Existing Program Review
Institutional Self-Study Guidelines

Goals, Objectives, and Activities

Describe specific educational goals, objectives, and activities of the program.

Environmental problems are the result of decisions made by individuals, communities, and corporations. Thus, environmental problems are actually political problems, as well as scientific, engineering, or agricultural problems. Environmental scientists cannot simply understand an ecological system and how humans disturb it. They must also understand how society and corporations are run, and how public views and habits develop and change. Broad knowledge in different areas is needed for long-term solutions to environmental problems and for sustainable development. For this reason, the Arkansas State University Environmental Sciences Graduate Program has been designed and implemented as an interdisciplinary program that includes the Colleges of Science and Mathematics, Business, and Humanities and Social Science.

The mission of the graduate program in Environmental Sciences is to produce scientists with the knowledge needed to support the assessment, maintenance, and recovery of environmental resources. This includes an appreciation of the economic, social, political, and aesthetic context which shapes our interaction with and knowledge of the environment. Developing a balance between environmental protection and maintenance of economic growth is a major integrating theme within the program. This mission is in accordance with the University's mission to pursue and share knowledge within a caring community and prepare students in challenging and diverse ways to become more productive global citizens.

The Environmental Sciences Graduate Program intends to produce scientists trained within an interdisciplinary curriculum. Incorporation of diversity within the core curriculum is intended to provide background knowledge outside of the graduate's area of focus, facilitating future incorporation of environmental concerns with public and economic perceptions and risk. As a reflection of the interdisciplinary nature of the program, a course of study is tailored to each student's scholarly interests, research, and proposed career direction, as approved by his/her advisor and graduate advisory committee.

Strategies used to support the program's mission include the development of problem solving skills, study of the complex interactions between biotic and abiotic characteristics of the environment, and the application of innovative scientific research techniques and technologies. The breadth of a multidisciplinary program allows students to gain an understanding of the societal constraints placed upon the implementation of scientifically derived strategies, the translation of such strategies to public policy, and the role of the scientist in that process.

Explain how the program serves the general education program and other disciplinary programs on the campus.

As a graduate program, EVS does not serve the ASU general education program. However, it does help support the other graduate programs on campus, particularly in those colleges and departments whose faculty participate in the EVS interdisciplinary curriculum. More specifically, many EVS graduate courses are dually listed in Biology and Chemistry, so many ASU students are able to benefit from faculty expertise in Environmental Science.

Document market demand for careers stemming from the program.

According to the Bureau of Labor Statistics (BLS), approximately 83,700 Environmental Scientists were employed in 2006 (BLS 2008). Most of these were in federal, state, and local government positions; the second largest group was in private environmental consulting firms. Additional individuals held environmental science faculty positions in colleges and universities (approximately 16,000 or a mean of approximately 4 for each of the 4,300 degree-granting institutions of higher education; US Department of Education, 2007), but they are classified as postsecondary teachers. The BLS predicts that job opportunities for environmental managers and environmental technology specialists will expand much more quickly than similar engineering/science jobs in other specialties. The projected number of environmental scientists that will be employed in 2016 will be approximately 103,700, according to the National Employment Matrix (BLS 2008). This is an increase of 24% over the 2006 level. This large increase is expected to be driven by increasing public perceptions and concern over pollution, global warming, corporate responsibility, and sustainability. Much of this job growth will result from a continued need to monitor the quality of the environment, to interpret the impact of human actions upon terrestrial and aquatic ecosystems, and to develop strategies for restoring ecosystems. In addition, environmental scientists will be needed to help planners develop and construct buildings, transportation corridors, and utilities that protect water resources and reflect efficient and beneficial land use (BLS 2008). Environmental scientists will also be in demand to help interpret (and eventually limit) the effect of human actions on our natural ecosystems (of which we have many in the Natural State) and to assist in the effort of restoring these ecosystems (World Wide Learn 2009). The need for environmental competence is also growing in international cooperation, for instance, in the EU and the UN (Karlstad 2009).

Document student demand for the program.

Typically two to three students contact the EVS office directly each month. Individual faculty are also routinely contacted by potential EVS students inquiring about space and funding in their research laboratory's. It is difficult to quantify this, but informal discussion with other faculty indicate they each receive 1-3 such inquires each month. Thus, the EVS program and affiliated faculty are contacted by approximately 20 to 25 potential students per month. Many of these are international students who are more interested in getting any degree possible rather than a desire to establish a career in environmental science. However, the program has also identified many successful students through these enquires. Other indicators of demand are interests exhibited at

scientific meetings and conferences where ASU Environmental Science enjoys a high reputation for quality graduate education.

Curriculum

Provide an outline for each program curriculum, including the sequence of courses.

State the degree requirements, including general education requirements, institutional, college or school requirements, and major requirements.

Before 2007, to accommodate the interdisciplinary nature of the Program, the Environmental Sciences Graduate Program (EVS), required a minimum of nine hours of core courses from outside the student's study area, as chosen from the following:

CHEM 5043 Environmental Chemistry
CHEM 5053 Geochemistry
CHEM 6144 Environmental Instrumentation
ENVR 5203 Environmental Toxicology: Mechanisms and Impacts
ENVR 6103 Environmental Systems Analysis
ENVR 6303 Case Studies in Ecosystem Management
POSC 5533 Environmental Law and Administration
POSC 6173 Environmental Policy Processes
ECON 6353 Environmental Economics

In 2007, the EVS Program Committee instituted an "Experimental Core," a nine-credit hour course designed to introduce incoming graduate students to the many topics that Environmental Sciences encompasses, to replace the nine-credit hour core above. This was designed as a team-taught, three-semester sequence, and included almost all EVS faculty. The first two semesters were classroom based, with Semester 1 covering mostly science-related topics important to Environmental Sciences, while the second semester focused upon more societal issues, including policy, law, and economic issues. The third semester was designed as a practicum, with students undertaking a limited research problem mentored by EVS faculty. The Program Committee and EVS faculty are evaluating the success of this overview course.

For all students, the core curriculum also includes two hours each of the following seminars:

ESCI 7111 Seminar in Environmental Sciences
ESCI 7121 Topical Seminar in Environmental Sciences

Six hours from the following statistics classes (or equivalent) are included in the core curriculum:

STAT 6613 Nonparametric Statistics
STAT 6643 Multivariate Analysis
STAT 6653 Data Analysis I: Regression Analysis

STAT 6663 Data Analysis II: Analysis of Variance (ANOVA)
STAT 6673 Experimental Design
STAT 6833 Biostatistics

In addition to the above curriculum and additional course work approved by the student's graduate advisory / dissertation committee, a minimum of 18 dissertation hours as:

ESCI 8891-6 Dissertation Hours

are required prior to graduation.

Student assessment:

EVS applicants must attain total GRE scores of 1000, with 1200 suggested, and international students must also have a TOEFL score that places students within high rankings in reading and writing ability in English. Students must include letters of recommendation, as well as a narrative describing their research interests and goals. Applicants are urged to communicate with EVS faculty that share their research interests and are willing to precept (??) their graduate work. All applications are reviewed by the EVS Program Committee for acceptance into the Program, as well as for assistantship or fellowship support.

Once matriculated, each student's progress is monitored by his or her advisor, in concert with the student's advisory committee. To reinforce the interdisciplinary nature of the EVS Program, students are required to include as one member of their committee a faculty member from outside of the concentration area of their research (that is, a member from the sciences, engineering, agriculture, or business/social science). Committee meetings are recommended at least yearly, so the program of studies and progress with courses and qualifying examinations are monitored. Again demonstrating the interdisciplinary facets of the program, students must pass one qualifying exam outside of the general area of their research. The Program Committee also reviews progress of all students yearly to ensure that all are in good standing with respect to grades and research progress. Finally, students are expected to demonstrate comprehension of higher order statistics, pass qualifying examinations, comprehensive examinations, public presentation and defense of the proposal, and public presentation and defense of the dissertation.

In summary, expected proficiency in skills and competencies is reflected by a developed program of study, satisfactory progress in all courses as directed in the Graduate Bulletin, time in residence, time in degree, defense of the dissertation proposal after completion of core courses, and successfully passing two qualifying exams. This is followed by admission to candidacy, continuous enrollment, the comprehensive exam, and a completed and successfully defended dissertation.

Completion of an exit interview is required of all students completing the program. Highlights from these interviews are evaluated by the Program Committee.

Indirect indicators of learning include presentations and publications at levels ranging from state, regional, national and international stature. In the future, students

may also be judged in part by their active participation and success in acquiring research funding.

Indicate the semester/year the major courses were last offered. Exclude general education courses.

Fall 2006	**Enrollment**	
ENVR 5203	9	Environmental Toxicology Mechanisms and Impacts
CHEM 5043	9	Environmental Chemistry
STAT 6653	22	Data Analysis Regression
POSC 5533	12	Environmental Law
ESCI 7151	18	Responsible Conduct
ESCI 7111	19	Seminar in Environmental Sciences
ESCI 7121	0	Topical Seminar ((Phytoremediation; Phosphorus Runoff; Herpetology)
Spring 2007		
ENVR 6101	6	Environmental Systems Analysis Lab
ENVR 6103	6	Environmental Systems Analysis Lec
STAT 6663	19	Data Analysis: ANOVA
ESCI 7111	13	Seminar in Environmental Sciences
ESCI 7121	5	Topical Seminar (Data Analysis; Biogeochem; Neurotoxicology; EPA Testing
Fall 2007		
STAT 6623	29	Statistical Methods (SAS)
AGRI 6243	6	Environmental Sustainability
ESCI 7151	17	Responsible Conduct
ESCI 613V	2	Ind. Research ESCI Core I
ESCI 713V	7	Ind. Research ESCI Core I
ESCI 7111	11	Seminar in Environmental Sciences
ESCI 7121	2	Topical Seminar (Risk Assessment; Bioanalysis; Isotopes; Malacology; Experimental Design; Models and Modeling
Spring 2008		
STAT 6643	18	Data Multivariate Analysis
ESCI 613V	6	Ind. Res.Envir. Sci Core II
ESCI 613V	3	Ind. Res.Envir. Sci Core II
ESCI 7111	5	Seminar in Environmental Sciences
ESCI 7121	0	Topical Seminar (Ecotoxicology)
ESCI 713V	4	Ind. Res.Envir. Sci Core II
ESCI 713V	4	Ind. Res.Envir. Sci Core II
Summer 2008		
STAT 6673	6	Experimental Design
Fall 2008		
STAT 6653	23	Data Analysis Regression
ENVR 6303	2	Case Studies in Ecosystem Management
ENVR 6301	2	Case Studies in Ecosystem Management Field and Laboratory
ESCI 613V	0	Ind. Research ESCI Core I

ESCI 7151	6	Responsible Conduct Research
ESCI 7111	6	Seminar in Environmental Sciences
ESCI 713V	0	Ind. Research ESCI Core I

Spring 2009

STAT 6663	22	Data Analysis: ANOVA
ESCI 7111	0	Seminar in Environmental Sciences
ESCI 7121	0	Topical Seminar (Insect/Bird; Molec Ecol)
ESCI 6303		Global Water Issues
ENVR 6101	3	Environmental Systems Analysis Lab
ENVR 6103	3	Environmental Systems Analysis Lec

Provide syllabi for discipline-specific courses and departmental objectives for each course.

See Appendix 1.

Outline the process for the introduction of new courses, including all internal curriculum review processes and the findings.

New EVS courses are designed by individual faculty by preparing a new course proposal, which includes rationale, weekly schedule, student evaluation, and course assessment. EVS (ESCI) course proposals are reviewed by the College of Science and Mathematics Curriculum Committee; successful proposals are then forwarded to the Graduate Council for final review and approval. Dually listed courses must also be approved by the appropriate departmental Curriculum Committee before College Committee review.

List courses in the proposed degree program currently offered by distance delivery.

At this time, no ESCI courses are offered by distance delivery.

Faculty (full-time/adjunct/part-time)
Provide curriculum vitae for all program faculty.

Faculty members associated with the Environmental Sciences Program come from several different departments/colleges: agriculture, biology, business, chemistry/physics, engineering, economics, history, policy……. A subset at any given time utilizes release time from their respective colleges for activities pertaining to the program. During the Fall 2004 semester, release time through the program was granted to five faculty members, including two each from the departments of Chemistry and Criminology, Sociology and Geography, and one from the Department of Biological Sciences.

Below is a list of associated and adjunct faculty for the EVS Program. Credentials, year of association with ASU, and titles are included. Vitae for associated faculty are appended (see Appendix 2).

EVS Faculty

Full-time at ASU

James C. Bednarz	PhD	1993	Professor of Wildlife Ecology
Ellis Benjamin	PhD	2007	Assistant Professor of Chemistry
Kris Biondolillo	PhD	1991	Associate Professor of Psychology
Jennifer Bouldin	PhD	2004	Assistant Professor of Environmental Biology
Roger A. Buchanan	PhD	1992	Professor of Zoology
Ricky C. Clifft	PhD	1980	Dean of College of Engineering, Professor Civil and Environmental Engineering
Carolyn B. Dowling	PhD	2004	Assistant Professor of Chemistry
Robert D. Engelken	PhD	1982	Professor of Electrical Engineering
Jerry L. Farris		PhD 1994	Professor of Environmental Biology
David F. Gilmore	PhD	1992	Assistant Professor of Environmental Biology
Steven Green		PhD 2006	Assistant Professor of Soil and Water Conservation
Richard S. Grippo	PhD	1995	Professor of Environmental Biology
Anne A. Grippo	PhD	1995	Associate Professor of Biological Science, Interim Director Environmental Sciences Graduate Program
Gauri Guha	PhD	2001	Associate Professor of Economics and Decision Systems
Shivan Haran	PhD	2002	Assistant Professor of Mechanical Engineering
David R. Harding	PhD	1992	Associate Professor of Political Science
Debra K. Ingram	PhD	2000	Associate Professor of Mathematics and Chair of Department of Mathematics and Statistics
Ronald L. Johnson	PhD	1992	Professor of Zoology
Tanja McKay PhD	PhD	2004	Assistant Professor of Entomology, Department of Biological Sciences
Amy R. Pearce	PhD	2001	Associate Professor of Psychology
Greg C. Phillips	PhD	2003	Dean of Agriculture and Professor of Agriculture
Scott W. Reeve	PhD	1994	Associate Professor of Chemistry
Tom S. Risch	PhD	2001	Assistant Professor of Environmental Biology
Aldemaro Romero	PhD	2003	Professor of Biological Sciences and Chair of Department of Biological Sciences
Malathi Srivatsan	PhD	2003	Associate Professor of Biological Sciences
Hubert B. Stroud	PhD	1974	Professor of Geography
Tina G. Teague	PhD	1988	Professor of Plant Science/Entomology
Stan E. Trauth	PhD	1984	Professor of Zoology

Temporary adjunct faculty

Andy L. Adams	PhD	Temporary Adjunct Faculty
Asish R. Basu	PhD	Temporary Adjunct Faculty
Cynthia D. Burroughs	PhD	Temporary Adjunct Faculty

Kristofor R. Brye	PhD	Temporary Adjunct Faculty
Steve Coghlan Jr.	Ph D	Temporary Adjunct Faculty
Charles M. Cooper	PhD	Temporary Adjunct Faculty
Michael Daniels	PhD	Temporary Adjunct Faculty
Gary Emmert	PhD	Temporary Adjunct Faculty
Edmund Gerstein	PhD	Temporary Adjunct Faculty
Billy R. Griffin	PhD	Temporary Adjunct Faculty
Terry Wayne Griffin	PhD	Temporary Adjunct Faculty
Stephen T. Hasiotis	PhD	Temporary Adjunct Faculty
Robert Kissell	PhD	Temporary Adjunct Faculty
Jonathan D. Maul	PhD	Temporary Adjunct Faculty
Vahid Majidi	PhD	Temporary Adjunct Faculty
Chris McAllister	PhD	Temporary Adjunct Faculty
Matt T. Moore	PhD	Temporary Adjunct Faculty
Catherine O'Reilly	PhD	Temporary Adjunct Faculty
Jon L. Russ	PhD	Temporary Adjunct Faculty
Robert Skinner	PhD	Temporary Adjunct Faculty
Jim Warren	PhD	Temporary Adjunct Faculty

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Indicate the academic credentials required for adjunct/part-time faculty teaching major courses.

Adjunct faculty do not teach major courses, but are included on some graduate advisory committees of EVS students. Adjunct faculty, who must have graduate degrees, preferably doctoral, are identified by individual students' committees as having particular experience and background to supplement ASU faculty expertise in mentoring EVS students. Adjunct faculty are required to submit a CV, and must be acceptable to the EVS Program Committee and the student's advisory committee. Final approval must be obtained by the Dean of the Graduate School.

Describe the orientation and evaluation processes for faculty, including adjunct and part-time faculty.

Full time faculty are oriented through their home departments. ASU provides a two-day orientation program to assist incoming faculty, providing information on administrative and academic requirements and opportunities. Adjunct faculty are not oriented through ASU; they are focused to specific student advisory committees, and participate through the advisement of each student's ASU graduate advisor and graduate committee.

Provide average workload for full-time program faculty.

The EVS Graduate Program does not have full-time faculty assigned. The workload for departmental faculty affiliated with the program is 12 credits per each Fall and Spring semester. No release time from department teaching is available when

affiliated Program faculty teach Program-only courses (i.e., EVS Experimental Core courses I, II and III, Responsible Conduct in Research, Global Water Issues, Seminar in Environmental Science, Topical Seminar in Environmental Science). Thus, any teaching of Environmental Science program courses constitutes an overload for participating faculty, most of whom also have busy research loads (several faculty have >10 graduate students, although not all of those students are in the Environmental Sciences Graduate Program).

Program Resources

Describe program resources (human, technical, labs, etc.)

The Program Director reports to the Dean of the College of Sciences and Mathematics and is aided in the office by a half-time administrative secretary. A Program (Review) committee meets at the Director's request on issues of policy, application review, response to university administrative order, and at student or faculty request. The Director is responsible for orientation of students, facilitating interdisciplinary administration and recruitment, directed application to the Graduate School, directed faculty reassignment requests, administration of program budget, and all activities appropriate to the office and degree program that supports student placement and advancement. Personnel support for EVS has been marginal at best. Current and past EVS directors have sacrificially expended themselves, particularly in the summers, to develop and sustain the Program. In the longer-term, the EVS Program will require at least one full-time secretary dedicated to only EVS (instead of the current half-time sharing arrangement with Molecular Biosciences), at least a half-time professional technician for instrumentation, computer, and network challenges, full-time summer salary support for the director, and eventually its own dedicated faculty, including an assistant director.

The Environmental Sciences faculty and staff are housed in the Laboratory Science Complex (consisting of two parallel wings) and the Arkansas Biosciences Research Institute (ABI) Building. The Laboratory Sciences building has an area of 61,000 ft^2, 80% of which is utilized by the Environmental Sciences Program, Biological Sciences, and Chemistry and Physics. This space includes 13 research laboratories, six instructional laboratories, a climate-controlled greenhouse, electron microscope facilities, and office space to house faculty and graduate students. In addition to the Laboratory Science complex, core curriculum classes are also offered in the Computer Science/Mathematics Building, Wilson Hall, and the Business Building. Additional EVS faculty associates and faculty research activities are housed in the Agriculture Building and College of Engineering, the latter also in the west wing of the Laboratory Sciences Complex.

The office of the Director of Environmental Sciences, some EVSS students, and some EVS faculty research laboratories are housed in the Arkansas State University Biosciences Institute (ABI) building. This is a 94,000 ft^2 state-of-the-art research building that opened on September 18, 2004, and is dedicated to basic and applied research at the interface of agriculture and medicine. Space and resources within this facility are not

limited to ABI faculty or those associated with EVS or Molecular Biosciences (MBS), but are available to other ASU researchers. The ABI has invested over $4,000,000 in equipment used for research and teaching and the ABI building houses an extensive, modern suite of equipment that supports research in a number of different disciplines Thus, this building is an important resource for researchers from technically-based graduate and undergraduate programs and has proven to be an important asset in the recruitment of faculty and students for a number of academic units. The research laboratories are serviced by shared equipment rooms (with Sorvall RC5C and Revolution centrifuges, a Beckman Ultracentrifuge, -80^{o}C and -20^{o}C freezers, ice machines, etc.), 2 dark rooms with automated film-processors, RO and ultra-pure water purification systems, a containment laboratory for radio-isotope use, a central dishwashing / autoclave facility, and several specialize support facilities (described below). Additionally, the building contains conference and seminar rooms, journal reading areas, break rooms, and office/desk areas to foster a highly interactive research environment. The building is fully "wired" with potential for more than 400 data ports. Wireless internet access is available throughout the building. The ABI at ASU is part of the state-wide Arkansas Biosciences Institute consortium funded by Arkansas' tobacco settlement funds with a mandate to facilitate agriculture and biomedical research with a long-term goal of enhancing the health of Arkansans. Through this consortium, ASU researchers can access specialized facilities at member institution including the Advanced NMR and Protein Structure/Function Center at UA, Fayetteville and the Genomics Facilities at UAMS in Little Rock.

Arkansas State University Ecotoxicology Research Facility (ERF) is currently certified by the US EPA certified laboratory provision (# AR-00917). Consistent with it being a multi-user facility, Good Laboratory Practice (GLP) is enforced within the ERF for all students, researchers, and laboratory technicians. Laboratory areas include vertebrate and invertebrate rearing, algal culturing, and biomarker assessment. The ERF is a 3,750ft^2 building on the ASU campus that provides maximum security in testing and culturing. It hosts numerous incubators, muffle furnace, drying ovens, and an environmental growth chamber. Collaborating laboratory facilities are located in the Arkansas Biosciences Institute and Agriculture and Technology buildings.

Describe the institutional support available for faculty development in teaching, research, and service.
Describe the professional development of full-time program faculty over the past two years including the institutional financial support provided to faculty for the activities.

The Judd Hill endowment ($58,045 2008-09 budget) has been available to fund faculty reassignments for research or course development: Faculty choose a 1-course reduction (if feasible within a given academic unit) or supply and student stipend support, or use funding to enhance upper level and graduate courses.

Examples of support for faculty development include:

1. Page charge costs on a publication

2. Conference attendance (usually with students)
   a. Global Consortium of Higher Education and Research in Agriculture, (Costa Rica)
   b. SENCER conferences (Maine, California)
   c. Society of Environmental Toxicology and Chemistry, Mid-South Chapter (Nashville TN, Vicksburg MS)
   d. Arkansas Environmental Federation (Hot Springs AR)
   e. AR Water: Preparing Local Leaders for Water Challenges (Ferndale, AR)
   f. American Fisheries Society, AR Chapter (Bentonville, AR)
   g. Arkansas Academy of Science

3. Hosting workshops at ASU
   a. "Non-biting Midges (Diptera: Chironomidae) A Gentle Introduction"

4. Student recruitment costs

5. Purchase of books, references, audiovisuals, etc.

Although the EVS Program and its directors have been as generous and resourceful as they could be within resources and constraints, in general, broader institutional support for the EVS Program has been marginal.

Describe the availability, adequacy, and accessibility of research/library resources. Give the annual library budget for the program or department.

The Dean B. Ellis library supports the Environmental Sciences Program with its current budget. The library service model used by ASU is to provide on-site core subject collections focused upon the local academic programs and to use the rich resources available through interlibrary loan agreements with regional institutions. Specialized librarians provide research, reference, and library skills instruction for ASU students and faculty. These librarians are responsible for developing the science reference collection and serving as the subject liaison to the science faculty. The library policy of securing university-wide site licenses to electronic databases and full text journal collections is important to ASU with access to the major science databases and full text journals.

Provide a list of program equipment purchases with costs.

When the EVS Program began, funds were used to purchase office equipment and furniture for graduate students. These have had continued use, and have been replaced periodically. In the past year, student infrastructure funds have been used to purchase laptop computers and accessories, a high resolution photo printer, and a gas vapor probe system for soil sampling.

Distance Technology

Summarize the policies and procedures to keep the technology infrastructure current.

The EVS website is the primary portal to our Program. Unfortunately, it has not been kept current over the past year, which is a negative with respect to recruiting prospective students and information for our current students. ASU Information Technology Services has been helping with website maintenance temporarily. We anticipate shifting this responsibility to a part-time student helper, who we plan to employ to supplement our administrative staff until a permanent Director is found. In the longer-term, the EVS Program will require at least a half-time professional technician to help with network, computer, and even more important, instrumentation issues.

Summarize the plan for faculty workload, compensation, and ownership of intellectual property.

Critical to the mission of Arkansas State University are collaborative academic endeavors that provide opportunities for faculty to teach, conduct research, and provide professional service across programs, departments, and colleges. The Environmental Sciences Graduate Program, as an interdisciplinary program, depends upon faculty with home departments in the Colleges of Agriculture, Business, Engineering, Humanities and Social Science, and Science and Mathematics to mentor students and teach classes. Those graduate faculty whose training, backgrounds and research interests merit their naming as EVS faculty request such from the EVS Director and Program Committee. All requests must demonstrate that petitioning faculty help fulfill the missions of the Program as well as those of the home department. The *home* unit has the lead responsibility in the management of personnel issues and coordination of annual performance evaluations, merit decisions, tenure, and promotions in rank reviews. For tenure-track or tenured faculty, the commitment of tenure and rank is within the home unit.

The evaluation procedures of the home unit is followed; the home unit recognizes the jointly appointed faculty members' multiple academic commitments, and bases evaluations upon the faculty member's total performance, inclusive of his or her interdisciplinary instruction within EVS. It is recommended that as an intermediate-term goal, EVS pursue the gradual appointment of some specific dedicated EVS faculty, transformation into a full department with its own full Chair, and official joint appointments of some faculty in both EVS and the other department closest to the faculty member's expertise.

Students

1. Describe strategies to recruit, retain, and graduate students.

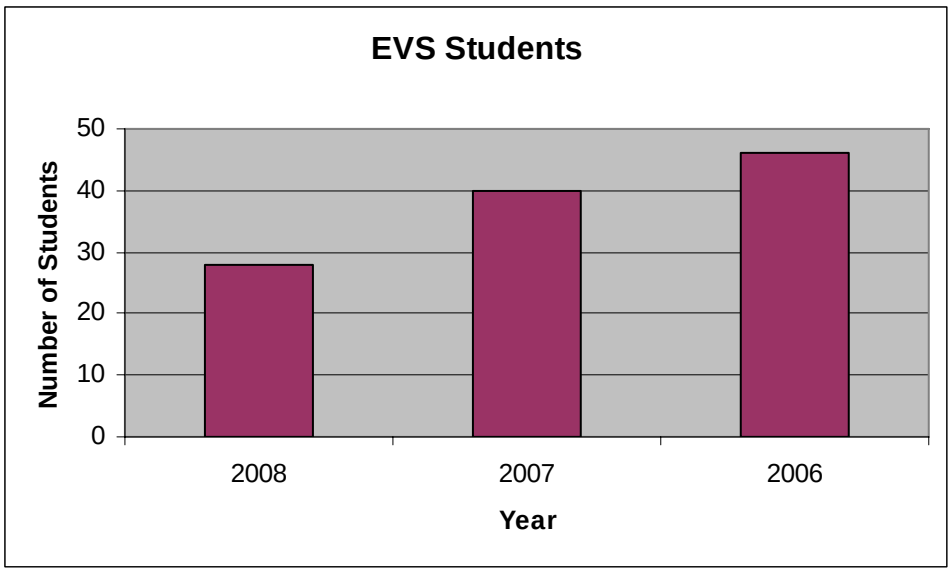
Recruitment tables with program material, give-aways, and a descriptive poster have been set up at state (Arkansas Environmental Federation), regional (Mid-south

Chapter of the Society of Environmental Toxicologists and Chemists) and national level conferences (annual meetings of the Society of Environmental Toxicologists and Chemists). Additionally, the Environmental Sciences Graduate Program is listed on multiple web sites, including GradSchools.com, Collegeboard.com, PhDs.org and the like. Of course, the almost one hundred EVS faculty and student presentations at dozens of scientific meetings remains our best recruitment tool. The support that ASU provides in terms of travel funds, poster printers and supplies, and presentation software licenses has contributed immensely to these targeted recruitment opportunities.

Retention is accomplished via a combination of providing opportunities to excel (travel support, office space with computers (until ABI came on-line and office space opened up in that building), coordination of the program through a ½ time secretary, and a Program director available to handle problems. The Director also meets with the students one-on-one as needed to work on individual concerns. This has been especially useful with dealing with the unique challenges that international students face.

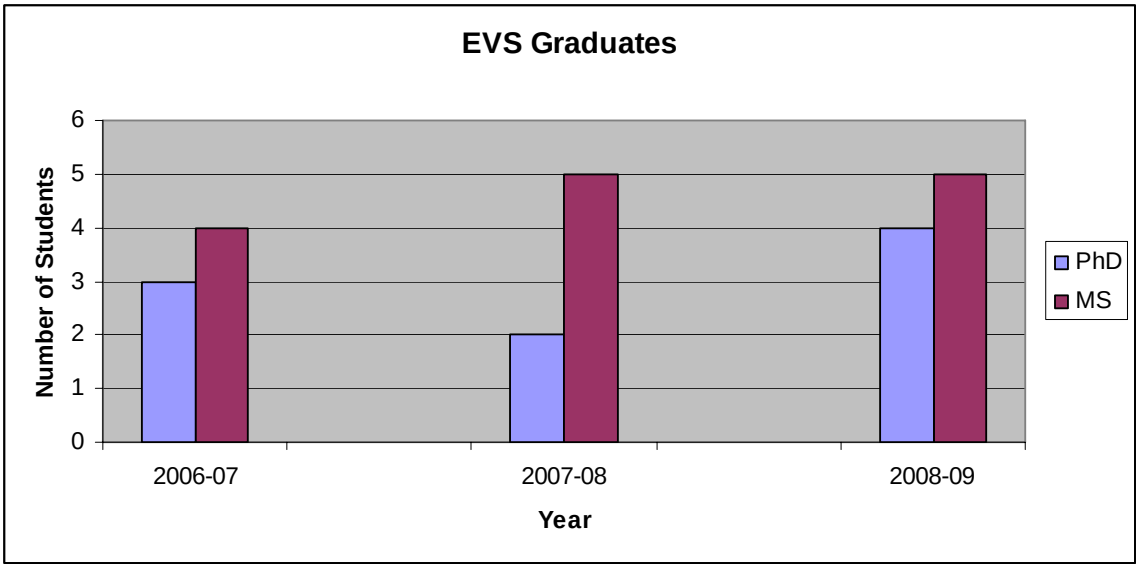
Encouraging graduate students at the time of research and dissertation completion is always a challenge. This process is expedited by both the individual student's dissertation committee advisor, and the Director working together to make sure that the student is meeting deadline targets (qualifying exam, research proposal, etc) as he or she moves through courses and research. Students who do not make adequate progress risk losing assistantship support and may be asked to leave the program.

2. State the number of undergraduate/graduate majors in each degree program under review for the past three years.



3. Provide the number of program graduates over the past three years.

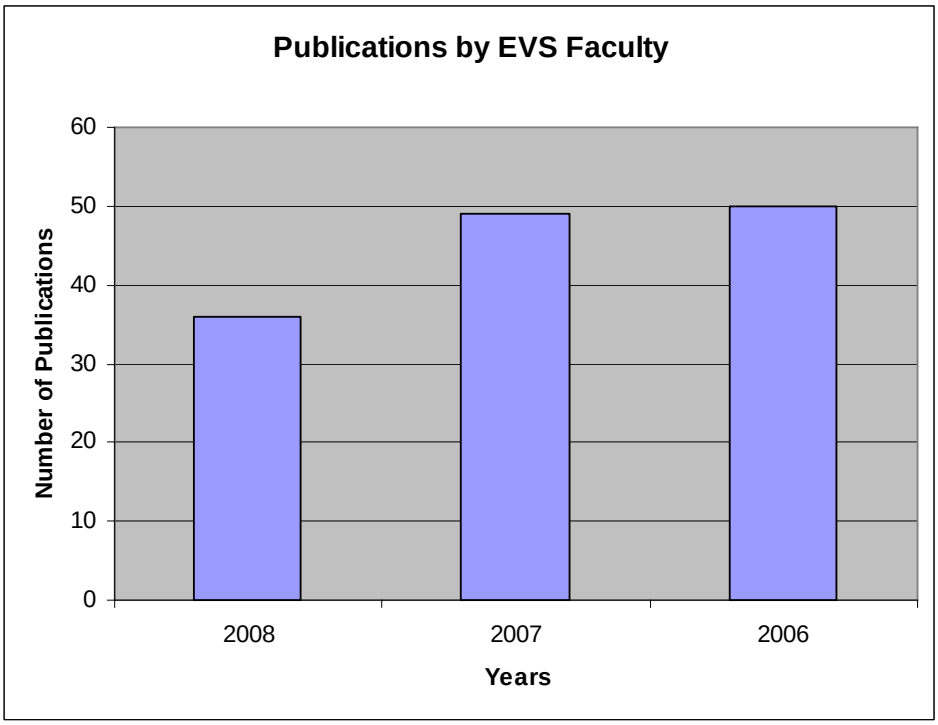
9 PhD; 14 MS

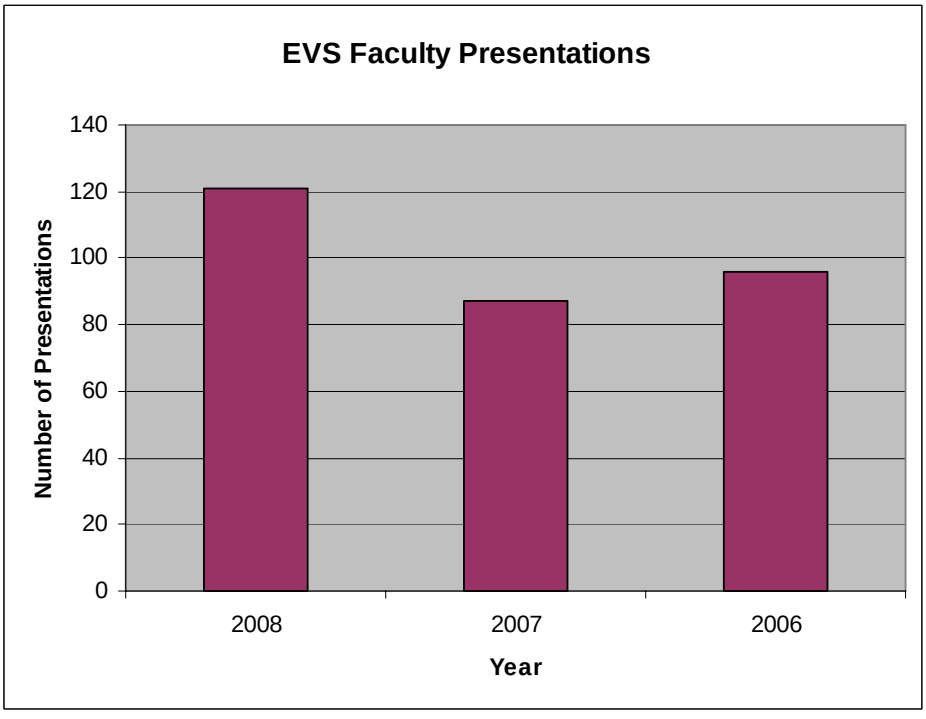


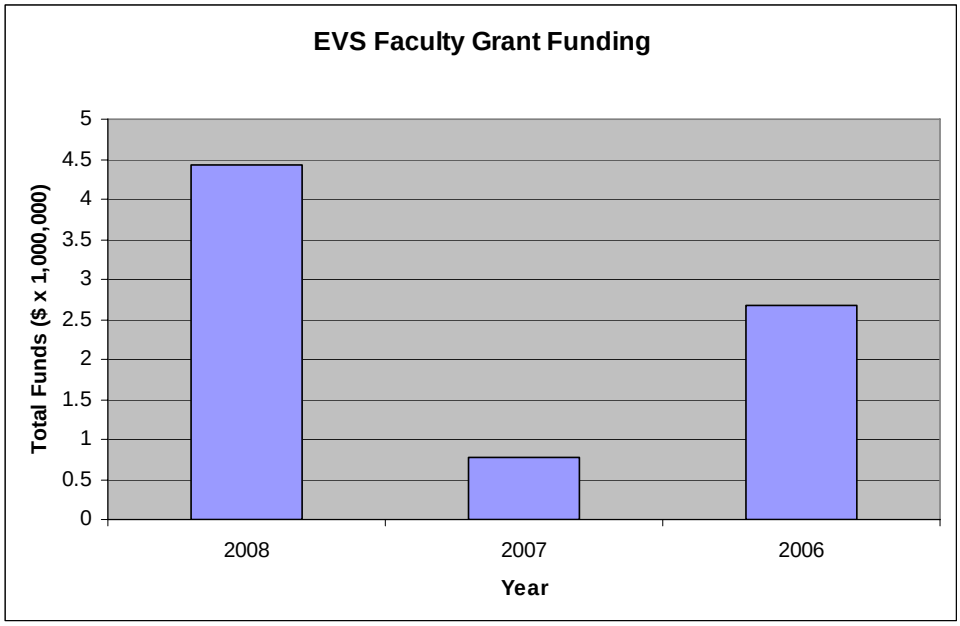
Program Assessment

Describe the program assessment process and provide outcomes data (standardized entrance/placement test results, exit test results, etc.). Describe exit or capstone requirements.

As a graduate program, our students' focus is on original research or practicum culminating in written work, worthy of peer-reviewed publication. Students must successfully defend their theses (M.S.) or dissertations (Ph.D.), by submission of written work to their advisory committees, public presentation of their work, and oral defense of the work to ASU's professional community and the advisory committee. From faculty CVs, publication, presentation, and funding totals over the past 3 years are as follows:


Publications by EVS Faculty
Number of Publications
60
50
40
30
20
10
0
2008
2007
2006
Years


EVS Faculty Presentations
Number of Presentations
140
120
100
80
60
40
20
0
2008
2007
2006
Year



Provide information on how teaching is evaluated, the use of student evaluations, and how the results have affected the curriculum.

Curricular assessment follows the respective departmental assessment guidelines for courses offered by credited faculty through their respective colleges or departments affiliated with the program. Curricular assessment for courses located only within the Environmental Sciences Program (ESCI 7111: Seminar in Environmental Sciences and ESCI 7121: Topical Seminar in Environmental Sciences, and ESCI 8891-6: Dissertation Hours) is accomplished by the Environmental Sciences Program Review Committee convened as necessary during each semester. In addition to present concerns, such as policies and procedures, periodic reviews of curriculum and faculty are incorporated within each meeting. Policy changes suggested by the program committee are forwarded to the affiliated faculty, the Dean of Sciences and Mathematics, affiliated deans and department chairs, the Graduate Dean and, whenever necessary, the Graduate Council. After review and assessment by these involved parties, it is often necessary to meet with respective administrators which may at times involve the Vice-Chancellor of Academic Affairs. It has also been prudent to consult and cooperate with other doctoral program directors and interdisciplinary program directors on campus during the initial phases of program development and growth.

Provide job placement information for program graduates, including the number of graduates placed in jobs related to the field of study.

The following lists all EVS graduates and their employment status.

Student		**2002-03**	Employment
Sam Cron	PhD	Fall 2002	ASU Department of Chemistry
Kwang-Min Lee	PhD	Fall 2002	Seoul National University

Student		**2003-04**	
Malcolm McCallum	PhD	Summer 2003	Louisiana State University, Lafayette
Larry Stauber	PhD	Fall 2003	United Agri Prod., TN
Nate Bickford	PhD	Spring 2004	University of Alaska, Anchorage
Jonathan Maul	PhD	Spring 2004	Texas Tech University

Student		**2004-05**	
Anil Baral	PhD	Summer II 2004	Post-doc at Ohio State Univ
Bill Stephens	PhD	Summer II 2004	ENSR, Houston
Jennifer Bouldin	PhD	Fall 2004	Arkansas State University, ERF director

Student		**2005-06**	
Heidi McIntyre	MS	Summer II 2005	Environmental Planner, HNTB Co
Azah Abanda	PhD	Summer II 2005	MS Co. Community College
Aboubakar Sako	PhD	Summer II 2005	South Africa
Melissa Hobbs	PhD	Spring 2006	Asst. Professor, Williams Baptist College

Student		**2006-07**	
Mai Elobeid	PhD	Summer II 2006	U Ala, Birmingham
Sam McCord	PhD	Summer II 2006	MacTech Consulting, St. Louis
George Morara Ogendi	PhD	Summer II 2006	Egerton Univ., Kenya
Sheryl Greenway	MS	Fall 2006	HS teacher Mtn View
Matthew Horton	MS	Fall 2006	Hyphenated Sol'ns
Traci Hudson	MS	Fall 2006	ASU PhD program
Aaron Archer	MS	Spring 2007	Univ. Mo PhD program Env Eng.
Mathangi Gopalan	MS	Fall 2007	ASU PhD program
Bindu Kaimal	MS	Fall 2007	Canada (unemployed)
Elizabeth Medlin	MS	Fall 2007	unemployed (recently divorced)
Mellissa Milligan	MS	Fall 2007	Biology teacher, Turrel HS
Blaine Buckman	PhD	Spring 2008	Sr. Mgr. Crane Composites, Jonesboro
Jaimie Conrad	MS	Spring 2008	Arcadis Env. Consulting, Chicago IL
Leonette Cox	PhD	Spring 2008	Univ Rochester postdoc

Student		**2008-09**	
Deborah Leslie	MS	Summer II	Ohio State Univ PhD program
Holly Martin	MS	Summer II	unemployed
Irene Mundali	MS	Summer II	ASU PhD program
Sharon Wren	MS	Summer II	Unknown
Rodney Wright	MS	Summer II	ASU PhD program
Thomas Benson	PhD	Summer II	Illinois Natural History Survey
Bindu Kaimal	PhD	Summer II	Canada (unemployed)
Ken Levenstein	PhD	Summer II	University of Washington
Jason Self	PhD	Summer II	Asst. Prof. ASU-Heber Springs

Provide results of student/alumni/employer satisfaction surveys.

No surveys have been employed recently.

Describe how the program is aligned with the current job market needs of the state or local communities.

When the EVS program proposal was first prepared, a survey was performed to determine what potential employers in industry, state/federal agencies, and academia were seeking in terms of education, training and skills of environmental science doctoral graduates. This survey, performed both at the national level in an annual meeting of the Society of Environmental Toxicologists and Chemists, and in the region, at the annual meeting of the Arkansas Environmental Federation, provided valuable insight into the type of student "product" that the program should put forth to meet the job market needs of the state and region, and even nationally. The curriculum and faculty were aligned with these needs in mind. After the program proposal was completed, two separate consultant groups indicated that the program was on the mark in terms of meeting the current job market needs.

As time has progressed, job market needs have changed somewhat and the general curriculum and specific courses within the program have changed to meet these new needs. For instance, the necessity for studies in nanotoxicity has increased, and EVS, in conjunction with MBS and ABI, has been one of the leading institutions in the environmental science field of nanotoxicity, both in the development of focused research (Buchanan, Srivatsin and Bouldin) and in addition of nanotoxicity teaching units within established courses (Case Studies in Ecosystem Management, Environmental Toxicology: Mechanisms and Impacts). Another example is in the area of phytoremediation, which is using plants to detoxify or remove pollutants from the environment. The Arkansas Delta's elaborate ditch system filled with aquatic plants of all description have proven to be an ideal field laboratory setting for "ditcherine" research (Bouldin, Farris) and teaching (Case Studies in Ecosystem Management, Wetland Workshop courses). Yet another example is the emerging field of "green chemistry" in which chemical manufacturing and industrial processes are evaluated for reduction in environmental impact while simultaneously turning a higher profit. EVS faculty (Engleken, Ghua) have worked on developing green chemistry aspects of chromium electroplating and evaluating new coating technologies for RV and travel trailer siding. A final example is the increasingly important skill of environmental problem solving.

Environmental science is fundamentally the science of solving problems related to the environment. A core course within the EVS program (Environmental System's Analysis) is aimed specifically at teaching environmental science students how to approach problem solving in a formal, quantitative, focused process to enable both solving the problem and evaluating the uncertainty of the chosen solution. Potential employers are very interested in graduates who have done well in this course.

Another way the program aligns itself with current job market needs is through the use of Topical Seminars. The focus of these seminars varies by semester and by instructor, so there is great flexibility to change course topics as market demand changes.

Describe how program content parallels current thinking/trends in the field/trade.

Environmental dynamics are complex and need to be approached with a multidisciplinary perspective for a complete understanding of the processes and solutions to environmental problems. The multidisciplinary approach allowed by an independent Environmental Science Program encourages cooperation and synergy among the constituent departments and programs at Arkansas State University and results in graduates from the EVS program who are highly sought for their multidisciplinary training, experience, problem-solving ability, and management skills. Indeed, it has been documented that so-called multidisciplinary environmental science education is hindered when the socio-economic disciplines are not fully integrated into the educational planning for environmental science students (Giacomelli, et al. 2003).

Thus, the reorganization of the EVS program, placing it into any currently existing separate single department, would likely significantly diminish cooperation from other departments and reduce the employer demand for our graduates. On the other hand, providing EVS its own full independent departmental status, probably best within the Graduate School or College of Science and Mathematics, and within the context of continuing full interdisciplinary cooperation, would have significant programmatic and logistical advantages. Indeed, this is the model used by most Universities with Environmental Science programs. Appendix 3 is the first page taken from a quick Google survey of “environmental science programs” in the US. All of these programs were independent and were not housed in any science or other department. Common to all the programs listed was a description of the interdisciplinary nature of the field and the many and varied collaborating departments and faculty.

It is completely clear that the current structure of EVS as an independent unit housed within a college is the accepted model among environmental science programs in the US. By moving this program to the direction of any specific department, the interdisciplinary nature of the field will be hindered, and the scope of education ASU will provide in this field will no longer be competitive with other programs.

Program Effectiveness (strengths, opportunities)
List the strengths and opportunities of the program.

Since Fall 2002, five years after its inception, the Environmental Science Graduate Program has awarded 21 doctoral (Ph.D.) degrees and 15 M.S. degrees. Of the M.S. awardees, five are currently working toward the doctorate in the ASU EVS Program. In 2008-09, we have 28 students enrolled, with several anticipating spring or summer graduation. Our graduates have gone- on to postdoctoral positions and visiting

and assistant professorships in several states and countries, as well as careers in government and industry (see Job Placement information above).

The EVS Program has striven to design and act on the definition of environmental science as an integrated, quantitative, and interdisciplinary approach to the study of the environment and human impacts upon it. By requiring all students to sample both quantitative science/technology and the social and business aspects of environmental impacts through their coursework and examinations, all graduates have developed an understanding and appreciation for the many aspects of environmental science with which they will work during their careers.

A major strength is the interdisciplinary nature of its curriculum, faculty and students. The Program's location outside any single department has allowed it the flexibility to pull from faculty of all departments/disciplines to teach courses, mentor students, and provide insight and guidance for the Program.

List the areas of the program most in need of improvement.

With some key personnel leaving the Program to new positions, we will be refocusing somewhat as new faculty enter ASU and participate in EVS.

The EVS website must be better designed and maintained to increase our web presence, and increase our recruitment.

The core curriculum must be definitively established. The Experimental Core course, while imperfect, offered several advantages, and may be reinstituted with some changes made, after full assessment by the Program Committee.

Release time for other departmental faculty teaching courses within the program is not available.

List program improvements accomplished over the past two years.

The MS degree in Environmental Science was approved in the summer of 2006; since that time the program has awarded 14 MS degrees. The number of doctoral graduates was maintained, with nine PhD students earning degrees in the same time period. Because the previous Director (Robyn Hannigan) spent last year working for the NSF and spent most of her time in Washington, DC it is unclear what she considers to be the programs greatest accomplishments. She has been contacted to provide information in this regard but so far has not responded.

Describe planned program improvements, including a timetable and the estimated costs. Identify program improvement priorities.

As mentioned in part above, recommended improvements include:

(1) A full-time (versus current half-time) secretary (immediate)
(2) A half-to-full-time technician (immediate)

(3) Full summer salary for the director (immediate)
(4) Placement of the EVS Program under the auspices of the Graduate School and fully independent of any existing single department
(5) Gradual hiring of dedicated EVS faculty, including hiring or naming an assistant director (over the next 2-5 years)
(6) Expanded supply, travel, faculty reassigned time, and capital equipment support (gradually over the next 1-5 years)
(7) Expanded library support (gradually over the next 1-5 years)
(8) Eventual full independent department status (no later than 5 years hence)

Describe program changes that have occurred as a result of previous program reviews.

This is the first full program review of the Environmental Science Graduate Program. A previous program review in 2004 described the program, but did not address prioritized planned program improvements. Thus, the program improvements that have occurred were not a result of the previous program review.

Describe program viability measures that have been initiated.

Students

Program viability with regard to students is based on the number of students applying to the program, the number of students admitted, the number graduated, and the types of positions they obtain after graduation.

Faculty

Program viability with regard to faculty is based on the number of faculty affiliated with the program, the number of EVS students they carry, the number of publications and the number, duration and size of monetary awards for research grants.

Institutional Review Team

List the names/departments of the self-study committee chair and committee members.

Anne Grippo, Richard Grippo, Robert Engelken, Jennifer Bouldin, Scott Reeve

References

Giacomelli, P; C Travisi and M. Nava, 2003. Are graduates in environmental sciences potential managers of the environment?: Some problems and examples in the north of Italy. International Journal of Sustainability in Higher Education. 4(1):9-16.

Karlstad. 2009. Karlstad University, Sweden. Environmental Science Programme http://www.kau.se/education/program_detail.lasso?ID=PR1043

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US Department of Education, 2007, Institute of Education Sciences, National Center for Education Statistics, Digest of Education Statistics, 2007, NCES 2008-022, p. 263.

Appendices

Appendix 1: Syllabi of courses

Appendix 2: EVS Faculty CVs

Appendix 3: Google Search: Environmental Science Programs

Appendix 3

"Environmental Science Programs"

First page of listings in Google search of "Environmental Science Programs" and first page of GradSchools.com listing of "Environmental Science"

School	Department, Program or Division	Degrees Offered
Univ. of West Florida	Department of Environmental Studies	MS
Colorado School of Mines	Environmental Science and Engineering	BS,MS, PhD
Duquesne University	Environmental Science and Safety	BS, MBA/MS, JD/MS,
	MS /Certificate in Public Health	
Loyola Marymount Univer.	Environmental Science	MS
University of Idaho	Environmental Science	MS, PhD
Univ. Massachusetts, Amherst	Environmental Science	BS
Brown University	Center for Environmental Studies	AB, SciB, MA
DePaul	Environmental Science	BS
Southeast MO State Univ.	Environmental Science	BS
College of William and Mary	Environmental Science and Policy	BS
Columbia University	Environmental Science and Policy	MPA
Wesley College	Environmental Science	MS, MBA in Environ. Policy/Manag.
SUNY Brockport	Environmental Science and Biology (note: Program is *not* in Biology Department)	MS
Tarleton State University	Environmental Science	MS
University of Michigan	School of Public Health	MS, PhD

Also: Asked repeatedly to start up a program in Environmental Health (Newark Power plant environmental person) "desperately needed in AR"