Academic Program
Plan for Assessment of Student Learning Outcomes
The University of New Mexico

A. College, Department and Date

1. College: Arts and Sciences, University of New Mexico
2. Department: Earth and Planetary Sciences
3. Date: September 15, 2014

B. Academic Program of Study*

B.S., Environmental Sciences

C. Contact Person(s) for the Assessment Plan

Laura Crossey, Chair, Earth and Planetary Sciences, lcrossey@unm.edu
Joseph Galewsky, Chair, Undergraduate Committee, galewsky@unm.edu

D. Broad Program Goals & Measurable Student Learning Outcomes

1. Broad Program Learning Goals for this Degree/Certificate Program

All Environmental Science Bachelor of Science Majors shall:

A. Develop an understanding of interconnected Earth systems and evaluate interactions between different Earth spheres (e.g., atmosphere, hydrosphere, biosphere, and geosphere) in terms of conservation of mass, momentum, and energy.

B. Develop an understanding of the role of Earth materials and Earth structure in Earth Systems.

C. Develop an understanding and ability to evaluate a landscape to infer past active processes and past climates.

D. Acquire environmental science data in the laboratory and the field, analyze these data, and interpret their meaning through application of the scientific method.

E. Read and understand scientific literature and present information on environmental science (both in oral and written form) clearly and concisely.

F. Evaluate atmospheric processes and impacts of global climate change on Earth Systems.

G. Evaluate and numerically model hydrologic and geochemical processes in Earth Systems, focusing on processes found in the critical zone.

H. Follow the principles of ethics in the conduct and application of science within the academic and professional arenas.

I. Solve problems quantitatively by applying first principles from supporting sciences.

* Academic Program of Study is defined as an approved course of study leading to a certificate or degree reflected on a UNM transcript. A graduate-level program of study typically includes a capstone experience (e.g. thesis, dissertation, professional paper or project, comprehensive exam, etc.).

2. List of Student Learning Outcomes (SLOs) for this Degree/Certificate Program

A.1. Students will be able to describe and quantify reservoirs and fluxes of energy and mass between various portions of the Earth's system.

B.1. Students will be able to demonstrate (quantitatively) how concepts of conservation of mass, momentum and energy apply to evaluation of atmospheric, hydrogeologic, and/or biogeochemical cycles in Earth systems.

C.1. Students will interpret and map the environmental relationships of a field study site or region based on an analysis of remotely sensed, geomorphic, map, and/or laboratory data.

D.1. Students will formulate a testable hypothesis based on field and / or laboratory observations, and devise appropriate tests of their hypotheses.

E.1. Students will present clear and concise written and oral reviews and reports, discussing environmental science interpretations and problems.

F.1. Students will be able to collect, organize and analyze data sets with appropriate statistical rigor, using modern data analysis software tools.

G.1. Students will use professional ethical standards for reports and publications associated with collaboration, data collection, authorship, and citation of previous results.

H.1. Students will solve environmental science problems quantitatively using mathematical, chemical, and physical equations and principles.

E. Assessment of Student Learning Three-Year Plan

All programs are expected to measure some outcomes annually and to measure all priority program outcomes at least once over two consecutive three-year review cycles. Describe below the plan for the next three years of assessment of program-level student learning outcomes.

1. Student Learning Outcomes

[Insert at least 2-5 priority learning outcomes that will be assessed by the unit over the next three years. Each unit will select which of its learning outcomes to assess.]

Relationship to UNM Student Learning Goals (insert the program SLOs and check all that apply):

University of New Mexico Student Learning Goals				
Program SLOs	Knowledge	Skills	Responsibility	Program SLO is conceptually different from university goals.
B.1. Students will be able to demonstrate (quantitatively) how concepts of conservation of mass, momentum and energy apply to evaluation of atmospheric, hydrogeologic, and/or biogeochemical cycles in Earth systems.	XX		XX	
C.1. Students will interpret and map the environmental relationships of a field study site or region based on an analysis of remotely sensed, geomorphic, map,	XX	XX		

and/or laboratory data.				
F.1. Students will be able to collect, organize and analyze data sets with appropriate statistical rigor, using modern data analysis software tools.	XX	XX		
H.1. Students will solve environmental science problems quantitatively using mathematical, chemical, and physical equations and principles.	XX	XX	XX	

2. **How will learning outcomes be assessed?**

A. What:

Student Learning Outcome B.1.

i. The students will report to the class orally, using appropriate visual aids, on a series of topics related to the hydrologic cycle.
ii. Each measure is direct.
iii. We expect 80% of the students to exhibit mastery of the general principles, and describe system components and processes using a professional vocabulary.

Student Learning Outcome C.1-F.1.

i. The principal means of assessment of this outcome will be through student laboratory exercises, in particular in Advanced Environmental Science (EnvSci 430), where students are instructed in how to measure actual laboratory and field based environmental parameters (e.g., well monitoring, streamflow measures, and water quality measurements).
ii. The measure(s) is (are) completely direct.
iii. The criteria for success include adequate competency in student performance of how measurements are made and how the data can be interpreted. A performance target of 80% for this outcome is reasonable.

Student Learning Outcome H.1.

i. The principal means of assessment of this outcome will be the student's ability to work with others to complete a field-based environmental project that is sufficient in scope to require the involvement of peers. Students will conduct the project and prepare a report, over the time frame allotted, that will be presented to the class. The faculty instructor will be responsible for assessing the oral and written project results, as well as ascertaining the contribution of each individual to the team effort.
ii. The measure is completely direct.
iii. The criteria for success will be the quality of the student projects and reports. Our performance target for this "capstone" course in the Environmental Science program is 70%, in that we look for an effort that results in a project that is carried out successfully with a high level of peer interaction and a related report that accurately and thoroughly describes the project.

B. Who:

Student Learning Outcome B.1.
Evidence from all BS majors in the EnvSci program will be included. Students enrolled in Envi Sci 430, a required course for all majors, will all be included. Enrollment ranges from 9-25 per year.

Student Learning Outcome C.1-F.1.
Evidence from all BS majors in the EnvSci program will be included. Students enrolled in Envi Sci 430, a required course for all majors, will all be included. Enrollment ranges from 9-25 per year.

Student Learning Outcome H.1.
Evidence from all BS majors in the EnvSci program will be included. Students enrolled in Envi Sci 430, a required course for all majors, will all be included. Enrollment ranges from 9-25 per year.

3. **When will learning outcomes be assessed? When and in what forum will the results of the assessment be discussed?**

Student Learning Outcome B.1.

This outcome can be assessed in the spring semester of the academic year. EnvSci 430 (Advanced Environmental Science), is taught each spring semester. Assessment can be carried out for each year of the three year time frame.

Student Learning Outcome C.1-F.1.
This outcome can be assessed in the spring semester of the academic year. EnvSci 430 (Advanced Environmental Science), is taught each spring semester. Assessment can be carried out for each year of the three year time frame.

Student Learning Outcome H.1
This outcome can be assessed in the spring semester of the academic year. EnvSci 430 (Advanced Environmental Science), is taught each spring semester. Assessment can be carried out for each year of the three year time frame.

4. What is the unit's process to analyze/interpret assessment data and use results to improve student learning?

Student Learning Outcome B.1.
The gathering of evidence can be conducted by the faculty instructor for EnvSci 430. The evidence can be analyzed, discussed, and interpreted by the EPS Undergraduate Committee and recommendations from this committee can be made to the full faculty. The Undergraduate Committee and then the full faculty can discuss the implications of this assessment for changes to assessment mechanisms, to curriculum design, and to pedagogy.

Student Learning Outcome C.1-F.1.
The gathering of evidence can be conducted by the faculty instructor for EnvSci 430. The evidence can be analyzed, discussed, and interpreted by the EPS Undergraduate Committee and recommendations from this committee can be made to the full faculty. The Undergraduate Committee and then the full faculty can discuss the implications of this assessment for changes to assessment mechanisms, to curriculum design, and to pedagogy.

Student Learning Outcome H.1.
The gathering of evidence can be conducted by the faculty instructor for EnvSci 430. The evidence can be analyzed, discussed, and interpreted by the EPS Undergraduate Committee and recommendations from this committee can be made to the full faculty. The Undergraduate Committee and then the full faculty can discuss the implications of this assessment for changes to assessment mechanisms, to curriculum design, and to pedagogy.