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 Appendix A. Embedded exam questions were also used to evaluate GE learning objectives in ENVS 10; questions, outcomes, and results are attached as Appendix 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 Appendix C. In ENVS 111, learning outcomes #1, #3, #4, #5, #6, and #7 were evaluated; results are in Appendix D. For ENVS 112 (International Environmental Problems) results are attached as Appendix 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:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Meets/exceeds</th>
<th>Approaches</th>
<th>Fails</th>
</tr>
</thead>
</table>

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 objectives, 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.
APPENDIX 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.

<table>
<thead>
<tr>
<th>Concentration (ng/mL)</th>
<th>Reading (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>10</td>
<td>10.3</td>
</tr>
<tr>
<td>50</td>
<td>51.2</td>
</tr>
<tr>
<td>100</td>
<td>104</td>
</tr>
</tbody>
</table>

$R^2 = 2/11 = 18\%$  $2 = 5/11 = 45\%$  $3 = 4/11 = 36\%$

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?

$R^2 = 8/13 = 62\%$  $2 = 2/13 = 15\%$  $3 = 3/13 = 23\%$

3. Analysis of final project data

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?

$R^2 = 10/14 = 72\%$  $2 = 2/14 = 14\%$  $3 = 2/14 = 14\%$
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
APPENDIX 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.”
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

\[
\begin{array}{c|c|c}
\text{Control Males} & \text{Atrazine-treated Males} & \text{Control Females} \\
\hline
2 & 1 & 0
\end{array}
\]

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

\[
\begin{array}{c|c|c}
1 & 2 & 3 \\
62/75 = 83% & 1/75 = 1% & 12/75 = 16%
\end{array}
\]

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.
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.
Appendix 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.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Meets/exceeds</th>
<th>Approaches</th>
<th>Fails</th>
<th># students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 write/speak</td>
<td>20</td>
<td>4</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>2 quant reasoning</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3 research</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>4 scientific concepts</td>
<td>16</td>
<td>6</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>5 econ &amp; politics</td>
<td>12</td>
<td>12</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>6 ethics/justice</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7 competing persp</td>
<td>22</td>
<td>0</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>8 integrate</td>
<td>22</td>
<td>0</td>
<td>2</td>
<td>24</td>
</tr>
</tbody>
</table>
Appendix 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.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Meets/exceeds</th>
<th>Approaches</th>
<th>Fails</th>
<th># students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 write/speak</td>
<td>17</td>
<td>6</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>2 quant reasoning</td>
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<td>27</td>
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<tr>
<td>3 research</td>
<td>14</td>
<td>8</td>
<td>5</td>
<td>27</td>
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<tr>
<td>4 scientific concepts</td>
<td>18</td>
<td>6</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>5 econ &amp; politics</td>
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<td>7</td>
<td>0</td>
<td>27</td>
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<tr>
<td>6 ethics/justice</td>
<td>17</td>
<td>10</td>
<td>0</td>
<td>27</td>
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<tr>
<td>7 competing persp</td>
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<tr>
<td>8 integrate</td>
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APPENDIX 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 assessment were 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.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Meets/exceeds</th>
<th>Approaches</th>
<th>Fails</th>
<th># students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 write/speak</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>7</td>
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<tr>
<td>2 quant reasoning</td>
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<tr>
<td>3 research</td>
<td>5</td>
<td>2</td>
<td>0</td>
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<td>4 scientific concepts</td>
<td>5</td>
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<td>7</td>
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<td>5 econ &amp; politics</td>
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<td>8 integrate</td>
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