California State University, East Bay

5-Year Program Review for

Biological Sciences and

Marine Sciences

2005-06 through 2009-10

Self Study and 5-Year Plan approved by faculty on: February 24, 2011

External Reviewer Report received by the program on: May 26, 2011

Program's Response to External Reviewer's Report completed on: May 31, 2011

Complete 5-Year Program Review Report submitted to CAPR on: June 1, 2011

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A Summary of Report (1-2 pages, summarizing Items 1-4)

- The Department of Biological Sciences was moderately successful in implementing many of its goals from the previous 5 year review. Continued success in implementation of departmental goals has been hampered by severe budget cuts in the past 3 years.

- The department has experienced substantial growth in FTES, number of majors, SFR, students with identified ethnicities, number of courses over the past 5 years.

- The department has experienced a significant reduction in the Supplies and Services (S&S) budget that supports instruction and other fixed costs in the department. This has led to a decline in instructional quality.

- The department has redesigned student learning outcomes and simplified assessment.

- The department has created several new courses, redesigned the Microbiology/Biomedical Laboratory Sciences option and created a new Master of Arts (MA) program to replace the former 'Plan C' MS in Biology.

- The department has hired three new faculty members, but FTEF has remained unchanged owing to separations/retirements.

- The department generated over $6 million in total grants (internal and external) and published 58 peer-reviewed articles and book chapters over the past 5 years.

- The department has inadequate resources (Library, equipment, infrastructure, laboratory supply budget) to maintain a high level of quality instruction and professional research activities. This can be tied directly to increased workloads and budget cuts that affect all departments including biology.

- The department has lost 0.5 positions in office staffing and has had four different office managers over the past four years. This has created turmoil and inefficiencies in the department's ability to take care of day to day operations. These problems have impacted the chair position dramatically as some these staff changes also coincided with changes in the chair position.

- Department plans for the next five years are highly uncertain owing to potential cuts to the CSU, the university and department. Any positive changes to curriculum, resources, hiring, etc. are unlikely to occur with further cuts.

1. Self-Study

1.1. Summary of Previous Review and 5-Year Plan

Previous plan summary

- Devise a 'concept map' for the major and specific options. This will help drive curriculum changes over the next 5 years
- Develop of options within the major to provide students with specialization within the major. Options were introduced to the major in fall, 2005. The options to be offered are in the areas of Physiology, Cell/Molecular Biology, Forensic Science and Ecology/Conservation Biology.
- Faculty hires in the area of Genetics, Microbiology and Physiology owing to high FTE load in those areas. Possible expansion of faculty into other areas such as Bioinformatics, Environmental Biology and Biology Education.
- Increase sections to accommodate increased enrollment. This entails more PT hires. Increase B6 upper division GE courses. Implement laboratory fees.
- Develop a plan for equipment replacement
- Ensure that salaries and startup for new faculty allow Biology to hire the best available faculty.
- Purchase new equipment for large enrolled courses and move away from equipment doing 'double duty' for research and teaching.
- Develop a Comprehensive Examination Track for Master's students
- Classroom space will be critical in light of increasing enrollments.
- Develop new research space for faculty. Laboratory research space is at a critical point in Biology.
- Reinstate travel funds particularly for new faculty.
- Develop additional assessment tools and SLOs if resources are available.
- Areas for improvement and future tasks including: determine means for adequate funding of field trips and expensive lab courses; define how we will assess SLOs and adopt standards for collection/analysis of these data; refine SLOs in light of options within Biology; determine the impact of freshman clusters on the Biology major; investigate whether mandatory advising is necessary.

Progress in implementing the previous Plan

Despite the considerable budgetary problems faced by the University and by the Department over the past three years, the Department of Biological Sciences was moderately successful in fulfilling several of the action items (listed above) from the previous five year review:

1. We successfully developed options within the B.S. undergraduate major. However, with recent budget cuts, it has become more difficult in many cases to schedule enough courses in each area to allow students to fulfill the option requirements. Our ability to schedule courses to allow sufficient breadth to cover the option requirements depends largely on our ability to hire part-time instructors and this depends on the prevailing budget.

2. We successfully hired three new faculty into the areas of Genetics/Virology (Dr. Kenneth Curr), Microbiology (Dr. Stephanie Molloy) and Physiology (Dr. James Murray). The

department was approved (twice) for another Physiology position, but both searches were cancelled due to budget cuts.

3. Enrollment in the department continues to grow despite recent budget cuts. This has led to increased SFR in most undergraduate courses (majors and non-majors). Our ability to hire PT faculty to keep up with course demand is completely dependent upon the College of Science allocation to the department which has steadily decreased over the past three years.

4. There has been no new equipment purchased in the past five years. However, the Provost's new equipment initiative should bring a substantial amount of money to the department to purchase badly-needed equipment in all areas of instruction. This should dramatically improve instruction and research starting with the 2011-12 AY.

5. The department developed a Comprehensive Examination track for Master's students in the MA program (formerly Plan C Master's degree) with mixed success. There has been little participation in this program from the faculty except in the area of Physiology. There has been discussion within the department to consider eliminating the MA program and keeping the MS (Research Thesis) program as the only graduate degree option.

6. The current chair developed a plan to implement laboratory course fees and spent two years working with the administration to bring the plan to the Course Fee Advisory Committee (CFAC) to vote on it. The plan was stalled with substantial changes within Academic Affairs (3 different Provosts in the past 3 years). Finally, in summer 2010, the department was told that there would be no implementation of laboratory course fees; rather, the College of Science would receive a greater budget allocation in lieu of course fees. The department remains one of the few Biology departments in the entire CSU system without laboratory course fees to offset instructional costs.

7. Travel funds have been reinstated as a result of increased budgets at the College level and an increase in funds to the department through Biology extension courses that support the new Pre-Health Academic Professional Program directed by Dr. Oscar Wambuguh (Dept. of Health Sciences). The department will continue to use PHAP revenues to support professional development for Biology faculty.

1.2. Curriculum and Student Learning

Development of Learning Outcomes and Learning Outcomes Assessment.

Since 2005, the Department of Biological Sciences redesigned Student Learning Outcomes (SLOs) to better reflect our departmental mission while simplifying assessment.

Our departmental mission is as follows: "To teach our students basic knowledge in biology, equip them with a deep understanding of the allied physical sciences, provide them with skills to enhance this basic knowledge, engage them in critical scientific inquiry, and provide opportunities to communicate scientific information clearly in preparation for employment and/or continuing advanced education in graduate or professional programs in the life sciences." This mission statement reflects our wish to provide a learning experience that helps student to realize their academic and professional goals in life and to become active, well-informed

members of society. Our assessment efforts focus on both Biological Literacy and Scientific Inquiry.

Revised student learning outcomes for the B.A. and B.S. in the Biological Science:

Outcome 1
Students will be able to describe living organisms according to the principles of form and function at the levels of molecules, cells, tissues, organs, organisms, populations, communities and ecosystems.

Outcome 2
Students will be able to integrate knowledge of the unifying biological principles that underlie the complexity of the many interactions that all organisms experience. At the cellular level, this includes the genetic code that specifies a cell's complex biochemistry. At the organismal level, this includes the communication between cells within organs, and among organs within an organ system. At the population level, this includes the dynamic interactions among organisms and their environment.

Outcome 3
Students will be able to apply methods of scientific inquiry. Specifically, students will be able to formulate testable hypotheses; to effectively collect, analyze, and present data; and to evaluate scientific approaches in the context of current biological literature.

Revised student learning outcomes for the Biological Science M.S.:
Outcome 1
Students will be able to use the scientific method to examine questions about the natural world. Specifically, they will be able to formulate testable biological hypotheses, analyze empirical data, and synthesize the results of the analysis.

Outcome 2
Students will be able to present the design and results of an observational or experimental analysis in a well-organized manner using the scientific paper format.

Outcome 3
Students will be able to orally communicate the design and results of an observational or experimental study in an effective manner.

Outcome 4
Students will be able to evaluate primary scientific literature and judge the value of the information presented in relation to particular biological questions.

Curriculum Mapping of Biological Sciences Courses

We have further broken down the SLOs into the following 14 categories (see below). We then "mapped" our courses against each of these 14 student learning outcomes (SLOs) in order to identify which courses are intended to address which student learning outcomes, and to what degree they address each SLO ("Introduction", "Reinforcement", and/or "Emphasis"). Although

all students do not take all of our courses, the map shows that our curriculum does address each of the 14 SLOs in multiple courses. The effectiveness of this evaluation depends on both the judgment of the faculty that determine which SLOs their courses cover, as well as the fact that not all courses are available to all students. Some courses have not been offered in years. The judgment of the faculty will be validated in part by an outside evaluator that can determine if the syllabi of our courses address each of these SLOs.

Outcome 1

Describe form/function at level: molecules	Describe form/function at level: cells	Describe form/function at level: tissues	Describe form/function at level: organs	Describe form/function at level: organisms	Describe form/function at level: populations	Describe form/function at level: communities	Describe form/function at level: ecosystems

Outcome 2

Integrate knowledge of principles of interactions: cellular level	Integrate knowledge of principles of interactions: organismal level	Integrate knowledge of principles of interactions: population level

Outcome 3

Sci Method: formulate hypotheses	Sci Method: collect, analyze, present data	Sci Method: evaluate scientific approaches/literature

If this map is compared to the coursework taken by each of graduates, we should be able to determine whether each student was able to meet each SLO. This evaluation will require a computer program that can match the matrix of our map to the database computerization of our student graduation checklists, which list the course they took at CSUEB as well as the courses for which they received transfer credit.

Assessment of SLO 1 and SLO 2 for the B.A. and B.S. in the Biological Science

We used the ETS Major Field Test in Biology to assess the effectiveness of our program in regard to SLOs 1 and 2 of the BA and BS in Biological Sciences. Twenty student volunteers took a supervised online test during spring of 2006. The following table summarizes the results, compared with nationwide scores. As can be seen in the tabular summary, our students received high total scores, and did about equally well in all subscores. These results indicate effectiveness of our program in regard to SLO 1 and SLO 2.

Mean student performance on the ETS in Biology (2006). Total scores and subscores are shown (means ± 1 standard deviation) for CSUEB biology majors and students tested nationally that year.

	Total score	**Cell Biology**	**Molecular Biology & Genetics**	**Organismal Biology**	**Population Biology, Evolution & Ecology**
CSUEB (20 students)	163 ±13	60 ±12	63 ±11	64 ±11	60 ±15
Nationwide (20,649 students)	154 ±13	56 ± 12.5	55 ± 12.3	53 ± 13.8	54 ± 13.8

Assessment of SLO 3 for the B.A. and B.S. in the Biological Sciences

After assessment of SLO 1 and 2 in 2006, we developed a plan to assess SLO 3. To this end, we developed rubrics for scoring student poster presentations in introductory and upper division classes. Since the end of Spring quarter 2007, we have collected data for both introductory and upper division classes. To collect these data individual faculty and graduate students have scored poster presentation in the following courses:

Lower and upper division coursework for the introduction and mastery of Student Learning Outcome 3 for the B.S. and B.A. in the Biological Sciences degree

Course	**SLO3**	**description**
BIOL1402	Introduction	Individual Research project, poster presentation
BIOL4456	Mastery	Individual Research project, poster presentation
BIOL4485	Mastery	Individual Research project, poster presentation

Summary of BA and BS SLO3

Oral and Poster Communication Checklist. A score of + indicates good, a score of +- indicates satisfactory, and a score of – indicates non-satisfactory.

	BIOL1402 2007	**BIOL4456 2007**	**BIOL4485 2010**
Overall organization is clear and concise	38+ (86%) 6+- (14%)	17+ (89%) 2+- (11%)	12+ (100%)
Introduction gives sufficient background	27+ (61%) 12+- (27%) 5- (11%)	18+ (95%) 1+- (5%)	8+ (67%) 4+- (33%)
Significance of research is clearly stated	25+ (57%) 9+- (20%) 10- (23%)	16+ (84%) 2+- (11%) 1- (5%)	11+ (92%) 1 +- (8%)
Hypothesis and/or specific objective is clearly stated	37+ (84%) 4+- (9%) 3- (7%)	12+ (63%) 3+- (16%) 4- (21%)	10+ (83%) 2+- (17%)
Materials and methods are clearly described	32+ (73%) 10+- (23%) 2- (4%)	16+ (84%) 3+- (16%)	12+ (100%)
Results are presented in a clear and understandable form	34+ (77%) 10+-(23%)	13+ (68%) 6+- (32%)	12+ (100%)
Good use of figures and/or tables for data presented	33+ (75%) 10+- (23%) 1- (2%)	18+ (95%) 1+- (5%)	12+ (100%)
Results are based on sufficient replications, controls are used were appropriate	25+ (57%) 10+- (23%) 9- (20%)	13+ (68%) 6+- (32%)	11+ (92%) 1+- (8%)
Conclusion is based on data presented	36+ (82%) 8+- (18%)	17+ (89%) 2+- (11%)	12+ (100%)
Student is able to explain and	42+ (95%)	17+ (89%)	9+ (75%)

discuss research project	2+- (5%)	2+- (11%)	3+- (25%)
Total	329+ (75%) 81+- (18%) 30- (7%)	157+ (83%) 28+- (15%) 5- (2%)	109+ (91%) 11+- (9%)

Assessment of SLO3, as summarized above, indicates that the majority of students are mastering SLO3 adequately, both at the introductory level (BIOL 1402, "Plant Biology", a course that also covers Evolution) and at the Mastery level (BIOL 4455, "Molecular Cell Biology, and BIOL 4485 "PCR DNA Sequencing and Fragment Analysis"). We are aware that it is difficult to interpret trends in performance from the introductory level (BIOL 1402) to the Mastery level (BIOL 4455 and BIOL 4485), due to the subjective nature of scoring student performances. For example, the students' ability to explain and discuss research projects scored higher in the introductory level than in the mastery-level courses, most likely due to higher expectations and thus more stringent scoring at the latter. Nevertheless, the total score indicates a promising trend from 75% receiving a positive (+) score at the introductory-level to 83% and 91%, respectively at the mastery-level courses.

Assessment of SLO 1-4 for the M.S. in the Biological Sciences

During the discussion of assessment possibilities for the SLOs for the M.S., we realized that the combination of a proposal, thesis, and oral defense already provided assessment of all 4 SLOs. SLO1 and SLO4 are specifically assessed by both the proposal and the thesis. The thesis further provides assessment for SLO2, while the thesis defense assesses student mastery of SLO3. In other words, successful completion of the proposal, research thesis, and thesis defense indicate mastery of SLO1-4. The department plans to continue assessment of SLOs 1-4 in this way.

Future Plans for Assessment in the Biological Sciences. In order to improve our assessment of our revised SLOs (1 – 3) for our biology undergraduates, we will implement a pre-test/ post-test protocol. All incoming biology majors (both new and transfer students) will be requested to take an on-line summative assessment exam within the first two weeks of their first quarter at CSUEB. These questions will be a series of multiple-choice and short-answer type questions that will cover the range of content knowledge mastery, i.e., from fundamental knowledge/comprehension to more higher order indicators of learning (application, analysis, and evaluation). These higher order questions will be critical to the assessment of SLOs 2 and 3.

The same or similar ("isomorphic") on-line exam which will assess learning of the same concepts will be administered to all graduating seniors during their last quarter at CSUEB. Learning gains will be quantified by pair-wise comparisons of pre-/post-test performances. IRB approval will be sought for obtaining these student data. The summative assessment questions will be derived from the available "validated" assessments from several concept inventories. In addition, these questions will be vetted by all biology faculty. Examples of biological concept inventories and associated assessments are as follows:

- The AAAS- sponsored Bioliteracy Project http://bioliteracy.colorado.edu/
- The International Union of Biochemistry and Molecular Biology sponsored Molecular Life Sciences Concept Inventory http://www.lifescinventory.edu.au/

California State University, East Bay

APR Summary Data

Fall 2005 - 2009

1.3. Students, Advising, and Retention

REPLACEMENT TABLE 1.
Biology Department data 2005-2009
(WITH POSTBACCALAUREATE NUMBERS SEPARATED FROM MASTER'S NUMBERS)

Biological Science					
	Fall Quarter				
	2005	**2006**	**2007**	**2008**	**2009**
A. Students Headcount					
1. Undergraduate	370	426	472	533	553
2. Postbaccalaureate (only)	30	28	19	29	43
3. Graduate (Master's only)	23	37	50	43	54
4. Total Number of Majors	423	491	541	605	650
	College Years				
B. Degrees Awarded	**04-05**	**05-06**	**06-07**	**07-08**	**08-09**
1. Undergraduate	64	64	83	87	80
2. Graduate	6	10	7	14	19
3. Total	70	74	90	101	99
	Fall Quarter				
	2005	**2006**	**2007**	**2008**	**2009**
C. Faculty					
Tenured/Track Headcount					
1. Full-Time	13	12	13	14	14
2. Part-Time	1	1	1	2	2
3a. Total Tenure Track	14	13	14	16	16
3b. % Tenure Track	60.9%	56.5%	63.6%	64.0%	64.0%
Lecturer Headcount					
4. Full-Time	0	0	0	0	0
5. Part-Time	9	10	8	9	9
6a. Total Non-Tenure Track	9	10	8	9	9
6b. % Non-Tenure Track	39.1%	43.5%	36.4%	36.0%	36.0%
7. Grand Total All Faculty	23	23	22	25	25
Instructional FTE Faculty (FTEF)					
8. Tenured/Track FTEF	13.5	12.7	10.3	10.0	12.4
9. Lecturer FTEF	3.9	5.4	5.8	5.9	4.4
10. Total Instructional FTEF	17.4	18.1	16.1	15.9	16.8
Lecturer Teaching					
11a. FTES Taught by Tenure/Track	293.5	276.0	286.6	299.3	417.5
11b. % of FTES Taught by Tenure/Track	81.2%	71.0%	72.9%	67.5%	84.1%
12a. FTES Taught by Lecturer	68.0	112.5	106.7	144.1	79.2
12b. % of FTES Taught by Lecturer	18.8%	29.0%	27.1%	32.5%	15.9%
13. Total FTES taught	361.5	388.5	393.3	443.4	496.7
14. Total SCU taught	5422.0	5828.0	5899.0	6651.0	7451.0

D. Student Faculty Ratios					
1. Tenured/Track	21.7	21.8	27.8	29.9	33.6
2. Lecturer	17.3	20.8	18.4	24.5	18.1
3. SFR By Level (All Faculty)	20.7	21.5	24.5	27.9	29.6
4. Lower Division	28.6	39.7	32.6	45.7	36.5
5. Upper Division	16.8	18.6	21.8	23.6	27.7
6. Graduate	11.0	5.7	9.7	8.1	13.2
E. Section Size					
1. Number of Sections Offered	87.9	86.7	99.0	101.0	119.0
2. Average Section Size	28.9	31.1	27.4	29.1	27.0
3. Average Section Size for LD	34.8	37.5	28.7	31.6	27.1
4. Average Section Size for UD	23.8	25.7	27.0	27.0	27.9
5. Average Section Size for GD	12.3	16.5	15.0	13.7	16.3
6. LD Section taught by Tenured/Track	15	6	9	7	15
7. UD Section taught by Tenured/Track	28	30	36	26	37
8. GD Section taught by Tenured/Track	17	15	23	23	29
9. LD Section taught by Lecturer	19	26	27	37	37
10. UD Section taught by Lecturer	4	5	6	9	5
11. GD Section taught by Lecturer	0	1	0	0	0

Source and definitions available at: http://www.csueastbay.edu/ira/apr/summary/definitions.pdf

- The Genetics Concept Inventory and Assessment http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2592048/
- The American Physiological Society concept inventory in physiology (work in progress)Further assessment of SLO 3 will continue to be done through individual research projects and oral/poster presentations done in the courses listed in the previous section. Several faculty assign research projects and/or oral/poster presentations in their courses. However, the method of assessment for such student work varies. The faculty can work together to develop a more standardized assessment rubric that can be implemented in all the courses that can assess SLO 3. These data can then be compiled at the end of each year to get a more universal gauge of SLO 3 mastery in our biology majors.

New Courses and Programs (2005-2009)

Undergraduate

Microbial Symbioses (Biol. 4142)
Molecular Microbiology (Biol 4143)
Medical Microbiology (Biol 4413)
Water Quality and Human Heath (4435)
Neural Development (Biol. 4525)
Environmental Toxicology (Biol. 4517)
Animal Senses (Biol. 4513)

Graduate

Microbial Symbioses (Biol. 6142)
Molecular Microbiology (Biol. 6143)
Water Quality and Human Health (Biol. 6435)
Neural Development (Biol. 6525)
Environmental Toxicology (Biol. 6517)
Animal Senses (Biol. 6513)

New Graduate Program: Master of Arts in Biological Sciences (MA completed with coursework and culminating in a written Comprehensive Examination) replaced the former 'Plan C' MS degree in Biological Sciences. The majority of new undergraduate courses were created in the area of Microbiology. These courses were created to support one of our new faculty members (Dr. Stephanie Molloy) and the reorganization of our 'Biomedical Laboratory Sciences' option within the BS degree. The reorganization of this option was a major undertaking by the department. The newly reorganized option (Microbiology/Biomedical Laboratory Sciences) provides students with more flexibility within the option and essentially provides two tracks: 1) students seeking a BS degree with an option in Microbiology, and 2) students seeking to enter the Clinical Laboratory Sciences licensing programs who require specific coursework offered within this option.

Table 2. Race/Ethnicity of Biological Sciences Students (undergrad and grad)

		2005	2006	2007	2008	2009
Biological Science	**Race/ethnicity unknown**	61	54	71	80	84
	Black, non-Hispanic	49	62	53	82	67
	Asian or Pacific Islander	151	191	196	215	215
	Hispanic	49	52	58	76	108
	White	85	97	110	105	116
	American Indian or Alaska Native	3	4	10	4	5
	Nonresident aliens	25	31	43	43	44
	Multiple ethnicity					11
	All	423	491	541	605	650

Fig. 1. Top: Biology majors (all levels) for past 5 years. Bottom: Student Faculty Ratio (SFR) comparison between CSUEB Biology and CSU Biology departments.

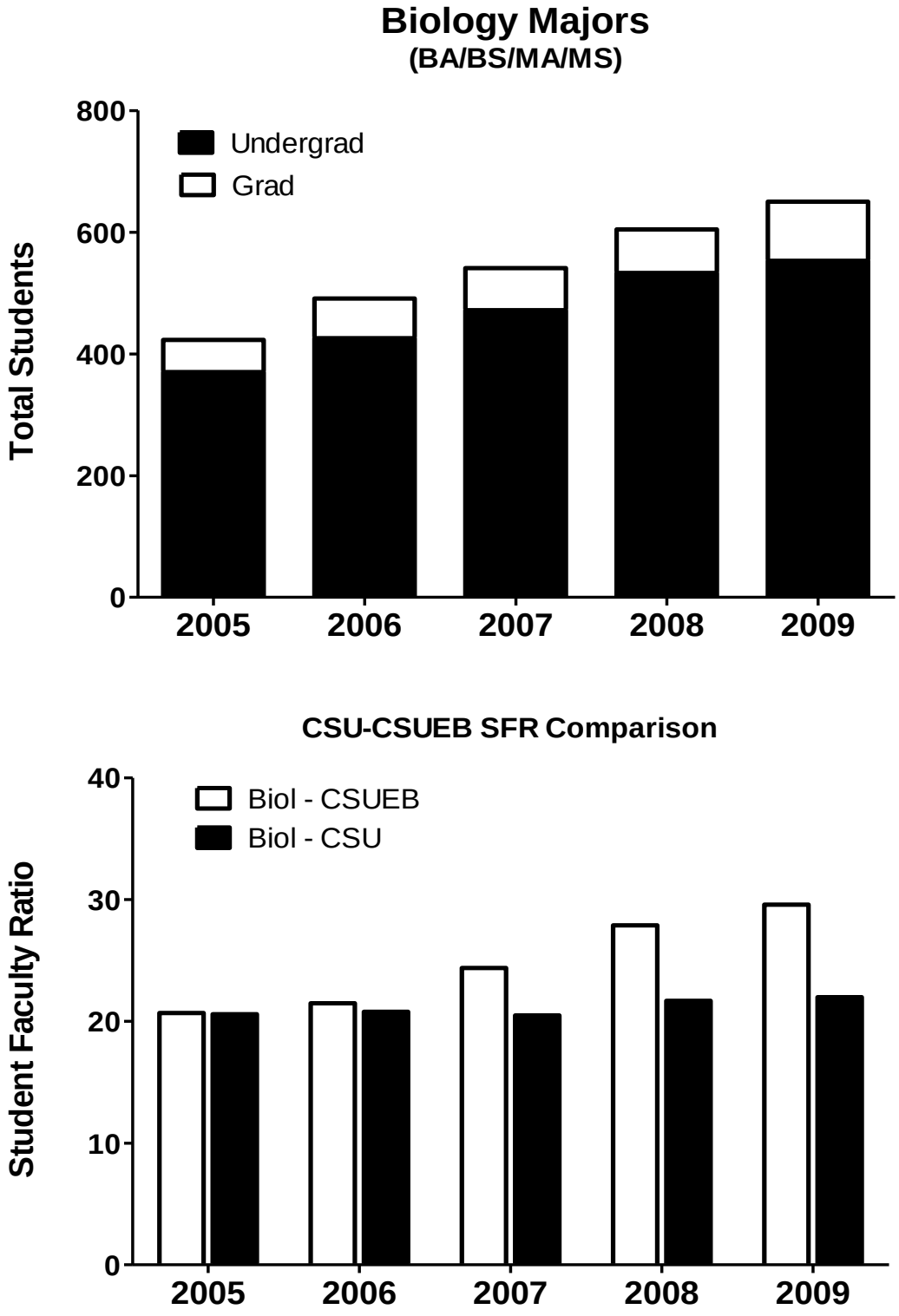
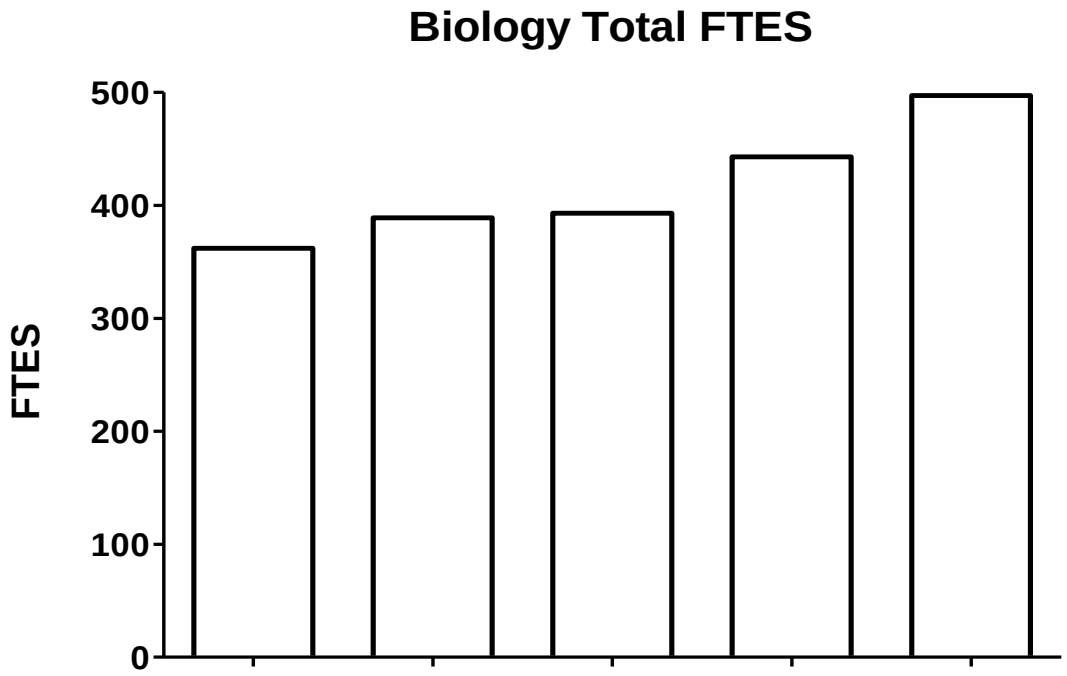


Fig. 2. Top: Total Biology Full-Time Equivalent Students (FTES) over past 5 years. Bottom: Total Biology FTE Faculty (FTEF) over past 5 years.



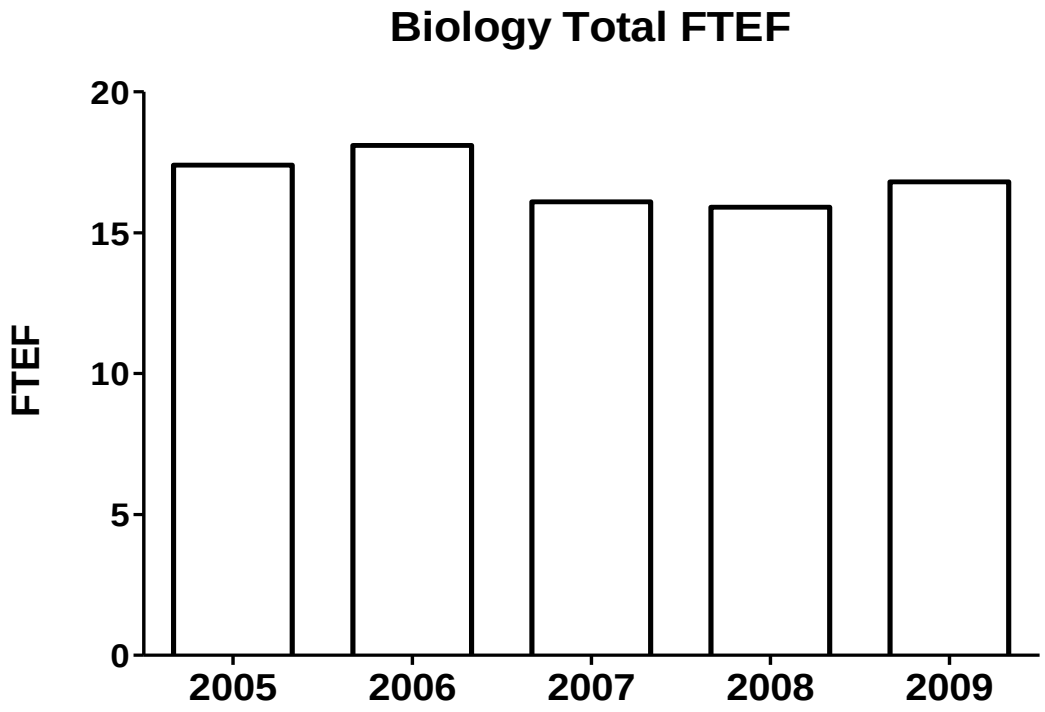
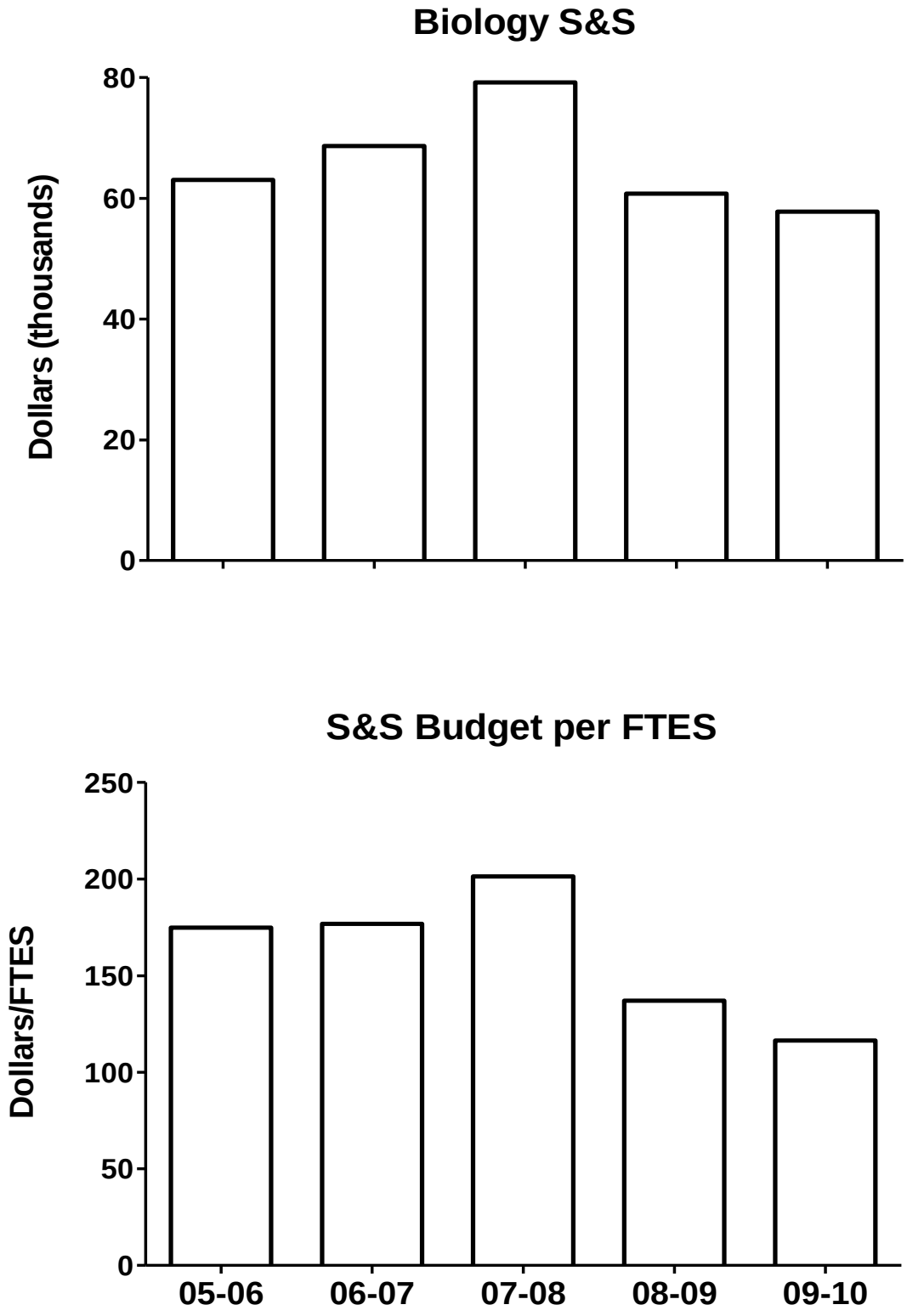


Fig. 3. Top: Biology Supplies & Services (S&S) budget over past 5 years. Bottom: Biology S&S per FTES over past 5 years.



Section 1.3 Summary: As shown in the preceding Tables and Figures, the Biology department has seen substantial growth in all categories except two - the departmental Supplies and Services (S&S) budget that supports instruction and the number of full time faculty. While the number of majors, students with identified ethnicities, FTES and SFR have all increased significantly over the past 5 years, there has been a steady decline in department revenue leading to a reduction in the amount of money spent per student on basic instruction. It is particularly noteworthy that our department's SFR is increasing steadily beyond the system-wide SFR average in Biology and we fully expect this trend to continue. Although not indicated in these figures, the departmental allocation from the college was reduced an additional $12,000 in Fall, 2010, thus creating a departmental deficit. The department has reached a critical juncture such that we cannot reduce costs further without completely revamping our curriculum, which may be necessary if budget cuts continue. We have maintained flat FTEF during this time, accounting for the increase in SFR, but we will have more separations in the coming years that will need to be replaced. The bottom line is that the department is serving an ever-increasing number of students without any increases in the number of faculty and in the face of declining budgets. This trend will also have a negative impact on workload because all Biology faculty are involved with advising and will need to spend more time on advising as enrollments continue to grow.

1.4. Faculty

- Physiology TT position description (See Appendix 1)
- The department was allocated a Physiology TT position in 2008, but this search was aborted due to lack of resources. We have submitted a new Physiology TT position request for Fall, 2012 when the next TT faculty will be hired.
- The department had two separations in the past five years: Dr. Stephen Benson retired in 2008 and Dr. Susan Opp was appointed AVP for Academic Programs and Graduate Studies.
- Two faculty entered the FERP program: Dr. Richard Symmons is currently in his final quarter and will fully retire in Spring, 2011. Dr. Beverly Dixon is currently in her 4th year of the FERP program and will fully retire in Spring, 2012. Thus, the department will lose 1 FTEF to retirements by this time next year (Spring, 2012).
- We have hired three faculty in the past five years: Dr. Kenneth Curr (Genetics/Virology), Dr. Stephanie Molloy (Microbiology) and Dr. James Murray (Physiology/Neurobiology). These hires have allowed us to maintain a flat FTEF (currently 16, Table 1), but will decline to 15 next year. This is the same number of FTEF in 2000, thus we have not had any change in faculty over the past 10 years despite a 66% increase in the total number of majors from 392 (310 FTES) to 650 (497 FTES) over the same 10 year period!
- The faculty has continued to make significant professional effort in research over the past 5 years (Appendix 2). During this period, Biology faculty published a total of 58 articles and book chapters, and have brought in over $6 million in external and internal grants (Appendix 2). This is a high level of achievement given the high workloads and budget problems faced by the department and university. The department has a long history of professional activities and has had considerable success in acquiring external grants and publishing in professional journals and books. This will continue to improve if we can hire new Assistant Professors in the next five years that are trained in research track post-doctoral positions and provide them with adequate resources and start-up.

1.5. Resources

Library. The Biology faculty require access to current and past journals in order to maintain currency in the field. The current needs are primarily in the area of electronic access to journals. The library is woefully underfunded such that many journals are unavailable to faculty. This is a severe problem when faculty need access to a wide variety of journals in order to write articles and grant proposals s. This is a severe problem that needs to be addressed by the university.

Equipment. The department has not had an infusion of new equipment for teaching and research for many years. This will be partially addressed by the Provost's equipment initiative that is funded from Summer, 2010 self-support courses. This will help, but is a one-time solution to a long-standing problem of inadequate equipment.

Research Infrastructure. The College of Science lacks many basic infrastructure necessities that allow faculty to be competitive for external funding. Some of these inadequacies include proper animal care facilities, major 'core' equipment facilities, staff to maintain core facilities, lack of indirect cost return from grants to support continued research, outdated physical plant and research laboratory space.

1.6. Units Requirement

- 180 units are required.

2. Five-Year Plan

2.1. Curriculum

Student Learning Outcomes for BA-Biology and BS-Biology Degrees

It is imperative that CSUEB Biology students possess sufficient theoretical and practical training in molecular and cell biology, physiology, forensic science and ecology in order to become competitive for a professional degree program (i.e. M.D., Ph.D., PharmD) or the biotechnology industry (B.S., B.A., M.S., M.A.). Students planning for entrance into graduate school or pre-professional school are more than adequately prepared for post-baccalaureate training. A complete listing of Biology courses is provided in Appendix 3.

Degrees Offered in the Department of Biological Sciences:

Bachelor of Arts (B.A.): Biological Sciences
Bachelor of Science (B.S.): General Biology Option
Bachelor of Science (B.S.): Cell and Molecular Biology Option
Bachelor of Science (B.S.): Microbiology/Biomedical Science Option
Bachelor of Science (B.S.): Physiology Option
Bachelor of Science (B.S.): Forensic Science Option
Bachelor of Science (B.S.): Ecology Option
Bachelor of Science: (B.S.): Marine Science

Master of Science (M.S.): Biological Sciences
Master of Science (M.S.): Marine Science
Maters of Arts (MA): Biological Sciences
Minor in Biological Sciences

General Learning Objectives for students obtaining a Bachelor's of Arts or Science Degrees:

The students obtaining a degree in Biology will achieve:

- An understanding of the importance of and reason for course prerequisites.
- A strong background in mathematics (Algebra, Trigonometry and Calculus) through the use of mathematics in laboratory, physics and chemistry classes.
- A strong background in the life and organismal sciences such as cell and molecular biology, molecular and developmental genetics, animal and mammalian physiology, ecology and evolutionary biology.
- The ability to think critically, conceptually and analytically.
- The ability to work effectively in a laboratory environment and to use modern chemical/biochemical instrumentation and procedures.
- The ability to use computer software and scientific databases (i.e. bioinformatics), in experiments (biostatistics), data analysis (i.e. 1400 Biology series).
- The ability to communicate effectively, both orally and in writing (i.e. undergraduate and graduate seminar).
- The ability to complete the undergraduate and/or graduate program that is as competitive as the programs at local institutions such as San Francisco State University, San Jose State University, University of California, Berkeley and Stanford University.

Learning Outcome 1: Undergraduate biology students should have a strong background in lower division physical sciences.

Excellent grades are the best indicator of mastery of biological subjects. Students should understand the reason for course prerequisites and need to complete specific courses in the correct sequences in the pattern indicated in the catalog. Students have to understand that it is not taking the prerequisite course, but the knowledge from the prerequisite course that is needed in the upper division courses. This includes one year of general chemistry, one year (or two quarters for the B.A.) of organic chemistry and at least one quarter of protein chemistry (Chem 4411). Students must also take one year of general physics, which includes motion and mechanics (Phys 2701), electricity and magnetism (Phys 2702 and optics (Phys 2703), as well as one quarter of Calculus (Trig for the B.A.).

Learning Outcome 2: Undergraduate biology students should have a solid background in the core biology courses, regardless of the chosen option.

Each option in the Department of Biology must successfully complete one year of general biology (molecular and cell biology, botany and organismal biology), molecular genetics,

physiology ecology and evolution. By taking these core classes in the life and environmental sciences students should be proficient in

(1) Understanding the structure and function of the basic molecules found in living cells (eg. amino acids, peptides, proteins, enzymes, carbohydrates, lipids, nucleotides).
(2) Understand cell division and the genetic process that are involved in gene transcription and regulation.
(3) Understand enzyme structure, function, and kinetics.
(4) Understand DNA and RNA structure and function, DNA replication, and RNA transcription and protein synthesis.
(5) Understand basic theory on evolution, phylogentic analysis, organismal relationships, biodiversity, extinction and habitat
(6) Understand general principles of botony, such as photosynthesis and the carbon cycle.
(7) Understand the nervous, sensory, osmoregulatory, muscular, respiratory, circulatory, digestive, and endocrine systems facilitated by an understanding of the cellular processes governing these systems.

Examination of selected students will be used to assess the ability of students to be proficient in the above categories.

Learning Outcome 3: Undergraduate biology students should have a solid background in their chosen options

For example, students enrolled for the molecular and cell biology option has to complete several upper division electives that are specific to the discipline, such as Principles of Virology, Microbiology, Functional Genomics, Immunology, DNA Sequencing and Sequencing Analysis and Molecular Genetics, Molecular Evolution and Cell Culture Techniques. Each of these courses provides in depth coverage of the specific topics covered. We have a number of upper division electives in which students can take, which offers them in depth coverage of the specified topic (See below)

	CSU East Bay	**CSU Domingez Hills**	**CSU Sonoma State**
Physical Sciences:	1 Yr Physics	1 Yr Physics	1 Yr Physics
	1 Yr G. Chem	1 Yr G. Chem	1 Yr G. Chem
	1 Qtr (Biostats)	1 Sem (Stats)	1 Sem (Stats)
	1 Qtr (Calculus)	1 Sem (Calculus)	1 Sem (Calculus)
	1 Yr (O-Chem)	1 (O-Chem)	1 (O-Chem)
	N/A	1 Sem (Biometry)	N/A
	N/A	1 Sem (Com. Science)	N/A
Life Sciences:	1 Yr (Biology)	1 Yr (Biology)	1 Yr (Biology)
	1 Qtr (Physiology)	N/A	N/A
	1 Qtr (Ecology)	1 Sem (Ecology)	1 Sem (Ecology)
	1 Qtr (Evolution)	1 Sem (Evolution)	1 Sem (Evolution)
	1 Qtr (Development)	1 Sem (Adv. Cell Biol.)	1 Sem (Adv. Cell Bio)

Electives: All of the comparable CSU's have electives that are geared toward the specialty of the various tenure-track faculty. We are equally as competitive in the number and variety of our elective courses with comparable campuses, except in the area of upper division laboratory courses. Our campus appears to have fewer courses.

Total Units for B.S. Degree: 100 Quarter 81-84 Semester 84-86 Semester Units

Degrees: Minor in Biology Minor in Biology Minor in Biology
Bachelor of Arts Bachelor of Arts Bachelor of Arts
Bachelor of Science Bachelor of Science Bachelor of Science

B.S. Degree with Options (CSUEB): General, Cell and Molecular, Ecology/Conservation, Forensic Science, Microbiology and Biomedical Laboratory Science, Physiology
B.S. Degree with Options CSUDH: General, Cellular and Molecular Biology, Ecology and Environmental Biology and Microbiology.

B.S. Degree with Options Sonoma State: General, Cell and Molecular, Ecology/Conservation, Marine Biology, Microbiology and Physiology.

CSUEB B.S. Marine Science Curriculum: The undergraduate curriculum is designed to fulfill major requirements for qualified upper division and graduate students. We have a standing collaborative academic interaction with the Moss Landing Marine Laboratories for students pursuing a Bachelor or Masters in Marine Science. Such students can plan their academic schedules to provide for one or more terms at the Moss Landing Marine Laboratories and will be considered as in-residence at Cal State East Bay. The curriculum between CSUEB and Moss Landing Marine Laboratories is:

M SC 4103 Marine Ecology
M SC 4104 Quantitative Marine Science (6)
M SC 4105 Marine Science Diving (4.5)
M SC 4112 Marine Birds and Mammals (6)
M SC 4113 Marine Ichthyology (6)
M SC 4124 Marine Invertebrate Zoology I (6)
M SC 4125 Intertidal Invertebrates of California (4.5)
M SC 4131 Marine Botany (6)
M SC 4135 Physiological Ecology of Marine Algae (6)
M SC 4144 Biological Oceanography (6)
M SC 4900 Independent Study (1.5-6)

General Learning Objectives for students obtaining a Master Science Degree:

It is imperative the CSUEB Biology students possess sufficient theoretical and practical training in cell and molecular or environmental and conservation biology so that they will be able to assume the significant technical responsibilities required by government agencies (FDA, USD, National Labs), pharmaceutical and biotechnology industries or competitive applicants for terminal degrees (*e.g.* Ph.D or M.D.) that will employ or accept them into their program. In addition, it is important that students planning for entrance into Ph.D. programs or pre-professional programs are more than adequately prepared for entrance into these programs. Our Master Degree program allows our students to be as competitive with students From the University of California System. The completion of Master of Biology Degree will allow the student to

(1) Use the scientific method to examine questions about the natural world; specifically, they will be able to formulate testable biological hypotheses, analyze empirical data, and synthesize the results of the analysis,
(2) Present the design and results of an observational or experimental analysis in a well-organized manner using the scientific paper format,
(3) Orally communicate the design and results of an observational or experimental study in an effective manner,
(4) Evaluate primary scientific literature and judge the value of the information presented in relation to particular biological questions.

Learning Outcome No. 1: Newly admitted biology graduate students should be prepared and ready to study biology at the graduate level.

All newly admitted biology graduate students that apply to the Masters program (including the submittal of a statement of purpose) are expected to an undergraduate degree (B.S. or B.A.), take the General GRE Test and apply with competitive scores (> 70th percentile). They must have three strong letters of recommendation from faculty or their immediate supervisor if they work in some scientific capacity. They must have an undergraduate GPA of at least 2.75 to apply, but must maintain a 3.0 GPA through the program.

Learning Outcome No. 2: Biology graduate students who have undergone the program should have a solid background in advanced biology.

Depending upon the discipline (*e.g.* Molecular/Cell or Ecology), biology graduate students must complete coursework in graduate level courses, which include Advanced Molecular and Cell Biology (Biol 6141 and 6142), Graduate Seminar (Biol 6800's) and courses designed to further their expertise in their individual discipline (M.S. Course table below)

Each graduate student will have to complete 36 units of academic study (16 units of 6000 level courses required) plus their thesis units, for a total of 45 graduate units. Before students can take thesis units, a student must be accepted into a functional laboratory, in which active research is being conducted. They must write and submit an experimental proposal, which specifies the significance of the project, the uniqueness of the project and the experimental protocol as to how

they will answer their stated hypothesis. Upon acceptance of the proposal the student will take nine units of thesis units in order to complete their experimental work. Once the experimental work is completed the student will write-up their results and defend their thesis at an open invitation seminar, followed by a private 2-3 hour oral exam (conducted by the students graduate committee).
Students are easily assessed in the oral exam, as the committee asks basic questions from their discipline, as well as questions from their experimental work. A student can only pass with a thorough (mastering) understanding of the topic. To pass the Thesis examination the three-member committee must come to a unanimous decision.

Learning Outcome No. 3: Graduate students in biology should be competent in new protocols and technologies within their respective discipline.

Department facilities and resources have equipment and technologies that are currently used in industry, academia and government. Our facilities are open for student research and study, which include herbarium; greenhouse; insectary; radiation hot lab; microbiology facilities; cell culture facilities; animal rooms; molecular biology laboratory (Biocore: includes DNA sequencing and FACS Analysis); microscope laboratory including phase, differential interference contrast and fluorescence microscopy; and DNA sequencing and cell storage facilities. Local field opportunities may be found at a wetlands field station at the San Francisco Bay National Wildlife Refuge, the brackish and salt water marshes of the Hayward Regional Shoreline of San Francisco Bay, and a 35-acre oak-grassland preserve located immediately adjacent to the Hayward Hills campus and contiguous with Garin Regional Park (one of the East Bay Regional Parks).

Related Program:

The Biotechnology Certificate Program within the department is a post-baccalaureate program emphasizing molecular and cellular techniques. The program will complete the program in one-year and is specific for students who need advanced experience and in- depth knowledge in Molecular and Cellular techniques. This is a competitive program in which applicants must apply and submit a statement of purpose. The student will take graduate and upper division courses related to molecular and cellular techniques (see below). A 3.0 GPA must be maintained for the duration of the program. Before students receive the degree, they will have to take a two-part exit exam. The first part is a quantification exam in which students must receive a 100% on this portion in order to take the second part, which concentrates on conceptual questions. This certificate will give students the education and experience that is needed to be competitive in today's biotechnology industry.

Five-Year Objectives:

We envisage the strengthening of the Biology Departments curriculum in three different areas (i) increase the number of non-tiered graduate courses for students pursuing a Masters Degree, (ii) increasing the number of upper division laboratory courses offered in each of the options leading to a Bachelor of Science or Bachelor of Arts Degree, (iii) offering hybrid courses that can be utilized in STEM education and (iv.) reinvigorating the Marine Science Degree and our

relationship with the Moss Landing Laboratories. All of these areas will strengthen the curriculum within the Department of Biology.

Objective No.1: Increasing the number of non-tiered graduate courses for students pursuing a Masters Degree.

Many of the graduate courses currently offered are tiered undergraduate/graduate courses, by increasing the number of non-tiered graduate courses we hope to provide a more appropriate experience for our Masters candidates, including more mature and in-depth readings and discussions of current scientific literature and the development of analytical and presentation skills.

Objective No. 2: Increasing the number of upper division laboratory courses offered in each of the options leading to a Bachelor of Science or Bachelor of Arts Degree

Increasing the number of upper division courses that have a laboratory component will better prepare CSU East Bay graduates for entering the local workforce which is of a highly applied and technical nature or for pursuing doctoral degrees at other institutions. Skills and experience gained in a hands-on environment in the laboratory cannot be replicated by simply attending lectures and reading.

Objective No. 3: Offering hybrid courses that can be utilized in STEM education

The Department of Math & Science at CSU East Bay has an approval for mathematics teaching credential, and the university is currently is working on getting the science program approved. Biology will be a critical component of the science program and the Department of Biology will need to develop courses that support science teacher preparation in Subject Matter Preparation and in the Single Subject Credential Program.

Objective No. 4: Reinvigorating the Marine Science Degree and our relationship with the Moss Landing Marine Laboratories

The Moss Landing Marine Science Laboratory (MLML) and the area is a valuable teaching resource, which is currently underutilized by biology students and faculty at CSU East Bay. MLML is situated adjacent to the Monterey Submarine Canyon, the largest such feature on the west coast of North America, and the facilities are amenable to hands-on, field-oriented student learning experiences. The M.S. in Marine Science is offered through the Department of Biological Sciences and the Department of Earth and Environmental Sciences, provides the opportunity for students to acquire a practical and theoretical education in the marine sciences to prepare them for careers as marine specialists, scientists, and teachers. We aim to reinvigorate our relationship with MLML by encouraging faculty collaborations, investigating the reinstigation of a permanent CSU East Bay faculty member at MLML and promoting the M.S. in Marine Science degree within our department and to incoming and future students.

2.2. Students

1. Do you see the number of students majoring in your program increasing or decreasing during the next five years?

The Biology program has seen a steady increase in the number of majors (undergraduate and graduate) in the past 5 years. Although this trend should continue, it is impossible to predict what might happen if there are more rounds of severe budget cuts to the CSU.

The Department instituted Options (listed below) in the last five years to accommodate the diversity of scientific disciplines to provide a variety of career paths for our majors.

Cell and Molecular: The Bay Area is the "Birthplace of Biotechnology." The need for well trained entry-level technicians in the discipline is expected to grow steadily for decades.

Physiology: The need for health-care professionals from physical therapists to MDs is expected to increase especially with the retirement of "Baby Boomers."

Microbiology and Biomedical Laboratory Technology: This option will produce students trained for a number of laboratory, healthcare and government laboratory career positions--all of which are likely to increase in the next five years.

Ecology and Conservation Biology--The increased concern over ecological concerns such greenhouse gas release and global warming will likely result in increases in this option within the next five years.

Forensic Science – There is a documented shortage of qualified forensic scientists. This interdisciplinary option (with Criminal Justice) is well poised to capitalize on this shortage.

2. Refer back to the statistics in the Self-Study. Do you anticipate new programs or outreach to new student populations?

Given the steady increase in majors (Table 1, Figs 1&2), we do not anticipate an increase in the number of programs or outreach to new student populations. However, the creation of BS options in Biology, the newly approved MA in Biology, and the MS in Biotechnology (under development) all anticipate student demand. Otherwise no new programs are deemed necessary in the coming 5yr cycle.

3. Will the career opportunities open to your graduates change during the next five years? (As addressed in point #1 above).

This is impossible to predict given the current budget climate. There is continued demand for qualified graduates in the Biotechnology sector and we don't anticipate that this will change. We will continue to provide quality instruction in this area which is strong within the department, however, with declining budgets, our ability to deliver quality instruction will also continue to decline in the absence of increased revenues to support these costly courses. There is likely to be increased demand in Forensic Science, and we are well-situated with our B.S. Option in Forensic Science

4. How will your program adjust its curriculum and program practices to prepare students for those opportunities?

This requires an assessment of current option enrollments and curriculum. However, with budget cuts looming on the horizon, the department will not be in a position to expand offerings. Most likely, the department will be asked to cut back on courses and part-time lecturers which will make it difficult to deliver courses to satisfy the current options.

5. Do you expect your total enrollment to increase or decrease during the next five years?
We expect continued increases in enrollment, but again this depends on the budget and whether the CSU will need to cut back on student enrollment with declining state support. Our large increases in enrollments are due to: 1) increased number of Biology majors, and 2) increased number of students in non-major courses that support the Nursing program which has seen huge increases in enrollment. Thus, we expect that Biology enrollments will continue to grow in both areas.

6. How are advising and retention studied and supported for students in the program?
Currently advising is based on student initiation demand. The Department should adopt a more proactive policy of identifying and contacting new freshman majors and major transfers for initial and follow up advising. All majors should be paired with a "default" major advisor. The department currently has no process of measuring and assessing major retention. A procedure needs to be developed and put in place. Currently, all faculty are responsible for majors advising.

7. Are changes needed in the program's learning goals? How will you assist students in attaining those goals during the next five years?

Assessment of student needs is imperative for the continuation of a program that will afford extensive student development. If we want to increase the number of students choosing careers that require post-baccalaureate education, to put forth a degree program plan that will offer broad based academic and research training activities that are not currently offered by the university. The rationale for establishing these goals and their relationship to our institutional need is reflected in the proposed measurable objectives that have been developed to meet the goals.

In addition to these goals, there is an emerging need in our curriculum to add an element of training our students more for collaborative-based activities, this especially true for our graduate students. While students need to demonstrate a personal ability to conduct research, possess skills and problem-solve, they also need to learn how to do collaborative research beyond sharing equipment. They must become astute in multi-tier design, and intra-specific communication.

Goal 1: Foster and maintain interest among students for the science field.

Measurable Objectives:

A. Increase academic success students majoring in Biological Sciences.

B. Increase the retention rate of students within the Department of Biological Sciences.

Planned Activities to Meet Objectives:

The following activities will be designed to increase academic success and retention. The rationale for each activity stems from the need to increase student motivation for their major courses.

A. Tutorial Workshops
B. Mandatory Advising
C. Faculty and Peer Based Mentoring

Goal 2: Increase the number of students applying and gaining acceptance into post-baccalaureate programs.

Measurable Objectives:

A. Increase test scores among majors taking the graduate program entrance and/or related exams.

B. Increase the number of majors who choose biology related careers.

Planned Activities to Meet Objectives:

To increase the number of students opting for biology related careers, it will be necessary to adequately introduce and train students in the practice of biology. We intend to do this through the implementation of extended advising and advertisement of internship opportunities.

A. Advertise Intramural and Extramural Research Opportunities

Graduate Students – A Select Group

Our graduate student population reflects a motivated group of students. Nevertheless, we intend to measure success through their filing of a questionnaire following graduation. Each program graduate will indicate employment and/or graduate education placement.

8. What are your specific plans in the areas of curriculum change, outreach, scheduling and retention to increase student enrollment?

Scheduling: Expand the Biol. 1401-1402-1403 Introductory series to accommodate majors initiating the series Fall, Winter and Spring. Restricting the Introductory majors series causes a bottleneck in enrollments of downstream (upper division) courses. With the Microbiology/BLS option, meetings have taken place and will continue to take place with Bay Area Hospitals and collaborating CSUs, (i.e. San Jose State and San Francisco State) to adjust curriculum and program practices. The Biomedical Lab Sciences option was changed this past year as a result of such meetings and state requirements.
Also addressed in goals in #7 above

Outreach: Institute a policy for rotating visits by faculty to our major feeder community colleges. This is already being done by the chair on a limited basis, but could be expanded to include more faculty in these efforts.

9. If your program has inadequate resources to serve your students, what does the program

require?

The primary requirements are 1) updated equipment in teaching laboratories, and 2) an adequate departmental allocation to equip laboratory and field courses with the necessary supplies to allow inquiry-based experiences by students. In the absence of laboratory fees (proposals were consistently rejected by the administration), the department must rely on the College allocation funding formula for its S&S budget. Because the department is already operating on a 'bare-bones' budget, this will become a critical issue if the department allocation continues to decrease as it has for the past four years.

- Envisioned changes of trends for the next five years, addressing recommendations and concerns identified in the Self-Study, from external reviewer(s), and from assessment, including, but not limited to the following issues: **To be completed after receipt of the Outside Reviewer's Report**

2.3. Faculty

- We anticipate continued need for one or two more physiologists to keep pace with the growing enrollment in this area and to replace 1.5 FTEF anticipated separations in physiology. We will have a 0.5 FTEF separation in 2010-11 when Dr. Richard Symmons fully retires and an additional 1.0 FTEF separation when the current chair (Hedrick) leaves to start a new faculty position in Fall, 2011. Continued enrollment growth in Microbiology, coupled with a 0.5 FTEF separation (Dr. Beverly Dixon) in 2012, will require us to hire an additional Microbiologist.

- With the University emphasis as a STEM campus and the initiatives surrounding this designation, we anticipate further needs in Biotechnology (Cell & Molecular Biology, Forensic Science) instruction and research to support the STEM initiative. We anticipate further hires in the area of Science Education to support the STEM initiative.

- The current departmental climate is one of harmony and a general sense of 'pulling together' to improve the department. This has not always been the case as the previous 5 year review pointed to serious 'divisions' within the department. This divisiveness has all but disappeared with changes in personnel within the department. A more pressing issue for the department at this time is with long-term leadership at the Chair position. The current chair is leaving the department and relinquishing chair duties in July, 2011. Former chair Don Gailey has indicated that he will serve as chair for one year will provide a short-term solution to this problem, but the department will need to identify someone within the department to serve as chair and provide some long-term stability to the department. However, given the harmonious nature of the department, there is general confidence that someone will 'step up' and fill this role for the department.

2.4. Other Resources

Will your current level of resources (staff, equipment, library resources, travel funds, etc.) be adequate to permit the maintenance or improvement of program quality during the next five years?

Given the trends over the past three years and projections by the state, it seems unlikely that the department will be able to maintain (and certainly not improve) program quality over the next five years. We are certainly not alone as the huge budget problems affect all departments within CSUEB and the CSU in general. We have already seen erosion in program quality over the past three years with reduced budgets and increasing enrollments, and this erosion will most certainly continue with more budget cuts. The department aggressively sought to deal with this erosion in quality by trying to implement laboratory course fees in order to have a steady income to support laboratory instruction, but has been consistently rebuffed in these efforts by the administration. There does not seem to be an adequate administrative explanation for rejection of fees when nearly every other CSU Biology department and University currently has laboratory fees in place.

Staff. The department has suffered immensely under the budget cuts with regard to office staff. We lost through retirement one of the longest serving and premier office managers in the University. Since that retirement, the department has gone through four office managers in the span of four years. Needless to say, this has placed a tremendous strain on the chair and faculty who have had to deal with the disruptions this turnover has caused. In addition, the department has lost 0.5 positions in the department office and is now down to 1.5 positions. The loss of staff positions due to budget cuts, coupled with a high turnover of office staff, has made the job of the chair extremely difficult in carrying out the day to day tasks required of running a large department such as Biology. Other departments of similar size in the College of Science have two full-time office staff and the restoration of the 0.5 position to the department is sorely needed.

Equipment. The department has begun to assess by discipline its current holdings of equipment, their projected life and utility, and a plan developed for replacement/addition. We are carrying out a similar study relative to space need analysis and an equipment study would be equally important. This establishes priority for attracting tenure-track applicants and maintains state-of-the-art experience for students in laboratory classes. Moreover it provides a centralized core of equipment for faculty research. It is this chair's belief that such needs should be institutionalized and not drawn from Supplies & Services funds. Our department prepared numerous equipment proposals, although state money has been non-existent until now. Outside research funding has had to subsidize many of our courses. The current equipment initiative, instituted by the Provost, will clearly have a positive impact on the departmental equipment situation. We anticipate a significant increase in our ability to deliver high quality courses with the substantial upgrade of new equipment that this initiative will provide. The positive impact of the new equipment should be realized in the next academic year (2011-12).

Library Resources. The most important resource the library can provide for its science faculty is electronic access to journals. This is necessary for faculty to maintain currency in teaching as well as providing up to date information in all fields to maintain professional currency for writing manuscripts for professional journals and grant proposals to funding agencies. Not surprisingly, access to electronic journals has steadily declined as budget cuts have forced the library to cut back on subscriptions to the journals.

Recruitment. The department has not implemented any organized recruitment plan outside of the

ongoing university recruitment efforts. This does not seem necessary given the steady increases in enrollments in the department and the potential for enrollment cutbacks based on shrinking state budgets. The department engages in several university-wide recruitment efforts including the Majors fair, new freshmen and transfer recruitment efforts organized at the College level.

Salaries and start-up. Hiring the best available faculty and staff is enabled by the ability to offer competitive salaries. CSUEB Biology should not lose applicants to other CSU campuses because they are able to offer higher salaries and start-up packages. Although we have not been able to hire a new faculty member in the past three years, it will become important to remain competitive with other universities if we are to recruit and retain highly qualified faculty. However, the department has little control over this aspect of budgeting and remains at the mercy of the administration with regard to salaries, start-up funds and other aspects of recruiting.

3. Outside Reviewer(s)' Report

[Insert report here]

4. Program Response to Outside Reviewer's Report

Appendix 1. Physiology TT job description

Assistant Professor - Physiology

The Department of Biological Sciences, California State University, East Bay, invites applications from physiologists for appointment to a tenure-track position at the level of Assistant Professor for Fall, 2007. We seek an individual who uses modern approaches to study physiological problems of vertebrates or invertebrates at any level of organization, from cellular/molecular to the whole organism. The successful applicant will combine innovative, externally funded research with teaching responsibilities in our physiology curriculum. Teaching duties include courses in Human Anatomy and Physiology for non-majors, Animal Physiology for Biology majors, and the development of upper division/graduate courses in applicant's area of expertise. Applicants must have a Ph.D. and postdoctoral research experience. Apply by hard copy with CV, statement of research interests and goals, statement of teaching experience and philosophy, selected reprints, and three letters of recommendation to: Physiologist Search, Department of Biological Sciences, California State University, East Bay, Hayward, CA 94542. Review of applications will begin October 16, 2006; the position will remain open until filled. [cite Job Announcement #xx; EOE.]

Appendix 2. Biology faculty publications and grants 2005-2010

58 Publications (peer-reviewed journal articles and book chapters) by 14 full-time faculty members. This represents an average of 11.6 publications/year by faculty or 0.83 publications per year per faculty member.

$6,108,561 in Total Grants (External and Internal) by 14 full-time faculty members. This represents an average of about $1.2 million per year or approximately $86,700 per year per faculty member.

Appendix 3. Biology department course offerings.

Elective Courses at CSUEB: Each campus has courses designed around the specialty of their faculty. We have a diverse and very competitive program in the Department of Biology as can be seen from the number of courses available to students each term, once a year, or once every two years.

Biol 3001: Concepts in Molecular Biology. Principles and practice of molecular biology with emphasis on the human genome, human genetic diseases, and human evolution.

Biol 3006: Insects and Humans. Beneficial and harmful insects and their relatives as important factors in human welfare. Topics include insects as pollinators, the basis for food webs, vectors of disease, feared creatures.

Biol 3015: Natural History of Marine Organisms. Natural history of marine plants and animals with emphasis on explorations of local marine habitats.

Biol 3020: Genetics, Evolution, and Humanity. Principles of genetics, their application to human problems, and to theories of evolutionary change, including the evolution of humans.

Biol 3031: Nature Study. Natural history in the field and laboratory with emphasis on biotic communities and their component plants and animals.

Biol 3065: Humans and Sex. The genetic, hormonal and behavioral basis of sexuality in humans from conception to adulthood; developmental and behavioral variation; enhancement and suppression of fertility; genetic screening.

Biol 3070: Human Nutrition. Key nutrients, including carbohydrates, lipids, proteins, vitamins, and minerals. Role each plays in human metabolism. Current controversies in nutritional information, including food supplements and claims for prevention of disease

Biol 3215: Marine Biology. The general biology of marine organisms with emphasis on the ecology of local marine communities.

Biol 3216: Freshwater Environments. Comparisons of freshwater physical and biological environments with their major communities of plants and animals

Biol 3405: Microbiology. The general biology of major groups of microorganisms, including their morphology, metabolism, reproduction, genetics and ecology.

Biol 3410: Epidemiology. Study of the distribution and determinants of disease and health-related aspects in populations. Application of results to the prevention and control of health problems.

Biol 3425: Biomedical Laboratory Research. First-hand experience in a wide variety of basic biomedical research techniques as applied in the study of human disease mechanisms at the

cellular and molecular level.

Biol 3430: Hematology. Morphology, function and composition of human blood fluids and cells, both normal and diseased.

Biol 3441: Biomedical Parasitology. Study of protozoa and metazoa important in the pathogenesis of human diseases, including pathology, immunology and epidemiology, identification and life cycles.

Biol 3898: Cooperative Education. Supervised work experience in which student completes academic assignments integrated with off-campus paid or volunteer activities.

Biol. 3999: Issues in Biological Science. Readings, discussion, and research on contemporary and/or significant issues in biological science.

Biol 4010: Microbes and Humanity. Historical review of microbial organisms, their role in causing disease and beneficial contribution to humanity.

Biol 4015: Horticultural Botany. Plant biology as illustrated by contemporary horticultural applications, including biotechnology, with lab exercises on plant morphology, plant growth experiments, water relations, horticultural techniques and soil conditioning.

Biol 4130: Biogeography. Study of the distribution of organisms; the evolution and ecology of biomes, their biotas, dispersal, change in range, phylogenetic systematics and islands.

Biol 4142: Microbial Symbioses.Addresses symbiotic associations relevant to human medicine, veterinary sciences and agriculture, with emphasis on interactions that lead to the establishment of stable symbioses of plants, animals, and other microorganisms.

Biol 4143: Molecular Microbiology. Provides a deeper understanding of the molecular principles underlying basic microbial processes, such as regulation of growth, molecular determination of virulence, and phylogenetic relationships between microorganisms.

Biol 4150: Mammalian Physiology. Mammalian physiological systems with particular emphasis on homeostasis and mechanisms of muscle, cardiovascular, respiratory, renal, and acid-base physiology.

Biol 4160: Medical Physiology. Particular emphasis on human pathophysiology, its etiology, diagnosis, and the physiologic rationale for treatment of multiple system disease, entities, and/or failures.

Biol 4175: Population Biology. Study of the sizes and distributions of plant and animal populations. Processes affecting reproduction, age structure, density and population fluctuations. Recommended for students interested in ecology, conservation, or environmental biology.

Biol 4200: Plant Taxonomy. Principles of plant taxonomy. Field and laboratory studies of native

seed plants.

Biol 4300: General Entomology. Introduction to the anatomy, physiology, ecology and behavior of insects. Identification of local insect forms and techniques of collecting, rearing and preserving insects.

Biol 4310: Insect Systematics and Identification. Advanced study of the evolutionary history and systematics of insects and their terrestrial arthropod relatives. Taxonomy and identification of insects including techniques of collecting and preserving.

Biol 4340: Environmental Microbiology. Key positions that microorganisms occupy in nature and their effects on global ecosystems; includes bioremediation, disease transmission/public health, biogeochemical cycling, plant-animal-insect-microbe interactions.

Biol 4351: Biological Conservation. Principles and theories of conservation biology, including biodiversity, extinction, habitat fragmentation, captive-breeding programs, restoration ecology, and the role of humans in western U.S.

Biol 4405: Microbial Physiology and Biochemistry. Emphasis on the study of microbial function and biology required to fully understand microbial growth relevant to medical and economic importance, including the exploitation of microbial processes for biotechnological advancement.

Biol 4413: Medical Microbiology. Introduction to medical microbiology using a system-based approach. Microbial basis of infection, host response, antibiotic resistance, prevention and public health measures.

Biol 4430: Immunology. Specific and nonspecific reactions in immunity; manifestations of antigen-antibody reactions, hypersensitivity and transplantation immunity

Biol 4431: Immunology Laboratory. Antibody/antigen interactions, T and B cell functions, and the variability in the immune response. Biochemical and recombinant DNA techniques, as well as standard immunodiagnostic tests.

Biol 4435: Water Quality and Human Health. Exploration of the connections between water quality and human health. Topics include the influence of waterborne pathogens on human health, detection of microbes in the environment, transmission and fate of health-related microbes, and water quality regulation.

Biol 4441: Principles of Virology. Survey of the DNA and RNA viruses of bacteria, plants and animals. Focus on the molecular mechanisms of infection and replication, including viruses of biomedical importance such as HIV, subviral particles, prions and viroids.

Biol 4450: Cell Culture Techniques. Techniques of in vitro culture of primary and established cell lines of multi-cellular origin. Topics include nutrition, growth, cloning, cell fusion, transformation, preservation, karyotyping, autoradiography, metabolic labeling, quality control applications.

Biol 4455: Molecular Cell Biology. In-depth look at molecular aspects of cellular processes; emphasis on experimental evidence of molecular mechanisms responsible for implementation and regulation of gene expression, protein synthesis, membrane transport, intracellular transport, cell signaling, and cell division.

Biol 4456: Molecular Techniques. Techniques utilized in contemporary experimental cell biology; laboratory studies designed to mimic, in practical fashion, the usual course a researcher takes in examining an experimental question relevant to cell biology. Study will include a broad range of experimental techniques including: polymerase chain reaction (PCR), recombinant DNA construction, advanced genetic analysis, protein detection, isolation and analysis, and microscopy.

Biol 4485: PCR, DNA Sequencing and Fragment Analysis. Laboratory course covering the theory and applications of PCR, DNA sequencing and Fragment Analysis. Topics include DNA sequencing and sequence analysis, genomic PCR, quantitative PCR, RT-PCR, DNA fingerprinting and an individual project.

Biol 4490: Bioinformatics. Introduction to Molecular Bioinformatics. Survey of concepts and methods for assembly, comparison, and annotation of DNA sequence data. Analysis of protein structure and function. Phylogenetic analysis, database techniques, and selected molecular biology applications.

4500: Quantitative Methods in Physiology. Quantitative treatment and analysis of physiological data using modern methods including applied statistics, spread sheets, graphical methods and data presentation.

Biol 4504: Comparative Physiology. Physiology of metabolic, respiratory, circulatory, excretory, muscle, and nervous systems of vertebrate and invertebrate animals with an emphasis on physiological diversity and adaptation.

Biol 4506: Animal Physiology Laboratory. The examination of regulatory mechanisms of animal organ systems using controlled laboratory experiments, with an emphasis on experimental design and data analysis.

Biol 4510: Neurobiology. The structure and function of the vertebrate and invertebrate nervous system with emphasis on the principles of communication, control, and sensorimotor responses. Survey of concepts of neurochemistry, feedback, bionic models, and higher brain processes.

Biol 4513: Animal Senses. Survey of how animals use remarkable sensory abilities to communicate, navigate, and detect prey, predators and mates. We will focus on extreme and unusual sensory systems such as echolocation, electroreception, and magnetoreception, as well as vision, smell, touch, and hearing. Prerequisite: BIOL 3151 or permission of instructor.

Biol 4516: Environmental Animal Physiology. An examination of the physiological adaptations that animals use to cope with their environments, emphasizing the physiological responses of

species to extreme environments.

Biol 4517: Environmental Toxicology. Exploration of the physiological effects of exposure to environmental toxicants in animals, from the subcellular to organismal levels. Concepts covered include routes of exposure, modes of action, and metabolism, as well as how toxicants are monitored and regulated.

Biol 4518. Animal Behavior. Behavior patterns of animals; sensory adaptations, perception, orientation, imprinting instinct and learning, social and reproductive behavior; communication; emphasis on evolutionary relations.

Biol 4525: Neural Development. Survey of various aspects of vertebrate and invertebrate neural development including neurogenesis, neuron polarity, axon/dendrite guidance, target selection and synapse formation.

Biol 4530: Ecological Methods. Methods of design and analysis of ecological studies, including sampling techniques, field and laboratory measurements, and computer-aided data analysis including introductory modeling. Recommended for students interested in advanced study in ecology or conservation or environmental biology.

Biol 4560: Wildlife Ecology. North American gamebirds and mammals, world wildlife problems, wildlife management principles and techniques, the U.S. and California endangered species programs, and practical field work in the preparation of a wildlife environmental impact report.

Biol 4565: Ornithology. The major adaptations and habits of birds, including sensory and behavioral limitations, flight, migration, nesting, and distributional ecology. Identification and taxonomy with field and lab work emphasizing western U.S. forms.

Biol 4575: Herpetology. The ecology, physiology, ethology, identification, and evolution of amphibians and reptiles with emphasis on western forms.

Biol 4583: Vertebrate Biology. Overview of vertebrate origins, phylogeny, structural and functional adaptations, behavior, and ecology.

Biol 4820: Biology Seminar. Guest speakers describe their biological research and develop a dialogue between faculty and students.

Biol 4825: Science Information Seminar. Seminar series delivered by guest speakers who are pursuing careers in basic biomedical research of human disease mechanisms. Reading and discussion of the scientist's published work will precede each seminar, with post-seminar discussion and written critique.

Biol 4830: Seminar in Forensic Research. Seminar on biological aspects of forensic research. Current issues in forensic science based on biological concerns.

Biol 4900: Independent Study. Individual projects or limited reading for students competent to

assume individual work. Admission requires approval of professor and department chair.

Graduate courses in the Department of Biological Sciences:

Biol 6120: Environmental Experimental Analysis. Advanced applications of graphic modeling, experimental design, direct and remote monitoring, and modern statistical analyses of ecological/physiological experiments.

Biol 6141: Advanced Molecular Techniques. A laboratory course covering the theory, practice and application of advanced techniques in molecular biology through guided research projects and discussions of the primary literature. Techniques include current methods in recombinant DNA construction, nucleic acid isolation and gene expression analysis.
Biol 6142: Microbial Symbioses. Addresses symbiotic associations relevant to human medicine, veterinary sciences and agriculture, with emphasis on interactions that lead to the establishment of stable symbioses of plants, animals, and other microorganisms

Biol 6143: Molecular Microbiology. Provides a deeper understanding of the molecular principles underlying basic microbial processes, such as regulation of growth, molecular determination of virulence, and phylogenetic relationships between microorganisms.

Biol 6147: Functional Genomics. Laboratory course covering genome-wide analysis of gene function, including data-mining, mutant analysis, and expression profiling; discussion of original literature.

Biol 6151 and Biol 6152: Cell and Molecular Biology I, II. The cellular and molecular biology of eucaryote cells emphasizing membrane structure and function, structure of genetic material, control of gene expression, and protein synthesis, cell division and differentiation.

Biol 6160: Community and Ecosystem Ecology. Structure, dynamics and distributional aspects of ecological communities and energy flow relations in whole ecosystems. Lectures and intensive field work in selected communities, with emphasis on those of central California.

Biol 6175: Population Biology. Study of the sizes and distributions of plant and animal populations. Processes affecting reproduction, age structure, density and population fluctuations.

Biol 6340: Environmental Microbiology. Key positions that microorganisms occupy in nature and their effects on global ecosystems; includes bioremediation, disease transmission/public health, biogeochemical cycling, plant-animal-insect-microbe interactions.

Biol 6351: Biological Conservation. Principles and theories of conservation biology, including biodiversity, extinction, habitat fragmentation, captive-breeding programs, restoration ecology, and the role of humans in western U.S.

Biol 6405: Microbial Physiology and Biochemistry. Emphasis on the study of microbial function and biology required to fully understand microbial growth relevant to medical and economic importance, including the exploitation of microbial processes for biotechnological advancement.

Biol 435: Water Quality and Human Health. Exploration of the connections between water quality and human health. Topics include the influence of waterborne pathogens on human health, detection of microbes in the environment, transmission and fate of health-related microbes, and water quality regulation.

Biol 6500: Quantitative Methods in Physiology. Quantitative treatment and analysis of physiological data using modern methods including applied statistics, spread sheets, graphical methods and data presentation.

Biol 6504: Comparative Physiology. Physiology of metabolic, respiratory, circulatory, excretory, muscle, and nervous systems of vertebrate and invertebrate animals with an emphasis on physiological diversity and adaptation.

Biol 6506: Animal Physiology Laboratory. Examination of regulatory mechanisms of animal organ systems using controlled laboratory experiments, with an emphasis on experimental design and data analysis. An independent research project and oral presentation of these results will be required.

Biol 6513: Animal Senses. Advanced study of how animals use remarkable sensory abilities to communicate, navigate, and detect prey, predators and mates. We will focus on extreme and unusual sensory systems such as echolocation, electroreception, and magnetoreception, as well as vision, smell, touch, and hearing.

Biol 6515: Neurobiology. The structure and function of the vertebrate and invertebrate nervous system with emphasis on the principles of communication, control, and sensorimotor responses. Survey of concepts of neurochemistry, feedback, learning, and high brain processes. Students are required to make oral and written presentations of a current topic in neurobiology.

Biol 6516: Environmental Animal Physiology. An examination of the physiological adaptations that animals use to cope with their environments, emphasizing the physiological responses of species to extreme environments. Students to present (in oral and written format) and lead discussion on recent research on certain topics in environmental physiology

Biol 6517: Environmental Toxicology. Exploration of the physiological effects of exposure to environmental toxicants in animals, from the subcellular to organismal levels. Concepts covered include routes of exposure, modes of action, and metabolism, as well as how toxicants are monitored and regulated. Oral presentation and terminal assignment required.

Biol 6520: Mammalian Physiology Laboratory. Advanced treatment of regulatory mechanisms in mammalian organ systems. Laboratory techniques of anesthesia, surgery, instrumentation and data analysis. Emphasis on cardiovascular, respiratory, renal and gastrointestinal physiology. Terminal project required.

Biol 6525: Neural Development. Survey of various aspects of vertebrate and invertebrate neural

development including neurogenesis, neuron polarity, axon/dendrite guidance, target selection and synapse formation.

Biol 6530: Ecological Methods. Methods of design and analysis of ecological studies, including sampling techniques, field and laboratory measurements, and computer-aided data analysis including introductory modeling. Required ecological field project, designed, implemented and analyzed by student. Recommended: statistics course.

Biol 6801: Graduate Seminar-Ecology (3)
A seminar in ecology, with a different theme or subject area to be chosen each year. Course based on papers presented by students enrolled.

Biol 6811: Graduate Seminar-Physiology. A seminar course dependent upon papers presented by students enrolled. The specific subject area of physiology will be chosen each year.

Biol 6821: Graduate Seminar in Cell and Molecular Biology. A seminar course involving presentation and discussion of current research literature in cell and molecular biology. The specific subject matter will be at the discretion of the instructor.

Biol 6822: Biotechnology Colloquium. Biotechnology as science and business. Therapeutics research/design, diagnostics, and marketing analyzed via student presentations/industry guest speakers.

Biol 6831: Graduate Seminar in Microbiology. A seminar course based on papers presented by students enrolled. A different subject area in microbiology will be chosen each quarter of offering. Prerequisite: graduate standing or consent of instructor. May be repeated once for credit, for a maximum of 6 units.

Biol 6841: Graduate Seminar in Neuroscience. Presentation and discussion of current research in neuroscience. The specific subject area of neuroscience will be chosen each quarter. Prerequisites: BIOL 4510; graduate standing in Biology, or consent of instructor. May be repeated once for credit, for a maximum of 6 units.

Biol 6898: Cooperative Education. Supervised work experience in which student completes academic assignments integrated with off-campus paid or volunteer activities. Prerequisites: at least 3.0 GPA; departmental approval of activity. Only 4 units applicable to biology graduate degree. May be repeated for credit for a maximum of 8 units.

Biol 6900. Independent Study.

Biol 6910: University Thesis. Development and writing of a formal research paper for submission to the university in the specified bound format. Supervision by a departmental committee, at least one of whom must be a Cal State East Bay faculty member. Oral defense normally required.

Biol 6999: Issues in Biological Science. Readings, discussion, and research on contemporary and/or significant issues in biological science.

MARINE SCIENCES

MOSS LANDING MARINE LABORATORIES

in conjunction with the Cal State East Bay
DEPARTMENT OF BIOLOGICAL SCIENCES and
DEPARTMENT OF GEOLOGICAL SCIENCES

With historical information by E. Lyke and L. Chauffe, with recent information by C. Kitting, CSUEB, gratefully acknowledging discussions with G. Cailliet (MLML), M. Craig (CSUEB Geol and MLML), and formerly D. Warnke (CSUEB Geol), and past assistance by N. Franceschini (CSUEB Bio), D. Kline (MLML), P. Garbutt (CSUEB Geol), and A. Dobbin (CSUEB Science). MLML senior staff (G. Cailliet , D. Kline, and K.Coale) kindly provided prompt data and editing on a previous report. As recent budget crises prevented much decelopment at all CSU's, much of this report remains from the previous, 2005 report compiled by the thos authors above.

Moss Landing Marine Laboratories (MLML) comprises a major state facility on Monterey Bay. For the past 44 years, CSU Hayward/East Bay has been a member of a consortium of six CSU campuses: Cal State Universities at Fresno, East Bay, Sacramento, San Francisco, San Jose, and Stanislaus. In addition, the recent, seventh consortium campus at Monterey Bay appropriately provided additional funding to the consortium since joining it. All consortium campuses have contributed financially (only) to the cost of the visiting scientist position. These campuses together provide guidance on curriculum and governance for their Marine Science graduate programs. Technically, SJSU is MLML's operating campus. Registration (FTE) for each student at MLML apparently goes to the campus who registered the student. No additional costs come from those campuses.

This widely-known facility is dedicated to the pursuit of excellence in marine science education and research. The Laboratories provide a unique educational experience for both undergraduate and graduate students with a strong emphasis on field and laboratory research directed at a greater understanding of the oceans. The faculty and adjunct scientists represent a variety of disciplines, including Biological, Chemical, Geological and other Physical Oceanography, Ichthyology, Vertebrate and Invertebrate Zoology, Phycology, and Marine Ecology. All of these colleagues are involved in cutting-edge, state or nationally funded research, making MLML an internationally renowned center for scientific excellence in the marine sciences. MLML operates closely with the group of private and public marine science institutions surrounding Monterey Bay, which makes the area one of the world's premier sites for marine science education and research. In addition, MLML sponsors many school and community outreach programs designed to educate the public about the marine environment and environmental stewardship. MLML grants are administered by San Jose State University Foundation, where a quarter to a third of the Foundation's outside grant funds (from ~1,000 SJSU faculty) come from MLML. Such current MLML annual funding has risen to ~ $17

million dollars annually, in fiscal year 2004-2005, including significant funding from the National Science Foundation, the Office of Naval Research, NOAA, SeaGrant, Cal Fed, California Department of Fish and Game, and various other State and private organizations. Additional MLML support comes from the non-profit "Friends of Moss Landing Marine Laboratories" (FOMLML), a MLML fund-raising and support organization that is very active with the public. Many of these activities are itemized on the MLML website, in their annual report, and in a quarterly newsletter by Friends of MLML, "The Wave." A ten-year program plan for MLML has been prepared. Yet state funding for required MLML infrastructure, technology, high costs of living, and program continuity (during intermittent, related grants) continues to be inadequate, as elsewhere in the CSU.

The multi-campus MLML governing board and the entire marine science community serve as reviewers for this diverse program at MLML, which can be a model toward which other CSU programs can strive. In 2001, MLML sponsored a workshop entitled "CSU Excellence in Marine Science" that addressed both the triumphs and the tragedies of Marine Science research in the CSU. The resulting report showed that MLML is doing quite well academically, and professionally, MLML is more similar to a UC in terms of funding and faculty publications (see URL.) Programs are run by faculty, with expert staff support and minor if any professional administrators. An assistant to the director would be helpful. Assessment of this program largely is through that scientific community, documented in the widely recognized success of students from MLML, including those who registered through CSU East Bay, and earned bachelors and masters degrees at CSUEB, via work at MLML, sometimes entirely at MLML. Each such MLML Masters student requires a parent campus faculty member (eg from CSU East Bay) on their committee. Kitting and others have served as such committee members, and participated in seminars there, routinely, without campus support. Other CSUEB students register through CSEUB to take one of the 1-day per week classes for a MLML semester, although new software makes that less convenient now.

Many MLML students and former students, including those from CSUEB (and faculty) are honored in scientific societies, environmental agencies, education, and many of MLML's Masters graduates continue to be very successful in the finest doctoral programs in the Marine Sciences. Former MLML students obtain jobs in well-established institutions and organizations.

Moss Landing Marine Laboratories' website lists the following description and Mission :
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> Since establishment in 1966, Moss Landing Marine Laboratories (MLML) has grown an international reputation for excellence in marine science research and education, and is the second oldest marine lab on Monterey Bay. MLML is operated by a consortium of seven California State University campuses (Fresno, East Bay, Monterey Bay, Sacramento, San Francisco, San Jose, and Stanislaus), with consortium undergraduate and graduate students taking courses or pursuing their Masters of Science degrees at MLML. The lab is situated in an excellent location for the study of the marine world. The Monterey Submarine Canyon, the largest such feature on the west coast of North America, begins within a few hundred meters of the Moss Landing harbor and the MLML research fleet. Researchers can be over 2,000 m water depths with one hour steaming out of Moss Landing. To the east of MLML is the Elkhorn Slough, one of the

largest unspoiled estuarine wetlands off the west coast of the United States, and an important site for shorebirds and fishes. To the north and south are sand dunes, sandy beaches, and extensive kelp forest habitats along the rocky shoreline. Some of the most productive kelp forests and intertidal areas can be found in this region. MLML also is located between two large upwelling centers, which provide nutrients that stimulate an incredible amount of productivity but also provide a wealth of opportunities to study coastal oceanic processes.

The MLML **mission** is to: "Provision the Pioneers of the Future." We do this through a hands-on, field-oriented approach to our curriculum, which places our students at the frontiers of marine science where discoveries are being made. The expertise of nine full-time MLML faculty is strongly complimented by a number of adjunct professors and affiliated researchers, and we serve approximately 120 students with the support of about 50 talented staff. Because MLML is associated with the California State University system, the primary responsibility of the faculty is teaching. In addition to emphasizing well-taught courses and mentoring of graduate students, the MLML faculty and associated researchers are regional leaders within their research disciplines. The combined emphasis on teaching and research provides a unique setting for graduate student education. The great wealth of nearby marine resources, the faculty emphasis on mentoring and teaching with integrated research, and the excellent facilities, staff, and marine operations contribute to make this one of the best programs for a Master of Science in Marine Science in the United States.

In October, 1989, the entire main MLML facility was destroyed by the Loma Prieta Earthquake, and other facilities (Marine Operations, Small Boats and Research Diving Facilities sustained major damage. Now the original site has been restored to its original dune conformation, replanted, and donated to the State of California Parks Department as native coastal dune parklands. For eleven years after the quake, MLML operated out of temporary facilities in Salinas, with the addition of crude trailers and other facilities at Moss Landing (the "shore lab" both at the south end called “Sur” and the north end called “Norte”). During that decade, the entire MLML community (faculty, staff students, alumni, and public) devoted an immeasurable amount of time and effort to locate a new site (some of which was funded by private foundations) and rebuilt with significant funds from the Federal Emergency Management Agency (FEMA) and the California State Office of Emergency Services (OES). This effort culminated in the opening in January, 2000, of a new, state-of-the-art, marine science education and research facility at Moss Landing. This spectacular building, overlooking Monterey Bay from the highest point of land in Moss Landing, now serves as the primary home of MLML, with additional facilities for ship operations and ancillary units located nearby on the Moss Landing spit (or “Island”).

CSU East Bay’s participation in the programs at MLML is primarily through CSUEB’s Department of Biological Sciences and Department of Geological Sciences, and the Administration of the CSUEB College of Science. Each unit has a representative (and alternative representative) to the Governing Board of MLML, which is composed of representatives of all the consortium members. Home campus classes (such as Biology 3115, Marine Biology, and Geology 3400, General Oceanography) have been able to use a variety of valuable ships operated by MLML (until vehicle use became too expensive for CSUEB to

afford). With the re-establishment of the new facility, students in these and other courses were to be able to go to MLML for short-term and overnight field trips on Monterey Bay, along the coastline, and into Elkhorn Slough. In addition, consortium students and faculty can participate on the class cruises aboard the large NSF vessel, R/V Point Sur. Apparently, consortium campuses incur no net costs from MLML, as the small annual membership cost equals the value of the first FTES from a MLML student from a consortium campus. All student fees are paid directly to the consortium campus. MLML itself benefits from the collaboration with fine students and CSU faculty, not FTES ("full-time equivalent students" = enrollment).

MLML offers a full spectrum of undergraduate and graduate Marine Science classes on a semester basis, as well as occasional weekend courses designed for consortium students (See MLML's attached brochure and CSUEB's graduate flier.) Class scheduling is typically all-day, one day per week, to facilitate both resident and commuting students. Undergraduate courses may be used to satisfy consortium campus major requirements, while graduate courses (also available to qualified seniors) are used in either consortium campus master's programs or the Master of Marine Science degree program at MLML. In each case, the degree is awarded through one of the consortium campuses selected by the student during application. Due largely to convenient student housing, many MLML students now are registered through CSU Monterey Bay.

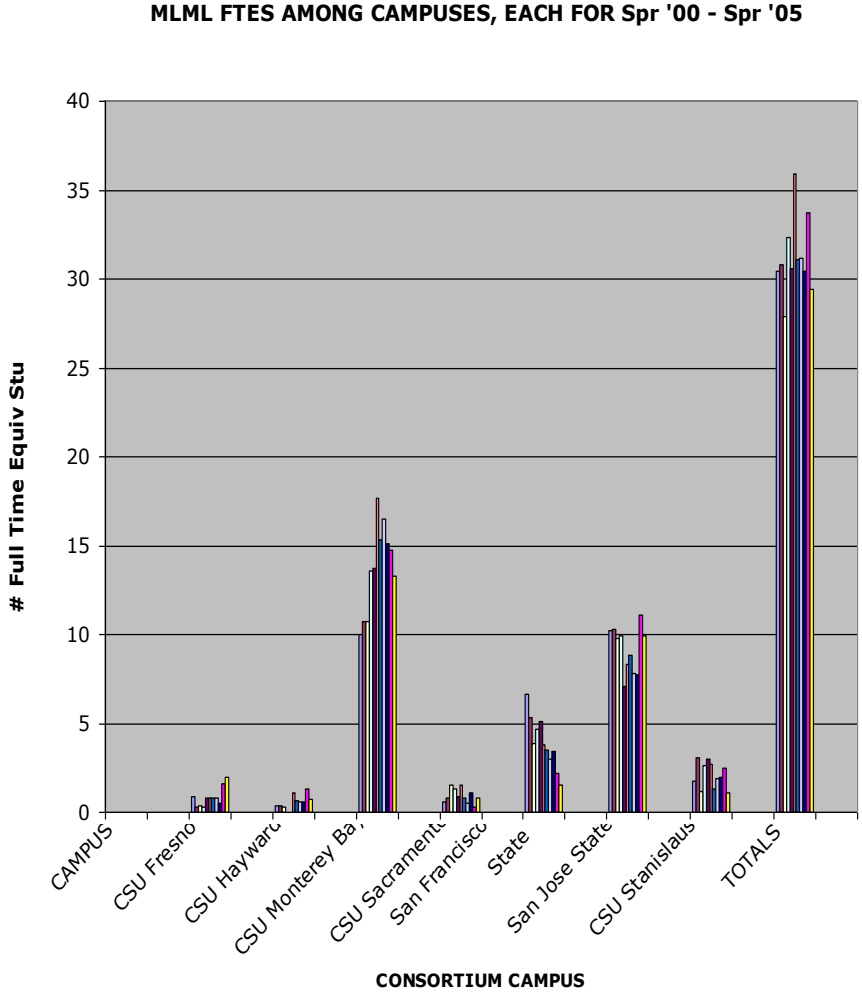
CSU East Bay student participation in the programs at MLML has been small in recent years, after reflecting loss of related faculty (and therefore students) on the East Bay campus, and changes in emphases within the disciplines of biological and geological sciences. Previously, CSU East Bay (Hayward) Professor Nybakken represented CSUEB at that lab, but upon retirement, CSUEB Bio Chairman Tullis allowed that position to go to SJ State U. Lyke, Tullis, and McGInnis, plus CSUEB marine geologists retired, while M. Craig (Geol) and J. Murray (Bio/Phys) have joined the CSUEB marine faculty. Kitting continues his MLML involvement despite CSUEB no longer having an academic motor pool and much field opportunity for such field trips with students. Yet CSU East Bay graduate students (in Biological Oceanography) at MLML have won awards recently, for outstanding graduate research. At least three CSU East Bay students successfully completed their graduate programs at MLML, recently. At least one of CSUEB's star undergrad's recently, a CSUEB Presidential Scholar, declined acceptances at UC and other good Doctoral Programs to choose MLML for her Masters work, where she has excelled. Alas, one CSUEB faculty member (while seeking to withdraw CSUEB from MLML) advised that student to register her MS program through the Monterey Bay campus, for the students MLML masters work. That same faculty member also arranged to replace CSUEB graduate classes that collaborated with MLML, and conducted analogous field work. CSUEB Science Dean Leung realized that trend, and committed CSUEB to MLML into the future.

CSUEB faculty proposed to include the following ~60-word statement in Cal State East Bay's new University Viewbook for student recruitment:

> **Marine Science:** In Earth's final frontier, these multidisciplinary classes and careers uncover and manage historical and new biological, chemical, and geological resources, and hazards, in oceanic environments. Registration for Marine Science courses is through CSUEB Biology or Geology

Departments. Most advanced classes meet one intensive day per week, at Moss Landing Marine Laboratories on Monterey Bay. Students there also can earn masters degrees in Marine Science.

During the past review between 1998-1999, 103-137 students were at MLML each semester, approximately 75% of them graduate students. MLML totaled 37~41 FTES there each semester. East Bay's FTES at MLML ranged 1~2 each semester, as small as Fresno and Sacramento State U's FTES there. San Jose had 15~17 FTES each semester, while CSU Monterey Bay and San



Francisco had at least ~7 FTES each semester.

MLML graduate programs continue to attract applicants from throughout the United States, and other countries. The nine permanent MLML faculty and ~ 9 adjunct faculty are extremely busy as research and thesis advisors, with an average of ~12 graduate students in each faculty lab. The students, teaching, and research faculty are supported by an excellent technical and administrative staff. The size of the MLML faculty and student body has remained quite constant over the years. The regular, tenure track MLML faculty have the same teaching requirement as other CSU faculty, including grant buyout. For some consortium campuses,

including East Bay, at least one faculty member (currently as volunteers at East Bay) from the host campus serves on each graduate student's committee at MLML. The proximity of CSU Monterey Bay provides a pool of students, with affordable campus housing, close to MLML.

Recent FTES data since 2000 are shown in the Figure above. (An MS Excel workbook is attached, with details in three worksheets, including this one.)

From 2000 through 2005, MLML total FTES (at the right of the figure) have fluctuated from 29~36, with no clear trend. However, these total FTES appear lower than the 37~49 FTES reported during the previous review ('98-'99). Research labs continue to be near capacity, with about 60% of the new graduate applicants declined. Hayward FTES at MLML were the lowest among the consortium campuses, ranging from 0 FTES in fall '01-spr '02 , up to 1.3 in '04. An average of about two Hayward students have been at MLML during the period. FTES from other consortium campuses have been fluctuating at higher levels throughout this 5-yr period, and as in the past, except San Francisco State's MLML FTES have been declining. (SF State U's Romberg/Tiburon Lab on San Francisco's Bay Shore has expanded, possibly shifting present undergraduate students toward that lab for the time being.)

Graduate applications to MLML and undergraduate registration at MLML through CSU East Bay have continued, although a small percentage of graduate student applicants (from any campus) can be accepted into MLML's crowded labs. Masters degrees there (and in many other Oceanography labs) can take over four years. Long durations are in part due to the high student:faculty ratio and the difficulty faculty have supporting all their students on grants associated with their thesis work. As such, many students must seek employment outside their areas of thesis research. Many additional students (not registered for those units) use MLML facilities, often for short-term or very long projects, and these students could be encouraged to register for additional, appropriate research units to formalize that work.

CSU East Bay College of Science, and in particular the few remaining aquatic faculty in the Departments of Biological Sciences and Geological Sciences, continue trying to help support the programs of MLML, advising those students interested in marine biology, marine geology, and/or oceanography to strongly consider MLML's curricular and/or research programs as a parts of the student's development as a marine scientist.

CSU Hayward/East Bay's previous five-year review of MLML anticipated this commitment to MLML to continue into the future, but recent East Bay enrollments at MLML have been the smallest of the consortium campuses. Yielding fewer recruiting faculty at Hayward (or East Bay's other campuses), almost all the once-major aquatic ecology faculty at Hayward have retired, with no approved, related faculty positions, yet. These Hayward/East Bay Aquatic programs have been famous, with at least eight major texts plus later editions authored by their faculty. Hayward even failed to seek replacing its faculty member at Moss Landing, Dr. Jim Nybakken, when he retired in ~2000. Nybakken remained ery active as a CSUEB faculty member, but died in summer, 2009. Senior faculty at MLML lament CSU East Bay's decreased visibility

at MLML. Instead, San Jose State U. soon added such a faculty member (Nybakken's field of Biology) at MLML. East Bay Biology's photographic displays (about MLML and Nybakken) could be updated and replaced in Hayward and Contra Costa Hallways. As Hayward's Chemistry Dept. has gained environmental faculty, who have proposed to collaborate with MLML's chemistry instrumentation, perhaps these East Bay Faculty, and others, can be encouraged to recruit more interest in MLML Marine Science through CSU East Bay. CSUEB's Geology faculty recruitment as a part-time MLML Visiting Scientist was a promising step for that department's increased role at MLML. CSU East Bay faculty have encouraged student carpools down to MLML with them in personal cars. However, our CSU East Bay Administration's recent, unilateral, serious impediments to all travel and field trips (including funding and "risk management," except for numerous campus vehicles for "facilities management" only) are becoming further obstructions to our collaborations with MLML. Such severe impediments must be corrected if CSU East Bay is to remain a university capitalizing on such historical strengths. Fine reputations do not maintain themselves for free.

Over ten years ago, CSU Hayward, as the only MLML Consortium member to have a quarter system, operated the entire MLML summer program each year, but the MLML Summer Teaching Program was discontinued. With CSU's recent commitment to become year-round, some day, East Bay's quarter system could again lead summer instruction at MLML, probably aided with new funding as training grants. In the mean time, the quarter/semester mismatch makes MLML fall or spring registration difficult for students and staff to arrange through Hayward, particularly while East Bay's present software will not allow ANY overlap in class times (for any part of a semester or analogous two quarters). Such CSUEB software should be modified for numerous reasons.

Moss Landing Marine Laboratories remain one of the premier undergraduate and non-Ph.D. graduate programs in the Marine Sciences in the country. CSU East Bay is very fortunate to be a member of the valuable CSU consortium that has operated MLML for the past four decades. The MLML Program works very well there, although CSU East Bay has the challenge to regain its active roll in that famous academic program in its natural environment, Oceans, as the final frontier on Earth, covering 71% of its surface.

APPENDIX A – BIOLOGY FIVE-YEAR REVIEW

FIVE-YEAR REVIEW MATRIX DEVELOPED FROM 08-09 CAPR 23 (REVISED)

2. Self-Study		
2.1. Summary of Previous Review and 5-Year Plan	**Yes/No**	**Comments**
Does the self-study provide a summary of the previous five-year plan	Y	This is available on page 3
Does the self-study provide details on progress in - implementing the previous Plan, - what remains to be completed, - other achievements (i.e. not specifically part of the previous plan)	Y	Such details can be found on pages 3 and 4.
2.2. Curriculum and Student Learning	**Yes/No**	**Comments**
Does the self-study include details on - student learning outcomes (SLO) assessment plan, - SLO assessment plan implementation - a summary of assessment summary results - a summary of measures identified to improve the program based on assessment	Y	Pages 16—20 discuss (student learning outcomes) SLOs for BA (bachelor of Arts), BS (Bachelor of Science), and MS degrees in Biology, but SLOs for BS in Marine Science and SLOs for MA in Biology cannot be found.
Does the self-study describe - the program's course offerings, - how the course offerings compare to comparable CSU programs, - how the course offerings compare to nationally recognized programs	Y	No data on how many students take each degree program. Somewhat – lacks comparison to UC/nationally recognized programs only to selected CSU.
If the program offers G.E. courses, does the self-study specifically provide summary data for student learning outcomes for these courses.	N	Makes no reference to the GE component of the program – how many courses, which courses, whether they are subject to assessment at all.
Does the self-study discuss course offerings at the Concord (and Oakland) campus and online	N	Not mentioned
Does the self-study discuss issues concerning multi-cultural learning	N	Not mentioned
2.3. Students, Advising, and Retention	**Yes/No**	**Comments**
Does the self-study contain Academic Performance Review Statistics from Planning and Institutional Research in the form of a table showing the following: Student Demographics, Student Level, Faculty and Academic Allocation, Course Data (see 10-11 CAPR 14)	Y	Tables 1 and 2 provide such statistics.
Does the self-study provide a summary of issues related to: - climate - advising, - scheduling, - recruitment	N	A minor discussion of these issues is available.
Does the self-study include an analysis of the data provided by PEMSA with respect to changing patterns of:	Y	The academic performance review statistics are summarized for the fall quarters from 2005-2009 showing a significant rise in majors (+50%) and

- enrollment (FTES & majors) trends (note is now headcount not FTES), - SFR, - % of courses/FTES taught by regular faculty, (note no longer provides FTES) - any other relevant information		FTES (+35%) and, because of limited faculty resources, a corresponding rise in SFR (+40%). However, the average section size decreased from 29 in 2005 to 27 in 2009.
Does the self-study include a discussion of the impact of the observed patterns and trends in the above statistics on the program and its quality	Y	Such discussion can be found on pages 15 and 16.
2.4. Faculty	**Yes/No**	**Comments**
Is there a list and descriptions of tenure track positions requested since the last review?	Y	Three requests made.
Does the self-study report progress in achieving these tenure track requests	Y	States that three were filled. One retired. One was appointed AVP for Academic Programs and Graduate Studies.
2.5. Resources	**Yes/No**	**Comments**
Is there a discussion of library resources with respect to the program	Y	The Biology faculty requires access to current and past journals in order to maintain currency in the field.
Is there a discussion of information/Instructional Technology issues with respect to the program	Y	Such discussion can be found on page 16.
Is there a discussion of Assistive Technology with respect to the program	N	
Is there a discussion of any other resource needs relevant to the program	Y	A good chunk of the discussion is oriented towards ways in which university procedures and systems have changed that impacts program performance. This discussion can be found on pages 26, 27, and 28.
2.6. Units Requirement	**Yes/No**	**Comments**
Does the self-study state that 180 units are required for the major to graduate (including GE units) and if more than180 units are required, is a justification given	Y	
3. Five-Year Plan		
Overall, is it clear that for each action item discussed in this plan for the next 5 years that for each aspect – curriculum, students, faculty and other resources, the plan clearly details:	**Yes/No**	**Comments**
1) specific actions/changes, 2) a clear timeline for those actions/changes 3) the person(s) in charge/responsible for those actions/changes, 4) the estimated cost for those actions/changes	N	Not really – the five-year plan lacks specificity in terms of concrete lists of actions.
3.1. Curriculum	**Yes/No**	**Comments**
Does the five-year plan detail the needed changes for the next five years that address the recommendations and concerns identified in the Self-Study, from external reviewer(s), and from assessment with	N	Doesn't really offer any specific detail on this other than there is a revision of SLOs.

respect to the following: - Concord and the Oakland campus) offerings - online offerings - G.E., offerings - multicultural learning		
3.2. Students	**Yes/No**	**Comments**
Does the five-year plan envision changes in trends for the next five years, based on recommendations and concerns identified in the Self-Study, from external reviewer(s), and from assessment, with respect to the following issues:	Y	A very limited amount of information.
Number of majors	Y	It is expected to continue growing.
Total enrollments	Y	
Student characteristics	Y	Says doesn't expect characteristics to change.
Student career opportunities	Y	Says it is impossible to predict given the current budget climate.
Program-level student learning outcomes	Y	
Outreach plans	Y	Do not anticipate an increase in the number of programs or outreach to new student populations.
Advising and retention strategies	N	Not mentioned.
Class scheduling	Y	Expand the Biol. 1401-1402-1403 Introductory series to accommodate majors initiating the series Fall, Winter and Spring. Restricting the Introductory majors series causes a bottleneck in enrollments of downstream (upper division) courses. With the Microbiology/BLS option, meetings have taken place and will continue to take place with Bay Area Hospitals and collaborating CSUs, (i.e. San Jose State and San Francisco State) to adjust curriculum and program practices.
New or changes to programs	Y	No significant changes will be made.
Resources to support student learning	Y	Following resource needs have been discussed: staff, equipment, library, recruitment, salary, and start-up.
Any other issues not listed above		
3.3. Faculty	**Yes/No**	**Comments**
Does the five-year plan envision changes in changes for the next five years in faculty resources that address recommendations and concerns identified in the Self-Study, from external reviewer(s), and from assessment	Y	The department has been allocated a new tenure-track faculty position in Physiology, pending budgetary approval, for the 2012-13 academic year. The department will need at least 2 additional positions in the next 2-3 years.
Does the plan list and justify anticipated new tenure-track applications.	Y	
Does the plan detail the following aspects with respect to faculty resources; - climate issues, - leadership-faculty communication - workload and PT&R challenges - advising plans	Y	Some discussions on these issues can be found in Outside Reviewer's Report on pages 36 and 37.
3.4. Other Resources	**Yes/No**	**Comments**

Does the five-year plan discuss envisioned changes and resource needs for the next five years, addressing recommendations and concerns identified in the Self-Study, including lessons from assessment, including:	Y	The discussion can be found on pages 26, 27, and 28.
Staff	Y	The department has suffered immensely under the budget cuts with regard to office staff.
Equipment	Y	The department has begun to assess by discipline its current holdings of equipment, their projected life and utility, and a plan developed for replacement/addition.
Library	Y	The most important resource the library can provide for its science faculty is electronic access to journals.
Travel funds	N	
Information/instructional technology; assistive technology	N	
Any other resource needs not listed above	Y	The five-year plan also mentioned resources related to recruitment and salaries and start-up.

Observations from External Reviewer Report

A. Need of at least one full-time faculty position in the next year in the area of physiology, and at least 2 additional positions in the next 2-3 years to match the loss of outgoing faculty.

The department has been allocated a new tenure-track faculty position in Physiology, pending budgetary approval, for the 2012-13 academic year. The department is in agreement with the external reviewer's assessment that, in addition to the new Physiology position, it will need at least 2 additional positions in the next 2-3 years.

B. The Department needs to reassess the number of options in the B.S. and/or course offerings relative to available faculty expertise.

The department agrees that it is time to reassess the number of options. Given the combination of budget cuts, demand for General Education and non-majors courses, and increases in majors relative to the number of full-time faculty, it has become increasingly difficult to schedule enough courses to allow students to fulfill the requirements for options within the B.S. The department has relied heavily on course substitutions to allow students to graduate on time with a B.S. and this has rendered the concept of "options" almost meaningless. The only mechanism, by which the department would be able to fulfill its obligations for the options, would be to drastically reduce or eliminate GE and non-majors courses within its curriculum. Because this is also an untenable solution, the department may need to seriously consider reducing or combining the number of options available to students.

C. The Department, in consultation with the administration, should examine the possibility of declaring impaction in the major.

The department had not considered the possibility of declaring impaction prior to the outside reviewer's visit, thus it would take some time to investigate what the declaration of impaction would mean for the department, college and university.