Metropolitan State University of Denver
Assessment Report
2014-15 annual reports

Program Name Environmental Science

Program Description – include a brief description of the program including a list of majors, minors, concentrations as applicable and the number of students in each, and the number of faculty by category.

The Environmental Science program is part of the Department of Earth and Atmospheric Sciences. Students must take a variety of courses in other programs such as Land Use, Chemistry, or Biology to complete degree requirements. Students must declare a concentration within Environmental Science. There are two (2) tenured/tenure line faculty specifically dedicated to the Environmental Science program for about 350 majors.

Program Goals

1. To provide students with the foundation to understand how our natural, global environment operates;
2. To prepare and train students to monitor and sample environmental conditions using modern technology and traditional techniques;
3. To develop a competency in oral communication and scientific writing;
4. To build life-long learning skills and scholarly inquiry so that students can critically assess and evaluate environmental problems and become leaders in their discipline; and
5. To prepare students for employment or a graduate degree so that they can shape a sustainable environment for our future.

Majors (Fall 2013 data)

- Environmental Science: no concentration declared - 216 students
- Environmental Science: Multidisciplinary – 30 students
- Environmental Science: Ecological Restoration – 31 students
- Environmental Science: Water Quality – 17 students
- Environmental Science: Environmental Chemistry – 7 students
- Environmental Science: Environmental Geology – 22 students
- Environmental Science: Science Licensure – 17 students

Minors

- Environmental Science – 19 students
- Environmental Studies – 7 students

Student Learning Outcomes (SLOs)
These are measurable statements of students' learning and development reflecting what the program would like students to know, be able to do and/or value. Please insert the appropriate number of rows in the table and letter or number the SLOs for easier reference to data collection and findings.
Environmental Science Program Outcomes 1 Students will be able to identify and explain environmental processes and human - environment interactions. 2 Students will be able to apply interdisciplinary perspectives and approaches to environmental problems. 3 Students will be able to critically assess and evaluate environmental problems at a local and global scale. 4 Students will be able to acquire the ability to monitor and sample environmental conditions. 5 Students will be able to design effective oral presentations and scientific papers.

Data collection			Findings						Target/ Expectation	Action and Rationale
Data were collected for ENV courses during both the Fall and Spring semesters.			2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015		
	Type of Assessment Activity	Applicable to SLO(s):								
Content Knowledge	Standardized Test - data were collected for only Freshman (ENV 1200) and Senior Experience (ENV 4960 & ENV 4970) courses.	1 & 3	68%	72%	78%	83%	No Data collected	82%	*80%*	Continue to improve content delivery to address a variety of learning styles. Communicate more effectively with affiliate faculty about curriculum content. Use additional technology, such as publisher provided software or Blackboard software, especially in introductory level courses.
Presentation Skills	4 Point scale Grading Rubric: Oral Presentations on Scientific Papers or Individual Research Projects in which students collect, analyze, and interpret their own data.	1, 2, 3, & 5	3.2	3.4	3.0	3.6	No Data collected	3.5	*3.0*	Continue to use presentations as an assessment method. Students are consistently strong presenters of material. Continue to encourage students to make use of technology in presentations. Purchase a new plotter for student presentation
Writing Skills	4 Point scale Grading Rubric: Scientific Research Papers in which students collect, analyze and interpret their own data or Literature Reviews.	1, 2, 3, & 5	2.8	3.4	3.5	3.4	No Data collected	3.6	*3.0*	Continue to use papers as an assessment tool. Students are gradually becoming better writers. Continue 1:1 editing and feedback sessions with students. Possbily hire excellent work-study students to serve as peer editors.
Field and Laboratory Skills	4 Point scale Grading Rubric: Scientific Research Papers or Laboratory/Field Exercises via written reports or field journals	4	2.5	2.8	2.9	2.6	No Data collected	3.2	*3.0*	Continue to enhance our field and lab equipment supplies through summer revenues. Renovate existing space to account for new program focus in water. Continue to offer new laboratory courses, including those that focus on water quality. Utilize newly acquired field equipment to enhance student skills.

Based on the data listed in the above table, the following conclusions can be made about meeting the expectations for SLOs. This is the first year in which all SLO have been met.

Student Learning Outcome	Conclusions
1	Met
2	Met
3	Met
4	Met
5	Met

Process for interpretation of findings – Describe the structure of responsibilities for program assessment. Specify processes undertaken for faculty review of findings prior to submission of this report. How did the program come to the decisions it made?

Environmental Science faculty have all reviewed and discussed this report.
The following were implemented over the last year:

- An alumni survey was created to get feedback about how graduates felt about meeting Environmental Science SLO to identify areas of improvement. The survey revealed that field and laboratory work were the two major strengths of the ENV program.
- An EAS department Assessment committee was created. This will help dissemination of report findings and provide the opportunity for other faculty to offer feedback

Response to prior peer review report(s) - Describe the ways in which the program has responded to any prior year's peer review report. What kind of continuous improvement cycle are you using?

Last year, the program received an established ranking. As recommended by our peers, improvements in the assessment procedure were needed. We believe that a department-wide assessment committee will help integrate programs and improve participation in the assessment process.

Plans for the program assessment process – To what extent does the program assessment process need modifications? Describe any plans for modifying the program assessment process. Is it the program's intent to gather data about every outcome every year? If not, what is the proposed data collection cycle?
The program assessment plan will be reassessed in year 5. Additional assessment information may be obtained through faculty member's personal assessment of graduates, a technique used by other programs such as Meteorology.

Implementation plan for applicable program changes - Summarize the changes described in the Action and Rationale columns above and specify the implementation plan including a timeline.
• Recruit and hire an additional Tenure-line or Category II faculty member • Utilize newly acquired equipment in courses to improve scores for SLO #4 • Course structure has been reformatted with more feedback at specific points for scientific papers (currently implemented).

Appendix

Course	Name	Learning Outcomes #1	#2	#3	#4	#5
ENV 1200-3	Introduction to Environmental Science	V		V		
ENV 1400-3	World Resources	V		V		
ENV 1540-2	Geol. and Env. Hazards - Denver	V	V/P	V	V/P	
ENV 3400-3	Water Resources	V	V/P	V		
ENV 3540-2	Adv. Geol. and Env. Hazards - Denver	V	P	V	P	
ENV 3620-3	Population, Resources, and Land Use	V	P	V		P
ENV 3700-3	Mountain Environments	V	V	V	V	V/D
ENV 3710-3	Environmental Remediation	V/P	P/D	V/P		
ENV 3720-3	Waste Management	V/P	P/D	V/P		
ENV 3730-3	Environmental Risk Assessment	V/P	P/D	V/P		
ENV 3740-3	Environmental Health	V	P	P		
ENV 4000-3	Environmental Geology	D	D	D	D	
ENV 4010-3	Environmental Hazards and GIS	D	D	D		D
ENV 4200-3	Environmental Policy and Planning	V	P	P		
ENV 4400-3	Landscape Ecology	P	P	D	D	P
ENV 4410-3	Water Law	V	P	P		
ENV 4420-3	Wetlands	V	P	P		
ENV 4430-3	Habitat Planning	V		P		D
ENV 4500-3	Environmental Biogeochemistry	V/P	D	P/D	D	
ENV 4910-3	Global Environmental Field Problems: VT	D	D	P/D	D	
ENV 4920-3	Topics in Environmental Science: VT	D	D		P	P
ENV 4960-3	Global Environmental Challenges	D	D	P/D		D
ENV 4970-3	Environmental Field Studies	D	D	D	D	D

Tiers

V = Discover (gain knowledge, comprehend information)

P = Practice (apply knowledge gained to real situations, issues, and questions)

D = Demonstrate (prepare a product that represents knowledge gained, application of knowledge, or evaluation of knowledge)

A curriculum map for ENV courses.

Group Members_____ Class _____ Date _____

Learning Outcome	Indicators	4 Exemplary	3 Proficient	2 Apprentice	1 Novice	Score
1. Students will be able to identify and explain environmental processes and human - environment interactions.	*A. Outline and interpret scientific literature.*	7 or more credible sources are identified; interpretation is correct.	5 or more credible sources are identified; interpretation is sufficient, but contains some minor flaws.	3 or more credible sources are identified; interpretation is sufficient, but contains some minor flaws.	Internet sources are abundant; interpretation contains major scientific errors.	
	B. Identify human impacts (hazards) on natural systems.	An understandable linkage between human and environmental systems is established; an important problem is identified.	An concrete linkage between human and environmental systems is established; an essential problem is identified.	A linkage of minor importance between human and environmental systems is established; a problem is identified.	An insufficient linkage human and environmental systems is established; a problem is identified.	
2. Students will be able to apply interdisciplinary perspectives and approaches to environmental problems.	*A. Knowledge from other coursework is drawn upon.*	Information from courses not offered in the Environmental Science program is abundant; knowledge is successfully integrated with broader environmental themes.	Information from courses not offered in the Environmental Science program is adequate; knowledge is indistinctly integrated with broader environmental themes.	Information from courses not offered in the Environmental Science program is lacking; ambiguous connections with broader environmental themes exist.	Information from courses not offered in the Environmental Science program is absent; connections with broader environmental themes do not exist.	
	B. Organize a thorough, systematic approach to the problem that utilizes GIS.	Environmental systems are creatively evaluated from a multidisciplinary perspective that utilizes GIS.	Environmental systems are adequately evaluated, but minor points are missing.	The paper is narrowly defined; major points are missing.	The paper is narrowly defined; environmental systems are ignored.	
3. Students will be able to critically assess and evaluate environmental problems at a local and global scale.	*Differentiate between local and global hazards.*	Topic is clearly defined and well supported by scientific literature; an organized discussion of appropriate project scope is provided.	Topic is clearly defined and supported by scientific literature; project scope is loosely tied to local/global issues.	Topic is vague and support from the scientific literature is limited.	Many topics are identified; project does not focus on a main issue; support from the scientific literature is non-existent.	
4. Students will be able to acquire the ability to monitor and sample environmental conditions.	*Assemble a GIS approach to investigate the environmental problem*	A strong GIS approach is developed; new techniques are implemented to examine the problem.	A good GIS approach is developed; traditional GIS methods are improved upon.	A good GIS approach is developed but is missing some key elements; traditional GIS methods are utilized.	A poor GIS approach that is missing major elements is developed.	

An example of a grading rubric.

5. Students will be able to design effective oral presentations and scientific papers.	*A. Demonstrate solid writing skills*	Paper is virtually error-free, is well organized and easy to read, and contains high quality graphics.	Paper is well organized and easy to read, contains high quality graphics, and contains few minor grammatical errors.	Paper is generally well written but contains some grammatical and/or organizational errors.	Paper is poorly organized, contains major grammatical and/organizational errors.	
	B. Organize a scientific paper	B1. Paper contains an Introduction; the problem is set up clearly; thorough background information is provided.	Paper contains an Introduction; the problem is identified, but could be set up more effectively; background information is provided.	Paper contains an Introduction; the problem is identified, but is not set up well; background information is provided.	Paper does not contain an Introduction; the problem is imprecise; some background information is provided.	
		B2. Paper contains Objectives; a well-defined main objective and multiple secondary objectives are provided.	Paper contains Objectives; a main objective and a few secondary objectives are provided, but others need to be considered.	Paper contains Objectives; a main objective and a secondary objective are provided, but other significant objectives are missing.	Overall/main objective is incomplete/missing.	
		B3. Paper contains a Study Area description; information about size, vegetation type, climate, soils, elevation, or anything pertinent to paper are provided.	Paper contains a Study Area description; some site conditions are addressed but more detail could be provided.	Paper contains a Study Area description; but does not contain specific site conditions.	Study area description is incomplete/missing.	
		B4. Paper contains Methods; data acquired and GIS methods are described in detail.	Paper contains Methods; data acquired and GIS methods are semi-complete but are missing some important details.	Paper contains a description of the Methods; data acquired and GIS methods are incomplete and miss major details.	Methods are incomplete/missing.	
		B5. Paper contains Results; results are logical and show a solid scientific understanding of materials.	Paper contains Results; results are reasonable and show an above average scientific understanding of materials.	Paper contains Results; results are reasonable but miss some important potential findings.	Results are incomplete/missing.	
		B6. Paper contains Conclusions; important conclusions are drawn from the results; a discussion of ways to improve the project is offered.	Paper contains Conclusions; some important conclusions are drawn from the results; a discussion of ways to improve the project is addressed but could contain more detail.	Paper contains Conclusions; few important conclusions are drawn from the results; a insufficient discussion of ways to improve the project is offered.	Conclusions are incomplete/missing. Suggested improvements are not offered.	
	C. Participation in the project	Student is extremely active, helps solve GIS problems, organizes and edits the paper, and assumes a leadership role.	Student is active, helps solve some GIS problems, and writes a section of the paper.	Student is semi active, lets others do most of the work, and writes a section of the paper.	Student is not active, lets others do the majority of the work.	

An example of a grading rubric.

Student Learning Assessment - Environmental Science

Please fill in the background information form and the question that follow below. The purpose of this survey is to assess the Environmental Science program. Your answers to the questions that follow will in no way affect your grade in this course. Data will be compiled and used to improve the existing Environmental Science Program.

First Name _____ What is your Major? _____

Last Name _____ What is your Minor? _____

Student 900 Number _____ Date 9/7/10

Which of the following Environmental Science Core courses have you taken in the past or are currently enrolled? (Check boxes for all that apply)

☐	MTH	1210	Introduction to Statistics	☐	CHE	1800	General Chemistry I
☐	ENV	1200	Introduction to Environmental Science	☐	GEL	1010	General Geology
☐	ENV	4960	Global Environmental Challenges	☐	BIO	1080	General Biology I
☐	BIO	1090	General Biology Laboratory I	☐	BIO	1081	General Biology II
☐	BIO	1091	General Biology Laboratory II	☐	CHE	1810	General Chemistry II
☐	CHE	1850	General Chemistry Laboratory	☐	CET	3320	Environmental Impact Statements
☐	MTH	3240	Environmental Statistics	☐	GEG	1220	Map Use
☐	GIS	2250	Introduction to Geographic Information Systems	☐	MTH	1110	College Algebra
☐	MTH	1400	Precalculus Mathematics	☐	MTH	1410	Calculus I
☐	ENV	4970	Environmental Field Studies				

Which of the following Environmental Science courses have you additionally taken in the past or are currently enrolled? (Check boxes for all that apply)

☐	ENV	1400	World Resources	☐	MTR	3100	Air Pollution
☐	ENV	3400	Water Resources	☐	ENV	3620	Population, Resources, and Land Use
☐	ENV	3540	Adv. Geol. and Env. Hazards—Denver	☐	ENV	3700	Mountain Environments
☐	ENV	3710	Environmental Remediation	☐	ENV	3720	Waste Management
☐	ENV	3730	Environmental Risk Assessment	☐	ENV	3740	Environmental Health
☐	ENV	4000	Environmental Geology	☐	ENV	4010	Environmental Hazards and GIS
☐	ENV	4200	Environmental Policy and Planning	☐	ENV	4400	Landscape Ecology
☐	ENV	4410	Water Law	☐	ENV	4420	Wetlands
☐	ENV	4430	Habitat Planning	☐	ENV	4500	Environmental Biogeochemistry
☐	ENV	4910	Global Env. Field Prob.: Variable Topics	☐	ENV	4920	Topics in Env. Science: Variable Topics

An example of a section from a standardized test.

*Click on the alternative that best completes the statement or answers the question. Your answer will be **highlighted in blue**.*

1) Which of the following best describes biodiversity?

A) plants and animals but not bacteria.
B) the sum of all plants, animals, and microbes on the planet
C) the sum of all plants and animals on the planet.
D) the kinds of plants and animals in a forest.
E) the kinds of trees and other plants in a forest.

2) A grouping of plants, animals, and other organisms interacting with each other and their environment in such a way as to perpetuate the grouping more or less indefinitely is called a/an

A) ecotone.
B) ecosystem.
C) species.
D) abiotic community.
E) population.

3) Which term best describes all of the gray squirrels living in an isolated park within a city?

A) ecosystem.
B) ecotone.
C) community.
D) population.
E) species.

4) Carbon Dioxide + Water ->light-> Simple Sugar + Oxygen is a useful general equation for describing

A) cell respiration.
B) fermentation.
C) secondary production.
D) photosynthesis.
E) anaerobic respiration.

5) Which of the following would most likely be a trait of a highly adaptable species?

A) short generation time.
B) limited geographic distribution
C) limited genetic variability.
D) small population.
E) low biotic potential.

6) Abandoned farmland usually reverts back to forest. This process of forest regeneration is called:

A) climax community.
B) biorestoration.
C) primary succession.
D) secondary succession.
E) bioremediation.

7) Compared to rates of change which occur in nature, human-induced changes tend to be:

A) variable, with many fluctuations.
B) slower.
C) extremely rapid.
D) only slightly faster.
E) similarly slow and gradual.

8) In kelp forests, sea otters control the population of sea urchins, who feed on kelp. In areas where sea otters have been extirpated, the kelp forests have been depleted as well. The sea otter is most likely a(n) _____ species.

A) invasive.
B) native.
C) endangered.
D) keystone.
E) exotic.

An example of a section from a standardized test.