Academic Program Review

Biological Sciences

California State University, Stanislaus

I. Program overview

The CSU Stanislaus Department of Biological Sciences provides students with a strong foundation in biology, enabling them to think critically about biological topics, to learn technical skills for solving biological problems, and to communicate biological information in oral and written formats. By offering courses that span the spectrum of biological disciplines and encouraging interdisciplinary study in other fields, the biology department prepares students for advanced studies in a wide variety of fields. Finally, the department's curriculum prepares all students to take a leadership role in society by furnishing them with the tools to make informed decisions about scientific issues.

The Department offers programs of study in the life sciences for students seeking either the Bachelor of Arts or the Bachelor of Science in Biological Sciences and at the Master of Science level in Ecology and Sustainability, Genetic Counseling, and, in conjunction with Moss Landing Marine Laboratories, Marine Science. Students have the option of concentrating in one of the following areas: Botany, Clinical Laboratory Science, Entomology, Environmental Sciences, Genetics, Marine Biology, Microbiology, or Zoology. For students planning to attend medical, dental, pharmacy, veterinary, optometry, physical therapy, physician assistant, clinical laboratory science, or podiatry schools, the department has a Pre-Health Professional curriculum.

The Department of Biological Sciences is the largest department in the College of Natural Sciences comprised of more than 50% of the students at California State University, Stanislaus majoring in the natural sciences (472 of 818 students). The faculty consists of 16 tenure-track faculty, one full-time lecturer, and 3 part-time lecturers, which are supplemented with graduate teaching associates. The Department is housed in the Nora and Hasem Naraghi Hall of Science occupying 8 teaching laboratories with 6 adjoining prep spaces, 24 faculty offices, a 3,000 square foot vivarium, an insectarium, faculty library, scientific apparatus room with a scanning electron microscope, and wet and dry specimen collection rooms. A new 1800 square foot greenhouse is also being added to the teaching space. Although these facilities serve double-duty for teaching and research, the department has no research-dedicated space per se.

II. Changes since the 2000 Academic Program Review

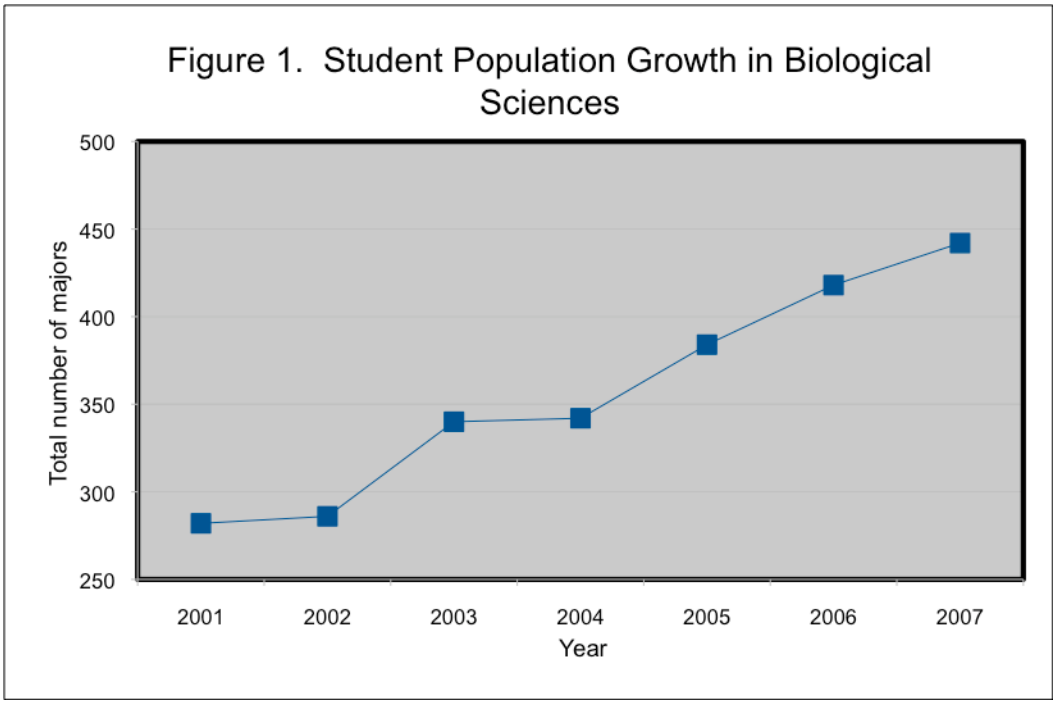
Program and Field Changes and Curricular Response

Program Changes

Since the Academic Program Review in 2000, the department of Biological Sciences has had changes in several areas such as growth in student and faculty numbers, addition of graduate programs, increased the sections of service and GE courses and increased laboratory and office space with a move into a new science building. The department can best be characterized as a growing program, but

underfunded and understaffed (staff and faculty).

At the last review, the department consisted of 12 tenure-track faculty, one full-time lecturer, three part-time lecturers and one volunteer lecturer. Four of those tenure-track faculty have since retired and were replaced with new tenure-track faculty. In addition, the department was able to acquire an additional four tenure-track faculty to increase this number to 16 (25% increase). As a result of these changes half of the faculty are new to the department since the last program review. Along with the 16 tenure-track faculty, in AY 2007-2008 the department had 2 full time lecturers, 3 part time lecturers and 5 graduate teaching associates. In this same time frame the number of students majoring in biology has increased from 282 (2001) to 472 (2008) (Figure 1) representing a 67% increase, approximately a 5-6% increase in enrollment per year while the number of tenure-track faculty has only increased by 25% (12 in 2000 to 16 in 2007). Over the years, the percentage of part-time to full-time students has remained constant at 25%.



In the Summer of 2007 the Department moved into the Nora and Hasem Naraghi Hall of Science with courses being offered in Fall of 2007. This move dramatically increased the facilities. The new science building increased the number of available faculty offices from 12 to 24, allowing all teaching faculty to be housed in the same building and on the same floor. In the old building, the department had 3, 24-station and 4, 18-station laboratories; in Naraghi Hall we have 8, 24-station labs. The increase lab space allowed the department to dedicate labs to particular disciplines such as anatomy, microbiology and biotechnology. Previously, these courses shared lab space with other courses resulting in the need

to move materials between labs. The current anatomy and biotechnology labs do not require the moving of materials between courses and the microbiology lab meets the criteria for level 2 biosafety which was not possible in Science I. The move did decrease the number of lab spaces we had dedicated to our diversity and ecology courses, but this has resulted in some changes in schedules to accommodate courses that were once taught simultaneously in different labs.

Changes in the Biological Science

The field of biology has exploded in the areas of genomics, regenerative medicine, and computational biology. With the sequencing of the human genome completed in 2003, research in molecular biology has driven biology to look at gene expression and genome comparisons with other sequenced organisms, putting this information to use. Attention has also been turned to proteonomics and epigenics, two fields that have been fueled by the genome project. There is also a growing interest in regenerative medicine using stem cells. In addition, the recent attention paid to the effects of human impacts on the environment and biodiversity has led to increased interest in how environmental policy decisions, green technology, and ecosystem services can act as ameliorating or reversing agents. Moreover, shortages in all areas of healthcare (predicted to continue for the next 10 years) have led to an increased interest in all these fields.

Curricular Responses

The department has attempted to respond to these external factors in a variety of ways:

The department curriculum committee is in the midst of reviewing and revising the program including a change in the introductory biology sequence, taking into account the changes in biology, especially in the area of biotechnology. The rest of the curriculum is being reviewed and revised as will be discussed in a later portion of this review.

A Professional Science Master in Genetic Counseling was added in 2008 to help fill a shortage of Genetic Counselors in the San Joaquin Valley. In response to changing views on environmental issues, the department began working toward a graduate program in this particular area. In 2006, the department admitted its first cohort of students in its thesis-based masters program in Ecology and Sustainability.

The department continues to support students preparing for applying to professional schools and has added a concentration in clinical laboratory science to prepare students for admission into a licensing program.

The addition of the two graduate programs has greatly increased the number of graduate students in the department above those normally channeled through the MS in Marine Science (in conjunction with Moss Landing Marine Laboratory) or the Interdisciplinary Studies Program. Total numbers of graduate students rose from 1 in 2001 to 25 in the Fall of 2008. We expect to see these numbers increase in the

future.

In addition to changes to benefit biology majors and/or pre-professional students, the Department has increased the number of sections of lower division GE courses, primarily Principles of Biology and the accompanying laboratory, World of Biology. A third section of Principles of Biology is taught in the Fall and Spring along with a Winter and Summer section. World of Biology sections have increased from 6 in the Fall and Spring to 10, with Winter term increasing from 2 to 3 and 2 sections offered in conjunction with Principles of Biology in the Summer. A new upper division course, DNA Code of Life was added to the upper division general education offerings. Another new course, Medicinal Plants is scheduled to be offered as upper division general education in the 2009-2010 academic year.

To continue servicing the needs of the department of Physical Education and Health while meeting the demands of the Nursing Program, the number of sections of Physiology and Anatomy were doubled in the Fall and Spring and a section of each course were returned to the Summer term. Additionally, the number of Physiology lab s was increased from 2 to 3. Similarly, anatomy laboratory sections were increased and then the course was split into two courses, Human Anatomy (Zool 2250) for pre-nursing students and Fundamentals of Anatomy (Zool 2260) for Physical Education students and students in other disciplines who may need a course in human anatomy. This allows the courses to concentrate on areas of interest to the two different group of students. The department also added Microbiology for Nursing, which is taught Summer term to students that have been accepted into the Nursing Program. A fully online section of Frontiers in Biology has been offered since the Fall of 2007.

Responses to Previous Recommendations

During the previous review (AY 2000-2001), four areas of recommendations were identified by the College of Arts, Letters and Sciences review, (1) Objectives/Assessment, (2) Curriculum, (3) Resources, and (4) Faculty/Students. Following are the recommendations and the status of the department's efforts in these areas.

1) Objectives/Assessment

The last review noted that although the department recognized the need for a formal assessment plan, none had been implemented. Since this review, a faculty member has been assigned the task of overseeing assessment. As part of the assessment process, a survey was developed and administered to all students taking a course to meet their physiology requirement. The physiology requirement is generally fulfilled in the student's senior year and all students must complete a physiology course before graduating. This ensures that all students take this survey before they graduate. Summaries of this survey are presented to the faculty during a department meeting early in the fall term. Results from the survey are in Appendix A.

The Student Learning Goals Assessment is an indirect measure of student's success in learning the topics the faculty have deemed as important. A majority of responses from students completing the

survey agree to strongly agree that the concepts were learned. With the limited numbers of responses and the fact this is a subjective measure of student success, little can be concluded. The department is working on a direct method of assessing students learning.

2) Curriculum

Two recommendations with respect to the department's curriculum were noted in the last review. The first encouraged the department to review the introductory sequence of courses, the major core and concentrations within the department along with a note on exploring alternative methods of delivery and times for scheduling courses of delivery. The second recommendation was to develop a proposal for a master's degree.

The department's curriculum committee has been looking at the overall program and is implementing some changes that are in line with the recommendations from the last program review. Beginning in the Fall of 2009, the lower division biology sequence of ZOOL 1050 and BOTY 1050 will be replaced with a new sequence, BIOL 1050 (General Biology I) and BIOL 1150 (General Biology II). This change reflects changes in the field by including molecular biology in the introductory sequence. It was also noted that the previous two courses in the sequence had overlap in content; the new sequence eliminates this content overlap and allows for a broader overview of biology. Copies of the course proposals are found in Appendix A.

The curriculum committee reviewed the major core and concluded that there was one vital aspect of biology missing. Since evolution is the cornerstone of the biological sciences, an upper-division course (BIOL 4400 Evolution) was added to the curriculum. Beginning fall 2009 this course will be required for all biology majors. Prior to this, students desiring a better understanding of evolution enrolled in BIOL 3020 Introduction to Evolution. However this course is an Upper Division General Education course rather than one specific to the needs of biology majors.

A need to examine alternative delivery methods including distance learning, online (both hybrid and fully online) and utilizing unconventional times (evenings and weekends) was also mentioned in the 2000 review. The department continues to offer a single course via distant learning (BIOL 3000, Frontiers in Biology) and has added a fully online section of this course. One difficulty in offering courses in the program in distant learning and online formats is the need to provide laboratory time. Students can register for Hematology-- a hybrid course available through concurrent enrollment with CSU Sacramento. In this course, students attend lectures on the Turlock campus that are delivered over the internet and then must attend two full day laboratory sessions in Sacramento.

Night courses tend to get low enrollments and are not desired times for faculty to teach so the department has limited night offerings. In the past we have found it necessary to offer night courses because of space limitations. With the increase in laboratory space in the new science building there has been little need to offer night courses. As the number of students in the major grows, the need for more night offerings to meet student needs will increase.

The recommendation to develop a master's program was followed. In fact, there are now two masters programs in place: MS in Ecology and Sustainability and PSM in Genetic Counseling.

3) Resources

Two recommendations with respect to the department's resources were noted in the last review. The first encouraged the department to prioritize the equipment needs of the program. The second recommendation was to enhance the overall resources especially clerical staff and operating budgets.

Many of the previously identified equipment needs were resolved with the move into Naraghi Hall. For instance, all laboratories are now equipped with new compound and dissecting microscopes. This allows students moving between laboratory courses to be exposed to the same type of microscopes and reduces the confusion of using different brands and models. This also increases the efficiency in maintenance as spare parts need only be stocked for one brand of compound and dissecting microscopes rather than the numerous types in the old building and technicians need only learn to service one brand. New equipment also allowed nearly all individual laboratory sections to be increased to 24 students in all labs where many of the upper division labs used to accommodate 18. Not resolved is the lack of funds for maintenance contracts on equipment and funds to replace broken or aged equipment. Lack of maintenance funds makes the need for replacement funds greater since a lack of routine maintenance and inspection schedule of equipment increases the rate of deterioration.

Also not resolved is the lack of support staff. The department did gain a 10-month administrative assistant for the front office and a part-time student technician for the biology field site/greenhouse who works approximately 20 hours per week, but current the budget crisis has put the latter in jeopardy. There still is only one Instructional Support Technician III for the 16-20 tenure-track and part-time faculty. A line item for a half-time student worker to assist in the stockroom has been added to the department budget. Under the work-study program, two student assistants are hired each term to supplement the Support Technician's activities and one half-time student for the main office. This is a less than ideal solution with students requiring time of the Support Technician for supervision and training; also, student turnover with graduation requires excessive time to train replacements almost every term. We are the only biology department in the CSU system with only one Instructional Support Technician and without a person specifically assigned to the greenhouse. This abysmally low support staff requires faculty to spend time preparing for laboratories that could be better spent mentoring students or doing research and scholarly activities.

4) Faculty/Students

The previous review listed concerns with replacing retiring faculty and adding faculty in response to anticipated growth. Retiring faculty thus far, have been replaced. In order to keep the Endangered Species Recovery Program (ESRP) at CSU Stanislaus after Dr. Dan Williams retired, Dr. Patrick Kelly was hired as its director. Dr. Glenn Hackwell was replaced by hiring Dr. Kenneth Schoenly, Dr. Pete Mayol was replaced by hiring Dr. Jane Bruner, Dr. Wally Tordoff was replaced by hiring Dr. Marina

Gerson, and Dr. Wayne Pierce was replaced by hiring Dr. Stuart Wooley.

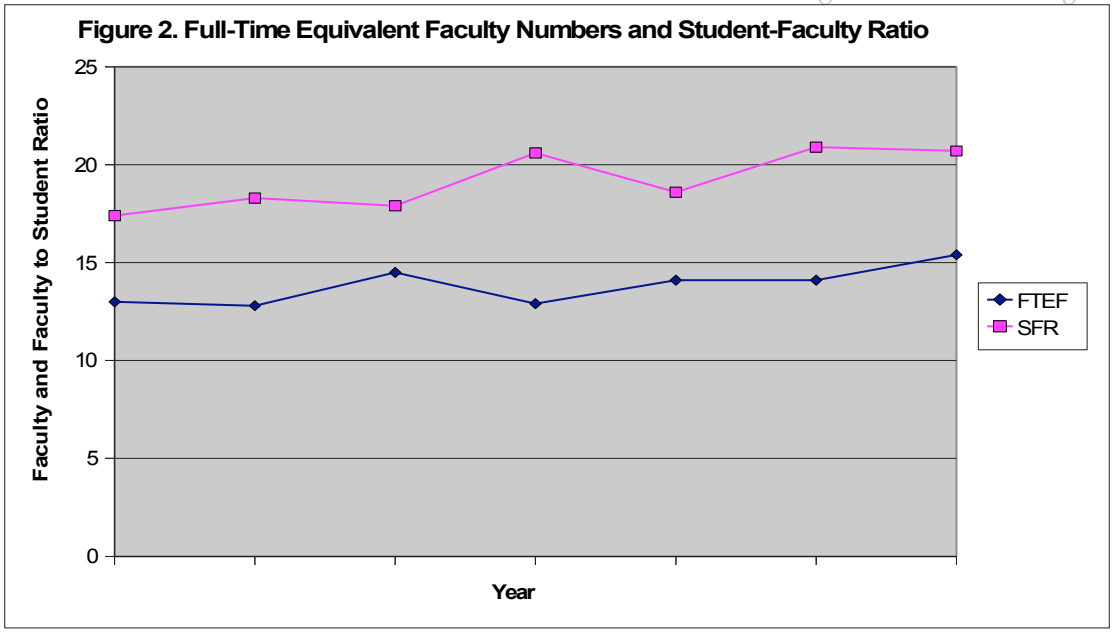
In response to growth in the department as well as in programs that we serve, the department was able to add three new tenure-track faculty. The department was able to add a second Microbiologist (Dr. My Lo Thao), an Anatomist (Dr. Terry Jones), and another Physiologist (Dr. Mark Grobner).

The previous review identified the need for more students to be trained as science teachers. This resulted in the hiring of a science education specialist, Dr. Michael Stevens. The final addition to the tenure-track faculty was Dr. Mathew Cover who is a restoration ecologist, critical to the masters program in Ecology and Sustainability.

Due to the high number of WTUs taught by part-time faculty, the inability to staff all majors courses with tenure-track faculty, and the increase in the need for GE and service courses, the department has sought an additional 5 tenure track faculty members. This is to help reduce the Student/Faculty Ratio, which is one of the highest of any of the departments at CSU Stanislaus and at or above average for biology departments throughout the system (Table 1). The rise in Full Time Equivalent Students is not being matched by a rise in Full Time Equivalent Faculty leading to the increase in the SFR (Figure 2.) New faculty are needed in the following areas: Anatomy/Physiology, Genetics/Molecular Biology, Microbiology, Science Education, and a Marine Biologist/Aquatic Invertebrate Zoologist to replace Dr.Pamela Roe who is currently in the FERP program. These positions were approved in 2007 but the searches were canceled in response to system- and university-wide budgetary problems.

Table 1. Student/Faculty Ratios

Year	FTES	FTEF	SFR	SFR Stanislaus	SFR Biology Systemwide
2000	225.3	13	17.4	17.6	17.7
2001	234	12.8	18.3	17.1	18.3
2002	259.4	14.5	17.9	17.5	19.1
2003	265.3	12.9	20.6	17.6	20.1
2004	263.1	14.1	18.6	18.1	20.9
2005	295.2	14.1	20.9	18.3	20.6
2006	318.6	15.4	20.7	17.9	20.8

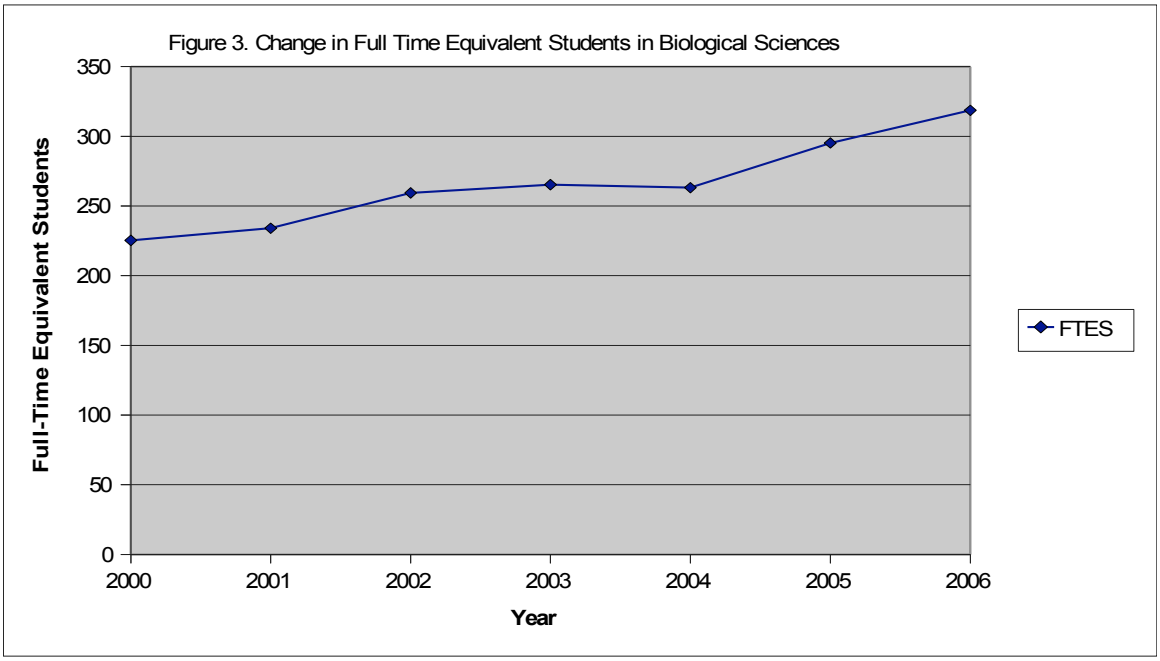


The need for a better, more formal mentoring program for new faculty was addressed by developing a faculty handbook specific to policies and procedures within the department. All faculty members received a copy of this manual. Department chairs are taking a more active role in mentoring new faculty, meeting them when they first arrive on campus and at least the beginning of each term. Junior faculty are directed to senior faculty for specific courses to help in developing course plans, lectures and syllabi.

Faculty advising is being distributed more equitably among the faculty through assigning students a faculty advisor. New students, either transfer or freshman, are assigned to faculty with the least number of advisees. Students must formally request a change in advisor, preventing the jumping from one faculty member to the next each term. Dr. Watson still maintains the position of the Pre-Health Professions advisor and receives 3 WTUs of reassigned time per academic year in that role. This role is in gathering letters for applications and maintaining current information on application procedures for the various health professions. However, the Pre-Health students are distributed among all faculty for academic advising.

Other recommendations made by the department include adjusting the operating budget commensurate with the increase in FTES and the need to control faculty resource dollars (Figure 3). The department's operating budget has remained unchanged from the last review in 2000. With the move into Naraghi Hall, there is an increase in the telephone charges to the department above the amount allocated in the budget. The department also incurred a five-fold increase in fees to certify bio-safety cabinets in going from 2 cabinets in Science I to 10 cabinets in Naraghi Hall. This is another cost not budgeted that will reduce the amount of available supplies and service money. The department did gain a line item for the

Bio Ag field site/greenhouse technician. Most of the course laboratory fees have been reviewed to keep up with the increase in the cost of disposable materials used in labs. Faculty resource dollars are better controlled in that they come back to the college and used to fund part-time faculty within the department in which the salary savings was generated. This has allowed for the hiring of one or two Full-Time Lecturers in positions we are unable to fill with tenure-track faculty. However, a lack of funding to replace instructional equipment is still a serious problem. With the move into Naraghi Hall, this need is not immediate, but as the new equipment ages and there are no funds for maintenance, this will continue to be an issue that will hamper the quality of instruction.



III. Enrollment Trends

Summary

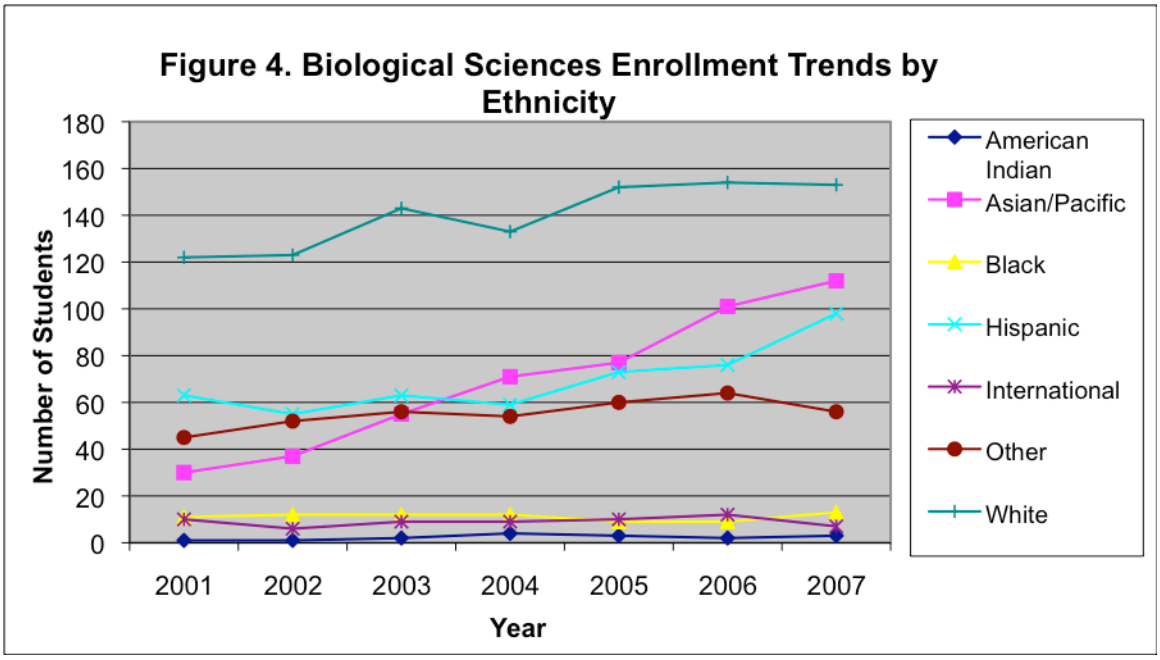
Table 1 lists data from Institutional Research summarizing the number of students majoring in biology along with student numbers for the College of Natural Sciences and university. Figure 1 shows the trends in student numbers for the department. Total numbers of students majoring in biology rose steadily over the seven-year period since the last review, with 282 students in 2000 and 442 in 2007. This represents a 57% growth in biology majors during the same time the overall university student population grew by 17%. By comparison, the number of tenure track faculty grew by 33% during this same period, however, the net gain in FTEF changed little with part-time WTUs being replaced by tenure track positions. The percentage composition of part-time and full-time students has remained constant with full-time students making up 70% of students.

Table 2	Student Demographics for the Department, College and University							
		2001	2002	2003	2004	2005	2006	2007
	Full Time	206	197	250	249	291	304	317
	Part Time	76	89	90	93	93	114	125
Total Students	Department	282	286	340	342	384	418	442
	CNS			631	663	684	754	783
	University	7534	7850	8072	7858	8137	8374	8830

Student Characteristics

Table 3 summarizes data from Institutional Research regarding the general characteristics of the student population in biology and Figure 4 shows the trends since the last review. There has been a definite shift in the gender of students entering the program with males comprising 66.7% of the students in 2000, dropping to 37.5% in 2007. A less dramatic shift is seen in the ethnicity of students, 56% which were non-Caucasian in 2000 increasing to 65% in 2007. The greatest growth has been in Asian/Pacific ethnicities with the number of students more than tripling between 2000 and 2007 increasing from 10% to 25% of the student population. The number of Hispanic students, although increasing numerically, still makes up about 22% of the population and students reporting their ethnic group as white have grown at a slower rate, originally comprising 43% of the student population and in 2007, making up only 34%. With respect to age, the number of students over the age of 25 has remained constant averaging 75 students while the growth in the department has been in students under 24 has almost doubled during the same time period. This trend may be the result of more students entering the program directly from high school. The number of freshman students doubled between 2001 and 2007 while the numbers of sophomores and juniors remained stable and the number of seniors increased by 50%. In 2000, 40% of the students in the program came directly from high school, with 55% in 2007. The numbers of students transferring from other 4-year institutions has remained constant over this same time period (average 48).

Table 3	Enrollment and Ethnicity						
	2001	2002	2003	2004	2005	2006	2007
American Indian	1	1	2	4	3	2	3
Asian/Pacific	30	37	55	71	77	101	112
Black	11	12	12	12	9	9	13
Hispanic	63	55	63	59	73	76	98
International	10	6	9	9	10	12	7
Other	45	52	56	54	60	64	56
White	122	123	143	133	152	154	153
Total	282	286	340	342	384	418	442



The data from Institutional Research show the department has been successful in recruiting students of Asian/Pacific ethnicity and women. This translates into the increased graduation rates for both groups. Table 4 is a breakdown of student enrollments adding gender, age, institution of origin and service area of origin to ethnicity. There has been a shift from a predominately male student population (66% male in 2001) to predominately female (38% male in 2007). Owing to an increase in the number of students coming directly from high school to the biology department, a larger percentage of students are under the age of 24 (81% in 2007 compared to 70% in 2001). More than 75% of biology majors come from within the service area of CSU Stanislaus.

Table 4 Student Demographics by Ethnicity, Gender, Age, Origin institution and Service Area

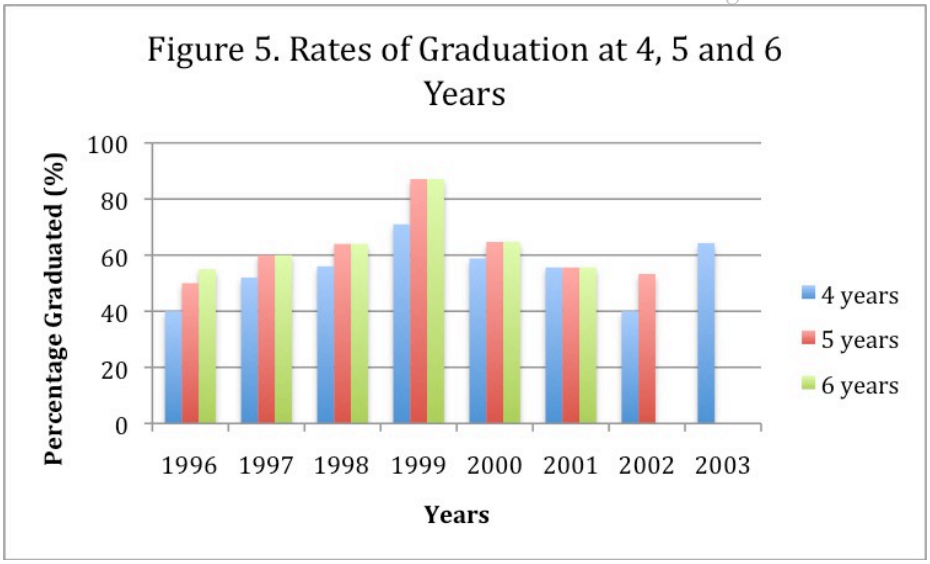
		2001	2002	2003	2004	2005	2006	2007
Ethnicity	Caucasian	122	123	143	133	152	154	153
	Non Caucasian	160	163	197	209	232	264	289
Gender	Male	188	191	225	230	248	267	166
	Female	94	95	115	112	136	161	276
Age	<24	197	217	270	275	314	342	361
	>25	85	69	70	67	70	76	81
Origin Institution	High School	115	122	170	180	197	219	242
	CC Transfer	121	119	126	117	134	149	145
	Other	46	45	44	45	53	50	55
Service Area	Primary Service Area	220	219	250	251	295		
	Outside Service Area	62	67	90	91	89		

Retention and Graduation Rates

Table 5 shows the graduation rates at 4, 5 and 6 years for students entering the program in 1996 through 2003. Transfer students are included with the year they started a program within the state of California, thus, someone starting at a community college in 1996 would be included in the data for 1996. There is a general trend to increasing the number of students graduating within 4 years: in 1996 40% of the students finishing in 4 years, while in 2003 this increased to 64.3% (Figure 5). Adding the students graduating by year 5 increases the percentage of graduating students from an average of 54.7% to 62%. Graduation rates do not increase beyond 5 years suggesting that most students either graduate by year 5 or leave school. Table 6 gives a breakdown of graduates by ethnicity and gender for the years 2001 – 2007. As with student numbers, students of Asian/Pacific ethnicity show a tripling of the number of students getting degrees while the Hispanic and White degree recipients are numerically similar for each year. In 2007, there was an overall increase in degrees awarded in biology. The number of females receiving Bachelor's degrees more than doubled while the number of males increased by less than 50% over the examined time frame.

Table 5 Biology Graduation Rates

Year admitted	4 years	5 years	6 years
1996	40	50	55
1997	52	60	60
1998	56	64	64
1999	71	87.1	87.1
2000	58.8	64.7	64.7
2001	55.6	55.6	55.6
2002	40	53.3	



Course enrollments

Tables 6 and 7 give data for the number of students and FTES for all courses in the disciplines within the biology department. The numbers of students per discipline give trends for growth areas, however, caution should be used in interpreting the data since the student numbers are dictated by maximum course caps. In some cases, such as Entomology, there are few courses with low course enrollment maximums that limit the potential for students to enroll. The area of Biology (BIOL) has most of the department's GE courses, both lower and upper division, where course capacities can be increased. Since the last review in 2001, the area of Zoology (ZOOL) has experienced the largest growth in enrolled students, increasing by 81%. Much of this is due to the addition of service course sections of Anatomy and Physiology to meet the needs of the Nursing program. These two courses have tripled in their enrollments while Zool 1050 has seen an increase enrollment of 65%. FTES trends follow those of student numbers, Biology has the lowest increase of only 17% while Zoology has the greatest with an increase of 110%. The increase in Biology FTES most likely results from the addition of a section of Principles of Biology, Biol 1010. The increase in FTES in Zoology relates to the additional sections of Anatomy and Physiology and an increase in Introduction to Zoology, Zool 1050. Botany, Entomology and Microbiology also show increases of 44-49%, most likely due to the limits on maximum course size. Most likely these areas would show a greater increase if more available seats were available.

Table 6. Total Enrollments by Discipline

	2001	2002	2003	2004	2005	2006	2007	% Increase
Biol	1949	1995	2081	2173	2153	2334	2557	32
Boty	139	173	187	171	216	191	239	72
Ento	10	13	14	28	12	31	15	50
Mbio	99	69	106	122	106	127	119	20

Zool	463	443	593	573	627	789	839	81

Table 7. Total FTES by Discipline

	2001	2002	2003	2004	2005	2006	2007	% Increase
Biol	149.9	159.0	167.4	166.3	159.7	177.1	175.8	17
Boty	16.5	18.4	20.5	20.0	22.7	22.1	24.5	49
Ento	2.7	3.2	3.1	3.7	3.2	4.0	3.9	44
Mbio	8.7	3.5	8.3	13.3	11.7	12.5	12.9	48
Zool	47.5	49.9	60.1	62.0	65.9	79.5	100.0	110
University	5181.0	5439.5	5677.0	5868.7	5777.5	6021.1	6316.4	

Enrollments for select courses are presented in Table 8. General Education offerings by the department are represented by Biol 1010, Biol 1020, Biol 3000 and Biol 3020. Both lower division courses increased by over 100 students between 2001 and 2007. Biol 1020 student numbers are limited by the fact it is a laboratory limited to 24 students per section. The department currently offers 10 sections each Fall and Spring with another 3 sections in the Winter and 2 in the Summer. Enrollment increases can only occur by additional sections. This would require offering more night and mid-day sections along with Friday sections that are generally low enrolled. Biol 1010 increased enrollment by the addition of a third section in the Fall and Spring terms. Maximizing enrollment in Biol 1010 would increase the student number to 900 per year. Offering enough laboratory sections for this many students is not practical. The number of students doubled in Biol 3020 while remaining steady in Biol 3000. In 2003, the department reduced the number of sections a term of Biol 3000 to one, limiting the ability to increase student numbers. In 2007, a second, online section of Biol 3000 was added and student numbers are expected to increase.

Table 8. Course Enrollments in Select General Education and Service Courses

		2001	2002	2003	2004	2005	2006	2007	% Increase
Biol	1010	632	626	672	613	590	697	747	15
	1020	415	396	429	453	398	497	510	19
	3000	171	250	238	232	178	210	219	22
	3020	104	66	116	131	198	135	197	47
	3310	93	71	87	82	93	89	108	14
	3350	93	87	76	81	101	108	98	5
	4010	12	20	17	11	9	15	12	0
	4940	17	11	18	20	49	33	46	60
Boty	1050	107	125	146	141	146	151	178	40
Ento	3000	10	11	11	14	12	15	14	28
Mbio	3010	40	27	43	56	47	54	53	25
Zool	1050	139	126	134	146	140	152	185	25
	2230	58	62	104	103	119	189	178	67
	2250	56	76	94	101	101	161	156	64

Two service courses are reported in Table 7, Zool 2230, Physiology, and Zool 2250, Human Anatomy. Both courses are taught for Physical Education and Pre-Nursing students. The enrollments for both have tripled, starting with a doubling of student numbers in AY 2002-2003, the year the nursing program started. Growth in these courses is limited by the number of laboratory sections offered.

In the areas of biology majors, the student numbers for the Freshman sequence, Boty and Zool 1050, two required upper division courses, Biol 3310 and 3350 and the technical writing course, Biol 4010 and interships, Biol 4940 are listed. Trends in Boty and Zool 1050 are for growth. The number of students enrolled in Boty 1050 increased greater than those in Zool 1050, most likely the result of the high numbers of non-biology students that take Zool 1050 as an elective. As students are better advised to take Biol 1010, the students normally taking Zool 1050 for GE credit are replaced with biology majors whereas the students in Boty 1050 are almost exclusively biology majors. The increase in students in both courses is directly related to the increase in students majoring in biology.

Student enrollments in Biol 3310 and 3350 have remained fairly stable, averaging about 95 students a year. A lack of growth is most likely the result of the limited number of sections offered and enrollment maximum capacities. These courses could be bottlenecks to students graduating in 4 years and adding sections should be addressed. To improve writing in the major, the department offers Technical Writing, Biol 4010. This course has had limited enrollment averaging about 12 students a year. With numerous writing proficiency courses available in other departments, most with reputations of being easier than the Technical Writing course, most students avoid the department's writing proficiency course.

The numbers of students doing internships (Biol 4940) has almost tripled since last reviewed. This comes partly from new internship opportunities that have developed with two local hospitals that have proved to be popular with pre-professional students. These students get experience required for application to professional programs, earn some elective units in the major and are paid. However, future enrollments will likely decline as the department recently implemented reduced maximums on the units allowed toward graduation.

Student/Faculty Ratio

Table 9 summarizes the full time equivalent students (FTES), full time equivalent faculty (FTEF), student/faculty ratios (SFR), and average size and numbers of courses for biology over the last 7 years. Figure 2 shows the trends in FTEF and SFR growth. The department has met and in most cases exceeded FTES targets and continues to have one of the highest SFR of any science department at CSU Stanislaus. The SFR of 20.7 compares with the SFRs reported by other CSU Biology Departments (Table 2). We tend to have one of the highest SFRs among all CSUs. There is also an increase in the average class size so the increase in SFR is the result of increase seat numbers within courses and not the fact that there are more sections of courses offered.

Table 9 . FTES, FTEF, SFR and Average Class Size

	2000	2001	2002	2003	2004	2005	2006
FTES	225.3	234	259.4	265.3	263.1	295.2	318.6
FTEF	13	12.8	14.5	12.9	14.1	14.1	15.4
SFR	17.4	18.3	17.9	20.6	18.6	20.9	20.7
Avg Class Size	27.3	28.2	28.6	29.8	29.5	30.5	29.1
Unique Courses	40	40	44	39	41	44	47
C-Fact Section	54	54	59	58	57	63	71
Small Section	4	3	4	0	4	5	2

Recruiting, Retaining, and Graduating Students

The department continues to use multiple approaches to the recruitment of students. Through the main office and from web-directed email, the department receives hundreds of inquiries about its programs from prospective students. The department also participates in university sponsored open houses and recruitment activities. Faculty and graduate students have provided exhibits for and tours of the departments facilities during the open house. Each year faculty members participate in “Dinner with a Scientist”, which brings prospective junior high school students to campus to meet with faculty and working scientists. Faculty also serve as event coordinators for the Stanislaus Science Olympiad that alternates each year between Modesto Junior College and CSU Stanislaus.

A new department fact sheet has been produced by University Communications under the department's direction to be used in recruiting. The department continues to maintain literature on course offerings that meet the requirements for admission into various professional and graduate schools. A list of over 500 jobs for individuals with a degree in biology is available and sent to prospective students. The department also has a Pre-Health Profession Committee to advise and recruit students to the department. The university catalog is also a useful tool listing the department's concentrations and courses.

Mandatory advising before each round of registration is the department's strongest commitment to student retention. Assigning a faculty advisor for each biology major allows for a student's progress to be more closely monitored. Students find that advising is more than just picking courses and many students will return to their advisor between mandatory visits.

One main reason students change their majors or withdraw from the university is poor academic performance. One problem area continues to be in student performance in pre-requisites and supporting courses for the major—introductory biology courses and math, chemistry, and physics, respectively. Inadequate preparation (prior to enrollment in the university) in math and science leads to difficulty in these areas. Advisors at new student orientations are looking at the student's previous math courses and ELM scores and suggesting that students take math before chemistry.

Transfer students pose another problem. The relationship with community colleges is a 2 X 2 program where the students complete their first 2 years at the community college and then transfer with the understanding that they can complete a degree in another two years. Most students come with most (or all) of their lower division general education requirements complete. However, they often come to the department without having taken the lower division pre-requisites (including some or all of the supporting courses) to the major. This results in them not being able to complete their degree requirements in 4 years. Transfer students are essentially are "Freshman" with respect to their science courses and have to compete with Freshman who have priority registration. As a result, most transfer students are not able to complete their degree requirements in 4 years. We have been attempting to address this by consulting with counselors at community colleges with the hopes they will advise students to take the pre-requisite science and math courses.

IV. Commitment to student learning

Program Success

The program has been successful, but the exact extent is hard to determine. Quantitative data currently do not exist, but anecdotal evidence from alumni suggests that the department has been very successful in preparing students for professional programs. The recent report from Institutional Research of the student learning goals assessment in general shows that 80-90% of the students "agreed" or "strongly agreed" that they were appropriately educated in the areas assessed. These areas represent the core knowledge of the biological sciences and in scientific methodology.

As mentioned previously, the current assessment for the department is subjective in nature and as such tells little about how well the faculty are doing. An attempt to produce a direct form of assessment and to better follow alumni are underway and will hopefully provide for a more quantitative look at the programs success next program review.

The department has a set of learning goals for its undergraduate and graduate programs. Listed below are the learning goals for undergraduates:

1. Cognitive skills: Graduates will demonstrate the ability to think critically, synthesize, rather than memorize information presented to them, and use this information to formulate scientific questions, design experiments to answer these questions, collect, analyze, interpret and report data.

2. Research skills: Students will demonstrate the ability to find, evaluate and integrate published information, and demonstrate computer literacy through the ability to use databases and information technology.

3. Communication skills: Students will demonstrate the ability to communicate effectively orally and in writing as professional scientists.

4. Biological knowledge: Graduates will demonstrate knowledge of the basic principles and unifying themes of biology.

5. Technical/Analytical skills: Graduates will demonstrate knowledge of and the ability to use mainstream laboratory/field procedures, methods and instrumentation to conduct biological investigations and safety issues associated with each.

6. Teamwork skills: Students will demonstrate the ability to work collaboratively and solve problems in a group.

Learning goals (graduates)

Students graduating with an MS in Ecology and Sustainability will:

1. Demonstrate knowledge and understanding of the importance of ecosystem health.

2. Demonstrate knowledge and understanding of the importance of ecology and conservation with respect to ecosystem health.

3. Demonstrate knowledge and understanding of the multi-dimensionality of maintaining or restoring ecosystems health.

4. Demonstrate the skills to contribute solutions to these areas.

5. Be able to provide much-needed service to improve health and sustainability of ecosystems, resulting in more sustainable conditions in the Central Valley and/or other regions served by graduates of the program.

6. Be prepared to work with governmental agencies and private entities to bring about, restore, and maintain the biodiversity and environmental health that are backbones of sustainability.

Students graduating with a concentration in Ecological Economics will:

1. Demonstrate knowledge and understanding of the importance of ecosystem services and the multi-dimensionality of maintaining or restoring ecosystems health.

2. Demonstrate knowledge and understanding of economics in order to work closely with economists to bring about changes to support ecosystem health.

3. Be able to provide much-needed service to businesses and governmental agencies, resulting in more sustainable conditions in the Central Valley and/or other regions served by graduates of the program.

6. Be prepared to work with economists in various industries to bring about business/corporate/governmental changes that are environmentally sustainable and at the same time financially profitable.

Students in the MS in Genetic Counseling will learn:

1. The inheritance patterns and clinical symptoms associated with a variety of common, complex, and rare medical genetic conditions.

2. The molecular, biochemical, immunological, and cytogenetic basis of genetic disorders, and the application of laboratory technologies from these fields to diagnose genetic conditions.

3. To analyze and interpret laboratory results

4. Research methods and professional writing and oral skills

5. The ethical, legal, psychosocial, and cultural issues associated with patient care and health sciences information delivery

6. Counseling techniques and theories for effective communication

7. Business issues related to the genetic counseling profession

8. How to integrate the above information in real world situations through internships

Students in the MS programs are evaluated using direct and indirect methods. Direct methods include thesis research projects in the MS in Ecology and Sustainability culminating in the production and defense of a thesis and in a research project with oral defense in the MS in Genetic Counseling program. Rubrics for evaluating the oral defense for both programs are currently under way.

In the case of the Genetic Counseling Program, embedded assessment using assignments graded by rubrics which are designed to provide scoring criteria specific to appropriate student learning outcome are used along with the American Board of Genetic Counseling (ABGC) certification examination.

Indirect methods include IDEA evaluations, supplemental faculty-developed student evaluation forms specific to course objectives and exit surveys. In the Genetic Counseling program, there are instructor interviews with students two to three times per semester, a Genetic Counseling program annual Alumni Survey and a Biannual Employer perception survey.

Data will be evaluated by taking samples of Competency Assessment Forms randomly selected from those completed by instructors and peers to be analyzed and in the case of the Genetic Counseling program, in comparison to the random samples taken from those completed by the clinical supervisors. Each semester one or two learning objectives will be evaluated by a faculty cohort and the Program Assessment Coordinator, using samples of rubrics from embedded course assignments (representative 10% of high, middle, low achievement). For students in the Genetic Counseling program, information regarding their performance on the ABGC certification examination will be requested. The results of all methods of assessment will be discussed at end-of-year faculty meeting.

V. Curriculum and Instruction

Program's effectiveness in offering non-conventional instruction

The department continues to offer Frontiers in Biology via distance learning to the Stockton campus and to Merced. It is also offered locally via cable TV. One continuing issue with offering courses either through distant learning or online is the need for laboratory space to serve students at the remote sites. This has long been an issue with offering courses at the Stockton campus and limits the offerings to those courses with no laboratory component.

The department also offers Hematology, through concurrent enrollment with California State University, Sacramento. The students attend lectures on the Turlock campus, but must go to Sacramento for two weekend laboratories during the term. In the Fall of 2007, the department offered its first fully online course, a section of Frontiers in Biology. This course has subsequently been offered each Fall and Spring term.

Effectiveness in improving students writing skills

The department continues to offer Biol 4010, Research and Technical Writing in Biology. This course focuses on writing exercises appropriate for the life sciences and is recommended to students planning on graduate school in the life sciences. Many students majoring in Biological Sciences are interested in professional schools and therefore seek writing courses that are taught by other departments.

Effectiveness of student advising and mentoring

All students majoring in Biological Sciences are required to be advised late in the Fall term by a faculty member before registering for either Winter/Spring and are advised in late Spring for Summer/Fall. An academic hold on student's registration prevents them from registering without being advised. Prior to Fall of 2008, students were allowed to sign up for advising with any faculty member who had an appointment available at a time of convenience. This practice limits the effectiveness of advising and mentoring since faculty do not always follow the progression of students through the program. Now, all students are assigned advisors, which should further facilitate mentoring and aid in the advising process. Assigning advisors should enhance the ability to reach students who are placed on academic probation. In the past, student notices of probation were placed in the students file with the hopes of the faculty member next to see them will discuss academic probation with them. By assigning advisors, faculty can take a more active role in address the issues leading to probation since the information can be passed along to a particular advisor at the beginning of the term rather than at the next advising session. By the time most advisors see their advisees, it is too late in the current term to provide meaningful direction.

In Fall 2008, the department also instituted an online advising form. The form outlines both the general education requirements and the courses required for the major in Biological Sciences. Each required area has a pull-down menu with a list of courses that satisfy the requirement. Biology majors can access their own advising forms at all times, helping them to make better decisions when selecting courses. Only advisors can save changes to the forms. This tool has been met with great enthusiasm by our students.

Role in providing service courses

The department has a strong commitment to service courses in the area of general education and service in the pre-Nursing, Physical Education and Health, Liberal Studies and Criminal Justice programs. The offerings of lower division GE courses have increased in both seat numbers in existing sections and in offering a third section of Principles of Biology offering 360 seats up from a potential 240. The laboratories that accompany the lecture have also been increased from 6 sections (144) in the Fall and Spring to 10 sections (240) each term. A third laboratory section was also added to Winter term and both the lecture and two laboratories are offered during the Summer term. Upper division GE offerings were increased when DNA, Code of Life (Biol 4350) was added to the Fall and Spring term. The addition of an online section of Frontiers in Biology in Fall of 2007 further increased the number of seats available.

The department's role in providing service courses has increased since the last review owing primarily to the introduction of the nursing program to the campus. This program increased the number of students taking Anatomy and Physiology lecture and lab from 24 students each per term to 96 students in Physiology lecture and 72 students in physiology lab and Anatomy lectures and labs. The department has also added Microbiology for Nurses in support of the Nursing Program. For the department of Criminal Justice, the department offers Forensic DNA. This course is critical for students wishing to enter a Forensic Science Program.

Program's effectiveness in graduate program

Both graduate programs are relatively new with no students having yet graduated. It is premature to offer an assessment of the effectiveness of the graduate programs.

Describe future curricular plans

The Curriculum committee has begun reviewing the major concentrations with a view toward: (1) making sure that the concentrations have maintained congruence with disciplines, (2) increasing the efficiency and effectiveness of advising and (3) setting a foundation for the addition of future courses and possible concentrations.

VI. Faculty

The department has experienced a significant turnover in faculty since the last review. Four faculty members have retired and been replaced, including the director of the Endangered Species Recovery Program. All retired faculty positions have been filled, and another 4 faculty members have been added. Thus, half of the tenure track faculty were not present at the last review. All full time faculty possess doctorates appropriate to their instructional duties. The tenure track faculty are supplemented with one Full Time Lecturer, 4 part time lecturers (2 with Ph.D.s and two with MS degrees), one Emeritus Faculty who volunteers to teach and advise students and at any given time 6-8 graduate teaching associates. A list of current faculty (including part time, but excluding graduate teaching associates) is listed in Appendix B. Also listed are the appointment status, research interests and teaching responsibilities of faculty still active in teaching or research.

The level of part time faculty is still excessive (amounting to 25% of the WTUs taught in the department) and the need for at least 5 more tenure track hires has been identified. The department will have to hire a Marine Biologist to replace Dr. Roe who is currently in the FERP program. A full time lecturer has filled the need for someone to teach Anatomy and Physiology. There is also the need for another molecular biologist to cover for the reassigned time allotted to one of the Geneticists to direct the MS in Genetic Counseling. This faculty member is needed to bolster our biotechnology offerings. The department also needs another Microbiologist with the increase demand with the clinical laboratory science concentration. Finally, the department, realizing the importance of science education and our need to train science teachers for the K-12 system, has identified the need for another science educator.

Faculty Research, Scholarship and Creative Activity

The department has a faculty that places teaching first, but also recognizes the importance of active scholarship and service to the university and community. Our most visible research program is the Endangered Species Recovery Program (ESRP) directed by Patrick Kelly. The program is housed in the department and has offices on campus and at CSU Fresno and CSU Bakersfield. The program averages about $2,.5 million in grants annually although the economic downturn has affected the programs ability to secure funds. Besides the visibility and opportunities for faculty collaborations, this program has provided overhead recovery money to establish a department research account. These funds are used to support faculty, and now graduate student, research and scholarship activities. Funding allows for equipment and supply purchase and travel to research sites and conferences for the presentation of research findings. This account utilizes funds from grant overhead that reverts to the department. Currently, most of the money in this account is from grants funded through the ESRP.

Faculty have also been successful in grant writing to the Research, Scholarship and Creative Activity (RSCA) grants administered on campus. Funding comes from the chancellor's office and supports various types of activities from research supplies to reassigned time to devote to scholarship. With the move into the new science building came a new funding opportunity from the Naraghi Family gift. Each year, faculty can apply for competitive grants for RSCA activities within the college. Several faculty have received awards of reassigned time or supply money to complete various stages of research projects.

The new science building actually hinders research among faculty since there is no space allotted to research. This limits doing research to times when courses are not in session so that teaching lab space can be used. Teaching is a priority for all available laboratory space in the new building.

VII. Preliminary implementation plan

Recommendations of the program faculty

1. Continue to explore alternative modes for offering courses.

- Distance-learning and fully online courses should be explored in cases where laboratories are not an issue.
- Greater utilization of non-traditional times for offering courses, especially evenings. This will be especially crucial as demand for laboratory sections increases.

2. Continued review of curricular offerings, concentrations and degree programs

- Review concentrations for low enrollments and modify the department's offerings accordingly

- Examine course offerings to ensure that student demand is met. Increases in the numbers of biology students requires extra sections of each course be offered to ensure students have the opportunity to matriculate in 4 years.
- Review the Environmental Science Concentration and reconsider its viability, this concentration has been stagnant for some time. It should either be updated or dropped.

3. Develop program assessment vehicles

- Use the Program assessment coordinator to develop a method for assessing the knowledge rather than just the satisfaction of students completing the program. An Assessment Committee has been formed to address this need.

4. Continue to seek augmentation in support staff, primarily Instructional Support Technicians (IST)

- CSU Stanislaus has the only biology department in the CSU system with one IST. Efforts to fund and hire at least two additional full time technicians need to be explored, one for microbiology/vivarium and one for Bio Ag/greenhouse
- Seek funds for an equipment technician in conjunction with chemistry, physics and geology to repair and maintain teaching equipment.

5. Operating budgets need to be adjusted commensurate with changes in FTES.

- The department continues to show increasing student numbers and FTES taught with no increase in operating budget. Naraghi Hall move has put new constrains on expenses with the need to certify biosafety hoods and maintain autoclaves.

6. Reduce the number of part time WTUs, especially in courses that serve biology majors.

- Seek tenure track hires for the 5 previously identified faculty positions. Continue utilizing graduate teaching associates in lower division labs to make tenure track faculty available for teaching upper division courses.

7. Develop a plan for equipment maintenance, repair and replacement.

- Currently the department and college do not have money budgeted for maintenance of equipment, much of which will have a greatly reduced lifespan without routine maintenance.

There is also no money to repair damaged equipment nor to replace what cannot be repaired. The department and college needs to develop a means to allocate money for equipment. Part of this money could be used to hire a technician to do the maintenance.

Anticipated student profile for next 7 years

Based on the previous 7 years, the department will most likely double in student numbers. The number of Asian/Pacific students will continue to increase as will the number of Hispanic students (Table 2 and Figure 4). Women will maintain a lead in the population of biology students. The trend for more Freshman entering the university will continue and the need for lower division sections of biology, chemistry and physics will grow as well.

Action steps to achieve recommendations and student enrollment over next 7 years.

- Increased number of seats in required courses must be provided by increasing class size and number of sections.

Types of human, fiscal and physical resources to implement recommendations.

- The department will need to increase the number of tenure track faculty to sustain student growth.
- A continued emphasis on hiring ethically diverse faculty will be important in serving the diverse student population.
- Utilizing laboratory space during unconventional times will support much of the anticipated growth, having faculty to staff the laboratories is a greater issue.
- Increased instructional support staff is vital to the departments ability to support growth in student and faculty numbers.

VIII. Final Implementation Plan

Appendix A

Department Faculty

Jane Bruner, Ph.D., University of California, Davis. Associate Professor of Biological Sciences. Interests: medical microbiology, immunology, hematology, epidemiology, molecular biology and clinical laboratory science. bruner@biology.csustan.edu Ph. 209-667-3485.

Tommi Lou Carosella, M.S., University of Wisconsin, Madison. Lecturer in Biological Sciences. Interests: community ecology, population ecology. tcarosella@csustan.edu Ph. 209-667-3596.

Matthew Cover, Ph.D., University of California, Berkeley. Assistant Professor of Ecology. Interests: stream ecology, restoration ecology, biological monitoring of water quality, and aquatic entomology, with a focus on Megaloptera. mcover@biology.csustan.edu Ph. 209-664-6694.

Marina M. Gerson, Ph.D., University of Texas at Arlington. Assistant Professor of Zoology. Interests: ecology, herpetology, behavioral ecology, evolution, desert biology, tropical biology. mgerson@csustan.edu Ph. 209-664-6547.

Mark A. Grobner, Ph.D., Oregon State University. Associate Professor of Biological Sciences. Chair of Department. Interests: Developmental Biology, emphasis on mammalian preimplantation embryo development. mgrobner@csustan.edu Ph. 209-667-3628.

Terry D. Jones, Ph.D., Oregon State University. Assistant Professor of Zoology. Interests: vertebrate functional morphology and paleobiology. tdjones@biology.csustan.edu Ph. 209-667-3488.

Patrick A. Kelly, Ph.D., University of California, Berkeley. Professor of Zoology, Director of The Endangered Species Recovery Program. Interests: Mammalian ecology and conservation, habitat management for endangered kangaroo rats and viability analyses for the San Joaquin kit fox and other animals. patrickk@esrp.csustan.edu Ph. 209-667-3446.

Ann K. Kohlhaas, Ph.D., University of Colorado. Professor of Zoology. Interests: Ecology, behavior, and conservation of vertebrates, especially primates, other mammals and birds. akohlhaas@csustan.edu Ph. 209-667-3695.

Pamela Roe, Ph.D., University of Washington. Professor of Zoology. Interests: Invertebrates, with emphasis on marine invertebrate natural history and ecology. pam@biology.csustan.edu Ph. 209-667-3484.

Kenneth G. Schoenly, Ph.D., University of New Mexico. Professor of Zoology. Interests: Invertebrate ecology, forensic entomology, ecological agriculture and biological control.

kgschoenly@biology.csustan.edu Ph. 209-667- 3949.

Michael T. Stevens, Ph.D., University of Wisconsin-Madison. Assistant Professor of Biological Sciences. Interests: plant ecology, evolutionary biology, plant-herbivore interactions, chemical ecology, biogeography and biology education mstevens@biology.csustan.edu Ph. 209-667-3603.

My Lo Thao, Ph.D., University of California, Davis. Assistant Professor of Microbiology. Interests: Genetics and evolution of endosymbiotic bacteria-insect associations, environmental microbiology (bioremediation), and molecular biology. mlthao@biology.csustan.edu Ph. 209-667-3649.

Flora Watson, Ph.D., University of Southern California. Professor of Zoology. Interests: Human biology and the physiological basis of animal behavior. flora@biology.csustan.edu Ph. 209-667-3483.

Steven J. Wolf, Ph.D., University of Alberta. Professor of Botany. Interests: Systematics, phytogeography and evolution of vascular plants, particularly Asteraceae. Computer applications in biology and education. swolf@arnica.csustan.edu Ph. 209-667-3489.

Stuart C. Wooley, Ph.D., University of California, Riverside. Assistant Professor of Botany. Interests: Plant-herbivore interactions, interactions between above- and below-ground organisms--particularly those that are symbiotic. Improving educational practices in biology or other science teaching. wooley@biology.csustan.edu Ph. 209-664-6926.

Janey Youngblom, Ph.D., University of Minnesota. Professor of Biological Sciences. Interests: Interest: Human genetics and the application of molecular and cytogenetic techniques to the study of human disorders. jyoungblom1@csustan.edu Ph. 209-667-3487.

James J. Youngblom, Ph.D., University of Minnesota. Associate Professor of Biological Sciences. Interest: Interests: Molecular genetics, particularly the current applications of recombinant DNA technology. jyoungblom@csustan.edu Ph. 209-667-3950.

Staff

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Christi Jantz. Administrative Support Coordinator. cjantz@biology.csustan.edu Ph. 209-664-6549.

Emeritus/Retired Professors

David Gotelli, Ph.D., University of Washington. Professor of Botany Emeritus. Interests: .

Steve Grillos, Ph.D., Oregon State University. Professor of Botany Emeritus. Interests: Phloem tissue development; systematics of ferns and fern allies. He is also co-authoring a book on Weeds of California. Ph. 209-667-3481.

Glenn Hackwell, Ph.D., Oregon State University. Professor of Zoology Emeritus. Interests: Include biology and the behavior of bees, insect systematics and pollination dynamics.

James Hanson, Ph.D., Oregon State University. Professor of Zoology Emeritus. Interests: Metabolism in cultured cardiac cells; microphotography and photomicrography for biological programs; the dynamics of cell divisions; early animal development.

Pete Mayol, Ph.D., Purdue University. Professor of Botany Emeritus. Interests: Include phytopathological and nematological studies; pathogenicity, host parasite relations and other microbial interactions.

Wayne Pierce, Ph.D., Washington State University. Professor of Botany. Interests: Membrane transport, mineral nutrition of hydroponic crops and propagation of plants.

Walter Tordoff, III, Ph.D., Colorado State University, Professor of Zoology Emeritus. Interests: Ecology of genetics of valley and mountain populations of reptiles and amphibians. wally@biology.csustan.edu.

Daniel F. Williams, Ph.D., University of New Mexico. Professor of Zoology Emeritus. Interests: Nongame wildlife conservation; ecology and evolution of desert rodents; ecology of bats and systematics of heteromyid rodents. danwilliams@bendcable.com.