**California State University, Sacramento**

# Environmental Studies Department

## Self Study

08

Environmental Studies Department 2008 Self Study

**Part I: "general information about the program, e.g., data on students, faculty, staff, facilities, etc."**

*Faculty:* Dudley Burton (Chair), Michelle Stevens, Virginia Matzek, Mary Brentwood (half-time FERP).

*Students:* Current major enrollment is 125; it has recently trended upward, from 90 in 2004 and 107 in 2006. Our students have average GPAs at or slightly higher than the university and college mean; are ~60% female and ~20% minority; are 100% Californian; and carry slightly lower unit loads than univ/college mean. Our ten-year mean faculty:student ratio is 28.7, higher than the college mean of 27.0 and the university mean of 21.6; in recent years, this ratio has approached 40.

*Staff:* Charlotte Gulde, ASC I

*Facilities*: Sequoia 443, Amador 350 (classrooms); Amador 5554A/B/C staff and student offices; 554D and 555A/B/C/D, faculty offices. Amador 120 (storage); Amador 124 (shared lab classroom with Psychology); Alpine 233 (lab equipment).

Below, we present two sections that are necessary to set in context the remainder of our self-study: First, we outline the department's history since the last review, with emphasis on the challenges faced by the department in recent years; and second, we give results of a comparison we did between our department and those of other institutions in our Carnegie class, using data from a 2008 nationwide survey commissioned by the National Council for Science and the Environment. The data show that we serve nearly ten times as many majors, per faculty member, as the average Environmental Studies program in an institution of our type.

**Departmental history since last review**

When the department was last reviewed in 2001-2002, it was in a major transition. The two major senior faculty, Valerie Anderson and Angus Wright, were in their FERPs (partial retirements), and two junior faculty, Mary Brentwood and Carlos Davidson, were in their probationary periods. Administration of the program had been turned over to Professor Krabacher of the Geography Department. There was considerable resentment among the departmental faculty because the campus administration had not reacted to increased student interest in environmental issues in the 1990s with commensurate program support, and the senior faculty had been left exhausted and frustrated.

The 2001-2002 review recommended recruiting more majors, even though faculty resources in the department had not been built, and changes in the national political climate, with the election of George Bush in 2000, were already reducing student interest in the major.

The current chair, Dudley Burton, was recruited in spring 2001. He worked with the program long-distance during fall 2001, and arrived on campus in spring 2002. Recruitment for an initial replacement of the two half-positions lost in FERPs was

completed in spring 2002, with the hiring of Edward Martinez, a biologist with a water management emphasis. The departmental objective at that time was explicit: to reach a "minimally sustainable faculty" of five. A major department retreat in summer 2003, involving both the FERPers and the new faculty, was convened to discuss curriculum opportunities. Two major changes that we propose below—separate B.A. and B.S. tracks, and a free-standing major with no required minor –were initially proposed then, but tabled due to lack of faculty and campus resources to pursue them.

Professor Davidson had won an NSF research grant in 2001 and worked only half-time in the department until leaving in spring 2005 and, after a year of leave without pay, resigning in spring 2006. Unfortunately, Professor Martinez also took a year of leave without pay beginning in spring 2005. He too resigned in spring 2006 in order to fulfill a requirement of service to repay his undergraduate institution for funding his graduate education.

Professor Wright finished his FERP in spring 2005 and Professor Anderson terminated her FERP for health reasons in fall 2005. Professor Brentwood, fearing the program might be cancelled, started her FERP in spring 2007, so for that semester, there was only one full-time, ladder-track faculty member in the department, the chair.

Recruitment for the two new junior faculty members in the department, Virginia Matzek and Michelle Stevens, also took place in spring, 2007, with the assistance of Professors Krabacher (Geography), Ewing (Biology), Crawford (Chemistry), and Horner (Geology). The explicit aim of the dean and the chair, reflecting a national trend in environmental studies program direction, was to move the department toward a more direct focus on science in understanding environmental policy and value issues, and to build legitimacy and working relationships with the relevant science departments on campus. This successful recruitment brought the department's full-time faculty resources to 3.5.

The chair requested that the program review scheduled for 2006-2007 be postponed until the new faculty recruited in spring 2007 could participate in it. Further, there had been campus-wide discussion about changing the focus of departmental review, for those departments so choosing, to make it more explicitly a part of program planning, curriculum development, and assessment implementation. This approach fit the department's needs and objectives in the context of new faculty and program directions.

The fact that two junior faculty left the department before completing their pre-tenure probationary period requires comment. In both instances, pressing personal considerations were apparent and valid. But it is also fair to say that both these faculty, who required laboratory and field support for doing their teaching and research, were disappointed in the facilities and the prospects for facilities at Sacramento State. The dean and the chair have tried to respond to these problems with respect to the new faculty in the department.

There are several key issues the department has had success with, despite struggles, since the last review period:

*Surviving tight budgets and the loss of faculty:* We have tried to assure that all environmental studies teaching staff carry more than average teaching loads relative to other departments in the College. We have tried consistently to justify the existence of the program both in the numbers of students taught and in the need of a "capital campus" to have an active environmental program.

*Recruiting, organizing, managing, and evaluating part-time faculty members:* The department has managed to cobble together a reasonable curriculum with a minimal permanent faculty, and the FERPers, because of the availability of excellent part-time faculty drawn from the community of itinerant teachers and environmental professionals in the Sacramento region.

*Offering detailed, consistent, conscientious advising for students:* We have tried to be available to students in person, or by phone and e-mail, as much as possible. We take pains to be flexible in helping more mature students take advantage of their prior academic work in designing curriculum plans. We have also been very successful in placing students in internships with local and state agencies.

*Promoting the program, recruiting students, and creating good impressions of the department across the campus and community:* We deal actively with other departments, environmental professionals in the government and community, parents, students, and potential students in efforts to educate them about what we do, while at the same time paying attention to the things we might be doing better.

*Contributing to the emergence of a campus sustainability movement:* The creation of an official University Sustainability Committee promises to elevate many of the key issues we have long discussed in Environmental Studies classes to the level of campus and community policy discussion.

On the failure side, we were not able to make substantial headway on the departmental website for a long time. We were not able, working with others, to bring CREST (Center for Research in Environmental Science and Technology) to significance on the campus. Finally, we have not been able to obtain lab facilities for the department beyond the barest minimum.

**Comparison of Sac State Environmental Studies department with others nationwide**

We used data collected in the last year for the CEDD Curriculum Study of Interdisciplinary Environmental Programs in the United States, conducted by Shirley Vincent of Oklahoma State University for the Council of Environmental Deans and Directors of the National Council for Science and the Environment. The data are from a survey of 343 interdisciplinary environmental degree programs at 235 U.S. institutions, representing a sample of about 31% of the environmental programs nationwide.

Summary statistics for our department compared to other institutions in our Carnegie class are shown below:

| | Majors | Faculty | Majors:faculty |
|---|---|---|---|
| CSUS | 125 | 5* | 25 |
| Other programs | 17 | 5.82* | 2.9 |

* assumes faculty classed as part-time, volunteer, or adjunct teach half-time

| | master's prog | growing** | enviro lab | field station | nature center |
|---|---|---|---|---|---|
| CSUS? | no | yes | yes | no | no |
| other programs | 4.30% | 30.40% | 28.60% | 57.10% | 66.70% |

** student enrollment increase characterized as "slow growth" or "rapid growth"

As these findings show, our department serves a far greater than usual number of majors with a smaller faculty; our popular major continues to grow; and we do this despite lacking an environmental field station or nature center to use for student projects and faculty research. (On this front, we are in informal conversation with a local agency about a possible field site for a nature center supported by a local high school.) We are, and have been for a long while, functioning very efficiently in our service to majors.

**Part II ("A statement of intended student learning outcomes at the program level; methods for assessing them, including the use of direct measures; assessment results to date; and documentation of the use of assessment results in efforts to achieve program improvements")**

Our department adopted its previous Assessment Plan in May 2004. Since then, some, but not all, of the plan's directives have been implemented; there has been a major faculty turnover; and University guidelines for performing assessments have shifted in focus, scale, and level of detail. We decided the self-study process accorded us an opportunity to revisit our learning outcomes and assessment process, which we did with the following goals:

*A) accurate reflection:* to ensure our learning outcomes accurately reflect the sum of skills, knowledge, and habits of mind we see as necessary to a graduate of a rigorous, well-rounded, interdisciplinary environmental studies program;

*B) University alignment:* to evaluate how well our learning outcomes fit into the general Universitywide learning goals;

*C) good data:* to ensure that our assessment methods gather quantitative data on student performance rather than merely gauging student satisfaction;

*D) GE courses:* to recognize that we provide an essential service to the university via our GE courses and to bring to bear an equally rigorous and thoughtful assessment process to those classes;

*E) tying objectives to curriculum:* to link specific objectives to specific courses, both for the purposes of having a regular assessment schedule and to help shape our new curriculum.

Our first task—devising learning outcomes that accurately reflect our sense of what a well-educated Environmental Studies graduate should be able to do—was relatively easy. Building on our prior objectives, we first agreed, that our students must have solid communication, mathematical/logical, and research skills:

*Learning outcome #1: Ability to write and speak clearly and persuasively*
*Learning outcome #2: Ability to reason quantitatively*
*Learning outcome #3: Ability to carry out research tasks appropriate to analyzing environmental problems*

Second, we agreed that we want students to be able to analyze complex problems from an interdisciplinary perspective solidly grounded in the sciences, social sciences, and humanities:

*Learning outcome #4: Ability to assess environmental problems and solutions by applying scientific concepts*
*Learning outcome #5: Ability to assess environmental problems and solutions by applying economic and political concepts*
*Learning outcome #6: Ability to assess environmental problems and solutions from the perspectives of ethics, justice, human rights, and cultural diversity*

Third, we agreed that students need to be able to think critically about environmental issues:

*Learning outcome #7: Ability to identify, understand, and critically evaluate competing perspectives on environmental issues*

And finally, we agreed that students need to show evidence of being able to synthesize knowledge and skills to achieve depth of understanding in a particular topic or discipline:

*Learning outcome #8: Ability to integrate knowledge, research, and interpretation with substantially greater sophistication than commonly expected in coursework*

Our second task was to ensure that our learning goals matched Universitywide learning goals (recognizing that no single department is expected to exhibit all of the University's core objectives). We considered that our learning goals #4, #5, #6, #7 and #8 aim to

achieve “competence in the disciplines”; that our learning goals #2, #3, #4, #5, #6, and #7 focus on “analysis and problem-solving”; our learning goal #1 aligns with “communication” and our learning goal #3 with “information competence”; and learning goals #6 and #7 reflect “values and pluralism.” Such broad coverage of University learning outcomes was no surprise to us; we are an interdisciplinary program, and we deliberately adopted our learning goals to reflect the breadth, depth, and well-roundedness that the University hopes to achieve in all its graduates.

Our third task was the continuation of a process begun last fall when we tackled a backlog of student surveys and prepared our annual assessment report (covering AY 05-06 and 06-07). At the time, our assessment consisted of an exit survey and a “narrative statement” for graduating seniors. In the exit survey, students rated their own performance, as well as departmental efforts to encourage the various learning outcomes. We also asked specific questions about major logistics, such as how students liked doing a minor or if their courses were offered in logical sequence. The narrative statements were open-ended and invited students to describe their experience in the major.

Responses to this survey and our evaluation of the narrative statements showed strong student satisfaction in the major, with a few clear trends in suggestions for improvement:

1) dissatisfaction with the degree being a B.A. from those students who seek jobs with state agencies (where a B.S. is required for many environmental positions)

2) desire for more hands-on, experiential learning (internships, field courses, research experience)

3) more emphasis on using economic tools and combining applied science and policy to understand environmental problems

4) support for making ENVS 122, which focuses on environmental impact reports required by state and federal legislation, a required course; students see this course as valuable to future job opportunities

5) offering courses in a more logical sequence, so that preparatory courses are taken before advanced courses

These responses were valuable, and in concert with informal comments that we have heard over the last few years, helped shape our discussion of a new curriculum for the department (see part III).

However, we also concluded that because they rely on student *perceptions*, rather than student *achievements*, these data were not sufficient for assessment purposes. We wished to move from asking students whether *they* think they have achieved our learning outcomes, toward asking whether *we* think they have achieved the learning outcomes (and potentially, whether the outside world thinks they have achieved them, too).

We developed a new assessment plan whereby faculty use embedded questions on final exams, or particular written or oral assignments, to evaluate whether graduating senior majors achieve our learning objectives. Faculty use a simple rubric (1 = meeting or exceeding outcome, 2 = approaching standard for outcome, 3 = failing standard for outcome) general enough to apply to any course or objective, and use their discretion to choose embedded questions or assignments that best exemplify accomplishment of the learning objective, and to decide what level of student performance rates a 1, 2, or 3. Using rubrics and a subset of questions/assignments allows us to assess multiple outcomes in the same course, and the same outcome across multiple courses, without large increases in the faculty workload. We also agreed that informal agreement among faculty on the rubric standards was sufficient to ensure that assessment was consistently and fairly applied across courses and students in the program.

We are also working on developing more external and long-term measures of assessment. Currently our field lacks a unifying certification process or record exam to judge our graduates against others from other schools, but over time we might be able to track a small sample from those who become certified wetland scientists, certified wildlife biologists, etc. We are beginning to develop an updated alumni database that would allow us to survey our alumni to determine, for example, how many of them are holding jobs in an environmental field, how many agree that their education in the department prepared them well for their careers, etc. Many more majors are expected to complete internships in the future (assuming our curriculum revisions are adopted), so we can use feedback from the internship coordinators to find out if our students are as well-prepared as we expect them to be. We also recognize the importance of continuing to communicate with our professional colleagues in government agencies, NGOs, consulting firms, and graduate schools about what skills and discipline-based training they think will make our graduates competitive. This has been happening on an informal basis, but we will need to formalize it in the future.

Our first term implementing the new assessment plan was spring ‘08. From these data we prepared our annual assessment report, which is attached below as Appendix A. Our results showed that we need to do a better job of teaching students to think and reason quantitatively, research questions independently, and to apply specific science and social science concepts correctly to their work.

Our next task was to apply the same new assessment process to our GE courses. Teaching GE courses is a large and vital part of our departmental mission; as much as 70% of our student enrollment in a typical term is in GE courses, and every year we teach about 1000 students in GE courses in areas A3 (critical thinking), B2 (life forms), and D2 (contemporary social issues). In spring ’08 we assessed GE-specific learning outcomes in three sections of ENVS 10 (area B2).

Finally, our last task was to use our learning objectives and assessment data to inform discussion of our curriculum. We held a faculty retreat in fall 2007, after the two new faculty hires arrived, to integrate input from the 2001 self-study, our most recent student surveys, the senior faculty’s collective experience, and the new faculty’s ideas and

expertise. Working out the details of the new curriculum continued in faculty meetings through late spring 2008. The outcome of these discussions forms the basis of part III of the self-study.

**Part III ("The results of a *focused* inquiry addressing issues of particular interest/concern to the program itself, in the context of what is currently important to the college and university.")**

As the focus of our faculty retreat and followup discussions, we asked generally: Is our current curriculum achieving our learning objectives? Does it respond to what students and professionals in the field say they want out of the program? Does it capitalize on our faculty strengths? Is it feasible within the confines of budget, facilities, and equipment?

Specifically, we asked: Should we have separate B.S. and B.A. tracks? Do ENVS majors need to have a minor in another department? Is a senior thesis useful? Should we require internships? What new courses should we offer to utilize the specialties of our new faculty? What old courses should we continue to offer, even if they must be taught by part-timers? How do we ensure adequate enrollment in our upper-division courses? Do we have the facilities and equipment to teach all the courses we think necessary?

The structure of our new proposed curriculum is attached as Appendix B. Below, we summarize the major changes made and our justification for making them.

*Separate B.A./B.S. tracks:*

We devised a science-heavy B.S. track, and a social science-focused B.A. track, in response to concerns from our graduates that they could not find jobs in certain fields with a B.A. degree. A B.S. is required for positions on the Environmental Scientist register, which provides job candidates for Department of Water Resources, Fish and Game, State Parks, and other agencies. Dual-degree options are common in Environmental Studies programs nationally. Because we regard interdisciplinarity as a core value of our program, we designed in considerable crossover between the B.A. and B.S. tracks. The lower division requirements are the same for both tracks and encompass both science and social science courses, while in the upper division, B.A. students must still take science classes and B.S. students must still take social science courses. The difference between the tracks is principally one of emphasis; B.A. students take more policy and law while B.S. students take more science.

*Broader lower division requirements:*

In lower division, we added one course that is a survey of environmental issues (ENVS 10, 110, or the planned GE Area B3 course "Joy of Garbage"). Our upper division courses assume a familiarity with contemporary environmental issues that we sometimes find lacking in students who have completed all the lower division requirements. Requiring a survey course will allow faculty to teach upper division courses at a more advanced level. We also changed the economics requirement to Econ 1B because we envision the B.A. track will include more elective economics courses that

have 1B as a prerequisite. We decided to allow GEOL 10 and GEOG 01 to substitute for each other; we wanted a general earth science course and either of these seemed sufficient in lower division for our purposes. Finally, we aligned our requirements more nearly with those of Biology so that students who have completed the lower division biology requirements can easily double major in, minor in, or switch majors to Environmental Studies.

*Upper division requirements concentrated within major:*

For both tracks, most upper division courses will be taken within the major (the principal exception being Biol 160, Ecology); and most courses taught by ENVS faculty will count for either track. Together, these two requirements should ensure adequate enrollment in our courses. The required ENVS courses common to both tracks consist of methods and research skills courses (120/121), the ethics course (111), a policy/law class (122), and an internationally focused class that satisfies the writing requirement (112), plus the senior thesis and internship. We are also proposing several new upper division interdisciplinary science courses that play to the strengths of our new faculty: Restoration Ecology (currently offered as an experimental 196A), Sustainable Management of Tropical Ecosystems, Agroecology, Wetlands Ecology, and Whole Earth Resource Management, to be added to the existing ENVS 130 Toxicology course as a set of upper division science options. B.A. students will choose two of these courses as electives, and B.S. students will choose three of them.

*Increase in major units, loss of required minor:*

The total number of units required for the major increases from 48 to 65-68 (the variability comes from possible differences in the unit count of extradepartmental electives and 195/198 units.) However, students will no longer be required to take a minor in a different department; depending on the minor, our ENVS students always completed an additional 18-21 units, so the overall unit count is nearly unchanged, and comparable to majors like Biology, Geology, and Geography. As we understand the history, the initial requirement of an outside minor was made because environmental studies was still seen as a "young" discipline, and additional specialization in a more established field was deemed desirable. After several decades and the establishment of environmental studies programs at hundreds of U.S. four-year colleges and universities, this is no longer a strong argument. We are confident that our students can be interdisciplinarily trained while gaining depth and disciplinary focus with the major as we structure it here.

*Course changes:*

As mentioned above, we are proposing several new elective upper division science courses that reflect our new faculty's specialties, as well as our desire to offer truly interdisciplinary courses with substantial treatment of economics, policy, law, globalization, and/or ethics along with the science. These courses are intended to be accessible to both B.A. and B.S. track students who have completed the lower division requirements, and we also expect that they will be of interest to students in other majors, particularly biology. Eventually we hope that there will be more mutuality between ENVS and Biology, so that some courses we teach can count as electives for their

conservation/ecology track, just as their courses count as electives for ours. However, the Biology department is in the midst of its own curriculum revision right now, so aligning the two sets of program requirements might be impossible in the near-term.

Another change is that we are requiring the CEQA/NEPA class for both tracks; for B.S. majors, this will be the principal law/policy class that they take. This course has consistently been rated as one of the most useful in the major on senior narrative statements, and familiarity with environmental impact reports is excellent preparation for work in many environmental fields.

Finally, we want to collapse the two methods courses, now labeled ENVS 120 (quantitative methods/statistics) and ENVS 121 (field methods), into a single course. This makes sense for several reasons. First, if students have completed BIOL 160 then they should already have had an introductory statistics course, so teaching introductory statistics in ENVS 120 may be repetitive. Second, the field methods course requires understanding of experimental design and statistics. A combination of the two courses, in which students would design and conduct environmental studies using up-to-date field methods, and simultaneously analyze the data from them using appropriate statistical tests, would amplify their understanding of environmental methods. This course will have Bio 160 as a prerequisite.

*Internship or research required:*

We are also newly requiring an internship or independent research (ENVS 195 or 198). Our discussions did raise the concern that some students will find this requirement a hardship, but enough of our students already do internships—and find them valuable job preparation—that we felt it was worth making a requirement. Allowing research as an option will also help boost the research productivity of the department and give those students who might want to go to graduate school or work in technical positions relevant experience. We also see the internship as a component of our departmental assessment, because we can get feedback on how our students do in real-world jobs before they graduate and become more difficult to track.

**Issues raised by adoption of a new curriculum**

As a group, we feel that this curriculum is more rigorous, more relevant, and more interdisciplinary than our old version. We see a lot of positives: separate tracks so that science-focused students can qualify for jobs that require a B.S., while others can emphasize policy and the law; more unit credit within the major; courses that reflect our current faculty specialties; courses offered in a more logical sequence; better alignment with other majors and minors; more depth and experiential learning.

However, we recognize that there are some tradeoffs inherent in these choices, and we have some concerns about potential negatives—principally, whether we will lose enrollment by instituting more rigorous requirements and adding requirements to the major. We also have some concerns about whether, in this tight budget climate, the college can support our future needs (although this would have been true whether we made changes to the curriculum or not). Specifically, we need to be sure we have the facilities, the equipment, and the staff to sustain this curriculum.

On the facilities side, we see a couple of major obstacles. One is that the College of SSIS does not control access to laboratory space that we need for our science courses. The Field Methods course in particular has suffered from this lack; last semester saw the students running back and forth between a conventional classroom and the hallway restrooms, to dispose of chemicals used for calibrating pH and conductivity meters. The department owns 31 excellent dissecting microscopes that were intended to be used to observe benthic microinvertebrates collected from the river, but that activity had to be curtailed because there was no place to set up the scopes. Currently, the ENVS department has a storeroom in 120 Amador that holds field equipment, and an office in 233 Alpine that is gradually being converted to a small working laboratory for faculty research but is much too small to accommodate even a 15-student lab exercise. One bright spot is that we have worked out shared access (with Psychology) to space in Amador Hall that has been used in the past for both ENVS and Psych labwork; renovations planned for this fall should make the room more usable for classes.

Another obstacle is that we have access only to one SSIS van for field trips; since this van holds only ten students, and our smallest field class is 15 people, we either need to rely on student transportation or we need to rent an additional van. (The College of Natural Sciences and Mathematics owns a few vans, but they are heavily used and NSM departments like Geology, Biology, and Geography have priority for scheduling them.) By its nature, environmental studies requires getting students out into the environment; our budget will permit us to rent a van a few times, but not as often as we need to give students relevant, hands-on field experiences in upper-division courses. Relying on student drivers is problematic because of University Risk Management guidelines that prohibit faculty from arranging carpools or taking students in their own private vehicles. Students have also complained that this makes field trips more costly than they would be if the department provided transportation. Many of our students also take field trips in biology, geography, or geology courses as part of our major, and they compare ENVS courses unfavorably to those courses because of the cost and hassle of field trip transport. We should also note that most other departments charge course fees for field trips; we have not done this, and recently there has been a moratorium on new course fees. We expect in the future to apply for permission to charge course fees for field-based classes.

Equipment-wise, the department is much better off than it was just a year ago; generous support from the dean in faculty startups provided for the purchase of desperately needed field and laboratory equipment, including soil and water samplers, safety gear, a weather station and its associated software, computers and mapping devices, lab chemicals and supplies. This equipment will be heavily used by students in the field methods course, as well as in Restoration Ecology, Wetlands Ecology and other field-based courses, and in faculty research.

Staff-wise, we are on a good footing with regard to science faculty, having just hired two new scientists with strong interdisciplinary interests and skills. However, we will soon find ourselves in need of more full-time faculty to teach on the policy side. Angus Wright, who had been teaching environmental law part-time, has now fully

retired, and our other social scientist, Mary Brentwood, is on half-time FERP. Approximately 45% of our students were taught by part-timers in GE courses last year; and this may go up as we seek a lecturer to cover ENVS 128 (environmental law). At our last review, a minimally sustainable faculty size, given the number of students we teach, was thought to be five; we are now at 3.5, and enrollment is increasing. As pointed out in the introduction, other environmental studies programs in our Carnegie class typically have more faculty—about 6—but fewer majors—only 17 on average, to our 125. The rebuilding of the department faculty from its low point in spring 2007—when the chair was the only full-time, ladder-track faculty member in the department—has begun, but has not been completed. We expect to require new tenure-track lines in the near future.

**Discussion of other issues of concern to department**

Heretofore we have focused our self-study on assessing our curriculum and how best to achieve our learning outcomes for our students. In this next section, we would like to discuss some of our additional goals and challenges. In no particular order, they are:

*a) presence/visibility on campus and in community*
We take seriously our mission to be a resource for the campus and community on environmental issues, and to participate in campus life. Recent examples of departmental engagement with the community include:

- rejuvenating the Environmental Students Organization
- demonstrating groundwater pollution at Sacramento Earth Day
- arranging campus film and lecture events on environmental issues
- engaging ENVS 10 students to gather data from campus populations for surveys and experiments (tap water vs. bottled water taste test, etc.)
- joining Sustainability Committee and Recycling Committee
- coordinating campus Earth Day planning with ASI and city Earth Day planning with ECOS
- organizing a field trip with campus faculty and the Sacramento Area Flood Control Agency to discuss research topics and possibilities for student participation in environmental monitoring
- Participation at Zoofest and Wildflower Weekend
- Advising the campus integrated waste manager on the choice of an e-waste vendor
- Monday Mingle—an informal coffee/cookies gathering to increase collegiality and familiarity among departments in SSIS and NSM

We are committed to continuing and expanding our presence on campus and in the community, despite the department still being at low levels of staffing.

*b) clarity on RTP value of community-based research activities*

Our community activities are important in and of themselves, but sometimes we struggle with how they should be regarded for RTP purposes. Some of our research activities may

cross the line into teaching and community service; conversely, some of our community activities blur the line between service and research. For example, if a faculty member produces a white paper or research report that guides policy for a governmental agency or NGO, the faculty member is acting as a scholar in producing the report, even if it is never published in peer-reviewed journals. Or, if a faculty member does a restoration project to improve riparian habitat and uses ENVS 121 students to monitor the restoration, that activity might simultaneously have research, teaching, and community service components. As we shepherd two new junior faculty through the RTP process, we need explicit guidance from the dean on how such cross-categorical activities will be regarded. We especially need to understand if claiming credit in more than one RTP category will be regarded as inappropriate "double-dipping" or—as we see it—as an efficient fulfillment of our interdisciplinary objectives and our mission as an undergraduate-focused, regional institution.

*c) part-time faculty, assessment, and GE*

We depend heavily on part-time faculty, particular to teach GE classes, and we have a responsibility to our students to make sure that part-time faculty are well-qualified, well-trained, and responsive to their needs. Part-timers teach about 45% of our GE students. We also need to ensure some consistency among different sections of the course from semester to semester, and to train our part-timers in the new rubric-based assessment tasks. Our feeling is that the best way to do this is to make our part-timers feel like the valued part of the department that they are, and to stay in communication with them on issues of curriculum, policy, and assessment. This year we will require part-timers teaching ENVS 10 to attend a meeting early in the semester to discuss the class. Our intent is to make this gathering a fun, informal exchange of ideas—where everyone benefits from the collective wisdom of our many experienced part-timers—rather than a prescription for how to teach the class. We will also use the opportunity to discuss the new assessment plan, and to distribute templates and rubrics for their use.

*d) expanding to a master's program*

In the long-term future, we foresee the department offering a master's degree. Right now we are too small, and in too much of a rebuilding stage, to contemplate such an expansion. However, two options currently available to us are to serve on master's committees for students in other departments, such as Biology; and to accept and advise students who wish to pursue an independent master's degree. We intend to pursue these options as they arise, and perhaps make expansion to a master's program the focus of our next self-study inquiry.

*e) research lab space*

Above, we mentioned the lack of control over classroom lab space by the college, which has hampered our instruction in field- and lab-based courses. We would also like to outline the current state of research lab space, which is minimal. The department's space in 233 Alpine has been converted from a faculty office to something approaching a working lab. It has a portable fume hood, a standard sink, and (as of this summer, and thanks to faculty startup support from the dean), sufficient electrical wiring capacity for

some lab equipment. The space is adequate for very basic lab work: samples can be preserved (frozen, dried, or in chemical storage) and basic measurements (temperature, weight) can be taken. It seems unlikely that any other campus lab space, or greenhouse space, will become available to us, so we are focused on pursuing off-campus research lab collaborations for any project that might involve more sophisticated labwork. We want to signal that the inadequacy of the space might harm our ability to seek outside grants to fund research, and will pursue monies as best we can given the constraints.

*f) international programs*

Many of our students are interested in environmental issues outside the Sacramento region, and we teach a course on international environmental problems. We would like to pursue the possibility of teaching summer or winter intersession field courses internationally. Stevens has field experience in the Middle East, and Matzek has taught field courses in Mexico, Central America, and the Pacific. We will seek guidance from the international programs office on campus on how we can develop an international component to our curriculum.

*g) cooperation with related departments*

As an interdisciplinary department, we need to have close working relationships with other departments that teach courses required for our majors. Research collaborations with faculty in these departments also strengthen our program and provide cross-pollination of ideas and projects. We have been heartened in recent years with the cooperation evident between ENVS and faculty in these departments, especially Biology, Chemistry, Geography, and Geology, and we will continue to try to build these relationships to our mutual benefit.

## Conclusion

This self-study has afforded us an opportunity to critically examine our recent history, our current successes, and our future challenges. We conclude that, although the department has weathered some rough times, we have managed to serve our majors' needs well. We touch many students' lives through GE courses, and we remain a vital part of the campus community. We expect to do this even better as the department continues to grow and rebuild.

# APPENDIX A: Assessment report for Environmental Studies, AY 07-08

**1. What goals or learning objectives/outcomes were assessed in the AY ending June 30, 2008?**

This spring the Environmental Studies Department was carrying out its self-study, and over the course of the term we condensed and slightly changed our learning objectives to the following:

*#1: Ability to write and speak clearly and persuasively*
*#2: Ability to reason quantitatively*
*#3: Ability to carry out research tasks appropriate to analyzing environmental problems*
*#4: Ability to assess environmental problems and solutions by applying scientific concepts*
*#5: Ability to assess environmental problems and solutions by applying economic and political concepts*
*#6: Ability to assess environmental problems and solutions from the perspectives of ethics, justice, human rights, and cultural diversity*
*#7: Ability to identify, understand, and critically evaluate competing perspectives on environmental issues*
*#8: Ability to integrate knowledge, research, and interpretation with substantially greater sophistication than commonly expected in coursework*

We assessed all eight of the learning objectives in spring courses taught by regular faculty: ENVS 111 (Environmental Ethics), ENVS 112 (International Environmental Problems), ENVS 121 (Field Methods), and ENVS 190 (Senior Seminar).

We also assessed GE objectives for Area B2 in three sections of ENVS 10 (Introduction to Environmental Science).

**2. How did you assess these learning outcomes?**

**a. Describe the measures you used and the information gathered? (Description, date administered, results)**

This year, for the first time, we moved to a system of embedded exam questions and learning-goal-specific rubrics for assessment of written and oral work. In the past, our assessment has relied on student perceptions of their own performance, as measured by exit surveys.

We adopted a simple evaluation metric for all assessment activities: 1= Meets or exceeds standard for learning objective; 2 = Approaches standard for learning objective; and 3= Fails standard for learning objective. Assessment of learning objectives was

separate from the grading process; it was directed at specific learning goals, and only considered the performance of ENVS majors.

For learning objectives assessed by means of embedded exam questions, faculty chose exemplary questions from final exams and decided how to assign student performances to categories 1 (Meets/exceeds), 2 (Approaches), and 3 (Fails). The only majors course to use this approach was ENVS 121 (Field Methods), which evaluated learning outcomes #2, #3, and #4; embedded final exam questions and results are attached as Report A. Embedded exam questions were also used to evaluate GE learning objectives in ENVS 10; questions, outcomes, and results are attached as Report B.

For learning outcomes assessed through performance on written essays and oral presentations, faculty adopted or developed rubrics to assess specific learning goals. For ENVS 190 (Senior Seminar), ENVS 111 (Environmental Ethics), and ENVS 112 (International Environmental Problems), written work was evaluated according to the CSUS Advisory Standards for Writing in the Undergraduate Major and the Assessment Criteria for Written Communication developed by the University of South Carolina. Oral presentation rubrics were adopted from Dr. Mary Allen's 2006 assessment workshop for CSUS Academic Affairs. Learning outcomes #1-#8 were variously evaluated in ENVS 190, according to the thesis topic (e.g., some students' topics did not lend themselves to evaluation of #2, quantitative reasoning; others did not bear on #6, ethics/justice or #5, economics/politics). Results from ENVS 190 are attached as Report C. In ENVS 111, learning outcomes #1, #3, #4, #5, #6, and #7 were evaluated; results are in Report D. For ENVS 112 (International Environmental Problems) results are attached as Report E.

Our methodology was based on several values we agreed upon. We considered it important for faculty members to be able to use their discretion in deciding what rubrics or questions to use, and how to assign student performances to categories 1/2/3 (Meets/Approaches/Fails). We determined that it was important to set a high bar for passing the standard, in order to judge the program by where we want it to be. We also considered it important that we assess only ENVS majors (except for GE objectives) and only in classes typically taken as juniors or seniors, so that we evaluate students who have completed or nearly completed our program of study. We insisted on embedding our assessment into assignments (exams/ essays/presentations), rather than doing artificial pre- and post-tests of specific tasks, so that students would give their best effort and not shrug off what might be considered pointless busywork. Finally, we considered it important to assess multiple objectives in multiple classes, over time, in order to get a complete picture of how the program is doing.

There are disadvantages to this approach, the principal one of which is that the data may be inconsistent from year to year and course to course because different faculty, with slightly different rubrics, may be doing the assessment. However, we feel that assessment is a multi-year process, and restricting data collection on any learning objective to a single course or single approach is too limited a snapshot. Moreover, by allowing faculty discretion over how to assess performance, they gain information that is tailored to their course.

Overall results from our majors assessment, combining student performance in all courses and all learning objectives assessed, are summarized below:

| Outcome | Meets/exceeds | Approaches | Fails |
|---|---|---|---|
| 1 write/speak | 72% | 21% | 7% |
| 2 quant reasoning | 40% | 33% | 27% |
| 3 research | 45% | 34% | 20% |
| 4 science concepts | 59% | 28% | 13% |
| 5 econ & politics | 60% | 34% | 6% |
| 6 ethics/justice | 71% | 29% | 0% |
| 7 competing persp | 76% | 21% | 3% |
| 8 integrate | 92% | 0% | 8% |

Our GE results from ENVS 10 showed that 88-92% of the students are meeting or exceeding Area B2 standards.

**b. As a result of these assessments what did you learn about the program's success in helping its students achieve these learning outcomes?**

**c. In what areas are students doing well and achieving expectations?**

**d. What areas are seen as needing improvement within your program?**

These assessment results represent a single semester's effort, with a new system that we are still breaking in. Moreover, two of our three full-time faculty are new to CSUS, we are embarking on a new curriculum, and our learning objectives have recently been reformulated. It is therefore early to draw any substantive conclusions from the data.

Nonetheless, we can tentatively agree that most of our students are able to write and speak persuasively, integrate various skills to produce a finished product, consider varying points of view, and appreciate the ethical ramifications of environmental problems. However, fewer than half of them meet our standard for reasoning and thinking quantitatively and doing independent research, and they are less successful than we would like at applying specific science and social science concepts.

On the GE front, our ENVS 10 course remains popular and assessment results indicate that the vast majority of students are achieving the learning objectives.

**3. As a result of faculty reflection on these results, are there any program changes anticipated?**

**a. If so, what are those changes?**

**b. How will you know if these changes achieved the desired results?**

We are in the midst of major program changes, spurred by the recent turnover in our faculty, increased interest in the major, and the happenstance of our required periodic self-study. Assessment is the guiding principle of our self-study, and by having reformulated our learning objecives, we are setting our new faculty on the right path to ensure that these objectives are emphasized in our new courses.

It is not surprising to us that our students need better quantitative and research skills. We are specifically addressing this by revamping our approach to ENVS 120 (Quantitative Methods) and ENVS 121 (Field Methods). More updated equipment has been purchased to give students better experience in collecting data in ENVS 121, and the structure of both 120 and 121 is being changed to integrate this data collection with analysis. By 2009-10 we hope to merge the two classes so that students do statistical

analysis of their own data. We will also add upper-division science courses for our planned B.S. track, so that students gain more experience in quantitative data analysis and science concepts. We will also require a lower-division economics course so that students enter our upper-division courses with more specific understanding of economics.

It will be some time before we can expect to see results from these changes, but we expect that tracking our assessment results over time will guide us.

**4. Did your department engage in any other assessment activities such as the development of rubrics, course alignment?**

Everything we did in assessment this year was developed anew—learning outcomes, assessment plan, methodology. Formerly our assessment was based around student survey data that we determined did not meet CSUS and WASC standards for learning outcomes. Assessment has also been the guiding principle of our self-study.

**5. What assessment activities are planned for the upcoming academic year?**

So far our new assessment plan has involved only the three full-time faculty who developed it. We need to involve our part-time faculty, particularly those who teach unique classes (e.g., Toxicology, NEPA/CEQA) and those with many years of teaching experience who can seamlessly integrate assessment into their grading process. This fall we will have a training session for the part-timers we want to involve in assessment, and are developing some templates and rubrics for them so as not to increase their workload unduly.

We are also working on our alumni database, so that we can track our graduates after they leave CSUS, and measure the success of our program partly by such metrics as graduate school entrance and employment opportunities.

REPORT A

ENVS 121 Assessment Spring 08

Assessment was done by rating student responses to exemplary final exam questions, as well as aspects of the final research project, according to the rubric: 1 = meeting/exceeding outcome standard, 2= approaching outcome standard, 3 = failing outcome standard.

Fifteen students took the class (including one enrolled in independent study who did not do the same final research project, but did take the final exam). Students had a choice of questions on the final exam, and so not all students answered all the assessment questions.

*Learning outcome #2: Ability to reason quantitatively*

**1. Water quality**

Construct a calibration curve for the following data and plot it with a trendline. Is the $R^2$ high enough to assume that your instrument is still functioning linearly? What is the equation of the best fit line? Use the best fit equation to tell the "true" value of the unknown whose reading on the instrument is 79.8.

| | |
|---|---|
| 0 ng/mL | 0.1 |
| 10 ng/mL | 10.3 |
| 50 ng/mL | 51.2 |
| 100 ng/mL | 104 |

**1 = 2/11 = 18%** **2 = 5/11 = 45%** **3 = 4/11 = 36%**

**2. EH&S**

The OSHA permissible exposure limit for carbon monoxide is 50 ppm for an 8-hour time weighted average (for industrial workers) and 200 ppm as a ceiling. If a worker is exposed to 50 ppm for 2 hours, 0 ppm for 1 hour, 100 ppm for 15 minutes, 90 ppm for 45 minutes, and 40 ppm for 4 hours, what is the 8-hour TWA for the worker, and has she exceeded her PEL or the ceiling?

**1 = 8/13 = 62%** **2 = 2/13 = 15%** **3 = 3/13 = 23%**

**3. Analysis of final project data**

**1 = 7/14 =50%** **2 = 2/14 = 14%** **3=5/14 = 36%**

*Learning outcome #3: Ability to carry out research tasks appropriate to analyzing environmental problems*

**1. Biodiversity Indices**

Find a journal article from the last ten years that uses Simpson's, Shannon's, or both biodiversity indices. Summarize the article in a paragraph or two. Why were they measuring biodiversity? What argument, if any, did they give for using Simpson's or Shannon's index? What did they find?

**1 = 10/14 = 72%** **2 = 2/14 = 14%** **3 = 2/14 = 14%**

**2. Appropriate and adequate references in final project**
**1 = 7/14 = 50%  2 = 2/14 = 14%  3=5/14 = 36%**

**3. Appropriate and adequate methods in final project**
**1 = 8/14 = 57%  2 = 5/14 = 36%  4 = 1/14 = 7%**

*Learning outcome #4: Ability to assess environmental problems and solutions by applying scientific concepts*
**1. Vegetation surveys**
What are the tradeoffs (pros and cons) of a line transect vs. an area-based method? Why would someone choose to use a point-quarter method rather than delineate particular plots or quadrats?
**1 = 6/11 = 54%  2 = 4/11 = 36%  3 = 1/11 = 9%**

**2. Mark and recapture**
What are the assumptions and possible biases of the mark and recapture method—i.e., the premises that, if they are not true, would lead to an inaccurate estimation of the population size? What are some ways that these assumptions might be invalidated in the real world?
**1 = 8/14 = 57%  2 = 4/14 = 28%  3 = 2/14 = 14%**

**Summary:**

**"Reason quantitatively": 45% met or exceeded standard, 24% approached standard, 31% failed standard**

**"Use research skills" : 60% met or exceeded standard, 21% approached standard, 19% failed standard**

**"Apply scientific concepts": 56% met or exceeded standard, 32% approached standard, 12% failed standard**

REPORT B

GE Assessment
Area B2
Course: ENVS 10 (Sections 5, 6, 7) Term: Spring 08
Instructor: Virginia Matzek

Assessment was done by rating student responses to exemplary final exam questions according to the rubric: 1 = meeting/exceeding outcome standard, 2= approaching outcome standard, 3 = failing outcome standard.

For short answer and essay questions, students were rated according to the accuracy and thoroughness of their written responses. Multiple choice questions have more than one possible answer, so a rating of 1 was given for completely or mostly correct answers, 2 for partly correct answers, and 3 if the answer given was the worst choice.

One hundred seventeen students took the final exam, but students had a choice of what questions to answer and so not every student answered every assessment question.

Outcome: *Demonstrate a knowledge and understanding of natural phenomena.*

1. Define the term "biological control" and give its relevance to an environmental issue discussed in class.

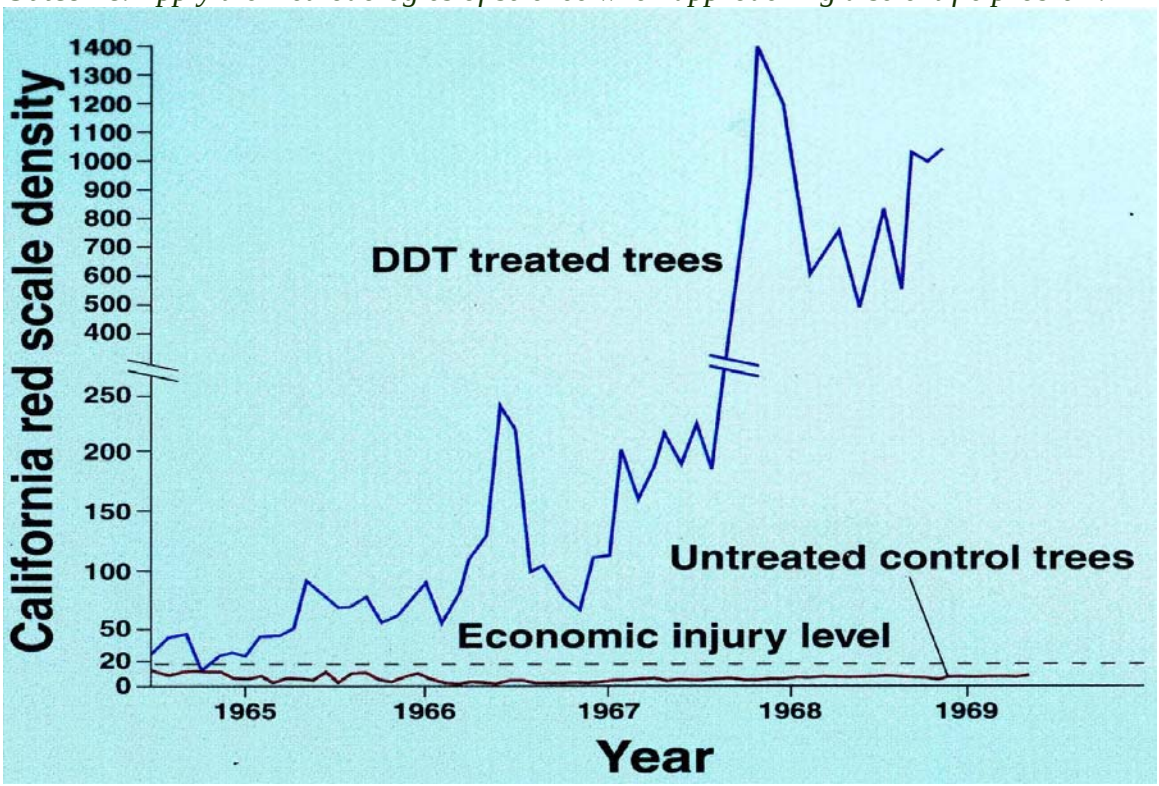
**1= 80/89 = 90%** **2 = 0/89 = 0%** **3 = 9/89 = 10%**

2. What four components are necessary for the production of ozone (photochemical smog)? Which one of these do we focus on in trying to control ozone pollution, and why? What produces this chemical compound and how do we control it?
**1 = 70/78 = 90%** **2 = 8/78 = 10%** **3 = 0/78 = 0%**

3. What is DNA mutation? How common is this phenomenon, what kinds of things cause it, and what are the possible consequences?
**1 = 77/81 = 95%** **2 = 4/81 = 5%** **3= 0/81 = 0%**

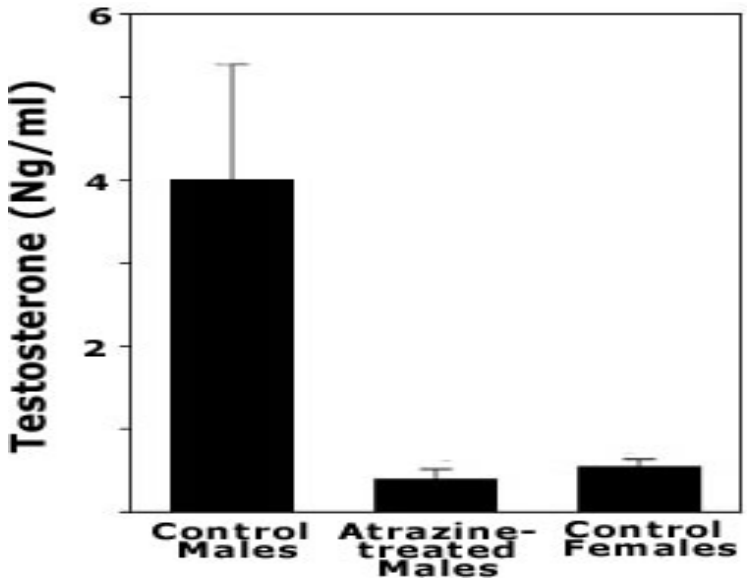
SUMMARY: 92% met or exceeded standard in "understanding natural phenomena."

Outcome: *Apply the methodologies of science when approaching a scientific problem.*




**1. The phenomenon shown in this graph occurred because:**
a. the DDT also killed off the natural predators of the pests, which reproduce more slowly than the pests themselves
b. DDT effectively controlled the pest, while untreated plants performed so poorly that they suffered economic injury
c. DDT bioaccumulated in birds and caused their eggshells to be weak
d. repeated application of the pesticide led to evolution of resistance in the red scale population

**1 = 54/64 = 84%** **2 = 9/64 = 14%** **3 = 1/64 = 2 %**




**2. The phenomenon in the graph shown above:**
a. is an example of a toxicological approach to experimentation
b. shows that when females were given a chemical to control their testosterone, it had the same effect as treating males with atrazine, but this chemical did not control testosterone in males
c. shows a feminizing effect of atrazine in males
d. is only relevant if the study were conducted in humans, because the human endocrine systems is unlike that of any other animal

**1 = 86/92 = 93%  2 = 0/92 = 0%3 = 6/92 = 7%**

SUMMARY: 90% met or exceeded standard in "applying methodology of science"

Outcome: *Explain the limitations of scientific inquiry.*
1. Multiple choice: An epidemiological approach to understanding the connection between a disease and the environment could include:
a) overlaying maps of malaria incidence with maps of rivers, wetlands, marshes, and other places mosquitoes breed
b) comparing the rate of "blue-baby syndrome" in rural areas served by wells and in urban areas served by city water supplies
c) exposing rats to different doses of bisphenol A and then comparing their rates of breast and prostate cancer
d) mutating the genes of bacteria with UV radiation in order to make them more resistant to antibiotics
**1 = 62/75 = 83%  2 = 1/75 = 1%  3 = 12/75 = 16%**

2. T/F: The EPA requires thorough testing of new synthetic chemicals before they can be released, but only in single-chemical experiments, because it is impractical to do

experiments that test exposure to several chemicals at once. *If true, write "true"; if false, write "false" and explain WHY it is false.*
**1 = 34/40 = 85%  2 = 6/40 = 15%  3 = 0/40 = 0%**

3. Short answer: The EPA and environmental organizations have been arguing over whether the EPA has authority under the Clean Air Act to regulate greenhouse gases like carbon dioxide. Give both sides of the argument and tell who is arguing what.
**1 = 94/101 = 93%  2 = 6/101 = 6%  3 = 1/101 = 1%**
SUMMARY: 88% met or exceeded the standard in "explaining limits of scientific inquiry"

OVERALL SUMMARY: Out of 620 total responses, 557 (90%) were rated as 1, meeting or exceeding standard; 34 (5%) were rated as 2, approaching standard; and 29 (5%) were rated as 3, or failing standard.

Report C

Assessment results: ENVS 190 (Senior Seminar)
Instructor: Dudley Burton
Spring 2008

This class guides students through the writing of the senior thesis. It is the only course in which Learning Outcome #8: *Ability to integrate knowledge, research, and interpretation with substantially greater sophistication than commonly expected in coursework* is evaluated.

All learning outcomes were evaluated on the finished product, the senior thesis, according to rubrics based on the CSUS Advisory Standards for Writing in the Undergraduate Major and the Assessment Criteria for Written Communication developed by the University of South Carolina.

| Outcome | Meets/exceeds | Approaches | Fails | # students |
|---|---|---|---|---|
| 1 write/speak | 20 | 4 | 0 | 24 |
| 2 quant reasoning | 0 | 2 | 0 | 2 |
| 3 research | 10 | 8 | 6 | 24 |
| 4 scientific concepts | 16 | 6 | 2 | 24 |
| 5 econ & politics | 12 | 12 | 0 | 24 |
| 6 ethics/justice | 2 | 2 | 0 | 4 |
| 7 competing persp | 22 | 0 | 2 | 24 |
| 8 integrate | 22 | 0 | 2 | 24 |

Report D

Assessment results: ENVS 111 (Environmental Ethics)
Instructor: Dudley Burton
Spring 2008

This course emphasizes reading, writing, and critical thinking around ethical issues pertaining to the environment. It is the principal course in which we evaluate Learning Outcome #6: *Ability to assess environmental problems and solutions from the perspectives of ethics, justice, human rights, and cultural diversity*. Students read, discuss and do oral presentations on covered topics.

Written work was evaluated according to the CSUS Advisory Standards for Writing in the Undergraduate Major and the Assessment Criteria for Written Communication developed by the University of South Carolina. Oral presentation rubrics were adopted from Dr. Mary Allen's 2006 assessment workshop for CSUS Academic Affairs.

| Outcome | Meets/exceeds | Approaches | Fails | # students |
|---|---|---|---|---|
| 1 write/speak | 17 | 6 | 4 | 27 |
| 2 quant reasoning | | | | |
| 3 research | 9 | 12 | 6 | 27 |
| 4 scientific concepts | 14 | 8 | 5 | 27 |
| 5 econ & politics | 18 | 6 | 3 | 27 |
| 6 ethics/justice | 20 | 7 | 0 | 27 |
| 7 competing persp | 17 | 10 | 0 | 27 |
| 8 integrate | | | | |

REPORT E

Course: ENVS 112 (International Environmental Problems)
Instructor: Michelle Stevens

This course is a writing-intensive course, so the primary learning objective is #1: *#Ability to write and speak clearly and persuasively.* Papers and oral presentations in the class also emphasize #3, research skills and #7, evaluation of competing perspectives.

Rubrics for writing assessmentwere based on the CSUS Advisory Standards for Writing in the Undergraduate Major and the Assessment Criteria for Written Communication developed by the University of South Carolina.

| Outcome | Meets/exceeds | Approaches | Fails | # students |
|---|---|---|---|---|
| 1 write/speak | 5 | 2 | 0 | 7 |
| 2 quant reasoning | | | | |
| 3 research | 5 | 2 | 0 | 7 |
| 4 scientific concepts | 5 | 2 | 0 | 7 |
| 5 econ & politics | 5 | 2 | 0 | 7 |
| 6 ethics/justice | 5 | 2 | 0 | 7 |
| 7 competing persp | 5 | 2 | 0 | 7 |
| 8 integrate | | | | |

## APPENDIX B: COMPARISON OF OLD AND NEW MAJOR REQUIREMENTS

CURRENT

**Lower Division**

| | | |
|---|---|---|
| Bio 1 | 5 units | |
| Bio 2 | 5 units | |
| Chem IA | 5 units | |
| Econ 1A | 3 units | |
| Geol 10 | 3 units | |
| **Unit total** | **21** | |

**Upper Division**

| | |
|---|---|
| Bio 160 | 3 |
| ENVS 111 | 3 |
| ENVS 112 | 3 |
| ENVS 120 | 3 |
| One of: | |
| ENVS 121 | 3 |
| ENVS 175 | 3 |
| One of: | |
| ENVS 128 | 3 |
| ENVS 171 | 3 |
| One of: | |
| ENVS 130 | 3 |
| Geog 109 | 3 |
| Geog 111 | 3 |
| Geog 111 | 3 |
| Geog 113 | 3 |
| Geog 115 | 3 |
| One of: | |
| Econ 110 | 3 |
| Econ 123 | 3 |
| Econ 162 | 3 |
| Plus: | |
| ENVS 190 | 3 |
| **Unit total** | **27** |

***Old Major total units***
***48 units + required minor (18-21 units)***

PROPOSED

**Lower Division**

| | |
|---|---|
| Bio 1 | 5 units |
| Bio 2 | 5 units |
| Chem IA | 5 units |
| Econ 1B | 3 units |
| Geol 10 or Geog 01 | 3 units |
| ES10 or ES110 or Joy/Garb | 3 units |
| **Unit total** | **24** |

**Upper Division, all students**

| | |
|---|---|
| Bio 160 | 3 |
| ENVS 111 | 3 |
| ENVS 112 | 3 |
| ENVS 120/121 | 5 |
| ENVS 122 | 3 |
| ENVS 190 | 3 |
| ENVS 195/198 | 3 to 6 |

**Upper division, B.A. only**

| | |
|---|---|
| ENVS 128 | 3 |
| ENVS 171 | 3 |
| Plus: | |
| Two ENVS options* | 6 |
| Two soc sci electives** | 6 |

**Upper division, B.S. only**

| | |
|---|---|
| Three ENVS options* | 9 |
| Three sci electives*** | 9 |

| | |
|---|---|
| **Unit total, BA** | **41-44** |
| **Unit total, BS** | **41-44** |

***New Major total units***
***65-68 units depending on internship credit***

*** ENVS options are:**

ENVS 130 (Toxicology)
ENVS 1__ (Restoration Ecology)
ENVS 1__ (Agroecology)
ENVS 1__ (Whole Earth Resource Management)
ENVS 1__ (Wetlands)
ENVS 1__ (Sustainable Mgmt Tropical Ecosystems)

**** Soc Sci electives are:**
Econ 110 (Cost Benefit Anal)
Econ 123 (Resource Economics)
Econ 162 (Energy Economics)
ENVS 124 (Social Justice/Interdisciplinary)
SOC 138 (Intro Enviro Sociology)
HIST 165 (American Enviro History)
Geog 147 (Urban Geography)
Geog 148 (Urban and Regional Planning)
Geog 161 (Calif's Water Resources)
Govt 180 (California State and Local Govt)
*or other courses by approval of dept chair*

***** Sci electives are:**
Biol 112 (Plant Taxonomy)
Biol 118 (Nat Res Conservation)
Biol 173 (Fisheries Biology)
Biol 179 (Wildlife Management)
Biol 117 (Field Botany)
Biol 157 (Entomology)
Biol 172 (Aquatic Entomology)
Biol 162 (Herpetology)
Biol 165 (Vertebrate Nat Hist)
Biol 166 (Ornithology)
Biol 168 (Mammalogy)
Biol 169 (Animal Behavior)
Biol 186B (Ecol and Enviro Issues Seminar)
Geog 109 (Geographic Info Systems)
Geog 107 (Remote Sensing)
Geog 119 (Advanced GIS)
Geog 111 (Meteorology)
Geog 113 (Climate)
Geog 115 (Geog of Plants and Animals)
Geog 116 (Global Climate Change)
Geog 118 (Changing Earth Ecosystems)
*or other courses by approval of dept chair*