Self-Study of the Geography Major
March 20, 2015

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A. Introduction

Geography is the academic discipline that bridges the natural and social sciences. Geographers study and analyze the relationships between human activities and the natural and built environment. Geography at SSU is housed within the School of Social Sciences, although Geography Departments are commonly found in Schools of Arts and Sciences and Natural Sciences as well.

Geography Majors develop a broad understanding of the world around them. They establish a strong foundation in the basic physical and social processes that shape rural and urban landscapes. They explore the roots of environmental and social problems, and they gain the analytical tools needed to solve those problems.

Most undergraduates majoring in Geography at SSU (65%) intend to pursue a higher degree in the future (Table 1). The Geography Program is therefore designed to meet two needs: preparing students for work and for graduate school.

<table>
<thead>
<tr>
<th># STUDENTS</th>
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* From student exit survey

Students develop practical skills as well as analytical thinking and writing skills that are directly marketable to a wide range of employers, and will prepare them for graduate school.

a. Previous Program Review

The Geography Department has conducted 3 Program Reviews in recent history, in 1989, 1996 and 2008. In its last Self Study, the Department identified at 14 specific goals, each of which is addressed further below in this new Self Study. The external reviewer, Dr. Christine Rodrigue of CSU Long Beach made four overarching recommendations to the University which are reviewed briefly here. Some have improved, and others not:

1. Better support for faculty research: Lower SFRs (Student Faculty Ratios) from ~30:1 to ~20:1; fund more sabbaticals; make grant and contract indirect allocation more transparent at all levels as is the case at CSULB; and institute internal competitions for research released time (critical for probationary faculty).

   Progress: SFRs are still high, sabbaticals remain at minimum level required by CSU, and internally-funded research release time remains unavailable. More indirect money from grants and contracts has been coming back to faculty, although the process remains opaque and uncertain.

2. Better support for facilities: Make lottery funds directly available to departments and schools on a well-publicized and competitive basis. Geography and Global Studies desperately needs to swap the computer and cartography laboratories.
Progress: Lottery funds have not become available, but the University and the School of Social Sciences funded a major remodel of the computer laboratory, which is detailed below.

3. Better allocation of instructional facilities: Geography and Global Studies needs prime time access to a jumbo classroom for another one or two sections per semester and another two or three medium-sized rooms

Progress: Room allocations have now been automated, so Geography now has equal chance to receive large classrooms.

4. Faculty allocation needs improvement: The Department immediately needs another tenure-track line to stabilize the curriculum and reduce the Department's dependence on an unusually unstable and green adjunct faculty pool. As well, the Department will need another tenure-track physical/environmental geographer to prepare for Dr. Freidel's retirement.

Progress: The Department has not received another tenure-track line, but Dr. Freidel was replaced after her retirement. Resources to hire adjuncts to meet target and provide resiliency to our curriculum are decreasing.

B. The Curriculum

1. THE PROGRAM

a. Learning Objectives

In the context of the 2008 Program Review, the Geography Department updated its overall learning objectives for the major to the following:

1. Understand the basic processes of the atmosphere, hydrosphere, lithosphere, and biosphere, and how those physical processes shape the patterns of the Earth’s surface
2. Understand the origins, characteristics, processes, and distribution of the world’s major economic and political systems, and culture area
3. Understand how a region’s economic, political, cultural, demographic, and environmental processes intertwine within and between regions, and across scales, to create the Earth’s complex human-environment mosaic
4. Use maps and other geographic representations, tools, and technologies to acquire, analyze, and report information from a spatial perspective
5. Understand how geospatial technology and procedures can be used for geographic inquiry and analysis
6. Understand how human actions modify the physical environment and how the physical environment impacts human systems
7. Oral and Written Communication Skills

These objectives do not represent the full breadth of the discipline, but they capture crucial components and prepare students as competent geographers.

The last objective, addressing oral and written communication skills, were included as essential goals of any department housed in a liberal arts institution.
b. Curriculum Structure
The major is designed to expose students to the full extent of the discipline, yet also allow them to develop an area of specialization if they choose. All majors experience the same general curriculum:

I. LOWER DIVISION CORE COURSES
- A human or world regional geography class
- A physical geography class

II. UPPER DIVISION BREADTH COURSES
- A human or human/environment geography class
- A biophysical geography class
- A regional synthesis class
- A geospatial techniques class
- A senior project class

III. UPPER DIVISION ELECTIVE COURSES
- 4 additional geography classes

IV. SUPPORTING COURSES outside Geography
- 2-3 classes in other disciplines related to their specific area of interest

This structure ensures that students develop proficiency in all of the major’s learning objectives (Table 2). Students may follow a General Plan, selecting all of their courses individually within that structure. Or, they may choose a concentration, which predefines appropriate courses in one of the four disciplinary themes:

   The Biophysical Environment: Natural environment systems from global to local scales, including weather and climate change, landform history, and biological patterns and processes.

   Environment and Society: Human-environment relations, natural resource management and sustainable development

   Geospatial Techniques: Geographic Information Systems and allied technology used to describe, model and manage coupled human and natural systems at local to global scales

   Globalization and Identity: Global economic and political change, and how these processes shape cultures, self-identities, and access to wealth and power.

The study plans for these concentrations do not deviate from the general curriculum structure shown above. They simply guide students towards particular breadth, elective and supporting courses that focus on their area of interest. The specific study plans for each of the four concentrations are provided in Appendix I.

c. Geography and GE
Five Geography classes are a part of the SSU General Education Curriculum:

201 Global Environmental Systems
203 Human Geography
202 World Regional Geography
302 World Regions in Global Context
338 Social Geography

B1 – Physical Environments
D2 – Historical Perspectives
D5 – International Perspectives
E – Integrated Person

The Department schedules a relatively large number of GE courses. A few other majors in the School of Social Sciences, such as Psychology, actually mount more GE classes in total than Geography, but GE
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**KEY to Classes**

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**FIELD**
- 312 Geographic Conferences
- 313, 314 Field Experience (Local & Abroad)
- 315 Field Methods in Geography
- 317 Lab Methods in Physical Geography

**HUMAN**
- 320 Geopolitics
- 338 Social Geography
- 350 Globalization and the City

**HUMAN/ENVIRON**
- 322: Globalization and Environments
- 335 Global Food Systems: Scarcity and Sust.
- 340: Conservation of Natural Resources
- 352 Climate Change and Society

**BIOPHYSICAL**
- 360 Geomorphology
- 365 Biogeography
- 370 Weather and Climate
- 372 Global Climate Change: Past, Prsnt, Future
- 375 Natural Hazards

**GEOSPATIAL**
- 380 Environmental Remote Sensing
- 385 Cartographic Visualization
- 387 Intro to Geographic Information Systems
- 483 Environmental GIS
- 487 Advanced GIS

**REGIONAL**
- 302 World Regions in Global Context

**SYNTHESIS**
- 490A/B Senior Seminar

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classes have a larger impact on the Geography Department because it is relatively smaller than those other majors. This situation is evident in the SFRs (Student Faculty Ratio) across the School, which shows Geography with the highest SFR (Figure 1).

![Figure 1. Student Faculty Ratio (SFR)](image)

SFR in Geography’s upper-division major courses are on par with other departments within the school – averaging around 25 (Figure 1).

2. CHANGES SINCE LAST PROGRAM REVIEW

a. Goals from previous review

All 3 goals set out in the 2008 Self Study concerning the curriculum were met:

1. Make the Department’s learning objectives more visible
   
   **How met:** The Department posted its learning objectives on several departmental web pages. The University adopted a universal syllabus format that requires learning objectives be included in class syllabi. The Department has fully implemented that policy.

2. Align paper format guidelines and standards across all upper division geography classes.
   
   **How met:** Guidelines have been developed and posted on a departmental web page.

3. Modify the Senior Exit Survey to assess learning objectives and to make them easier to summarize.
   
   **How met:** The survey was transformed from an essay to a set of quantitative and short-answer questions that ensure students address the issues consistently.

b. Additional significant changes

Over the last 6 years, the Department has:

1. Deleted and added several courses in the curriculum
With the replacement of two tenure-track faculty, and with updates by continuing faculty, several courses were deleted, modified or added over the years. Notable new additions include:

317: Lab Methods in Physical Geography  
322: Globalization and Environments  
352: Climate Change and Society  
483: Environmental GIS

2. Reconfigured GEOG 201: Global Environmental Systems

This lower division physical geography core course changed from a medium-sized lecture-oriented course to a large lecture/lab-oriented course. Experienced geography majors facilitate the course’s weekly 2-hour labs.

3. Redesigned GEOG 490: Senior Project

An additional unit was added to the Project, stretching it across the Fall (490A 1-unit) and Spring (490B 4-units). This change allows more instruction on research methods and it starts the research process earlier, which will (hypothetically) improve the quality of the end product.

4. Deleted GEOG 205: Introductory Map Reading (1-unit).

The learning objectives from this course were redistributed into three other courses, with 1) GEOG 203: Human Geography taking over the curriculum covering cartographic representation; 2) GEOG 201: Global Environmental Systems taking on coordinate systems and scale; and 3) GEOG 387: Intro to GIS expanding existing coverage of coordinate systems, scale, datums and projections.

The main reason for this change was to put an end to a human-resource problem. No single faculty member had room in his/her schedule, or the desire, to take on sole responsibility for the course. As well, the Department experienced poor results assigning the course to visiting lecturers. Hence, for several years, the Departments’ four tenure-track faculty ‘team-taught’ the class. The unit credit for the course was rotated to different faculty each semester – depending on who could officially fit it in their schedule. This model was unsustainable and produced weak student evaluations, and so the Department decided to experiment with distributing the course content to other classes.

5. Increased the number of student-teacher research activities available in the Department

The University has been promoting the student-teacher research model. The Geography Department has been particularly successful in implementing that initiative. Examples include:

- CIGA (the Center for Geospatial Analysis):
  - Two large grants funded by NSF and NASA in the last 5 years have involved students in GIS data organization, reference data collection from Google Earth, image processing, and field activities to support research involving remote sensing for land-cover change forest conservation applications in Latin America and California. Students interact closely with Dr. Clark and a post-doctoral researcher and receive pay as well as optional internship credits. In this time, CIGA’s grants have paid approximately $60,000 to employ 39 undergraduate and 3 graduate students that, combined, have logged over 5,000 hours of work. Students have come from Geography, ENSP (Environmental Studies and Planning), Computer Science and Biology departments.
SQUAL (the Sonoma Quaternary Lab):

- Six undergraduate students have participated in paleoecological data collection over the last 3 years. They have been included as co-authors and principal author on conference abstracts and presentations. Most students are paid but internship credit is also available.

Other faculty research

- One Geography student has participated in a Sandhill crane habitat mapping project, collecting ground-truth data for remote sensing analysis in the Northern Sacramento Valley.

3. ASSESSMENT

a. Learning Objectives

Over the last five years, the Department has used three instruments to assess how well its classes align with its learning objectives, and how well students meet them: 1) senior exit surveys; 2) class-level surveys; and 3) a course-embedded evaluation of student performance in a key course.

i. Senior Exit Survey  The Senior Exit Survey asked Geography Majors to assess how well the major, as a whole, met its departmental learning objectives. Scores reveal a strong upward trajectory across nearly all of the learning objectives between 2008 and 2014 (Table 3).

Table 3. Average Scores from the Senior Exit Survey

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Scoring Rubric: 1-7; 7=high
This particular assessment was not conducted in 2009, 2010 or 2013.
Samples are smaller than class sizes; some students did not take the survey.

Learning Objectives (LO)

1. Understand the basic processes of the atmosphere, hydrosphere, lithosphere, and biosphere, and how those physical processes shape the patterns of the Earth’s surface

2. Understand the origins, characteristics, processes, and distribution of the world’s economic and political systems, and major culture areas.

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5. Understand how geospatial technology and procedures can be used for geographic inquiry and analysis.

6. Understand how human actions modify the physical environment and how the physical environment impacts human systems

7. Oral and/or written communication skills
Table 4. Scores for student perception of how well the learning objectives were met by each class (Fall 11/S12)

| 1 | 4.5 | X | 5.0 | x | 4.9 | 4.4 | x | 4.5 | 4.6 | 4.5 | 4.0 | x | 4.8 | 4.3 | 4.9 | x | 4.6 | 4.5 | 4.9 | 4.7 | 4.6 | 4.0 | 4.8 | 4.3 | 4.9 | x | 4.6 |
| 2 | x | 4.9 | x | 4.9 | x | 4.7 | 4.4 | x | 4.8 | 4.4 | 4.4 | 4.8 | 4.4 | x | 4.9 | 4.9 | 4.7 | x | 4.9 | 4.9 | 4.7 |
| 3 | x | 4.9 | x | 5.0 | x | 4.8 | x | 4.9 | x | 4.2 | x | 4.9 | x | 4.7 | x | 4.8 | 4.6 |
| 4 | 4.7 | x | 4.5 | x | 4.9 | x | 4.7 | x | 4.8 |
| 5 | x | 4.9 | x | 4.9 | x | 4.3 | 4.9 | x | 4.6 |
| 6 | 4.5 | x | 4.9 | x | 5.0 | 4.3 | x | 5.0 | x | 4.8 | x | 4.5 | x | 4.7 | 4.0 | x | 4.8 | 4.8 | 4.5 | 4.9 | 4.7 |
| 7 | x | 4.9 | x | 4.8 | x | 4.0 | x | 4.8 | 4.7 | x | 4.4 | 4.4 | x | 4.9 | 4.9 | 5.0 |
| N | 50 | 80 | 3 | 11 | 30 | 25 | 23 | 19 | 15 | 19 | 16 | 14 | 30 | 60 | 13 | 8 |

**Learning Objectives (LO):**

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7. Oral and/or Written Communication Skills

**KEY to Classes**

**CORE**
- 201 Global Environmental Systems
- 202 World Regional Geography
- 203 Human Geography

**FIELD**
- 312 Geographic Conferences
- 313, 314 Field Experience (Local & Abroad)
- 315 Field Methods in Geography
- 317 Lab Methods in Physical Geography

**HUMAN**
- 320 Geopolitics
- 338 Social Geography
- 350 Globalization and the City

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- 352 Climate Change and Society

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- 365 Biogeography
- 370 Weather and Climate
- 372 Global Climate Change: Past, Prsnt, Future
- 375 Natural Hazards

**GEOSPATIAL**
- 380 Environmental Remote Sensing
- 385 Cartographic Visualization
- 387 Intro to Geographic Information Systems
- 483 Environmental GIS
- 487 Advanced GIS

**REGIONAL**
- 302 World Regions in Global Context

**SYNTHESIS**
- 490A/B Senior Seminar

* X’s indicate that the class was not taught or evaluations not made

Scoring Rubric: 1-5; 5=high
The trend is especially notable in the oral and written communication skills (#7) as well as in the core human and regional geography objective (#2). Overall, scores are now relatively strong across the board, which suggests that the Department has substantially improved the alignment of its curriculum with the learning objectives. It also suggests that the quality of teaching has improved overall.

ii. Class-level Surveys of Learning Objectives  Between Fall 2008 and Spring 2012, during teaching evaluations, students were asked to assess how well they felt that class met the departmental learning objectives assigned to that course. Only scores for the more recent years are reported (Table 4). Results suggest that all courses meet the learning objectives solidly and consistently, with no classes receiving a mean score below “effective” -- 4.0 out of 5.

iii. Student performance in key classes  In 2010, the Department conducted a course-embedded assessment of how well students who took its lower division physical geography course (GEOG 201: Global Environmental Systems) were meeting the Department’s key bio-physical learning objective:

**LO #1:** Understand the basic processes of the atmosphere, hydrosphere, lithosphere, and biosphere, and how those physical processes shape the patterns of the Earth's surface.

To conduct this assessment, Dr. Goman, the faculty member who teaches that course, reviewed student performance in the cumulative final exam. Each exam question was categorized into one of the four major spheres. She created 4 exam keys with each one focusing on one “sphere,” and requested statistical output for each individual student. She also created a rubric which categorized each student into one of three achievement levels. In this way, the Department was able to determine how well each student understood a particular “sphere” by the end of the course. The assessment reveals that students find mastery of the lithosphere the most challenging, but that most students are meeting the overall objective (Table 5).

This assessment approach provides the most rigorous data, but is time intensive to implement. The Department has not chosen to pursue this approach for any other department learning objectives.

<table>
<thead>
<tr>
<th>Table 5: Student mastery of biophysical learning objective in GEOG 201 (Number (and %) of students scoring at each level for each sphere)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphere</td>
</tr>
<tr>
<td>Atmosphere (18 Questions)</td>
</tr>
<tr>
<td>Hydrosphere (18 Questions)</td>
</tr>
<tr>
<td>Lithosphere (29 Questions)</td>
</tr>
<tr>
<td>Biosphere (15 Questions)</td>
</tr>
</tbody>
</table>

N=45

b. Curriculum Deficiencies
The curriculum needs to provide students with more experience and marketable skills in the fields of resource management, geospatial technology and statistical data analysis -- particularly in topics that span human and natural processes. Geography departments typically offer a range of courses that provide students with a strong foundation in the physical and social sciences behind particular environmental challenges, an understanding of various policy approaches to their resolution, and experience with various tools used to analyze the ecological and socio-economic implications of those approaches. Some courses teach students how to model those problems and assess policy impacts through analysis of geospatial and
other quantitative and qualitative datasets. These are highly marketable skills for students. Typically, Geography Departments offer several courses focused on particular resources, such as water (e.g. Watershed Analysis) or soil (e.g. Rangeland Management). At present, our Department only offers a few basic introductory courses that broadly exposes students to these issues and modeling approaches, such as GEOG 394: Conservation of Natural Resources and GEOG 483: Environmental GIS.

Our Department proposes to strengthen its curriculum in this area through the lens of ecosystem services. Recently, Geography and other environmental fields have begun to utilize the concept of ecosystem services as a unifying theme that focuses scientific inquiry and management efforts towards maintaining basic ecosystem functions that support human well-being in the face of global change. These functions provide supporting (e.g., nutrient cycling), provisioning (e.g., food, water, fiber), regulating (e.g., climate, flood control, disease), and cultural (e.g., aesthetic, recreational) services. Ecosystem services are also employed to frame urban sustainability and environmental justice studies.

This new curriculum would build on the foundational courses that we currently offer, and provide students with a deeper scientific understanding of particular ecosystem services (depending on the background of the faculty member), how to analyze the socio-economic and ecological implications of various policy approaches, and how to model certain aspects of those policy approaches through the scientific method and statistical analysis of geospatial and other datasets.

In addition to our existing courses, new courses would provide Sonoma State students with highly marketable skills relevant to natural resource management and conservation, land-use planning, environmental and social sustainability, climate change adaption and mitigation and scientific research.

c. Utilization of Study Plans

The Concentrations within Geography are designed to help students understand the different fields within the discipline, choose courses relevant to their career goals, and market themselves when they leave SSU. Many students choose to follow a concentration, although about half do not (Table 6). The low number of students following the Geospatial Techniques Concentration may be caused in part by the fact that Dr. Clark, the primary faculty member teaching in that area, does not carry a full teaching load. He is assigned 4 units per semester to manage CIGA, so the advanced courses are offered in alternating years. Students have to start the sequence of courses on time and be vigilant about taking the right courses to ensure a timely graduation. That problem has been exacerbated since he became Dept. Chair. Many students with a strong interest in that area have been temporarily advised to follow the general plan with no concentration, although they are taking all available classes in that field.

The relatively low numbers in the Environment and Society Concentration can probably be attributed to the presence of Environmental Studies and Planning (ENSP), which competes with Geography for students who have that interest. ENSP wins.

<table>
<thead>
<tr>
<th>Table 6. Distribution of Geography Majors among the concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biophysical Environment</td>
</tr>
<tr>
<td>Environment and Society</td>
</tr>
<tr>
<td>Globalization and Identity</td>
</tr>
<tr>
<td>Geospatial Techniques</td>
</tr>
<tr>
<td>General Plan, no concentration</td>
</tr>
</tbody>
</table>
d. Graduation Rates

Geography Majors at SSU navigate the curriculum and graduate in a timely fashion. In the 2011-2013 time period, Geography Majors who came to SSU as “first time freshmen” took an average of 134 total units, and graduated in 4.2 years (Table 7). These figures are in line with, or better, than other Geography Departments within the region. They also confirm that the Department’s curriculum structure does not currently contain any bottlenecks that prevent its majors from graduating on time.

<table>
<thead>
<tr>
<th></th>
<th>Student Count*</th>
<th>Years to Graduate (median)</th>
<th>Total Units Earned (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacramento</td>
<td>16</td>
<td>4.67</td>
<td>130.24</td>
</tr>
<tr>
<td>San Francisco</td>
<td>43</td>
<td>4.36</td>
<td>132.35</td>
</tr>
<tr>
<td>San Jose</td>
<td>7</td>
<td>5.00</td>
<td>138.79</td>
</tr>
<tr>
<td>Sonoma</td>
<td>18</td>
<td>4.19</td>
<td>133.84</td>
</tr>
</tbody>
</table>

It should be noted that the student count is very low because these figures are limited to students who arrived at SSU as declared Geography Majors. This is very rare. Most students declare Geography in their sophomore or junior years, after having taken a Geography course.

e. Reconfiguration of GEOG 201

The reconfiguration of the introductory physical geography course GEOG 201: Global Environmental Systems, from a lecture-only to a lecture/lab course, has had a number of impacts, both positive and negative. Notable impacts include:

- Larger class sizes (increasing from about 45 to 120) per class. Hence, more SSU students are exposed to physical geography.
- An increase in hands-on activities for students in the lab sections.
- An increase in opportunities for teaching and leadership experience for student T.A.’s who run the labs.
- An increase in human resource challenges for Dr. Goman, the faculty member running the course. Recruiting quality T.A.s has been difficult and, once, an unstaffed section had to be cut.
- Increases in management tasks for Dr. Goman, although some of that time is compensated by an extra unit of WTU.
- An increase in efficiency in FTES per WTU.

In Fall 2014, 26 current and former student lab facilitators were sent a survey to assess their experience. Fifteen responded. All of them indicated that they would recommend being a lab facilitator. A majority indicated that the experience had a positive impact on their own studies and career decisions. Students
were asked to identify the specific skills they gained. Nearly all highlighted how they developed their communication skills, their understanding of physical geography, and their ability to “think on their feet” (Table 8). Students have found the communication skills to be especially useful after graduation (Table 8).

<table>
<thead>
<tr>
<th>Table 8. Lab facilitator survey responses</th>
<th># Resp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which skills did you gain or improve by being a lab facilitator?</td>
<td></td>
</tr>
<tr>
<td>Organizational skills</td>
<td>10</td>
</tr>
<tr>
<td>Confidence in public speaking</td>
<td>12</td>
</tr>
<tr>
<td>Ability to &quot;think on your feet&quot;</td>
<td>14</td>
</tr>
<tr>
<td>Communication skills</td>
<td>14</td>
</tr>
<tr>
<td>Better understanding of physical geography</td>
<td>14</td>
</tr>
<tr>
<td>Which skills (developed as a lab facilitator) have you used in your professional career?</td>
<td></td>
</tr>
<tr>
<td>Public speaking</td>
<td>10</td>
</tr>
<tr>
<td>Organizational skills</td>
<td>10</td>
</tr>
<tr>
<td>Communication skills</td>
<td>12</td>
</tr>
<tr>
<td>N</td>
<td>15</td>
</tr>
</tbody>
</table>

f. Student Performance in Basic Spatial Concepts

As noted above, in 2012 the Department deleted its Introduction to Map Reading course, and redistributed the learning objectives to several other courses. The Department has not yet conducted an independent assessment on the impact of this change. But, the Department has discussed their anecdotal observations and identified several reasons for concern, including:

- Students are not remembering the basic spatial concepts (e.g., projections, coordinate systems, scale) they learned in the GE human and physical courses well enough to apply them in the geospatial techniques courses. Those concepts have to be taught again, beyond a simple review, in the techniques courses.
- There are no lower-division prerequisites for geospatial techniques courses, so many non-Geography majors, who have not taken those GE courses, have not been exposed to basic spatial concepts at all.
- The techniques courses do not have enough time to cover spatial concepts adequately, so the material is covered too quickly. Student performance in the exams suggests that they are not mastering it.

These observations suggest that the current approach is not working.

g. Student Assessment of the Curriculum

The Senior Exit Survey posed several open-ended questions to ascertain students’ satisfaction with the major’s curriculum. Two of the questions asked students to assess where their training was strongest and weakest. These questions did not elicit useful information, however, because their responses largely aligned with the courses that they chose to take, or with the concentration they chose to follow. For
example, students who focused on biophysical courses said that their training was weakest in the human fields, and visa-versa. The questions did not identify holes in the curriculum as hoped.

Students were also asked to compare their Geography courses with other courses they have taken at SSU. The results were only marginally more insightful. They said that they find their major courses more interesting, but this is not surprising since they presumably chose this major because they found the courses most interesting (Table 9). Most also felt that the courses were harder, but this can also be expected since upper division major courses are likely harder than the general education courses students typically take outside their major. Nevertheless, the responses suggest that most Geography Majors find the major to be rigorous, and they appreciate interacting with high-quality teachers (Table 9).

<table>
<thead>
<tr>
<th>Comment</th>
<th># Resp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>more challenging / harder</td>
<td>8</td>
</tr>
<tr>
<td>more interesting / enjoyable / stimulating</td>
<td>8</td>
</tr>
<tr>
<td>more interaction with teachers / teachers</td>
<td>7</td>
</tr>
<tr>
<td>more approachable</td>
<td></td>
</tr>
<tr>
<td>better teachers</td>
<td>5</td>
</tr>
<tr>
<td>easier</td>
<td>3</td>
</tr>
<tr>
<td>on par</td>
<td>2</td>
</tr>
<tr>
<td>more hands on</td>
<td>1</td>
</tr>
<tr>
<td>N</td>
<td>34</td>
</tr>
</tbody>
</table>

Survey years: 2008;2011;2012;2014

In addition, the students were asked to score (quantitatively) how well the curriculum improved their analytical thinking skills and stimulated them to produce high quality work. Results indicate that students are, indeed, stimulated by the curriculum (Table 10). Notably, the scores have risen significantly over the last several years, which suggest that the students are particularly happy with the quality of teaching from the new faculty.

<table>
<thead>
<tr>
<th>Table 10. Student Perceptions of the quality of the curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>2008</td>
</tr>
<tr>
<td>The Major has been intellectually stimulating</td>
</tr>
<tr>
<td>The major has improved the quality of my thinking</td>
</tr>
<tr>
<td>The curriculum stimulated me to do my best work</td>
</tr>
<tr>
<td>N</td>
</tr>
</tbody>
</table>

Scoring Rubric: 1-7; 7=high
Samples are smaller than class sizes; some students did not take the survey.
In 2009 and 2010, two versions of the survey were distributed, and only one version contained these questions.

3. ACTION PLAN

The Department does not foresee the need for a major overhaul of its curriculum in the near future, but it has identified a few areas in need of further attention and improvement.

Goal #1. Strengthen the curriculum (through a new hire) with courses in the areas of human-environment interactions, data analysis and geospatial science
The Department needs to broaden its curriculum in the areas of human-environment interactions, data analysis and geospatial science. Courses in these areas would strengthen students’ understanding of the physical and social science behind environmental problems, the socio-economic and ecological implications of various policy approaches, and how to model the impacts of various management approaches through scientific analysis of spatial and other data.

**Goal #2. Develop a new human-environment GE course**

At this point, students largely regard the Environmental Studies and Planning (ENSP) as the only major at SSU that examines human-environment interactions. ENSP’s lower division GE course “Global Environmental Issues” addresses environmental sustainability and recruits many majors. Current GE offerings in Geography do not clearly demonstrate to students that Geography addresses environmental sustainability. A course that demonstrates this aspect of Geography may be a better recruitment tool than Human or World Regional Geography.

The Department should also consider integrating the Department’s upper division GE course GEOG 338: Social Geography into the major’s curriculum by accepting it as an upper division human course.

**Goal #3. Improve recruitment of T.A.s for GEOG 201: Global Environmental Systems**

Dr. Goman is committed to maintaining the new lecture/lab model for this course into the near future. The Department will implement new strategies to increase the pool of T.A. applicants, such as:

- Make connections with the Education Department to recruit student-teachers intending to teach science.
- Explore whether ENSP and Geology can be additional sources for T.A.’s, perhaps by cross-listing an experience course.

**Goal #4. Strengthen the introductory spatial concepts curriculum**

The Department needs to rethink its strategy for delivering the spatial concepts formerly taught in GEOG 205: Introduction to Map Reading. Possible strategies might include:

- Resurrecting GEOG205 and making it a prerequisite to all geospatial techniques courses.
- Creating a new course (e.g. GEOG 287: Introduction to Spatial Analysis) which would include the basic geospatial concepts (e.g., projections), as well as some of the more basic GIS concepts through web-based technology. This course would not use the full professional GIS software. GEOG 387, the current introductory course, would then expand its instruction and use of the professional GIS software.
- Implementing new pedagogical approaches in GEOG 387 to review and develop student understanding of these concepts more deeply and quickly. Tools might include online videos, web resources and homework assignments.

**Goal #5. Improve the quality and utility of the senior assessment instruments**

To improve students’ assessment of their experience, redesign the Senior Exit Survey to make it easier for students to navigate correctly. Rewrite the short-answer questions to be clearer in their intent.

To improve the department’s assessment of student performance, it should consider:
• Participating in the Collegiate Learning Assessment (CLA) which measures college students’ performance in analysis and problem solving, scientific and quantitative reasoning, critical reading and evaluation, and critiquing an argument, in addition to writing mechanics and effectiveness.

• Developing an assessment rubric of its own, perhaps in the Senior Project.

**Goal #6. Maintain resources critical to the curriculum**

The department needs to maintain a vigilant eye on two critical sources of supportive funding:

• Funds used for field excursions

  The Department’s curriculum is greatly strengthened by field excursions. Academic Affairs sought to take away these additional funds in the 2015-2016 but then retracted the decision when faced with resistance from impacted departments and students, who would be asked to pay additional course fees. The Department must act quickly if those resources are in jeopardy.

• Funds that support the Map Library’s staffing

  When the Department’s technical assistant, Mike Hearty, retired in 2010, the School agreed to fund students to take over some of his duties, including maintaining the Map Library. Over the last several years, the School has followed through with that commitment, but the Department has to remember to ask for it.

**Goal #7. Make the Department more visible to the University Community**

The Department should make it clearer to the University how it contributes to two major initiatives on campus:

**The Sustainability Initiative**

The University recently adopted a sustainability initiative that, among other things, intends to promote curriculum and co-curricular programming around environmental sustainability. Throughout the process of developing that initiative, it was repeatedly apparent that much of the University community is not adequately informed about Geography’s established curriculum in that arena.

The Department should consider various options such as:

• Maintaining faculty presence on committees associated with sustainability initiatives

• Increasing the visibility of the Department’s environmental sustainability curriculum through strategies, such as renaming courses, recasting course descriptions, rewriting course learning objectives and redesigning outreach materials such as brochures and hall posters.

**STEM Curriculum**

The University has been strengthening and coordinating its STEM curriculum. At the same time, the University community remains inadequately informed about Geography’s established curriculum in that arena.

The Department should consider various options such as:
• Emphasize to the Social Science administration that there are upper-division STEM courses taught in Geography that require investment in equipment and commitment to low class sizes.
• Maintaining faculty presence on committees associated with STEM initiatives
• Make the Department’s current STEM-related serviced-based learning projects more visible within the University. Strategies might include posting them on the departmental web page, coordinate press releases with the campus News and Information Coordinator and encouraging students to present their work in various forums.

C. Student Body

1. THE PROGRAM

SSU Geography Majors are motivated, active, and excited about Geography. Perhaps the best testament to the quality of the students is their performance in regional professional meetings. Over the past five years, 26 students presented their original research to the annual California Geographical Society meeting. One student won first place in the undergraduate poster competition, and two won the Christopherson Prize. Others have been awarded third place and honorable mentions in the paper competitions. Two students have given papers recently at the AAG (one received an honorable mention in a specialty group student presentation competition) and APCG conferences.

a. Number of Geography Majors

The Geography Major is relatively small. Over the last 15 years, the major has averaged around 35-40 students (Figure 2).

![Figure 2. Number of Geography Majors](image)

About half (51% in the 2011-2013 time period) of those students come to SSU as transfers. Very few freshmen arrive as declared Geography Majors. Moreover, it takes a while for them to discover the discipline. This situation creates an unbalanced distribution of majors (Table 11). If more students found out about Geography earlier, the Department would likely average closer to 50-60 majors.
Table 11. Proportion of Geography Majors by class level

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2011</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>14%</td>
<td>13%</td>
<td>7%</td>
</tr>
<tr>
<td>Sophomores</td>
<td>12%</td>
<td>20%</td>
<td>28%</td>
</tr>
<tr>
<td>Juniors</td>
<td>46%</td>
<td>22%</td>
<td>32%</td>
</tr>
<tr>
<td>Seniors</td>
<td>27%</td>
<td>46%</td>
<td>32%</td>
</tr>
<tr>
<td>N</td>
<td>41</td>
<td>46</td>
<td>43</td>
</tr>
</tbody>
</table>

Importantly, the Department houses two majors. Together with Global Studies, the Department had about 110 majors last Spring 2014. These numbers suggest a 40:60 ratio of Geography and Global Studies students. Relative to the rest of the School of Social Sciences, the Department remains small, even with both majors (Figure 3).

![Figure 3: Majors in the School of Social Sciences, Spring 2014](image)

b. Advising

Relative to the rest of the School of Social Sciences, the Department’s advising ratio is on par with other Departments of comparable size. (Figure 4). That provides an opportunity for the Department to provide personalized and attentive advising.
c. Student Club

The Department has a student club that serves both the Geography and Global Studies majors. Geography Majors tend to be the dominant force in this club. The club has business meetings several times a semester and sponsors activities that support awareness of Geography on campus and promote social cohesion and fun among majors.

2. CHANGES SINCE LAST PROGRAM REVIEW

a. Goals from Previous Review

The two goals set out in the 2008 Self Study concerning the Student Body focused on implementing strategies to recruit majors:

1. Maintain high targets, and possibly increase targets, for GE classes in order to recruit majors

   How met: Through negotiations with the Dean for classroom space and FTES, the Department met that goal, increasing the number of large GE courses it offers. As noted earlier, that strategy manifests in Geography’s relatively high overall SFR (Figure 1).

2. Develop and prioritize other strategies to increase interest, visibility and awareness of Geography

   How met: The Department identified a range of strategies it might try. The following identifies which it implemented (YES), which it did not implement (NO), and which were partially implemented (PARTIAL):

   - Launch or redesign classes to increase their student appeal (YES)
     - Redesigned 201 with hands-on labs.
     - Created classes on contemporary topics, such as Global Climate Change and Society and Environmental GIS.
     - Redesigned current classes to be more contemporary, such as changing Urban Geography into Globalization and the City.
• Encourage integration of Geography classes into other majors (YES)
  ✓ Promoted the integration of GEOG 201 into the ENSP curriculum
  ✓ Promoted the integration of GEOG 317 into the CRM curriculum
  ✓ Added several Geography courses into the Global Studies curriculum (e.g. GEOG 320, GEOG 322, GEOG 340, GEOG 350)
  ✓ Remodeled the GIS lab and offered more seats to attract students from other departments, particularly ENSP. GEOG 387 was added to concentrations in ENSP

• Market classes in the hallways (YES)
  ✓ Maintained and updated class posters on hallways on a semester basis

• Participate in freshmen orientation activities (YES)
  ✓ Dr. Baldwin regularly participated in summer freshmen orientation programs
  ✓ Dr. Baldwin and Dr. Goman regularly gave lectures in the freshman first-year-experience courses
  ✓ Dr. Baldwin taught a sophomore seminar that exposed undeclared students to Geog.
  ✓ Dr. Clark regularly hosted a GIS lab open house for Seawolf Decision Day and summer orientation.

• Encourage direct student-to-student outreach about Geography (YES)
  ✓ The Student Club regularly set out an information table in the SSU Quad during Geography Awareness Week

• Maintain student and faculty research posters in hallways (PARTIAL)
  ✓ The posters on faculty research were kept relatively current. Front pages of faculty publications were arranged in a display case.
  ✓ The posters showing student work and student careers etc. were not kept current.

• Increase University-wide marketing of Geography (PARTIAL)
  ✓ Updated and improved our departmental website in 2012, but have not done so recently
  ✓ Updated the University informational brochure in 2010 and distributed those brochures to the Dean of Social Sciences and the SSU Advising Center. This has not been done recently.
  ✓ Held informational meetings with staff in SSU Advising around 2008/09, but have not done so recently
  ✓ Worked with SSU Web Administrators to update the presentation of Geography on the University Web Pages, but have not done so recently

• Increase outside marketing of Geography at SSU (PARTIAL)
  ✓ The Department intended to repeat an earlier recruitment strategy to send out the SSU Geography brochures to junior colleges throughout Northern California, but it did not do so.
Dr. Clark regularly worked at a department information table at the annual Sonoma County GIS Day event.

- Strengthen relationship SRJC Geography (PARTIAL)
  - Dr. Baldwin met with the Earth Science Dept. Chair at SRJC, but the Department has not followed through.
  - Dr. Clark met with faculty at SRJC and agreed to articulate SRJC’s Intro to GIS course

### 3. Assessment

#### a. Recruiting Majors

The Department has not experienced an increase in majors since the last Program Review. Despite all of the recruitment strategies it implemented (above), the numbers have continued to follow a boom/bust cycle, with no discernable overall improvement ([Figure 2](#)). It should be noted, however, that the overall average of 35 students may actually be a sign of success. In absence of those strategies, Geography may very well have experienced a decline in majors. This is impossible to know.

At this juncture, it is useful to analyze the nature of the situation and consider how the Department might direct its future efforts.

#### i. Where potential Geography Majors are going

ENSP is Geography’s greatest competitor for majors. With around 200 majors, that Department is clearly drawing in most students interested in environmental studies. Geology recently added an Earth Science B.A. to its program, and the department’s majors have since doubled, again successfully tapping into the pool of potential Geography majors.

Many ENSP students retain a strong interest in Geography, which can be seen in the numbers declaring it as a minor ([Table 12](#)). Global Studies is the next largest student group with a strong interest in Geography. In general, more Social Science majors than Science and Tech majors appear interested in Geography.

Notably, the Geography Minor has been on the decline over the last several years, although it is not clear why ([Table 12](#)). It may signal a wane in student interest or a change in marketing or advising. Or, it may be caused by the University’s enforcement of a unit-cap, which has discouraged minors across the campus.

#### Table 12. Geography minor students’ principal major

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2011</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENSP</td>
<td>20</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Global Studies</td>
<td>5</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Other Social Science Majors</td>
<td>6</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Science &amp; Tech Majors</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Other*</td>
<td>6</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>N</td>
<td>38</td>
<td>40</td>
<td>23</td>
</tr>
</tbody>
</table>

Majors from Arts and Humanities as well as Business and Economics
A review of majors taking Geography classes confirms the same trends (Table 13). ENSP and Global Studies majors are the largest groups taking Geography classes, with 28% and 8% of seats in Geography classes taken by these majors respectively. It should be noted that the Department focused its efforts on integrating Geography classes into these majors, and several courses have become requirements. For example, GEOG 387: Intro to GIS is a requirement in ENSP, and GEOG 320: Geopolitics is a requirement in Global Studies. Other Geography classes serve as electives in those majors, which is how GEOG 483: Environmental GIS, as an examples, attracts ENSP students, and GEOG 350: Globalization and the City draws in Global Studies students (Table 13).

Overall, Geography has been successful at getting non-majors to take Geography classes. In fact, over the last several semesters, non-majors have occupied 59% of all seats in Geography classes (Table 13). While that strategy did not, as hoped, translate into more majors, it bolstered class sizes, which allowed Geography to mount many more courses than it would have otherwise. The strategy has been critical to the health of the major.

### Table 13. Distribution of Majors in Geography Classes (Fall 13, Spring 14, Fall 14)

<table>
<thead>
<tr>
<th>FIELD</th>
<th>HUMAN</th>
<th>HUM/ENV</th>
<th>BIO-PHYS</th>
<th>GEOSPATIAL</th>
<th>REGION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geography</td>
<td>317</td>
<td>320</td>
<td>335</td>
<td>350</td>
<td>352</td>
</tr>
<tr>
<td>ENSP</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Other Soc Sci</td>
<td>0</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>GLBL</td>
<td>0</td>
<td>13</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Other Sc &amp; Tec</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>UNDCL</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>CRM</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>% non-major</td>
<td>33%</td>
<td>83%</td>
<td>69%</td>
<td>48%</td>
<td>78%</td>
</tr>
</tbody>
</table>

**KEY to Classes**

<table>
<thead>
<tr>
<th>FIELD</th>
<th>HUMAN/ENVIRON</th>
<th>GEOSPATIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>317 Lab Methods in Physical Geography</td>
<td>335 Global Food Systems: Scarcity and Sust</td>
<td>380 Environmental Remote Sensing</td>
</tr>
<tr>
<td>320 Geopolitics</td>
<td>352 Climate Change and Society</td>
<td>385 Cartographic Visualization</td>
</tr>
<tr>
<td>338 Social Geography</td>
<td>360 Geomorphology</td>
<td>387 Intro to Geographic Information Systems</td>
</tr>
<tr>
<td>350 Globalization and the City</td>
<td>372 Global Climate Change: Past, Prsnt, Future</td>
<td>483 Environmental GIS</td>
</tr>
</tbody>
</table>

Notably, some classes draw in very few non-majors (e.g. the regional courses). As well, many more Social Science than Science and Tech majors are taking Geography classes (Table 12). This evidence
suggests that the Department may wish to improve its marketing of certain types of classes and target a wider array of majors, particularly in the School of Science and Technology.

iii. Which classes, beyond lower division GE, might be recruiting mechanisms

A couple of Geography classes are attracting undeclared students and could provide a forum (other than GE) for recruiting majors. GEOG 335: Global Food Systems, for example, drew in the largest number of undeclared students (UNDCL), followed by GEOG 387: Introduction to GIS (Table 12). Overall, however, it is clear that relatively few undeclared students are noticing Geography, which points to a visibility problem.

iv. How geography might market itself for greater appeal to students

It may be useful for the Department to consider why Geography Majors chose to declare the major and focus more effort in those areas. For example Geography Majors appear more attracted to the all-encompassing nature of Geography than to any particular sub-field within the discipline, which would suggest that the Department should highlight the generalist, integrative nature of the discipline (Table 14).

On the other hand, Geography may be losing those students who want to focus in a particular sub-field to other majors. That would complicate how the data should be interpreted. For example, many students interested in human-environment relations may have chosen the ENSP major instead. Hence, the Geography Majors who participated in the survey reflect the views of the more generalist students who remained in Geography.

<table>
<thead>
<tr>
<th>Table 14. Why student chose Geography Major</th>
</tr>
</thead>
<tbody>
<tr>
<td># RESP.</td>
</tr>
<tr>
<td>========</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>37</td>
</tr>
</tbody>
</table>

It is, therefore, difficult to draw clear strategies from this data. Should the Department strengthen the sub-fields to make it clearer to students that they can get that expertise in Geography? Or, should it focus on its strength as an integrative discipline?

b. Advising

The Senior Exit Surveys indicate that Geography Majors are generally happy with the quality of advising they receive in the Department, and that the quality is rising (Table 15). Most students take advantage of it, but their choice to seek advising appears to vary significantly by year.
Table 15. Student use and perception of advising

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2011</th>
<th>2012</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>The advising I received was helpful*</td>
<td>5.5</td>
<td>5.6</td>
<td>6.8</td>
<td>6.5</td>
</tr>
<tr>
<td>Percentage of students who sought advising 1-2 times per semester</td>
<td>100%</td>
<td>50%</td>
<td>90%</td>
<td>75%</td>
</tr>
</tbody>
</table>

* Scoring Rubric: 1-7; 7=high

Table 16. Student perception of the importance of the Student Club

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of students for whom the student club was important*</td>
<td>36%</td>
<td>33%</td>
<td>45%</td>
<td>40%</td>
</tr>
</tbody>
</table>

* Students who scored a 5 or higher in the 1-7 scoring rubric

c. Student Club

The strength of the Department’s Student Club ebbs and flows, depending on the club’s leadership as well as the general “culture” of students from year to year.

Nevertheless, the Senior Exit Surveys reveal a fairly consistent trend -- that the club is very important to only about 35-45% of majors (Table 16). Some students for whom it was less important cite time conflicts keeping them from participating. Others participate in other social networks and organizations. They do not have time to participate in the Student Club as well.

4. ACTION PLAN

The Department is committed to recruiting majors. With more majors, the Department would be able to support a greater variety of classes. This would, in turn, help generate further increase in the major – perhaps launching an upward-spiral towards a larger and stronger department. Hence, the Department adds this issue as its main goal in this area of the Self Study.

Goal #8. Recruit more majors

Strategies for recruiting majors over the next several years may include:

1. Better assess what draws students to Geography and target efforts in that direction
   - Rewrite the Senior Exit Survey to get a clearer picture of the different pathways to Geography

2. Increasing visibility and awareness of Geography
   - Talk to the Advising Center about how to continuously educate staff about Geography – especially among their rotating student-advisors
   - Continue participating in Freshman Summer Orientation activities, but shift to working specifically with undeclared students
   - Create a new human-environment GE course which may steer some students to Geography instead of ENSP
   - Incorporate the proposed the new human-environment GE course into the Social Science “house” of the new Academic and Career Exploration (ACE) program for Freshman.
3. Conduct another major overhaul of the departmental website

D. Faculty

1. THE PROGRAM
The Department has four tenured faculty, and around two part-time lecturers teaching Geography curriculum at any one time.

The faculty has four main areas of specialization:

Dr. Matthew Clark: Remote Sensing; GIS; Biogeography; Ecosystem Analysis and Conservation
Dr. Jeff Baldwin: Human-environment; Globalizing Economies; Latin American and the Caribbean
Dr. Michelle Goman: Biogeography; Paleoecology and Paleoclimatology; Geomorphology
Dr. Rheyna Laney: Cultural and Political Ecology; Ag Change and Development; Africa

2. CHANGES SINCE LAST PROGRAM REVIEW

a. Goals from the Previous Review
The two goals set out in the 2008 Self Study concerning faculty were to:

1. Ensure that Dr. Freidel was replaced after her retirement.
   How met: That goal was met when Dr. Goman replaced Dr. Freidel in 2011. Dr. Goman joined SSU with two years of credit towards tenure. She applied for and received early tenure in 2014.

2. Advocate for a new hire
   The Department has not received a new tenure track line.

b. Additional significant changes

1. Replacement of Dr. Feinhandler with Dr. Baldwin.
   Dr. Feinhandler chose to leave SSU in 2008. Dr. Baldwin replaced Dr. Feinhandler in 2009. He joined SSU with two years of credit towards tenure. He received tenure in 2013.

2. Some indirect money (~15%) from scholarly activity has begun to come back to the Department, helping to support further scholarly activities and equipment purchases.

3. ASSESSMENT

a. Teaching Performance
Overall, students rate Geography faculty teaching performance very highly (Table 17). Student evaluation scores (for all faculty teaching Geography courses) average in the range of “effective” (4) to “very effective” (5). The highest scores highlight faculty enthusiasm and competence in the classroom. The
lowest scores draw attention to the challenges of teaching complex topics and integrating active learning into the large lecture courses that dominate the sample.

<table>
<thead>
<tr>
<th>Table 17. Average Instructor Evaluations for all Faculty teaching Geography</th>
<th>F13</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Instructor displays enthusiasm for teaching the course</td>
<td>4.7</td>
</tr>
<tr>
<td>My Instructor is actively helpful when students have problems</td>
<td>4.4</td>
</tr>
<tr>
<td>My Instructor clearly presents course information</td>
<td>4.3</td>
</tr>
<tr>
<td>My Instructor seems well prepared for class</td>
<td>4.5</td>
</tr>
<tr>
<td>My Instructor clearly explained the goals of the course</td>
<td>4.4</td>
</tr>
<tr>
<td>In this course, my Instructor enables me to participate actively in learning</td>
<td>4.2</td>
</tr>
<tr>
<td>My Instructor respects different viewpoints</td>
<td>4.4</td>
</tr>
<tr>
<td>My Instructor encourages me to do further independent study</td>
<td>4.4</td>
</tr>
<tr>
<td>My Instructor provides opportunities to question ideas in class</td>
<td>4.4</td>
</tr>
<tr>
<td>The stated goals of this course are consistently pursued</td>
<td>4.4</td>
</tr>
<tr>
<td>The Instructor displays competence in course topics</td>
<td>4.6</td>
</tr>
<tr>
<td>My Instructor makes difficult topics understandable</td>
<td>4.1</td>
</tr>
<tr>
<td>My Instructor consults and advises effectively outside of class</td>
<td>4.4</td>
</tr>
<tr>
<td>My Instructor stimulates interest in the course</td>
<td>4.4</td>
</tr>
<tr>
<td>N</td>
<td>556</td>
</tr>
</tbody>
</table>

Scoring Rubric: 1-5; 5=high

b. University Service and Governance

Faculty participate in a range of service activities at both the University and Department levels. To highlight just a few over the last several years:

- **Dr. Matthew Clark**: University: CSU GIS Board member; Scholarship and Travel Committees
  Department: GIS Lab Manager; Dept Chair, Search Com. Chair; RTP Chair
- **Dr. Jeff Baldwin**: University: Structures and Functions and Diversity Committees
  Sustainable Campus Inventory Coordinator
  Department: Student Club Advisor
- **Dr. Michelle Goman**: University: Faculty Senate; Sustainability Executive, Copeland Creek and Web Advisory committees;
  Department: Map Library Manager
- **Dr. Rheyna Laney**: University: General Education Committee, Faculty Senate
  Department: Dept. Chair, Search Com. Chair; RTP Chair; Webmaster

c. Scholarly Activity

The faculty is active in their respective fields. Complete CVs are available through the Departmental website. Just a few representative scholarly accomplishments include:

**Dr. Matthew Clark**
- NASA HyspIRI Preparatory Airborne Activities and Associated Science ($604K) 2012-2015
Spectral and temporal discrimination of vegetation cover across California with simulated HyspIRI imagery

- National Science Foundation Grant ($1.5 million, 655K SSU) 2007-2012
  The impact of economic globalization on human demography, land use, and natural systems in Latin America and Caribbean


**Dr. Jeff Baldwin**


- Baldwin, Jeff. 2013. "Problematising beaver habitat identification models for reintroduction application in the western United States." *Yearbook of the Association of Pacific Coast Geographers* 75, 1: 104-120.


**Michelle Goman**

- National Science Foundation Grant (192K) 2009-15
  Collaborative Research: Reconstructing Prehistoric Land use Patterns in the Lower Río Verde Valley, Oaxaca, Mexico; Project RVEAL


- Conference Organizer Pacific Climate Workshop (Paclim2015)

**Rheyna Laney**

- CALFED Grant (175K) 2010-2015
  A socio-economic and behavioral analysis of farmers' decisions to adopt or reject conservation initiatives

- Nature Conservancy Contract (6K) 2015
  Sandhill Crane Habitat Mapping in Rice Fields of the Northern Sacramento Valley


**d. Workload**

In the last 5 years, workload within the Department has increased. Average total SFR for the Department (including GE and major courses) rose from 30 in Spring 2008 to 52 by Spring 2014 (*Figure 1*). Similarly, Departmental FTES rose from about 145 in 2008 to 165 in 2014.
As explained above, that shift largely reflects the Department’s decision to mount more large GE courses in order to increase visibility and recruit majors. Average SFR for upper division major courses remains close to the School average (Figure 2). A disproportionate share of large GE classes is taught by lecturers, so much of this workload is being born by part-time faculty. The Department has been able to recruit excellent lecturers to teach most of those classes, particularly in human geography (Human Geography, World Regional Geography and Social Geography). Adjunct units are more restricted for Fall 2015, however, and the Department has not been able to retain their talented lectures due to the high local cost of living, job instability and low pay.

4. ACTION PLAN

Like all departments in this University, Geography’s main goal is to:

Goal # 9. Add another tenure-track line

The strongest arguments to support this case are:

1. Need to fill a programmatic deficiency in the field of human-environment interactions, particularly in evaluating ecosystem services for human well-being

   The faculty member would develop courses that focus on the assessment, monitoring and management of ecosystem services within his/her area of expertise. As explained in the Curriculum Section (p. 11-12), these courses would examine the physical and social science behind the various threats to these services in natural, rural and urban environments. As well, students would explore various management approaches, in part through geospatial modeling and statistical analysis of the social and natural processes that impact those services.

2. Need more staffing in the geospatial techniques and scientific data analysis

   Dr. Clark is unable to fulfill the demand for geospatial techniques courses. They are in very high demand from within Geography as well as from other departments such as ENSP, Biology and Geology. The introductory GIS course (Geog 387) has grown steadily from 24 to 70 students over the last eight years. The course serves many departments and recruits majors.

   The additional faculty member would share the task of teaching GEOG 387: Introduction to GIS and possibly help develop a lower-division spatial concepts course (e.g., GEOG 287 described earlier). This would help strengthen students’ understanding of geospatial technology and concepts, and allow Dr. Clark to teach more upper-division GIS courses. A new faculty member could broaden the topics taught, particularly in human-environment interactions, and could provide additional methodological approaches to our curriculum, such as modeling, statistical analysis, and quantitative analysis of large socio-economic and environmental datasets.

   Geospatial and other quantitative analytical skills are highly marketable for students. Additional courses with geospatial technology and data analysis would also support other departments throughout the University.

3. Need more staffing in General Education and in the Major
The Department relies on large GE courses to meet FTES target and still be able to schedule relatively small upper-division courses -- particularly those with a field or lab component that cannot hold more than 12 to 17 students.

The department has historically relied on adjunct lecturers to meet target (with GE courses) as well as to offer key upper-division courses required in the major. In the past, we have been able to attract highly competent and dynamic lecturers, mostly from outside of the Bay Area. Lately, however, as the cost of living has risen and as resources for adjunct lecturers have declined, we have not been as successful. We were unable to attract and hire any adjuncts for our human geography GE courses this Fall 2015. Our reliance on adjuncts thus puts the department in a precarious situation, where we risk not being able to meet target or mount the courses that we need to fulfill our major.

A new hire could help build resiliency into the department by teaching existing lower-division human geography GE courses, or perhaps a new physical science-based GE course focused on environmental sustainability, as well as critical upper-division courses for the major.

E. Research Centers

1. THE CENTER FOR INTERDISCIPLINARY GEOSPATIAL ANALYSIS (CIGA)

CIGA is directed by Dr. Matthew Clark.

a. The Mission

The mission of the Center for Interdisciplinary Geospatial Analysis (CIGA) is to enable and promote the application of geospatial technology to social and environmental problems through research, education and community service. The Center seeks interdisciplinary collaboration among campus and external researchers, students and other organizations in projects that involve geographic information and spatial analysis at local to global scales. To accomplish these goals, the Center provides: computer, software and data resources; Geographic Information System (GIS) and remote sensing expertise and consulting services; educational courses; and community outreach. Courses in the Department of Geography and Global Studies provide a solid foundation in geospatial science. Students are given a unique opportunity to broaden and refine their education by working on real-world problems in CIGA research projects and service contracts through paid internships.

b. Facilities

The Center has a research computer lab for GIS analysis, image processing, and digital cartography. There are 5 desktop PCs, a laptop and 50 TB of RAID attached network storage in the research lab, as well as a color laser printer, GPS units, laser surveying equipment and a Licor Leaf Area Index (LAI) field instrument. The research lab has a full suite of GIS, remote sensing, and statistics software. Information Technology maintains 3 servers and 20 TB of attached storage in the SSU Data Center.

c. Current Research

Over the last several years, CIGA has had three main research agendas:

1. Assessment of Hyperspectral Infrared Imager for land cover mapping
In October 2012, Dr. Clark and his team in CIGA began work on a three-year, $605,000 grant funded by NASA’s HyspIRI Preparatory Science program. The Hyperspectral Infrared Imager (HyspIRI) is a satellite currently being considered by NASA (http://hyspiri.jpl.nasa.gov/) to improve our ability to map and monitor the Earth’s ecosystems and provide timely information on natural disasters.

This research uses images from NASA’s airborne hyperspectral sensor (AVIRIS) acquired from a jet to simulate images that would be acquired from HyspIRI. Dr. Clark and his research team is investigating the utility of HyspIRI imagery for discrimination of natural vegetation at two levels of floristic organization, lifeform land-cover classes at a regional spatial scale and finer-scale National Vegetation Classification System (NVCS) “alliances” in northern California and Yosemite National Park. Map accuracies are compared to what can be achieved with a conventional multi-spectral satellite, Landsat, using similar analytical techniques.

This grant employs a full-time Research Fellow (post-doctoral researcher), Dr. Nina Kilham, who is focused on a subset of research questions for analysis and publication and also helps manage students in the lab and in the field. To date, the NASA funding has employed one Master’s graduate student and 19 undergraduate students from Geography, Environmental Studies and Computer Science. Student employees gain a range of geospatial and quantitative science skills, including in GIS database development, image processing, programming custom web-based tools, aerial photo interpretation, field work, figure development, and literature review.

2. Forest biomass (carbon) mapping

A smaller project is funded with $10,000 from PG&E to map forest biomass, half of which is carbon, in the SSU Fairfield Osborn Preserve. The overall scientific goal is to quantify the carbon stocks in the preserve using state-of-the-art technology and methods that could ultimately be used in this and other protected or working forests to acquire money from California’s new carbon emissions cap and trade program (SB32). This project uses high-density, Light Detection and Ranging (lidar) data acquired by PG&E as part of a transmission line vegetation management project. Students in the Geog 315 Field Methods class in Spring 2015 will help establish biomass field plots in the preserve, and then three students employed with these funds will augment the plot network and perform the lidar-based modeling of forest biomass in CIGA using the field samples for calibration and validation.

3. Driving forces of land-use / cover change in Latin America

In July 2012, Dr. Clark completed a five-year, $655,000 ($1.5 million total among collaborating PIs) National Science Foundation research grant to examine land change and associated economic, demographic, political and environmental drivers at multiple spatial scales across Latin America and the Caribbean. This grant employed:

- a full-time research technician to manage students and conduct image processing, programming and GIS tasks.
- 2 Master’s students
- 19 undergraduate students

Dr. Clark and fellow collaborators published 15 peer-reviewed scientific papers, mostly in high-impact journals such as Remote Sensing of Environment, Proceedings of that National Academy of Science, and PLOS ONE.
d. Past Contracts

CIGA is currently focused on research from large grants, but in the past has worked on local contracts with various local and state agencies and NGOs in need of GIS services. Dr. Clark acts as Principle Investigator, and manages students to do the work. These activities provide additional opportunities for students to gain valuable geospatial skills with very concrete, real-world tasks. Past contracts include:

- U.S. Fish and Wildlife Service. $7000. Salt Marsh Harvest Mouse (SMHM) Cooperative Agreement.
- Sonoma County and the Laguna de Santa Rosa. Development of a GIS database of the Laguna.
- University Enterprises, Inc. and California Department of Parks and Recreation. $9,600. Spatial database development for Marin District state parks.
- Gnomon, Inc. $36,095. OHP/NRCS GIS Project: Development of a GIS database of California historical resources.
- California Department of Forestry and Fire Protection. $39,748. Spatial database development of timber harvest plans.
- California Department of Parks and Recreation. $23,832. Development of a GIS database of California historical resources.

e. Changes since Last Program Review

The goals set out for CIGA in the 2008 Self Study included:

1. Upgrade computer equipment through grants
   
   How met: This goal was successfully accomplished with over $80,000 in equipment purchases since 2008. Two servers and attached storage with backup space were purchased on the first NSF grant, and then another two servers and attached storage units were purchased on the more recent NASA grant. Other grant equipment include two desktop computers, two laptops, an iPad tablet, a Trimble tablet GPS, and a $13,500 Licor LAI instrument.

2. Employ more undergraduates
   
   How met: With well-funded research grants, many more students were brought into paid CIGA positions than possible with contract work. Across both the NSF and NASA grants, a combined 41 students were paid to work in cutting-edge, remote sensing scientific research.

3. Foster interdisciplinary research within the lab that includes faculty across the University
   
   How being met: This action item is still a work in progress. CIGA’s NSF- and NASA-funded research projects involve national and international interdisciplinary collaboration with scientists, professors, doctoral researchers and graduate students outside of Sonoma State. These activities have left relatively less scope for deeper campus collaborations, which tend to have a local focus. However, CIGA has made strides in creating local collaborative relationships.

Local collaboration with county stakeholders:

- Dr. Clark is serving on the Vegetation Mapping and Remote Sensing Advisory Committee, comprised of 15 experts in remote sensing, GIS, vegetation mapping, and technology, that steers the development of a county-wide vegetation map for the Sonoma County Agricultural Preservation and Open Space District, Sonoma County Water Agency and other planning and scientific activities. He attends formal group
meetings and meets continuously with the local contractor on this project to build synergy in efforts with CIGA mapping projects.

- Dr. Clark is also on The Nature Conservancy’s Climate Action Through Conservation Advisory Group, which advises TNC’s geospatial ecosystem service and conservation pilot study in Sonoma County.
- Dr. Clark has established collaborations with the Conservation Fund and the Pepperwood Preserve for monitoring forest structure and species composition with new hyperspectral and lidar datasets.

Campus-wide collaboration:
- Dr. Clark functions as the geospatial liaison on campus by attending the CSU GIS Board meetings each year, providing students with access to evaluation copies of ArcGIS and web-based training, and interfacing regularly with IT and faculty to find efficient solutions to deploy ArcGIS and Erdas Imagine software across campus;
- Dr. Clark has worked with SSU Facilities to map their infrastructure with GPS receivers and an ArcGIS Online web application as part of the Geog 315 Field Methods course;
- Dr. Clark regularly interacts with faculty, staff and students to discuss geospatial technology and analytical techniques and has served on six graduate student committees (Anthropology, Biology and Interdisciplinary Studies) as a geospatial expert; and, the new PG&E lidar biomass project involves SSU Preserves staff and Biology faculty.

4. Resolve the human resource issues

How met: The computer administrator retired at the end of 2008. In 2009, Dr. Clark worked closely with the Dean, Provost, and Chief Information Officer to migrate CIGA’s new NSF servers to IT’s Data Center. Server administration and imaging of PC desktops in CIGA and the GIS teaching lab were also brought into IT’s tasks.

Dr. Clark has had full system administrator rights on CIGA servers and desktops, allowing him to install basic and custom geospatial software programs without impediments. Recently he worked with IT to create virtual servers in IT to host his customized web-based tools, ArcGIS web adapter, and software license server. The relationship with IT has been largely successful, but does come at a cost in time and skill development not common in SSU faculty. Dr. Clark must act as a computer system administrator for most tasks not automated by IT. For example, network connectivity, system patches and security are handled by IT, but Dr. Clark must configure and administer the license servers for ArcGIS and Erdas, his Symantec disk and tape backup system, ArcGIS Server, ArcGIS Online organizational functions, and his web-based tools. Through time, Dr. Clark has steered some tasks to IT. For example, he initially had to build software images for the desktop PCs in CIGA, but IT now handles this task.

f. Action Plan

The goals for CIGA over the next five years are:

Goal #10. Successfully fund new research projects:
Apply for additional large (>$500k) research grants with a focus on remote sensing applications in terrestrial ecology, biodiversity monitoring and conservation, ecosystem services (e.g., water and carbon cycles). Projects may be regional or international in scope and should include funding for students and staff (post-doctoral researcher, research technician), as well as computer and data storage equipment.

**Goal #11. Increase CIGA outreach and collaboration within the University and beyond:**

Increase outreach:
- Develop CIGA’s website and utilize SSU’s News and Information Coordinator Jean Wasp to advertise the Center’s scientific and service-based learning accomplishments through periodic press releases, as well as disseminate information on campus GIS resources.
- Continue to pursue local and campus collaborations as a scientific advisor or with small research grants.

**2. THE SONOMA STATE QUATERNARY LABORATORY (SQUAL)**

SQUAL is directed by Dr. Michelle Goman, who established the lab in August 2011.

**a. The Mission**

The Sonoma State Quaternary Laboratory (SQUAL) examines questions regarding environmental change over recent to Holocene timescales. The lab specializes in utilizing biological, geochemical and sedimentary signatures preserved in soil, lake and wetland settings to reconstruct both natural and human forced environmental change. A major focus of SQUAL is to provide undergraduate students with hands on laboratory experience that has applications in the environmental fields and geoarchaeology.

**b. Facilities**

The Sonoma Quaternary lab (SQUAL) is fully equipped for microfossil (pollen, testate amoebae, and microscopic charcoal) and macrofossil (plant macrophytes and charcoal) preparation, extraction and analysis. The lab has multiple ovens, a furnace, spectrophotometer and Bartington magnetic susceptibility equipment. The microscopy lab houses two light microscopes, three dissecting scopes, digital imaging capabilities, a Velmex tree-ring measuring system and equipment for the preparation of dendrochronological samples. Field equipment includes a Livingstone sediment corer, Russian peat corer, soil auger samplers and tree corers.

**c. Current Research**

Recent research in SQUAL has focused on reconstructing environmental change in the lowland coastal region of Oaxaca. This research was funded through an NSF to Dr Goman. Five SSU students have been employed on the grant as well as a visiting student from Mexico. Two undergraduate students were also funded through a SSU Faculty Mini-grant to reconstruct prehistoric flood deposits in Petaluma Marsh. One CRM student has also used the lab for his master’s research.
F. Facilities

1. THE SITUATION

The southwest corner of third floor Stevenson has historically been Geography’s home, although a new university-wide scheduling system has reduced department control of space across the campus. Nevertheless, the Department continues to control scheduling in two teaching labs, and maintains two research labs (CIGA and SQUAL, detailed above).

2. CHANGES SINCE LAST PROGRAM REVIEW

a. Goals from Previous Review:

1. Continue lobbying for larger classrooms for our GE classes

   How met: This goal was largely met in 2009-2010 when the School still allocated particular rooms and timeslots to departments. Geography received about 2 more large room allocations per semester. Since the new university-wide scheduling system (“Schedule 25”) was adopted in 2013, Geography has retained the high FTES it garnered over that period, and now has equal access to large rooms as all other departments.

2. Move the GIS Teaching Lab to the current Physical Geography Lab/Map Library

   Ultimately, the Department chose not make this move. Instead, it chose to:

   Remodel the GIS Teaching lab (STEV 3059)

   The room was completely renovated in late 2011. The remodel included increased student capacity from 12 to 17 seats, new audio-visual technology, new configuration for the desktop computers, new furniture, asbestos removal, improved networking, and an overall more professional atmosphere. This remodel was funded by the School of Social Sciences and Provost.

   Reconfigure and upgrade the Physical Geography Lab/Map Library (STEV 3065)

   The room has long hosted all of the Departments’ courses that have physical lab components. The Department applied to the CSU system to have the capacity limit raised to 20. It then reconfigured the room to be able to host labs for the redesigned GEOG 201: Global Environmental Systems course. The room also holds the Department’s Map Library. Recently, audio visual technology was installed, funded in 3 phases with Departmental OE.

3. Identify a sustainable funding source to ensure that the GIS Teaching lab remains current

   Why not met: IT has assumed responsibility for maintaining the computer software used in this lab, as well as the desktops as long as they are under warranty. IT also reimages the computers each summer. The Department and School remain responsible for purchasing new hardware and equipment in the lab. A long-term plan for funding computer refresh has not been resolved.

   Under current budgeting / accounting regulations, the Department is cannot roll over OE in order to save enough funds for these types of purchase. As well, the Department is unable to charge a student fee for equipment used in classroom instruction.

   IT has indicated that it would take complete responsibility for the GIS lab if Geography were to open the room to scheduling by other departments.
b. Other significant changes

1. The creation of SQUAL in Stev. 3034

For many years Stev. 3034 was used by the department computer administrator and when he retired it became a storage space and office space for lecturing faculty. Upon her hire in 2011, the space was assigned to Dr. Goman to develop a research lab (see above). SQUAL and the Geography Dept also have access to Stevenson 2061. This lab and teaching space is held jointly with Anthropology. It houses the fume hood and other technical equipment used by SQUAL. Geog 317 is taught in this facility.

2. The administrative services for the Department have been joined with Anthropology, History and Political Science.

The Departmental office was transformed into a general purpose room for activities such as printing, advising, faculty meetings and make-up exams.

2. ACTION PLAN

In this area, the Department has two main goals to:

Goal #12. Secure sustainable funding its teaching lab and field equipment

1. The GIS Teaching Lab

According to SSU IT policy, the computers in the lab are due for a refresh. As explained above, the Department and School have failed to identify a sustainable funding source to ensure that the lab remains current. This problem needs to be resolved.

2. Field equipment (e.g. GPS units).

The Department faces this same funding problem with expensive field equipment items such as GPS Units.

Historically, the Department has been particularly successful in requesting and receiving “educational technology funds” distributed by the School of Social Sciences. Those funds have not, however, been available over the last several years. More recently, some field equipment has been purchased through across campus initiatives such the WATERS Collaborative.

Goal #13. Secure office space for our adjunct faculty

At present, adjunct faculty are assigned a very poor room. The Department would like to secure a room in the hallway that houses its current tenured faculty. Two potential rooms exist that would need to be reassigned to Geography.
### BIO-PHYSICAL ENVIRONMENT

#### I. CORE COURSES (7 units)
- GEOG 201: Global Environmental Systems (4)
- GEOG 202: World Regional Geography (3)
- GEOG 203: Human Geography (3)

#### II. UD BREADTH COURSES

**Human Geography (4 units)**
- GEOG 320: Geopolitics (4)
- GEOG 322: Globalization and Environments (4)
- GEOG 335: Global Food Systems (4)
- GEOG 340: Conservation of Natural Resources (4)
- GEOG 350: Globalization and the City (4)
- GEOG 352: Climate Change and Society (4)

**Geospatial Techniques (3-4 units)**
- GEOG 380: Environmental Remote Sensing (4)
- GEOG 385: Cartographic Visualization (3-4)
- GEOG 387: Intro to GIS (4)

**Regional Synthesis (4 units)**
- GEOG 392: Latin America & the Caribbean (4)
- GEOG 394: Africa, South of the Sahara (4)
- GEOG 396: Special Topics in Area Studies (4)

**Practical Experiences (3-4 units)**
- GEOG 312: Geographic Conferences (1-2)
- GEOG 313: Field Experience Abroad (2-3)
- GEOG 314: Field Experience (1-2)
- GEOG 499AB: Internship (2-3)

**Geographic Research and Synthesis (5 units)**
- GEOG 490A: Senior Pre-Seminar (1)
- GEOG 490B: Senior Seminar (4)

#### III. CONCENTRATION COURSES (14 units)
- GEOG 315: Field Methods in Geography (2)
- GEOG 317: Lab Methods in Physical Geog (2-3)
- GEOG 360: Geomorphology (4)
- GEOG 365: Biogeography (4)
- GEOG 370: Weather and Climate (4)
- GEOG 372: Global Climate Change (4)
- GEOG 375: Natural Hazards (3-4)
- GEOG 483: Environmental GIS (3-4)

#### IV. SUPPORTING COURSES (8 units)
- ENSP 302: Applied Ecology (4)
- ENSP 309: Soil Science (3-4)
- ENSP 322: Conservation Biology (3-4)
- BIOL 330: Plant Taxonomy – has prerequisites (4)
- BIOL 333: Ecology (4)
- BIOL 485: Biometry (4)
- GEOL 303: Adv. Principals of Geology (4)
- GEOL 304: Geological Mapping (1)
- GEOL 323: Hydrology (3)
- MATH 165: Elementary Statistics (4)

### GEOSPATIAL TECHNIQUES

#### I. CORE COURSES (7 units)
- GEOG 201: Global Environmental Systems (4)
- GEOG 202: World Regional Geography (3)
- GEOG 203: Human Geography (3)

#### II. UD BREADTH COURSES

**Human Geography (4 units)**
- GEOG 320: Geopolitics (4)
- GEOG 322: Globalization and Environments (4)
- GEOG 335: Global Food Systems (4)
- GEOG 340: Conservation of Natural Resources (4)
- GEOG 350: Globalization and the City (4)
- GEOG 352: Climate Change and Society (4)

**The Biophysical Environment (4 units)**
- GEOG 360: Geomorphology (4)
- GEOG 365: Biogeography (4)
- GEOG 370: Weather and Climate (4)
- GEOG 372: Global Climate Change (4)
- GEOG 375: Natural Hazards (3-4)

**Regional Synthesis (4 units)**
- GEOG 392: Latin America & the Caribbean (4)
- GEOG 394: Africa, South of the Sahara (4)
- GEOG 396: Special Topics in Area Studies (4)

**Practical Experiences (3-4 units)**
- GEOG 312: Geographic Conferences (1-2)
- GEOG 313: Field Experience Abroad (2-3)
- GEOG 314: Field Experience (1-2)
- GEOG 499AB: Internship (2-3)

**Geographic Research and Synthesis (5 units)**
- GEOG 490A: Senior Pre-Seminar (1)
- GEOG 490B: Senior Seminar (4)

#### III. CONCENTRATION COURSES (14 units)
- GEOG 315: Field Methods in Geography (2)
- GEOG 380: Environmental Remote Sensing (4)
- GEOG 385: Cartographic Visualization (3-4)
- GEOG 387: Introduction to GIS (4)
- GEOG 483: Environmental GIS (3-4)
- GEOG 487: Advanced GIS (3)

#### IV. SUPPORTING COURSES (8 units)
- MATH 165: Elementary Statistics (4)
- CS 101: Introduction to Computers and Computing (3)
- CS 115: Programming I (4)
**ENVIRONMENT & SOCIETY**

### I. CORE COURSES (7 units)
- GEOG 201: Global Environmental Systems (4)
- GEOG 202: World Regional Geography (3)
- GEOG 203: Human Geography (3)

**Choose one**

### II. UD BREADTH COURSES

#### Geospatial Techniques (3-4 units)
- GEOG 380: Environmental Remote Sensing (4)
- GEOG 385: Cartographic Visualization (3-4)
- GEOG 387: Intro to GIS (4)

#### Regional Synthesis (4 units)
- GEOG 392: Latin America & the Caribbean (4)
- GEOG 394: Africa, South of the Sahara (4)
- GEOG 396: Special Topics in Area Studies (4)

#### Practical Experiences (3-4 units)
- GEOG 312: Geographic Conferences (1-2)
- GEOG 313: Field Experience Abroad (2-3)
- GEOG 314: Field Experience (1-2)
- GEOG 315: Field Methods in Geography (2)
- GEOG 317: Lab Methods in Physical Geography (2-3)
- GEOG 460: Lab Assistant in Geography (2-3)
- GEOG 499AB: Internship (2-3)

#### Geographic Research and Synthesis (5 units)
- GEOG 490A: Senior Pre-Seminar (1)
- GEOG 490B: Senior Seminar (4)

### III. CONCENTRATION COURSES (14 u.)
Take at least 7 units from each group

#### Group I:
- GEOG 322: Globalization and Environments (4)
- GEOG 335: Global Food Systems (4)
- GEOG 340: Conservation of Natural Resources (4)
- GEOG 352: Climate Change and Society (4)

#### Group II:
- GEOG 360: Geomorphology (4)
- GEOG 365: Biogeography (4)
- GEOG 372: Global Climate Change (4)
- GEOG 375: Natural Hazards (3-4)
- GEOG 483: Environmental GIS (3-4)

### IV. SUPPORTING COURSES (8 units)
- ANTH 345: Anthropology and the Environment (4)
- ANTH354: Quest for the Other: Tourism and Culture
- ECON 381: Natural Resource and Environ. Econ. (4)
- ENSP 307: Environmental History (4)
- ENSP 310: Introduction to Planning (3)
- ENSP 330: Energy, Technology and Society (4)
- ENSP 404: Environmental Law (3)
- ENSP 416: Environmental Planning (3)

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**GLOBALIZATION & IDENTITY**

### I. CORE COURSES (7 units)
- GEOG 201: Global Environmental Systems (4)
- GEOG 202: World Regional Geography (3)
- GEOG 203: Human Geography (3)

**Choose one**

### II. UD BREADTH COURSES

#### The Biophysical Environment (4 units)
- GEOG 360: Geomorphology (4)
- GEOG 365: Biogeography (4)
- GEOG 370: Weather and Climate (4)
- GEOG 372: Global Climate Change (4)
- GEOG 375: Natural Hazards (3-4)

#### Geospatial Techniques (3-4 units)
- GEOG 380: Environmental Remote Sensing (4)
- GEOG 385: Cartographic Visualization (3-4)
- GEOG 387: Intro to GIS (4)

#### Regional Synthesis (4 units)
- GEOG 392: Latin America & the Caribbean (4)
- GEOG 394: Africa, South of the Sahara (4)
- GEOG 396: Special Topics in Area Studies (4)

#### Practical Experiences (3-4 units)
- GEOG 312: Geographic Conferences (1-2)
- GEOG 313: Field Experience Abroad (2-3)
- GEOG 314: Field Experience (1-2)
- GEOG 315: Field Methods in Geography (2)
- GEOG 317: Lab Methods in Physical Geography (2-3)
- GEOG 460: Lab Assistant in Geography (2-3)
- GEOG 499AB: Internship (2-3)

#### Geographic Research and Synthesis (5 units)
- GEOG 490A: Senior Pre-Seminar (1)
- GEOG 490B: Senior Seminar (4)

### III. CONCENTRATION COURSES (14 u.)

#### Group I:
- GEOG 320: Geopolitics (4)
- GEOG 322: Globalization and Environments (4)
- GEOG 335: Global Food Systems (4)
- GEOG 338: Social Geography (3)
- GEOG 350: Globalization and the City (4)

#### Group II:
- GEOG 302: World Regional Geography (4)
- GEOG 320: Geopolitics (4)
- GEOG 322: Globalization and Environments (4)
- GEOG 335: Global Food Systems (4)
- GEOG 338: Social Geography (3)
- GEOG 350: Globalization and the City (4)

### IV. SUPPORTING COURSES (8 units)
- ANTH 352: Global Issues (4)
- ANTH354: Quest for the Other: Tourism and Culture
- ECON303: International Economics (4)
- ECON403: Seminar in Economic Development (4)
- POLS303: Intro to Comparative Government (4)
- POLS304: Introduction to International Relations (4)
- POLS452: Third World Political Systems (4)
- WGS385: Gender and Globalization (4)