I. **SELF-STUDY** *(suggested length of 1-3 pages)*

A. Five-Year Review Planning Goals

   *Present your planning goals from your last 5-year plan.*

   1. Increasing the number of non-tiered graduate courses for students pursuing a Master’s Degree.
   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
   3. Offering hybrid courses that can be utilized in STEM education.
   4. Reinvigorating the Marine Science Degree and our relationship with the Moss Landing Marine Laboratories.
   5. Foster and maintain interest among students for the science field.
   6. Increase the number of students applying and gaining acceptance into post-baccalaureate programs.

B. Progress Toward Five-Year Review Planning Goals

   *Report on your progress toward achievement of the 5-Year Plan. Include discussion of problems reaching each goal, revised goals, and any new initiatives taken with respect to each goal.*

As might be expected with the department’s last five-year review from AY 201-11, and with the university conversion to a semester schedule, many of the goals listed above are either completed and/or have been reevaluated as part of the semester conversion process. Responses correspond to the numbered planning goals listed above.

1. With semester conversion the entire graduate curriculum was reevaluated and redesigned. In addition to doing away with M.A. degree that was previously offered, the remaining M.S. degree is now entirely thesis based with the thesis research serving as the capstone experience. As part of the graduate curriculum re-design, all tiered courses were removed so
that graduate level courses will now be offered as stand-alone 600 level courses rather than the dual-listed system that was previously in place. The Biology faculty voted unanimously to halt the offering of tired courses in order to ensure that going forward, all graduate courses are taught at the appropriate level.

2. With the transformation of our B.S. program the focus has become improved student performance and preparation in our introductory year courses (BIOL 140A & 140B). The new focus of the series will be accomplished with the previous model of one lab meeting per week, but now with the addition of a 2-hr activity section each week. The focus of the activity will be on development of writing and quantitative skills relative to the lab experience, and assessing understanding of lecture material. As part of the semester conversion process, a number of upper division lab courses have been transformed and/or combined into a single course, and several older courses that have not been offered in a number of years have been retired. The current semester catalog includes a total of 43 upper division major courses, the majority of which have a lab component. We anticipate that our upper division offerings will continue to increase as our recently hired faculty continue to design courses within their areas of expertise.

3. There have been no significant developments towards this goal since the 2017-2018 annual report. With the transformation of the Biology curricula to a semester schedule, the focus has been almost entirely on on-ground offerings. Now that the moratorium on new course proposals has been lifted, the department plans to begin designing on-line offerings of several lower division GE area B6 courses that we anticipate will garner high enrollment. In particular, we plan to develop on-line offerings of BIOL 334 - *Humans and the Living Planet* and BIOL 335 - *Humans: Health and Disease*.

4. Active participation by faculty members in MLML governance has led to increased student awareness. Our transition to semesters now aligns us with the semester programs at MLML, but geographical separation remains the major barrier to increased student participation. In addition, the future participation of CSUEB, and other CSU campuses, in the MLML consortium is in question due to an ongoing disagreement between SJSU and CSUMB as to which campus should be the operating entity. We are hopeful that once this situation is resolved CSUEB will be able to maintain our role in the consortium and encourage our students to take advantage of this valuable academic resource.

5. No specific progress to report on this goal since the previous annual report. The number of Biology majors at CSU East Bay has been decreasing slightly (1-3%) on an annual basis after peaking in Fall 2015.

6. No completed assessment of this goal was made during the period since the last annual report. The department has begun tracking our students post-graduation through the “Where do they go? *Professional outcome of CSUEB Department of Biological Sciences Graduates*” project being undertaken by Dr. Ana Almeida. To date this project has provided information nine Biology graduate and forty-seven Biology undergraduate students. Alumni are spread all over the world, with the majority of those who responded remaining in the Bay Area. Job titles include, but are not limited to: Physicians, Optometrists, Research Scientists, Lab and Project Managers, Veterinarians, Pharmacists, as well as Science Teachers and Biology Professors.
C. Program Changes and Needs

Report on changes and emerging needs not already discussed above. Include any changes related to SB1440, significant events which have occurred or are imminent, program demand projections, notable changes in resources, retirements/new hires, curricular changes, honors received, etc., and their implications for attaining program goals. Organize your discussion using the following subheadings.

**Overview:** The 2017-18 academic year was relatively chaotic with preparations for semester conversion in Fall 2018. There were no significant personnel changes to the department during the reporting period. The search for a tenure-track position in Integrative Biology was unsuccessful and has been rolled over to AY 2019-20. The department has now moved into recently completed Small Animal Care Facility and the Molecular Research Facility, and faculty and students are making excellent use of these new research and mentoring spaces. The department continues to have faculty, resource and space needs as we continue to grow and adjust to a semester calendar.

**Curriculum:** Significant changes highlighted above.

**Students:** In Fall 2017 the department served 774 undergraduate Biology majors and 34 actively enrolled graduate students. This was a 3% decrease in our undergraduate student count since 2017-18, and a 17% increase in our graduate student population. Please be aware however that the data provided by Pioneer Insights APR report does not agree with our internal accounting. While only 34 graduate students in Biology were enrolled in courses or thesis units in the Fall 2017 quarter, there were approximately 25 additional students that were actively working with faculty and/or writing theses, that were not enrolled in any units. It is these latter students that demand a great deal of faculty time and support as they complete their thesis research, even if these students are not enrolled in courses or thesis units.

**Faculty:** During AY 2017-18 the department initiated a search for a tenure-track position in Integrative Biology. A total of 5 applicants were identified for on-site interviews, two of which declined. Of the remaining three candidates that visited campus, the Biology faculty decided almost unanimously that none was a good fit for the department or our students, and requested that the search be rolled over to AY 2018-19. The search committee recently completed phone interviews for 15 candidates, are currently scheduling on-campus interviews for the top five applicants.

**Staff:** There have been no changes to the departmental staff during 2017-18. Natalie Granera continues to do an excellent job managing the departmental office, with Kathy Palmer serving as her administrative assistant. Due to the high volume of students requiring assistance from the office staff, we hired a work-study student in AY 2017-18 to assist with basic office tasks, and plan to do so again in AY 2018-19. The department also employs four Instruction Support Technicians and one Equipment Technician. With the move to a semester schedule, and the resulting increase in daily laboratory section offerings, the ISTs are barely able to keep up with the workload and must often work overtime to support our evening lab sections.
Resources: The department continues to replace existing, aging equipment, and add new equipment through the use of A2E2 and College of Science funds. However, great need still exists for additional equipment and resources required to offer our courses at a level deserving of our students.

The department continues to be “bursting at the seams” with regards to office and research space. Nearly all faculty in the department (tenure track and lecturers) currently share office space, and we have no available space in which to house all of our graduate teaching associates (they currently hold office hours in a shared a space limited to three TA's at a time). All of the research space that has been allocated to Biology is currently in use or slated to be filled by a new hire, and many research faculty must utilize classrooms (when available) to conduct their research. The completion of the Molecular Research Facility provided the department with desperately needed research and mentoring space, but with the completion of the current faculty search all of the available research space currently allocated to Biology will be filled.

Assessment: The department continues to assess our program learning outcomes with no significant changes to our schedule or plans. We have not included a Summary of Assessment here, but will submit this section by the end of the semester.

Other: Aside from transforming the entire Biology curriculum in preparation for the switch to a semester calendar, there have been no significant program modifications.

II. SUMMARY OF ASSESSMENT  (suggested length of 1-2 pages)

A. Program Learning Outcomes (PLO)

Students graduating with a B.S. or B.A. in Biological Sciences from Cal State East Bay will be able to:
1. Explain core biological concepts, including evolutionary processes, structure-function relationships across all levels of biological organization, homeostasis, information flow, matter and energy transformations, and the interactions and interconnectedness of living systems (ILO 6);
2. apply quantitative reasoning to explain biological phenomena and to address biological problems (ILO 1);
3. clearly communicate biological information in a variety of formats (written, oral, visual) using a style appropriate for the intended audience (ILO 1,2,6);
4. apply methods of scientific inquiry by formulating testable hypotheses, collecting and analyzing data, and reporting conclusions (ILO 1,6);
5. gather, interpret, and evaluate published scientific information (ILO 1,6).

Students graduating with a M.S. in Biological Sciences from Cal State East Bay will be able to:
1. Demonstrate a broad and sophisticated understanding that contributes to biological concepts and principles across all levels of biological organization, from ions to ecosystems (ILO 1,2,6);
2. demonstrate expertise in a specific area of biological science (ILO 6);
3. independently apply the scientific method to formulate testable biological hypotheses, analyze empirical data, and synthesize the results of the analysis (ILO 1,2,6);
4. clearly communicate the design and results of an observational or experimental analysis in a variety of formats, including the graduate thesis, scientific paper, scientific poster, and oral presentation (ILO 1,2,6); 

5. gather and evaluate primary scientific literature and judge the value of the information presented in relation to particular biological questions (ILO 1,6).

B. Program Learning Outcome(s) Assessed

B.S./B.A. Programs: No program learning outcomes were assessed for these programs during AY 2017-18.

M.S. Program: We assessed PLO 2, 3, 4 and 5 (see above). These program learning outcomes were also assessed in AY 2016-17.

C. Summary of Assessment Process

Instrument(s): Maria Gallegos further refined and modified the “Inquiry and Analysis Rubric” and the “Oral Communication Rubric” to assess the oral defense, a capstone event in partial fulfillment of the Master of Science Degree. A copy of these rubrics is included in the Appendix (Fig. A7). These rubrics are based on the VALUE rubrics developed by teams of faculty experts representing colleges and universities across the United States. The Value Rubric Development Project was sponsored by the Association of American Colleges and Universities.

Sampling Procedure: The combined “Inquiry and Analysis" and "Oral Communication" rubric was applied to all 9 M.S. students that scheduled an oral defense in during AY 2017-18.

Sampling Characteristics: The oral defense is one of the final requirements that our M.S. students complete. By the time a student schedules the oral defense, the University Thesis has been written and submitted for format review.

Data Collection: In all cases the three committee members (including the thesis advisor) completed the combined “Inquiry and Analysis" and "Oral Communication" rubric just after the completion of the oral defense by the student. The thesis advisor collected the completed rubric forms and submitted these documents to the Graduate Coordinator. Upon receipt, the graduate coordinator forwarded a completion memo to the University Graduate Evaluator.

Data Analysis: The results shown in D (Summary of Assessment Results) include all individual data points (filled black circles). The black horizontal line represents the average. The gray boxes represent the first and third quartile and the vertical lines represent the minimum and maximum. Figures D1 through D3 below include data for all 9 students evaluated in AY 2017-18.

D. Summary of Assessment Results

Main Findings: As with last year, we hoped all of our students would score at 3 or above as 3=proficient (4=exemplary). Looking at the individual PLOs assessed (Figure D1), the average score was 3 or above for all four PLOs. However, it can be seen from this same graph that
students also scored 2 (= basic) or 1 (=minimal) for several of the assessment criteria. A similar pattern can be observed in Figure D2, the average earned score for individual assessment criteria. In this graph we see that the average score for most criteria is 3 or higher, but for four of the criteria the average drops as low as 2.75. When comparing the performance of individual students (Fig. D3), three of the students (1, 5 and 6) scored 3 or above in all criteria, whereas the remaining six students had one or more criteria scores below 3. In the case of students 8 and 9, their assessment includes scores as low as 1 in several criteria.

**Figure D1.** Average rubric score for each PLO evaluated. Please note that PLOs were evaluated by more than one criteria (see rubric in Appendix).
Average Score Earned for Individual Categories (See Rubric)

Figure D2. Average rubric score earned for each PLO criteria evaluated.

Average Score Earned for Individual Students

Figure D3. Average rubric score earned for each PLO criteria for all 9 students evaluated in AY 2017-18.
**Recommendations for Program Improvement:** The faculty are aware of the areas in which our students require additional instruction and experience, and have decided upon steps that should be taken to improve student outcomes (see Next Step(s) below).

**Next Step(s) for Closing the Loop:** Our data suggests that our students need a formative assessment prior to the oral defense so that we can identify students that are struggling with specific program learning outcomes. In this way, we can attempt to address these issues before any such students are too far along in their thesis studies. The faculty have agreed to add a departmental requirement that students must meet with the committee members on a per-semester basis to demonstrate significant progress towards the completion the degree courses and thesis research. Additionally, students will also be required to demonstrate adequate proficiency in the program learning outcomes by the end of the first year through the preparation and oral defense of a thesis research proposal. With the transition to semesters, our curriculum now includes a year-long course (1 unit/semester) designed to explicitly teach our graduate students how to perform an effective literature review, communicate science (oral and written), gather and evaluate scientific data, and identify assumptions, caveats and limitations of their proposed research.

**Other Reflections:** In general, the faculty continue to value the rubric as an effective measure for assessing if our students are meeting our program learning outcomes. We are also confident that the inclusion of a year-long course in the curriculum that specifically focuses on the PLOs of the program will have a significant, positive impact on the success of our M.S. students. Additionally, by using the same Rubric year after year, we will increase our statistical power and be able to evaluate if any of our programmatic changes make a difference in student outcomes.

**III. DISCUSSION OF PROGRAM DATA & RESOURCE REQUESTS**

**A. Discussion of Trends & Reflections**

**Notable Trends:**
Academic Program Review summary data for AY 2013-2017 is presented as tables and graphs in the appendix to this document. The student data presented includes Biology enrollment, FTES number of Biology students by class level, degrees conferred, admit type, ethnicity and gender. Faculty data includes FTEF, FTES taught by faculty and FSR statistics.

The following trends can be observed from the student demographics:

- The population of Biology undergraduate majors increased significantly from 2013 to 2015, but has been decreasing annually since the 2015 peak by 1-3%.
- The graduate student population is currently listed at 34 in the APR summary, a 17% increase from 2017. However, our departmental records suggest we had closer to 50 active graduate students in Fall 2017.
- Biology FTES values continue to rise on an annual basis, with an increase of 4.9% since Fall 2013.
- The percentage of Hispanic students within the department has steadily increased since 2013, and currently appears stable 35%.
The percentage of Asian students in the department has declined from 34% in 2013 to 28% in 2017.
Graduation rates increased significantly between 2015-6 and 2017-18.
Aside from these minor changes, the student demographics have remained relatively constant over the 2013-2017 period.

The following trends can be observed from the faculty and coursework statistics:
- The proportion of FTES taught by lecturers gradually increased from 39% to 45% during the Fall 2013 to Fall 2015 period, but decreased to 37% by Fall 2017 with the hiring of Drs. Almeida and Guiton in tenure-track positions. FTES taught by tenure-track faculty and correspondingly increased to 63% by Fall 2017.
- SFR remains relatively high for the department at 30.2, but has been reduced significantly from a maximum of 35.3 in Fall 2015.

Reflections on Trends and Program Statistics:
The number of undergraduate biology majors appears to have reached its maximum value in Fall 2015, and has begun to gradually decrease on an annual basis with a total of 808 students in Fall 2017 (a 2.4% decrease from Fall 2016). Interestingly, FTES has correspondingly increased by 2.3% over the same period, suggesting that students are enrolling in more units per quarter. Looking towards semesters, it will be of interest to see if Biology enrollment numbers increase as it becomes more straightforward for students from other CSU campuses and junior colleges to transfer their earned semester units to East Bay. Given that roughly 39% of our current majors are transfer students, we expect that the move to semesters will have a significant impact on student numbers and student-faculty ratios. The department of Biological Sciences currently had one of the highest SFRs within the College of Science, and was been asked by Dean Singley to reduce this number to a value more in line with those of other College of Science departments. This has been accomplished through the hiring of an additional tenure-track faculty and/or lecturers. Assuming our FTES continues to increase, and accounting for faculty retirements, it will of course be necessary to hire additional tenure-track faculty in the near future.

B. Request for Resources

1. Request for Tenure-Track Hires

**Science Education Specialist** – As part of our transformed Biology curriculum, the department will continue to offer a B.A. in Biology Education. This is a concentration with growing demand around the country. As science education specialists, Drs. Wildy and Inouye have been the driving force behind our Biology Education concentration. With the move of Dr. Inouye into an administrative position, the department requests her replacement through the hiring of a Science Education Specialist at the level of assistant professor.

**Forensic Biologist** – The department will continue to offer a concentration in Forensic Science as part of our transformed semester curriculum. This is another field of growing demand in the United States, and student enrollment in the option at Cal State East Bay
continues to increase. We request the hiring of a Forensic Scientist at the assistant professor level that could offer specific courses in the field, as well as teach general biology courses for majors and non-majors.

2. Request for Other Resources

As discussed in Part I above, the current instructional support staff for Biology are spread very thin, regularly working overtime in the evening and on weekends to keep up with the demands of our semester laboratory course schedules. The department requests the hiring of an additional instructional support technician (level 1) at 0.5 time to help offset the overtime regularly worked by our current staff.

Appendix:

Figure A1. Enrollment Fall 2013 – Fall 2017.
<table>
<thead>
<tr>
<th></th>
<th>Fall 2013</th>
<th>Fall 2014</th>
<th>Fall 2015</th>
<th>Fall 2016</th>
<th>Fall 2017</th>
</tr>
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<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
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<td>2</td>
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<td>247</td>
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<td>269</td>
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<td>74</td>
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<td>100%</td>
<td>801</td>
<td>100%</td>
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Figure A2. Biology students by race/ethnicity.
**Figure A3.** Biology degrees awarded 2013–2017 (dark blue represents undergraduate degrees conferred, light blue indicates undergraduate + graduate degrees conferred).

**Figure A4.** Dept. of Biological Sciences FTES, FTEF and SFR.
Figure A5. Dept. of Biological Sciences FTES, FTEF and SFR over time.
Figure A6. Department of Biological Sciences proportion of FTEF by instructor category over time.
Program Learning Outcomes:

1. Demonstrate a broad and sophisticated understanding that contributes to biological concepts and principles across all levels of biological organization, from ions to ecosystems.

2. Demonstrate expertise in a specific area of biological science.

3. Independently apply the scientific method to formulate testable biological hypotheses, analyze empirical data, and synthesize the results of the analysis.

4. Clearly communicate the design and results of an observational or experimental analysis in a variety of formats, including the graduate thesis, scientific paper, scientific poster, and oral presentation.

5. Gather and evaluate primary scientific literature and judge the value of the information presented in relation to particular biological questions.

A description of an exemplary score is provided for each criteria listed below. An exemplary score is obtained for a given criteria when the description is true. A proficient score is obtained when the description is mostly true. A basic score is obtained when the description is somewhat true. *Scores: 4 = Exemplary / Mastery, 3 = Proficient, 2 = Basic, 1 = Minimal. The rubrics below are modified from the VALUE RUBRICS.

ORAL COMMUNICATION RUBRIC (PLOs 2, 4, 5):

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<th>Criteria</th>
<th>Capstone / Mastery</th>
<th>SCORE*</th>
<th>PLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization of the Presentation</td>
<td>The introduction, approach, results and conclusions are sequenced skillfully. Overall, the content of the presentation is cohesive with seamless transitions.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>Use language appropriate to the discipline as well as the audience. Discipline specific jargon is minimized or clearly defined.</td>
<td>2, 4, 5</td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td>Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling. Speaker is polished and confident</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Supporting Material</td>
<td>Supporting material (footnotes, analogies, etc.) are relevant to the presentation and central message and establish the presenter’s authority on the topic.</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Central Claim(s)</td>
<td>Main claim is clear and compelling (precisely stated, appropriately repeated, memorable, and supported with evidence).</td>
<td>4</td>
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INQUIRY AND ANALYSIS RUBRIC (PLO 3):

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<th>SCORE*</th>
<th>PLO</th>
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<tr>
<td>Hypothesis/Question (used for Thesis Defense)</td>
<td>Develops a creative, manageable and reliable hypothesis or question related to a topic that is significant yet poorly understood.</td>
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<tr>
<td>Background Knowledge</td>
<td>Synthesizes relevant information from reliable sources. Answers questions accurately.</td>
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<tr>
<td>Experimental Design</td>
<td>Develops methodology that is appropriate and clearly outlined. Includes proper controls.</td>
<td>3</td>
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<tr>
<td>Accurate Analysis</td>
<td>Performs an accurate analysis of the evidence to reveal the presence or absence of patterns related to the hypothesis/question.</td>
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<tr>
<td>Logical Conclusions</td>
<td>States a conclusion that is a logical extrapolation from the evidence outlined.</td>
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<td></td>
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<tr>
<td>Recognizes Limitations and Implications</td>
<td>Insightfully discusses relevant and supported (if possible) caveats, limitations and implications.</td>
<td>3</td>
<td></td>
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Figure A7. Rubrics used in assessment of M.S. student oral defense of thesis.