses and what the Department can do to improve the educational experience for future students.

#### **B. Senior Exit Survey**

Graduating seniors will be surveyed about their reason for choosing the Environmental Science program, their long-term career goal, their opinions of their university and department experiences, their assessment of the Environmental program and the faculty, and suggestions for improvements to the program.

#### **C. Employer Survey**

The Department of Earth & Environmental Sciences will solicit comments from student employers regarding the qualifications along with their training strengths and weaknesses.

## V. Student Learning Outcomes / Assessment Methods Matrix

This table provides information regarding how the outlined student learning outcomes will be assessed.

	Direct measures				Indirect measures		
	EES 30	EES 12 and EES 124	EES 12	EES 199	Alumni interviews	Exit interviews	Employer survey
Goal 1	X						
Goal 2		X					
Goal 3			X		X		X
Goal 4				X		X	X

## VI. Timeline for Implementation of Assessment Methods and Summary Evaluations

The assessment timeline is based on the program's external program review cycle, repeating each five to seven years beginning with the year following the completion of the department's self-study.

The following timeline outlines the schedule for review of that data by the department assessment committee.

### First Year (AY 2013-2014)

- EES 30
- EES 199
- Exit Survey

### Second Year (AY 2014-2015)

- EES 12/100 and EES 124/186
- EES 199
- Exit Survey

#### **Third Year (AY 2015-2016)**

- EES 12
- EES 199
- Exit Survey

#### **Fourth Year (AY 2016-2017)**

- EES 30
- EES 199
- Exit Survey

#### **Fifth Year (AY 2017-2018)**

- EES 12 and EES 124/186
- EES 199
- Exit Survey

### **VII. Process for Closing the Loop**

The Department of Earth and Environmental Sciences Assessment Committee is composed of the Assessment Coordinator and volunteer faculty. The committee meets once a year to discuss student learning outcomes and discuss possible curricular changes and revisions resulting from this information. The committee is responsible for collecting and summarizing assessment data and generating the annual written assessment report.

### **VIII. Appendix and Supporting Documents**

- 1 – Mapping rubric for EES 30 (Goal 1)
- 2 – Qualitative reasoning rubric for EES 12/100 and EES 118/124/186 (Goal 2)
- 3 – Student writing rubric for EES 12 and (Goal 3)

