

## HSU Academic Program Criteria

### Academic Program in Biology Graduate

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#### I. The Vision for Humboldt State University (Limit: 2 pages) [15%]

Describe up to 5 curricular or co-curricular features of the program that are consistent with the Vision of HSU, and indicate which aspect(s) of the Vision align with that particular feature. Please provide sufficient information such that an individual unfamiliar with your program will clearly understand the feature's relevance.

***An emphasis on the environment.*** Because of our natural setting, facilities, and the expertise of the faculty, the HSU Biology Graduate program attracts many highly qualified students with an interest in the broad field of conservation biology. We encourage these students to develop thesis projects that develop critical scientific thinking and at the same time generate data and understanding that are relevant to social and environmental issues. [Aligned with visions 1 and 4]

***Interdisciplinary studies.*** We are committed to the proposition that collaboration across disciplinary lines is a critical component of graduate education. Our students often engage in research that requires a wide range of expertise, a fact underscored by the composition of graduate committees. We encourage students to populate their committees with faculty from other departments in the CNRS (e.g., Math, NRPI, Wildlife) as well as scientists from other universities and government agencies. [Vision 2]

***New directions.*** The growth of modern genetics and biotechnology has provided a wealth of new tools and perspectives for addressing questions of fundamental and practical importance (including conservation of natural resources). We encourage graduate research projects that take advantage of these modern tools to study the organization and function of biological systems, from the cell to the community levels. [Vision 2]

***Leaders for tomorrow.*** The Biology Graduate Program prepares students at advanced levels to assume positions of increased responsibility and leadership in local, regional, and national centers of employment. Many of our Master's graduates are employed in science education or in federal and state level agencies with major responsibilities for environmental

management. A significant number are also employed in scientific and environmental research organizations. [Visions 5 and 7]

**Strength through diversity.** Just as biological systems flourish by the inclusion of diverse organisms, our graduate program flourishes through a diversity of perspectives and individuals in it. We are strongly committed to attracting students from a diversity of backgrounds and experience. Our students range in age from recent baccalaureate graduates to individuals pursuing second or third career options. We seek gender and ethnic balance in our graduate students. Several department programs (e. g., HHMI) allow us to offer support to grad students of diverse ethnic backgrounds. [Vision 6]

**Teaching as learning.** Our undergraduate program relies heavily on graduate lab TA’s, especially at the lower division level. This reliance creates unique opportunities for our graduate students to gain extensive experience as teachers. As junior scholars and beginning teachers, graduate students participate in the full cycle of science by generating and communicating knowledge that ultimately stimulates the next generation of discovery. There can be little doubt that our passionate young colleagues make a positive difference in the lives of their students. [Vision 8]

**II. Demand (Limit: 1.5 pages per option, not including tables) [20%]**

A. Internal demand for the degree program and courses in the degree program

1. Headcount Data

| <b>Major Academic Year (Fall/Spring) Average Headcount Summary</b> |                          |                 |                 |                 |                 |                 |                 |                 |                 |
|--|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Majors_overview_BIGR report generated: 16-APR-08                   |                          |                 |                 |                 |                 |                 |                 |                 |                 |
| <b>Major Code</b>  | <b>Major Description</b> | <b>AY 00/01</b> | <b>AY 01/02</b> | <b>AY 02/03</b> | <b>AY 03/04</b> | <b>AY 04/05</b> | <b>AY 05/06</b> | <b>AY 06/07</b> | <b>AY 07/08</b> |
| BIGR   | Biology-Grad             | 41              | 35              | 51              | 52              | 45              | 55              | 48              | 50              |
| <b>Total</b>   |                          | <b>41</b>       | <b>35</b>       | <b>51</b>       | <b>52</b>       | <b>45</b>       | <b>55</b>       | <b>48</b>       | <b>50</b>       |

| <b>Majors by Sex and Ethnicity</b>               |  |           |           |           |           |           |           |           |           |
|--|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Majors_overview_BIGR report generated: 16-APR-08 |  |           |           |           |           |           |           |           |           |
|  |  | <b>AY</b> | <b>AY</b> | <b>AY</b> | <b>AY</b> | <b>AY</b> | <b>AY</b> | <b>AY</b> | <b>AY</b> |
|  |  |           |           |           |           |           |           |           |           |

| SEX        | Ethnicity | 00/01     | 01/02     | 02/03     | 03/04     | 04/05     | 05/06     | 06/07     | 07/08     |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Female     | Asian     | 2         | 1         | 0         | 0         | 0         | 0         | 0         | 0         |
|            | White     | 15        | 13        | 25        | 26        | 18        | 26        | 21        | 22        |
|            | Other     | 1         | 1         | 1         | 2         | 2         | 2         | 1         | 1         |
|            | Unknown   | 2         | 4         | 5         | 7         | 10        | 7         | 7         | 6         |
| <b>sum</b> |           | <b>19</b> | <b>19</b> | <b>31</b> | <b>35</b> | <b>30</b> | <b>35</b> | <b>28</b> | <b>29</b> |
| Male       | Asian     | 0         | 2         | 2         | 2         | 2         | 2         | 1         | 1         |
|            | Hispanic  | 2         | 2         | 3         | 2         | 0         | 0         | 0         | 0         |
|            | White     | 15        | 7         | 10        | 11        | 11        | 14        | 14        | 16        |
|            | Other     | 0         | 0         | 0         | 0         | 1         | 1         | 1         | 2         |
|            | Unknown   | 5         | 6         | 5         | 3         | 2         | 4         | 5         | 4         |
| <b>sum</b> |           | <b>22</b> | <b>16</b> | <b>20</b> | <b>17</b> | <b>15</b> | <b>20</b> | <b>20</b> | <b>22</b> |

| <b>Biology-Grad (with options) Degrees Awarded (incl. primary and second majors)</b><br>degrees_awarded_M_BIGR report generated: 25-JUN-08 |             |             |             |             |             |             |             |             |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| MAJOR  | AY<br>99/00 | AY<br>00/01 | AY<br>01/02 | AY<br>02/03 | AY<br>03/04 | AY<br>04/05 | AY<br>05/06 | AY<br>06/07 |
| Biology-Grad   | 11          | 17          | 5           | 13          | 14          | 9           | 13          | 10          |
| <b>sum</b>   | <b>11</b>   | <b>17</b>   | <b>5</b>    | <b>13</b>   | <b>14</b>   | <b>9</b>    | <b>13</b>   | <b>10</b>   |

| <b>Biology-Grad Degrees Awarded by Sex and Ethnicity (incl. primary and second majors)</b><br>degrees_awarded_M_BIGR report generated: 25-JUN-08 |           |             |             |             |             |             |             |             |             |
|--|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| SEX  | Ethnicity | AY<br>99/00 | AY<br>00/01 | AY<br>01/02 | AY<br>02/03 | AY<br>03/04 | AY<br>04/05 | AY<br>05/06 | AY<br>06/07 |
| Female   | Asian     | 0           | 1           | 1           | 0           | 0           | 0           | 0           | 0           |
|  | White     | 6           | 4           | 1           | 5           | 9           | 4           | 7           | 5           |
|  | Other     | 0           | 0           | 0           | 0           | 0           | 0           | 3           | 0           |
|  | Unknown   | 0           | 2           | 0           | 0           | 0           | 1           | 0           | 2           |
| <b>sum</b>   |           | <b>6</b>    | <b>7</b>    | <b>2</b>    | <b>5</b>    | <b>9</b>    | <b>5</b>    | <b>10</b>   | <b>7</b>    |
| Male   | Asian     | 0           | 0           | 0           | 0           | 0           | 0           | 1           | 0           |
|  | Hispanic  | 0           | 0           | 0           | 1           | 2           | 0           | 0           | 0           |
|  | White     | 4           | 9           | 1           | 6           | 1           | 4           | 2           | 2           |
|  | Other     | 1           | 1           | 0           | 0           | 0           | 0           | 0           | 0           |
|  | Unknown   | 0           | 0           | 2           | 1           | 2           | 0           | 0           | 1           |
| <b>sum</b>   |           | <b>5</b>    | <b>10</b>   | <b>3</b>    | <b>8</b>    | <b>5</b>    | <b>4</b>    | <b>3</b>    | <b>3</b>    |

2. FTES by Course Code

| FTES taken in Biology classes by Majors (AY 02/03 - AY 07/08) |                  |                                    |             |             |             |             |             |             |
|---|------------------|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| course_ftes_smry_BIOL report generated: 30-JUN-08             |                  |                                    |             |             |             |             |             |             |
| SUBJ  | Course level     | Student Major                      | AY 02/03    | AY 03/04    | AY 04/05    | AY 05/06    | AY 06/07    | AY 07/08    |
|   | Graduate         | Biology-Grad                       | 15.8        | 16.7        | 13.5        | 17.5        | 15.8        | 16.5        |
|   |                  | Biology                            | 1.3         | 1.8         | .3          | 1.9         | .7          | 1.7         |
|   |                  | Wildlife                           | .3          | .5          | .1          | .0          | .2          | .4          |
|   |                  | Zoology                            | .0          | .3          | .0          | .0          | .2          | .3          |
|   |                  | Natural Resources (Fisheries)-Grad | .0          | .0          | .1          | .3          | .0          | .3          |
|   | <b>Sub-total</b> |                                    | <b>18.8</b> | <b>20.6</b> | <b>15.5</b> | <b>21.8</b> | <b>18.3</b> | <b>20.3</b> |

| FTES taken in Biology classes by Majors (AY 02/03 - AY 07/08) |              |                   |              |              |              |              |              |              |
|---|--------------|-------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| course_ftes_smry_BIOL report generated: 30-JUN-08             |              |                   |              |              |              |              |              |              |
| SUBJ  | Course level | Student Major     | AY 02/03     | AY 03/04     | AY 04/05     | AY 05/06     | AY 06/07     | AY 07/08     |
| BIOL  | All Levels   | Biology           | 55.4         | 56.3         | 64.6         | 62.0         | 56.9         | 56.6         |
|   |              | Biology-Grad      | 17.2         | 17.8         | 14.9         | 19.5         | 18.7         | 18.2         |
|   |              | Zoology           | 13.4         | 14.3         | 14.6         | 13.0         | 12.1         | 15.2         |
|   |              | Nursing Pre-Major | 3.0          | 4.9          | 9.7          | 13.4         | 11.8         | 12.7         |
|   |              | Wildlife          | 9.6          | 9.7          | 8.4          | 7.4          | 9.0          | 10.5         |
| <b>Total</b>  |              |                   | <b>192.0</b> | <b>193.7</b> | <b>201.7</b> | <b>206.4</b> | <b>198.8</b> | <b>208.5</b> |

3. Service to other HSU program/options

*Document other HSU programs/options (including, GE) with required coursework from your program*

| Other HSU program/option name  | Courses required<br>List course number and units | Restricted elective courses<br>List number and units   |
|--|--|--|
| The courses listed in the third column have been included on graduate course contracts for students in the various graduate programs in Natural Resources and Environmental Systems. |  | Biology 532 (3)<br>Biology 533 (4)<br>Biology 542 (4)<br>Biology 548 (3)<br>Biology 554 (3)<br>Biology 564 (4)<br>Biology 580 (1-3)<br>Biology 683 (1)<br>Botany 520 (4)<br>Botany 521 (3)<br>Botany 531 (4) |

|  |  |  |
|--|--|--|
|  |  | Botany 553 (3)<br>Zoology 530 (3)<br>Zoology 552 (3)<br>Zoology 556 (4)<br>Zoology 560 (4) |
|--|--|--|

4. Comment on the internal demand **FOR EACH OPTION** of the Major. Explain any significant changes in internal program demand over past 7 years. Provide any additional relevant information of internal demand.

*Biology-Grad*

Demand for our graduate program has remained remarkably stable for many years. On average, we have had 50 active students in the program each year since 1975, with a mean of 47 students for the past seven years.

B. External demand for “graduates” from the program

Imagine you are answering a parent’s question about job prospects and the demand for graduates of your program/option. Describe evidence of external demand for this program. Evidence may be cited from one of the following sources: the State of California <http://www.labormarketinfo.edd.ca.gov/>, the US Department of Labor <http://www.bls.gov/OCO/>, the National Association of Colleges and Employers, <http://naceweb.org>. Evidence may be cited from an additional source from, for example, a professional society relevant to your discipline.

**Biology-Graduate Program**

Data collected internally by our Department and the HSU Career Center show that demand remains high for graduates of the Biology Master's Program. Within two years of graduation, 94% of our graduates report that their job or professional duties are directly related to their area of study while a student, and 92% report that they are employed in their field of choice or are pursuing further education (Ph.D., M.D., D.V.M.). The website of the **American Institute of Biological Sciences** comments that “Job growth is expected in a number of areas, biotechnology and molecular biology in particular. Business leaders have begun to address the issue of creating more science and technology jobs in the United States to prevent them from being exported. Also, the number of openings in federal government agencies charged with managing natural resources, such as the Interior and Agriculture Departments and the Environmental Protection

Agency, is expected to grow. These openings will become available as many senior-level biologists and life scientists retire in the coming years.” According to a 2005 **US Bureau of Labor Statistics** report, the field of life sciences as a whole has a mean annual salary close to \$60,000, but as biologists gain more experience and education in their field, those in private industry may earn salaries of over \$80,000, while those working in government, academia, and the nonprofit sector earn around \$60,000 to \$70,000. Those with over 30 years of experience have a median salary of around \$103,000. Projections from the website of the **California Employment Development Department** predict 7700 new biology-related positions in California over the ten years from 2006-2016, approximately a 25% increase. Especially notable is the prediction of 1400 new jobs in postsecondary biology education, a 30.4% increase. As the data on job placement reported above attest, our graduates are well-positioned to take advantage of this increase in biology-related positions.

**III. Program Quality (Limit: 6 pages, not including tables) [30%]**

A. Students

1. For graduate and post-baccalaureate professional programs

| <b>Total Fall Applications received</b><br>appsXmajorFall report generated: 15-JUL-08 |             |             |             |             |             |             |
|---|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Explicit major</b>   | <b>2003</b> | <b>2004</b> | <b>2005</b> | <b>2006</b> | <b>2007</b> | <b>2008</b> |
| Biology-Grad  | 45          | 60          | 61          | 49          | 37          | 38          |

| <b>Total Fall Applicants who enrolled</b><br>appsXmajorFall report generated: 15-JUL-08 |             |             |             |             |             |             |
|---|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Explicit major</b>   | <b>2003</b> | <b>2004</b> | <b>2005</b> | <b>2006</b> | <b>2007</b> | <b>2008</b> |
| Biology-Grad  | 16          | 13          | 20          | 12          | 12          | 16          |

Provide an explanation of the above data, if necessary, and/or provide additional evidence indicative of program quality related to student achievement.

Our department completed a comprehensive review of the Graduate Program in 2005. This was based on data compiled for 36 students who began and finished their Master’s degree during a recent 7-year period (1997-2004). We do not have a comparable data set for 2005-2007, but we

feel confident that the program review document accurately captures current trends. The following summary was abstracted from that document.

Our program review found that 11% of the 36 students earned scholarships, 50% of the students were supported by extramural research grants, and 14% of the students were supported by intramural research grants (i.e., RSCA and Department of Biological Sciences Master's Student Grants). The thesis research of graduate students during the study period was disseminated in a variety of ways, including publication in peer-reviewed scientific journals (8%) and presentations at international (25%), national (31%), and regional (17%) scientific meetings. Of those who completed their Master's degrees during the past 7-year period, 21% of the students entered Ph.D. or M.D. programs after graduation. The remaining graduates now work in federal (15%), state (12%), or private (9%) agencies; teach part-time at HSU (9%); or are employed as biological consultants (33%). Thus 99% overall were employed in an area related to their chosen field of study. This accords with the survey data reported above, showing that two years after graduation, 94% of our graduates reported that their job or professional duties were directly related to their area of study while a student.

## B. Faculty

1. Provide evidence of teaching effectiveness and commitment to continuous improvement of teaching. Include, for example, engagement in professional development for teaching (including around campus themes on learning outcomes and diversity, and on accessibility training), program approaches to ensure quality, and/or recognitions, honors, and awards for excellence in the classroom as appropriate for your program.

The faculty of the Department of Biological Sciences is dedicated to teaching excellence. As such, all faculty regularly engage in wide range of professional activities to strengthen their effectiveness in the classroom and to continually improve upon their teaching. Some of the professional development activities that faculty have been engaged in include diversity and accessibility training, and training on new classroom techniques (Blackboard, Moodle, Photoshop, Powerpoint, Gallery, Response Cards/Turning Point). Several of our faculty have attended and presented CSU workshops (some examples include Patty Siering – CSU workshop on improving biology education; Sean Craig – the Teacher-Scholar Institute at San Luis Obispo;

and Sharyn Marks the Spring Teaching Showcase at Cal Poly Pomona). Several of our faculty have been actively engaged in college and university level committees that address campus themes on learning outcomes and diversity (i.e. WASC Action Team II – diversity, Learning Outcomes – College and Departmental Curriculum Committees).

Teaching effectiveness embodies not only the tools and skills that we are continually improving upon, it is also dependent upon faculty who are current and actively engaged in their discipline and who truly care about their students’ learning. All faculty in our department are actively engaged in scholarship and are committed to bringing current information to bear in their lectures – we are continually improving and updating course content. We are dedicated to bringing the excitement and vitality of the nature of science to our students. These are things not taught in workshops, but are the very essence of who we are and why we are here.

Teaching effectiveness is only truly measured by knowing how well students are learning what we are offering them. In addition to the assessment efforts underway, we all pay close attention to what the students tell us on mid-semester evaluations and we pay close attention to our formal student evaluations at the end of the semester. In addition, faculty value visiting faculty comments during the RTP process and we discuss and improve teaching pedagogy in formal (Departmental Retreats) and informal venues. For example, Dr. Michael Camann recently started an informal departmental group to discuss pedagogical innovation in the classroom, including incorporation of active learning approaches.

2. Evidence of faculty engagement in scholarship/creative activities and service. (Expressed as a percentage of full-time faculty members **affiliated with the program**. For example, if 9 of 10 faculty affiliated with your program gave a paper at a professional meeting in 04/05, then enter 9/10 = 90%.) This table is to be completed by the department.

| <b>Scholarship/Creative Activities/Service</b>                            | <b>05/06</b> | <b>06/07</b> | <b>07/08</b> |
|---|--------------|--------------|--------------|
| At least one peer-reviewed publication or creative product                | 52%          | 58%          | 58%          |
| At least one funded grant or contract related to scholarship              | 81%          | 76%          | 67%          |
| Invited participant or leader of workshops, expert panels, or task forces | 48%          | 44%          | 62%          |
| At least one presentation (paper, poster,                                 | 71%          | 76%          | 80%          |

|   |     |     |     |
|---|-----|-----|-----|
| exhibition, etc.) given at a professional society meeting                               |     |     |     |
| Professional service activities at a regional or national level                         | 76% | 76% | 80% |
| Service on at least one university or college-level committee (at least 1 hour/wk avg.) | 67% | 71% | 53% |

3. Provide explanations of the data above and/or descriptions of the patterns of faculty engagement in scholarly and/or creative activities and service as appropriate for your program.

During the evaluative period Fall 2005 to Spring 2008, every faculty member (100%) in the Department of Biological Sciences who was employed full time at HSU published and secured research funding in at least one of the years.

During the three year period above 70 peer reviewed papers were published, 151 presentations were given at state, national and international scientific conferences, and \$8,145,923 of grants were obtained by full-time faculty within the department of Biological Sciences. If spread evenly among faculty, these figures average to 1 publication/year, ~2 presentations/year at a scientific conference and ~\$120K/year in funding acquired.

4. Provide evidence for faculty mentoring of students. Include, for example, approaches to advising, directed study or research, and/or clubs or student professional chapters that involve faculty mentorship.

Graduate mentoring is explicitly provided by the student's faculty advisor and thesis committee, as well as by the Graduate Coordinator. From the initial development of a thesis proposal, through conduct of the research, through the process of data analysis and writing, regular contact and consultation with faculty are a routine part of our program..

5. Other evidence of quality indicators related to faculty that may not be listed elsewhere, including, for example, faculty diversity within the program.

We have had several individuals nominated or recognized by awards such as the Wang Award (2007, 2008) and the Andreoli Award For Biotechnology Education (CSU-Wide Award). One of our faculty was named HSU Outstanding Professor, and two individuals were recognized by the McCrone Promising Faculty Scholar Award.

### C. Curriculum (differentiate by option, if appropriate)

#### 1. Writing and oral communication learning outcomes

*Describe how written and oral communication skills are included in your program.*

Students build writing skills by preparing a formal thesis proposal and, ultimately, by writing and revising a thesis. Development of both documents involves intense editorial interactions between the student, advisor, and other committee members. We do not grade theses; rather theses are judged acceptable or not acceptable based on the quality of the research and writing. Students make revisions as needed until the thesis reaches a standard of exposition that is worthy of publication. Cycles of critique and revision refine analytical and writing skills.

Students present two formal oral presentations in the Introduction to Graduate Studies courses, both of which are critiqued by the Graduate Coordinator. A required public thesis presentation (“defense”) provides another opportunity to refine oral communication skills. Finally, although not a required component of the curriculum, most students serve as TA’s. This classroom experience arguably has the most dramatic impact on the ability of our students to communicate effectively.

#### 2. Assessment

[Data on program progress with assessment tasks will be provided from the Faculty Associate for Assessment]

*Provide 2 examples of how you have used results of assessment of your program’s student learning outcomes to adapt, enhance, or affirm your program’s curriculum.*

Several years ago we realized that students were taking too long to complete their degrees.

An analysis revealed multiple contributing factors, including uneven student preparation in various areas (writing, experimental design, use of literature resources), uneven advising, and failure to initiate research in a timely fashion. As a remedy we developed a two-semester sequence of courses to be taken by all incoming students. These *Introduction to Graduate Studies* courses set and enforce useful deadlines (eg., a preliminary thesis proposal is due by

the end of the first semester) and provide basic instruction on how to write a thesis proposal, give scientific presentations, acquire grant support, and take advantage of on-line literature resources. They help to establish a coherent curricular structure for our graduate program, which otherwise features a customized course of study for each student.

All graduate students who teach laboratory sections are required to take a 2-unit course in Methods of Laboratory Instruction. This course was established to provide strong hands-on training in teaching methods and establish accountability for active encouragement of involved learning by students in laboratory sections. This course is also required in the College Faculty Preparation Program - Biology (p. 70 of 2008-2009 Catalog). Our graduates with laboratory teaching experience are highly sought after by doctoral programs, with 100% of those interested being accepted into Ph.D. programs, and most securing teaching fellowships.

3. Accreditation (if applicable)

*If the program is accredited, describe the need for this accreditation and its impact on the quality and composition of the curriculum of the program.*

Not applicable.

4. Relevance and innovation

*Provide evidence through examples that demonstrate a curriculum that is relevant, innovative, forward looking, responsive to changing trends, and equips students to function in a diverse, global context.*

The best indication of the quality and currency of the department's graduate program is that *virtually all* of its graduates have either gone on for an advanced degree or found employment in biologically-related fields (as cited in section III.A). We take special pride in the many HSU biologists who hold positions of significant responsibility in federal, state, and county agencies. The reason for the success of our program is simple and clear: the active scholarship of the graduate faculty (documented in section III.B.2) insures that our graduate program remains relevant, forward-looking, and responsive to changing trends.

5. Interactions between graduate and undergraduate programs (if applicable)

*If this is a graduate program, what opportunities for undergraduates result (or are lost) by virtue of the graduate program.*

We regard our graduate program as pivotal to the success of our undergraduate program. Undergraduate students interact with our graduate students in several ways. They meet them as lab TA's and as fellow students in upper division and 500-level courses, and many work with graduate students as research volunteers. Although graduate students are beginning scholars by comparison with faculty, they can be very effective instructors, whose growing knowledge and enthusiasm for learning serve as excellent models for the undergraduates. Moreover, by soliciting undergraduates for help with their thesis projects, graduate students expand the range of research opportunities that the Department can provide at the undergrad level.

6. Program uniqueness

*If your program provides unique educational opportunities or course content that is found at few or no other CSU institutions, please describe this uniqueness.*

### **Biology-Graduate Program**

None of the other CSU campuses offer the breadth of opportunities we provide at the graduate level here at HSU. This breadth stems from our distinctive combination of diverse natural habitats, robust laboratory and field facilities, and diverse faculty expertise. This strength is reflected in the relatively large size of the program for the size of the school, attesting to our ability to attract students from afar. Our students come to us from across California and the rest of the country; if the financial barrier for out-of-state students weren't so high, we would be even more successful in recruiting such students.

7. Opportunities for undergraduate scholarship/creative activities/service

*Estimate the percentage of your undergraduate majors that participate in scholarship/creative activities/professionally-related service, and provide some illustrative examples of such activities. Can students receive academic credit for these activities and have them counted toward undergraduate major requirements?*

**ENTER COMMENTS HERE**

D. Affiliations/Equipment/Facilities/Environment

**1. Affiliations**

The Biology Department has strong connections to affiliated units on and off campus. We have listed the name, purpose, nature of our affiliation and the benefits that accrue our program of the some of our affiliations with centers, units or institutes in the table below.

| Name  | Purpose  | Nature of Affiliation   | Benefits to program/major   |
|---|--|---|---|
| California Ocean Observing System                                   | Monitor coastal marine ecosystems  | Elected member  | Student research opportunities  |
| Consortium of California Herbaria                                   | Document vascular plant diversity across the state   | Invited member  | Student research opportunities  |
| Natural History Museums (Smithsonian, Field Museum, Denver, Kansas) | Document diversity of living and fossil plants worldwide   | Research collaboration  | Specimen loans for graduate research  |
| FOAM – Friends of the Arcata Marsh                                  | Promote study and understanding of the Arcata Marsh and Wildlife Sanctuary,.   | Board members   | Research grant program, logistical support for research                               |
| HSU - Natural History Museum  | To inspire in North Coast residents and visitors of all ages an understanding and appreciation of the dynamic natural world and to provide a learning laboratory for Humboldt State University students. | Board Members, exhibitors   | Student outreach, public presentation, community service                              |
| NCIMS – Northern California Institute of Marine Sciences            | To facilitate and promote an interdisciplinary approach to marine sciences at Humboldt State University  | Board Members   | Integration and information transfer among the marine science departments on campus   |
| NMML – National Marine Mammal Laboratory                            | Conservation and Management of Marine Mammal Stocks  | Integral collaborator in coast-wide marine mammal monitoring programs | Student interns trained in survey techniques and become a part of a long-term project |
| National Marine Fisheries Service                                   | Manages the marine mammal stranding network for responding to stranded marine mammals  | Marine mammal Stranding center for northern California                | Students get to assist in conducting necropsy's on stranded whales                    |

| Name                           | Purpose   | Nature of Affiliation   | Benefits to program/major   |
|--------------------------------|---|---|---|
| Oiled Wildlife Care Network    | Rehabilitate and treat oiled wildlife   | Assist in coordinating field effort   | Students are trained in recovery of seabirds in the event of a spill and they can volunteer to assist in the recovery of oiled wildlife   |
| Marine Mammal Center           | Rehabilitation of stranded marine mammals                                     | We assist MMC on live strandings and we have given talks to their training groups and supplied interns for their rehabilitation program | Students can get marine mammal handling and rehabilitation experience   |
| Bureau of Land Management      | Conservation and Management of Public Lands                                   | Member of working group to rehabilitate an offshore seabird/sea lion rookery  | Student employment, experiential learning   |
| Yurok Tribal Council           | Governing branch of local Yurok Tribe   | Consultant with local tribe on marine mammal issues   | Student employment, experiential learning, exposure to different cultures and perspectives  |
| Moss Landing Marine Laboratory | Marine Laboratory of a number of central California State University Campuses | Part of collaborative group studying coast - wide marine mammal initiatives   | Students gained valuable hands-on experience handling seals, and tracking them via radiotelemetry from the air, sea and shore. Students also got to work with some of the other top researchers in the field. |
| Long Marine Lab – UCSC         | Marine Laboratory for University of California at Santa Cruz                  | On the board to coordinate state-wide Marine  | Experiential learning, introduction to  |

| Name  | Purpose   | Nature of Affiliation  | Benefits to program/major   |
|---|---|--|---|
|   |   | Mammal Research Symposium  | experts and grad students in MM science   |
| Whale Watching Spoken Here                          | Train docents in whale biology  | Serve as an expert to train interpreters   | Students are interpreters and interns   |
| Redwood National and State Parks                    | Preserve and protect natural resources  | Co-operative long-term projects on fungi and marine mammals and marine invertebrates   | Contributes to research and teaching – student experiential learning  |
| Siskiyou Field Institute / Deer Creek Field Station | Field-based environmental education and research  | Faculty Board member and Co-founder  | Student experiential learning through teaching and research opportunities   |
| HSU Vertebrate Museum                               | Support the educational and research missions of faculty and students at HSU through maintaining and supporting a collection of vertebrates for study.<br>The Vertebrate Museum is also an active member of the California Marine Mammal Stranding Network. | Contributing faculty member and advise students  | Student experiential learning through teaching and research opportunities   |
| Redwood Science Project                             | Improve science literacy and k-12 science educational outcomes  | Founded, multiple affiliations   |   |
| CSUPERB – California State University .....         | CSUPERB promotes biotechnology workforce development by supporting innovative coursework and programs, real-world research experiences, and core resources for faculty and students at all 23 CSU campuses.   | Board member, Grant review panels, students award committees, attend annual meetings, strategic planning council member, faculty consensus group member, Travel grant committee member, grants review committee member | Provide grant money, serving on panels and committees allows us to mentor faculty and students re: granting process |

| Name   | Purpose   | Nature of Affiliation                                      | Benefits to program/major   |
|--|---|--|---|
| MMERP  | Marine Mammal Education and Research Program – An undergraduate and graduate research program dedicated to the study of local marine mammal populations.                              | Director   | Student experiential learning through teaching and research opportunities |
| USDA Forest Service                                |   | Training workshops, Pacific NW Bat Grid, Technical Support | Supports student research   |
| Bat Conservation International                     |   | Training workshops   |   |
| Bats and Wind Energy Cooperative                   | Research initiatives to reduce bat mortality at wind energy facilities  | grant  | Supports student research   |
| DoD Legacy Program                                 |   | Training workshops, technical support                      |   |
| SERDP (Strategic Research and Development Program) | Research initiative to develop software and hardware for automated monitoring and species classification of bats  | grant  | Supports student research and provides stipend                            |
| CALTRANS   | Research initiative to develop software and hardware for automated monitoring and species classification of birds   | grant  | Supports student research and provides stipend                            |
| Texas Department of Transportation                 | Research initiative to assess impact of highway construction noise on federally listed golden cheeeked warblers   | grant  | Supports student research and provides stipend                            |
| INRSEP   | Provides support for Native American students planning a career in science. Nature of affiliation column. Faculty grants (HHMI, CSU-LSAMP) provide support for INRSEP & its students. |  |   |
| Humboldt Bay Harbor, Rec., and Cons. District      |   | Marine Mariculture Monitoring Committee Interact           |   |

| Name                                | Purpose   | Nature of Affiliation   | Benefits to program/major   |
|-------------------------------------|---|---|---|
|                                     |   | with agency and university professionals on developments and impacts of mariculture in HB |   |
| UC Reserve System<br>Angelo Reserve | The Angelo Coast Range Reserve is one of the 34 sites in the University of California Natural Reserve System. The mission of the NRS is to "contribute to the understanding and wise management of the Earth and its natural systems by supporting university-level teaching, research, and public service at protected natural areas throughout California." |   | Student experiential learning through teaching and research opportunities |

## 2. Facilities and resources

*Provide a brief listing of your most important facilities, equipment and information/library resources, and describe the degree to which the current facilities, equipment and information/library resources affect program quality.*

The quality of our graduate program depends heavily on several important facilities.

- Our Vertebrate Museum and Vascular Plant Herbarium house two of the largest and most highly regarded systematics collections in the CSU. These collections provide unparalleled opportunities for graduate students to learn crucial curatorial skills and to carry out research on the evolutionary relationships and conservation biology of plants and animals. Both facilities have well-established loan programs with other institutions across the country.

*Vertebrate Museum* – The vertebrate museum, containing more than 15,000 specimens, is the fulcrum of training in Mammalogy and Herpetology at HSU. It is an accredited museum used primarily for teaching, but also for graduate and faculty research. In addition to housing these collections, the museum includes a frozen tissue collection used for molecular studies.

The *Vascular Plant Herbarium* consists of nearly 100,000 dried plant specimens, with a strong emphasis in the flora of northwest California and southwest Oregon. Established in 1960, the Herbarium serves as a botanical resource for students and faculty, as well as community members and professional botanists. More than 20 graduate research projects have been centered on the collections held by the Herbarium.

- In addition to having the largest teaching greenhouse in the CSU system, our department operates a smaller Experimental Greenhouse, which has been a vital part of several graduate research projects. For example, several students have used the Experimental Greenhouse to study the potential of using plants to extract toxic materials from contaminated soils.
- Two key facilities support graduate education and research in the marine realm, the research vessel Coral Sea and the Telonicher Marine Laboratory.

The *Coral Sea* serves as an at-sea teaching laboratory for upper division and graduate courses in Invertebrate Zoology, Mammalogy, and Marine Mammalogy. The ocean off the coast of northern California is unpredictable and dangerous. Having a vessel the size of the Coral Sea provides incomparable opportunities for our students to study invertebrates, sea birds, whales, seals, and sea lions where they live.

The *Telonicher Marine Laboratory* provides vital laboratory space for assisting in graduate studies of the pristine rocky intertidal habitats at Trinidad Bay, and a large number of graduate theses have been carried out there.

- Our graduate programs in the areas of Cell and Molecular Biology are supported by the Biotechnology Laboratory and Core Facility as well as the scanning and transmission electron microscopes.

The *Biotechnology Laboratory* was remodeled with funds from the State and the Howard Hughes Medical Institute. The laboratory supports state-of-the-art graduate

research in Cell Biology, Genetics, Immunology, and Biotechnology. Major equipment and facilities include, ultrafreezers, walk-in cold room, thermal cyclers, microplate reader, laminar flow hoods, inverted microscopes, and computers. The *Core Facility* houses two real time PCR machines, thermal cyclers, and an automated DNA sequencer. Students are able to produce monoclonal antibodies, construct cDNA libraries, clone genes, sequence DNA, perform quantitative PCR and produce proteins using the baculovirus expression system.

The *Electron Microscopy Facility* includes both scanning and transmission electron microscopes. *SEMs (Scanning Electron Microscopes)* make high magnification images and are used to examine the surface structure of organisms and other natural objects. *TEMs (Transmission Electron Microscopes)* are used to take extremely high magnification (up to 100,000x) images of intracellular structures. Both have been integral to the work of at least five graduate students over the last several years.

3. Unique local and regional environment

*Describe how the program takes advantage of the unique local or regional social, cultural and/or natural environment available to students and faculty at HSU. (Do not include items listed under DI.)*

Our graduate program takes full advantage of the rich regional environments of northwestern California as venues for thesis research projects. Study sites available for thesis projects range from the marine, intertidal, and coastal strand to the high alpine of the Trinity Alps. Few campuses across the country can boast such a diversity of readily accessible field sites. Almost without exception, prospective graduate students identify our distinctive natural setting as a major reason for considering our Master's program.

**IV. Investments, Revenues, and Efficiencies (Response Limit: 2 pages of narrative, not including tables) [20%]**

A. Program Investments

1. Program Investment – Degree Requirements

*Enter the total number of required course units (as listed in the catalog) for this academic program, and then the number of required course units for this academic program that are from the primary course code associated with your program. Provide a total for each option if appropriate.*

Student Units

|                  |                     |  |
|------------------|---------------------|--|
|                  | Total required SCUs | Required Program SCUs in the primary Course Code |
| Biology Graduate | 30                  | 30   |

Weighted Teaching Units (WTU's)

*Total the number of WTUs required to teach 1 section of each of the required courses in the program. If there are lists of restricted electives (e.g., take 1 of the following 3 courses), then choose a representative course from the list. For required S-factor courses, estimate the typical number of WTU's assigned to a faculty member who teaches the course. Again, differentiate by option if appropriate.*

|                             |    |  |    |
|-----------------------------|----|--|----|
| Total Required Program WTUs | 30 | Required Program WTUs in the primary Course Code | 30 |
|-----------------------------|----|--|----|

2. Program investment – by Minimum Weighted Teaching Units required to offer coursework so students can make reasonable progress toward their degree.

*Complete the table below using the definitions that follow. Include additional columns as needed for additional options.*

| Total WTU in Course Code | WTU for GE and service to other academic Programs | WTU for Major Option 1 | WTU for Major Option 2 | WTU for Major Option 3 |
|--------------------------|---|------------------------|------------------------|------------------------|
| 30                       | 0   | N/A                    | N/A                    | N/A                    |

*Total WTU in Course Code: Sum up the total number of WTU that were used to teach courses in the primary course code associated with your academic program over the past two academic years. Exclude remedial courses.*

*Service to GE and other Academic Programs: Enter the total number of WTU that were used over the past 2 years to meet service demands imposed by students outside the major. (In other word, if 8 sections of Egyptology 301 have been offered over the past 2 years, but if 2 sections over the past 2 years would have been sufficient for the Egyptology majors, then count 6 sections of Egyptology, and the associated WTU, in this category.)*

*WTU for Major Option (s): Sum up the non-service WTU for the set of courses in the course code associated with your program that you would need to offer over a two year period to accommodate progress toward degree for your program students.*

*Notes: 1) In programs with multiple options, courses common to the multiple options should be included in all options. Hence the entries to the right of the "Total" entry will not sum to the total. 2) Do not pro-rate WTU's by the percentage of students in a particular section of a course that are majors. Include the course in the count if it must be offered during a 2-year period for students to make progress toward their degree. The 4-year major plan for Freshmen may be useful.*

3. Program Investments – by staff allocations.

*Estimate the percent of departmental expenditures for staff positions that can be attributed to this academic program. Provide an explanation, as appropriate.*

|                        |               |
|------------------------|---------------|
|                        | Major Program |
| Percents of Staff FTEF | 15%           |

| Description         | CBID | 1/31/2004 |      | 1/31/2005 |      | 1/31/2006 |      | 1/31/2007 |      | 1/31/2008 |      |
|---------------------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|
|                     |      | Count     | Sum  | Count     | Sum  | Count     | Sum  | Count     | Sum  | Count     | Sum  |
| BIOLOGICAL SCIENCES | R07  | 1         | 1.00 | 1         | 1.00 |           |      | 1         | 1.00 | 1         | 1.00 |
| BIOLOGICAL SCIENCES | R09  | 10        | 7.00 | 11        | 7.40 | 10        | 7.18 | 11        | 7.50 | 13        | 8.47 |
| <b>Total</b>        |      | 11        | 8.00 | 12        | 8.40 | 10        | 7.18 | 12        | 8.50 | 14        | 9.47 |

Biology is the largest major on campus (F'08 census, headcount data: 569), is internally diverse (8 options), and serves a large number of other programs. The cost of providing a lab

and field-based curriculum for this number of students justifies the WTU and staff costs shown in the tables above.

4. Program Investments – Other annual costs.

*Provide dollar estimates for other program costs by the following categories. Annualize periodic costs (equipment purchases or facilities upgrades) as necessary. Include an explanation, if appropriate. Do not include costs for commonly used items (smart classrooms, faculty workstations, etc.).*

| <b>Category</b>                                      | <b>Estimated Cost</b> |
|--|-----------------------|
| Equipment (including maintenance)                    | \$141*                |
| Instructional Supplies                               | \$3,893               |
| Temporary Help (graders, lab assistants, GA's, etc.) | \$14,892              |

*Note from Casey Lu: figures are averages based on past three years.*

*\*See also the Biology UG, Botany, and Zoology reports for equipment costs that certainly help support the Biology Graduate program.*

5. Program Investments – accreditation [if applicable]

*If this program is accredited, describe how this accreditation effects program costs.*

N/A

A. Gross Revenues

| <b>Revenue</b>                           |              |              |              |
|--|--------------|--------------|--------------|
| <b>DEPARTMENTS COMPLETE THIS SECTION</b> | <b>05/06</b> | <b>06/07</b> | <b>07/08</b> |
| Fundraising/donations                    | \$4,405      | \$4,186      | \$5,102      |
| Extended Education                       | \$1,772      | \$1,329      | \$1,071      |
| Student fees                             | \$28,613     | \$30,623     | \$28,849     |
| Instructionally Related Activities (IRA) | \$563        | \$2,663      | \$59         |
| Instructionally-related grants           | 0            | 0            | 0            |
| Grants and contracts to P.I.s            | ~1.8 M       | ~1.6 M       | ~2.1 M       |
| Other revenues                           | \$80         | 0            | \$756        |

*Provide an explanation for how these revenues support the academic program.*

Faculty in Biology are very active and successful in grantsmanship, bringing in nearly \$2 million in awards for each of the past three years. The benefits of these funds are seen in many aspects of undergraduate life in the department. Grants enable the faculty to stay current in their disciplines and active in their research. This is related to students in the classroom and through increased opportunities for experiential learning in the field and laboratory. These funds also support major equipment purchases and supplies which have a direct affect on the quality of the program we can offer undergraduate students. Finally, portions of these grants go directly to students in the form of stipends and travel to scientific meetings. They represent a key element contributing to the success of our program. Given that the budget provided by the state/CSU/CNRS for Biological Sciences is approximately \$3 million, grantsmanship in the department is supplementing 2/3 of our actual annual costs!

Modest additional revenue is generated from fund raising and Extended Education. Fund raising has recently (past year and coming year) increased thanks to large donations from two individuals/families. These funds (donations and Extended Education) are used toward general program costs, student employment (well-paid student assistant positions), and scholarships.

Student lab fees make up the largest portion of non-grant departmental revenue. These lab fees are used for expendable instructional materials and their use is tightly regulated by a student lab fee committee. It would impossible to operate our department without the student lab fees.

## B. Efficiency

### 1. Efficiency – By SFR for course code

| <b>Academic Year Averages</b> | <b>Subject</b> | <b>02/03</b> | <b>03/04</b> | <b>04/05</b> | <b>05/06</b> | <b>06/07</b> | <b>07/08</b> |
|-------------------------------|----------------|--------------|--------------|--------------|--------------|--------------|--------------|
| SFR                           | BIOL           | 13.62        | 15.78        | 15.94        | 14.86        | 13.88        | 16.33        |
| FTEF                          | BIOL           | 14.10        | 12.28        | 12.66        | 13.89        | 14.33        | 12.76        |

| <b>SFR SUMMARY</b>       | 02/03 | 03/04 | 04/05 | 05/06 | 06/07 | 07/08 |
|--------------------------|-------|-------|-------|-------|-------|-------|
| <b>AHSS</b>              | 20.36 | 22.05 | 21.94 | 20.61 | 21.19 | 22.91 |
| <b>CNRS</b>              | 15.66 | 16.90 | 17.17 | 16.04 | 16.82 | 18.28 |
| <b>CPS</b>               | 15.12 | 16.29 | 15.68 | 15.22 | 20.80 | 25.33 |
| <b>UNIVERSITY TOTALS</b> | 17.28 | 18.65 | 18.57 | 17.52 | 19.32 | 21.43 |

*Explain any substantial changes in SFR. Also explain why this SFR differs from the college and/or university SFR. What efforts have been made over the past few years by the program to improve this measure of efficiency? Use the data under part IV.E. as appropriate.*

The nature of a quality graduate education, which demands small classes where students and faculty can engage in intensive discussion, precludes attainment of impressive SFR values. This truism is especially apt for our graduate program, which offers a broad palette of specialized courses to students with diverse interests. We regard the curricular breadth of our graduate program as an important strength, but one inevitable corollary is that student demand for individual courses can be relatively low.

## 2. Efficiency – Other views.

The Prioritization Task Force will examine the data given under section IV.A and B in terms of the overall production (e.g. number of majors, number of graduates) in the program. Please comment if appropriate.

On average, 12 students complete our graduate program each year. This translates to an overall production efficiency of about 25% per year. Thus, even though we require students to identify a thesis project and advance to candidacy during their second semester, many take four years to complete their degrees, viz., twice as long as we would like. Part of the problem relates to the large fraction of students who select field-based research projects, most of which have a strong seasonal component. Often students need two field seasons to gather a credible data set, which means that they begin analysis and writing in their sixth semester. Another important problem is the meager level of financial support we can provide to students. Many are forced to take outside jobs, which prolongs their tenure.

## C. Budget cut impacts

*Indicate how your program has been affected by recent (since 2002-2003) budget cuts that have directly affected resources for your program (faculty, staff, operating expense) and course offerings (class size, reduced course offerings or options for the major.) Refer to the data included under section IV. E. or in the departmental report as appropriate.*

The impacts of recent budget cuts have come mainly via failure to fill vacated faculty positions. Loss of faculty has meant the loss of important and distinctive expertise (eg., molecular systematics) and has translated into a reduction in the number and diversity of courses we offer at both the graduate and upper-division levels. Perhaps most importantly, the current budgetary environment provides much less flexibility in constructing faculty work loads with attendant missed opportunities for creativity. For example, in the past our department chair was able to negotiate temporary reductions in teaching schedules so individual faculty could write grant proposals that might ultimately bring funding for graduate student research. This sort of flexibility no longer exists.

D. Additional Data

| <b>Course Offerings Profile in Biology (AY 00/01 - AY 07/08)</b><br>class_offerings_BIOL report generated: 27-JUN-08           |             |             |             |             |             |             |             |             |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|  | AY<br>00/01 | AY<br>01/02 | AY<br>02/03 | AY<br>03/04 | AY<br>04/05 | AY<br>05/06 | AY<br>06/07 | AY<br>07/08 |
| Distinct Courses Enrolled  | 25          | 24          | 25          | 20          | 21          | 20          | 23          | 23          |
| Sections Enrolled  | 96          | 87          | 93          | 86          | 90          | 90          | 94          | 91          |
| Average Section Enrollment   | 16          | 17          | 17          | 19          | 18          | 19          | 17          | 19          |
| <b>Distinct Courses Enrolled in Biology by Level (AY 00/01 - AY 07/08)</b><br>class_offerings_BIOL report generated: 27-JUN-08 |             |             |             |             |             |             |             |             |
| Course Level   | AY<br>00/01 | AY<br>01/02 | AY<br>02/03 | AY<br>03/04 | AY<br>04/05 | AY<br>05/06 | AY<br>06/07 | AY<br>07/08 |
| Lower-div  | 5           | 5           | 5           | 4           | 4           | 4           | 4           | 4           |
| Upper-div  | 14          | 14          | 13          | 11          | 12          | 11          | 13          | 12          |
| Graduate   | 7           | 6           | 7           | 6           | 5           | 6           | 7           | 8           |
| <b>Total</b>   | <b>25</b>   | <b>24</b>   | <b>25</b>   | <b>20</b>   | <b>21</b>   | <b>20</b>   | <b>23</b>   | <b>23</b>   |
| <b>Sections Enrolled in Biology by Level (AY 00/01 - AY 07/08)</b><br>class_offerings_BIOL report generated: 27-JUN-08         |             |             |             |             |             |             |             |             |
| Course Level   | AY<br>00/01 | AY<br>01/02 | AY<br>02/03 | AY<br>03/04 | AY<br>04/05 | AY<br>05/06 | AY<br>06/07 | AY<br>07/08 |
| Lower-div  | 31          | 30          | 30          | 28          | 29          | 31          | 30          | 31          |

|              |           |           |           |           |           |           |           |           |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Upper-div    | 43        | 40        | 40        | 36        | 43        | 38        | 42        | 37        |
| Graduate     | 22        | 17        | 24        | 22        | 19        | 22        | 22        | 24        |
| <b>Total</b> | <b>96</b> | <b>87</b> | <b>93</b> | <b>86</b> | <b>90</b> | <b>90</b> | <b>94</b> | <b>91</b> |

**Avg Section Enrollment in Biology by Level (AY 00/01 - AY 07/08)**

class\_offerings\_BIOL report generated: 27-JUN-08

| Course Level | AY<br>00/01 | AY<br>01/02 | AY<br>02/03 | AY<br>03/04 | AY<br>04/05 | AY<br>05/06 | AY<br>06/07 | AY<br>07/08 |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Lower-div    | 24          | 25          | 28          | 30          | 29          | 30          | 28          | 29          |
| Upper-div    | 15          | 15          | 17          | 17          | 16          | 17          | 16          | 19          |
| Graduate     | 5           | 4           | 5           | 6           | 5           | 6           | 5           | 5           |
| <b>Total</b> | <b>44</b>   | <b>45</b>   | <b>50</b>   | <b>53</b>   | <b>51</b>   | <b>53</b>   | <b>50</b>   | <b>53</b>   |

**FTES in Biology by Course Level (AY 00/01 - AY 07/08)**

class\_offerings\_BIOL report generated: 27-JUN-08

| Course Level | AY<br>00/01  | AY<br>01/02  | AY<br>02/03  | AY<br>03/04  | AY<br>04/05  | AY<br>05/06  | AY<br>06/07  | AY<br>07/08  |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Lower-div    | 84.0         | 86.1         | 95.5         | 95.0         | 97.6         | 104.9        | 95.4         | 101.6        |
| Upper-div    | 79.4         | 74.3         | 77.8         | 78.0         | 88.6         | 79.7         | 85.2         | 86.6         |
| Graduate     | 16.2         | 12.3         | 18.8         | 20.6         | 15.5         | 21.8         | 18.3         | 20.3         |
| <b>Total</b> | <b>179.7</b> | <b>172.7</b> | <b>192.1</b> | <b>193.7</b> | <b>201.7</b> | <b>206.4</b> | <b>198.8</b> | <b>208.5</b> |

**NOTE:** In the above tables all class sections have 2 or more students enrolled. This is done to minimize the influence of independent student sections.

Distinct Courses count each distinct SUBJ/Course-number combination enrolled.

All figures are Fall/Spring term averages. Due to the rounding of average Academic Year counts, the various breakouts may not add to the exact same amounts.

### Other Class Offering Breakouts

These examine independent study sections, and sections by different modes of instruction. The Lecture-only sections have only a C1 through C6 mode. The Lab/Activity-only sections have only a C7 through C-16 mode. Other modes and combinations contain the remaining modes or combinations of lecture and lab/activity modes.

**Other Special breakouts in Biology (AY 00/01 - AY 07/08)**

class\_offerings\_BIOL report generated: 27-JUN-08

|                                  | AY<br>00/01 | AY<br>01/02 | AY<br>02/03 | AY<br>03/04 | AY<br>04/05 | AY<br>05/06 | AY<br>06/07 | AY<br>07/08 |
|----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Sections with 1 student enrolled | 27          | 21          | 22          | 22          | 27          | 20          | 29          | 22          |
| Lecture only sections            | 23          | 20          | 20          | 17          | 19          | 19          | 21          | 19          |
| Lab/Activity only sections       | 45          | 41          | 41          | 37          | 38          | 40          | 39          | 39          |
| Other modes and combinations     | 28          | 27          | 33          | 32          | 34          | 32          | 34          | 33          |

**V. Potential (Please complete this section for each option. Limit: 2 pages per option) [15%]**

A. Program capacity with existing resources:

1. What is your program's maximum capacity with current resources? Use two metrics to define “capacity”: The number of graduates per year, and the number of FTES generated by courses that are unique to this option, per year.

| (Completed by the department)            | Graduates per year | FTES in the major option per year |
|--|--------------------|-----------------------------------|
| Existing                                 | 11.5               | 20.5                              |
| Maximum capacity with existing resources | 11.5               | 30.3                              |

2. If your program is at maximum capacity, proceed to part B. If you have capacity to grow with existing resources, what steps have been taken to increase enrollment? What have been the effects of these steps, and what results are still anticipated?

Our graduate program is operating close to maximum capacity. Faculty in the less resource demanding ecological sub-disciplines typically advise at least two students. Faculty in more cost-intensive sub-disciplines (e.g., genetics and molecular biology) tend to have fewer graduate students because of limited funding and course offerings. Currently we do not have enough office and research space for graduate students.

Maximum capacity for our graduate program is **not** a simple function of FTES. Rather, the maximum number of students we can support largely reflects the product of the number of graduate advisors we have and the number of graduate students each advisor can handle. Other constraints limiting expansion include insufficient office and research space as well limited funding to purchase needed supplies and equipment. The number of unfilled seats in graduate courses is not true measure of the capacity of the program.

B. Opportunities for future growth or substantial curricular changes

1. What opportunity does the program have for future expansion? Provide evidence for your response.

We believe that the following areas have significant potential for growth at the graduate level: Science Education, Biotechnology and Bioinformatics, and Marine Biology. See section IIB for evidence.

2. Describe the curricular changes and/or staffing increases required to accomplish such an expansion?

We estimate the need for an additional four-to-five tenure track positions with associated infrastructure support (office space, start-up money). As noted, the major limitation to our graduate program is the availability of faculty advisors. Only by bringing in more faculty can we adequately support an enhanced program. This would also have the benefit of allowing us to offer a wider variety of graduate courses, improving educational opportunities not only for our graduate students, but also for advanced undergraduates in the Biological Sciences and related disciplines (e.g., Forestry, Fisheries, Wildlife).

C. Impact of augmented resources

*Suppose that your program were ranked in a category that recommended augmentation of resources. What would be the impact of augmented resources? (Answer for a 10% augmentation and a 20% augmentation.)*

Traditionally, our graduate program has been strongest in the areas of ecology and systematics. Augmentation at either level would allow us to build on these traditional (and still vital) strengths, but importantly, **it would allow us to create new strengths in rapidly growing disciplines.** For example, hiring new faculty in the area of biotechnology (eg., stem cell research) would increase the visibility of the university, bring new opportunities for grant funding, and attract a new population of graduate students.

D. Impact of reduced resources

*Suppose that your program were ranked in a category that recommended reduction of resources. What would be the impact of reduced resources? (Answer for a 10% reduction and a 20% reduction.)*

The impacts of reduction at either level would be dramatic, especially since we are operating now at capacity. Under either scenario, we can project a reduction in the quality of the mentoring we provide and in number of graduates we produce. Since the

excellent reputation our program enjoys depends heavily on our graduates -- a large fraction of whom find employment in California in their field of study --, we fear that substantial budget reductions would ultimately bring a downward spiral in the number and quality of students that we attract. Our prospects for attracting new faculty would suffer in corresponding fashion. The biggest losers would be our undergraduate students, many of whom interact with graduate students and take graduate courses, and the many employers across the state who depend on our graduate program to generate superior job candidates.

E. Impact of program elimination

*Suppose that your program were recommended to be discontinued. What would be the impact of program elimination?*

Discontinuation of our graduate program would be an abdication of an important societal responsibility. Public and private employers across the state look to our graduate program as a source of well-educated, highly trained biologists, especially in the environmental fields. The loss of our graduate program would likely result in a substantial loss of prestige for HSU, as our graduates gradually came to fill an increasingly smaller fraction of job vacancies. Such a drop in prestige could easily cascade to a drop in enrollment in our undergraduate programs. A direct cause of such a drop in enrollment would be the very real decrease in the opportunities for undergraduate involvement in research.

Moreover, discontinuation of the graduate program would be economically unwise. Graduate TAs teach laboratory sections at a fraction of the cost of lecturers or tenure-track faculty. By eliminating the graduate program, this ready source of cheap labor would be lost.

Finally, faculty recruitment and retention are strongly tied to the graduate program. Most faculty identify the opportunity to work with Master's students as a prime reason for coming to HSU. Loss of the graduate program would make it more difficult to attract and retain quality faculty.