COLLEGE OF SCIENCE, TECHNOLOGY, & BUSINESS

DEPARTMENT OF BIOLOGY

UNDERGRADUATE PROGRAM

REVIEW SELF STUDY

October 28, 2024

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APPENDICES

1. BASIC INFORMATION*

Department or Program: Biology

COLLEGE: Science, Technology and Business

Date: October 28, 2024

Department Chair: Professor Sean Place
Programs Offered:
Bachelor of Arts in Biology; Bachelor of Science in Biology; Minor in Biology; Master of Science in Biology

Number of majors: 383
Number of Minors: 14
Number of permanent faculty: 11
Number of temporary instructors: 6
Number of courses: undergraduate – 62, graduate – 8
Number of GE courses: 11
BIOL 110 Biological Inquiry
BIOL 115 Introduction to Biology
BIOL 130 Introductory Cell Biology and Genetics
BIOL 131 Biological Diversity and Ecology
BIOL 218 Biology of Aging
BIOL 308 Environmental Toxicology
BIOL 309 Biology of Cancer
BIOL 311 Sexually Transmitted Diseases
BIOL 315 Plants and Society
BIOL 321 Molecular Biology, Cell Biology & Physiology
Number of Service Courses: 3
BIOL 220 Human Anatomy
BIOL 224 Human Physiology
BIOL 240 General Microbiology
Number of Degrees: 3 – B.A., B.S., M.S.
Number of concentrations: 5
BA: Zoology
BS: Molecular Cell Biology; Ecology and Evolutionary Biology; Marine Biology; Physiology

*Data presented in the self-study are derived from the Sonoma State Catalog, Tableau Server, or supplied by the Office of Reporting and Analytics, unless noted otherwise.

2. INTRODUCTION AND HISTORY

The Department of Biology, one of fifteen departments in the College of Science, Technology & Business, currently has 11 tenure track faculty members (7 professors, 3 associate professors and 1 assistant professor), 1.5 administrative coordinators, and 2 instructional support technicians. In addition, two temporary faculty members teach on 3-year contracts. As of Fall 2024, the department serves 383 majors and 14 minors. The department's faculty of professional scientists and its highly dedicated administrative and support staff strive to provide excellent educational experience to our majors and minors. Over the years the faculty has practiced a teacher-scholar model that embraces active participation in teaching and scholarship, with strong student involvement in faculty supervised research, to create and maintain a vibrant learning environment for our majors.

2.1 Summary of Programs

The Department of Biology offers two broadly based bachelor's degree programs (Bachelor of Arts and Bachelor of Science) and a Master of Science degree. Within each undergraduate degree program, there are opportunities for students to select a concentration that focuses their studies in a field of interest. A congenial atmosphere allows students to develop a close relationship with peers, graduate students, and faculty. Emphasis is placed on laboratory and field courses, and on participation in seminal research experiences. Laboratory instruction provides students with hands-on opportunities with variety of physiological equipment, ultracentrifugation, PCR, electrophoresis, epifluorescence and laser scanning confocal microscopy, and various microbiological techniques. Adequate laboratory and greenhouse facilities, such as the Raymond Burr Greenhouse, exist for maintaining live material for classroom use and student research. A radioisotope laboratory is also available. Field courses draw upon diversity of habitats in the North Bay region. They also capitalize on two nature preserves: Fairfield Osborn Preserve and Galbreath Wildlands Preserve, both administered by the College of Science, Technology & Business. In addition, the department maintains museum collections of local plants and fungi (North Coast Herbarium of California), vertebrates (Jack Arnold Vertebrate Collection), and insects and other invertebrates.

The Department offers a minor in Biology. The purpose of the minor is to provide the student with a background in biology that supplements the student's major. Students must develop a program in consultation with a faculty advisor in the Biology Department.

The Master's program in the Department of Biology is comprised of an active cohort of 34 graduate students engaged in original research with faculty members in all areas of research specialization covered in the department. Graduate research is often supported by external funding. Other support for graduate students includes teaching assistantships that involve close mentoring relationships with instructional faculty. Many graduates of the Master's program go on to pursue doctoral degrees, and others continue in research, biotechnology, resource management, and education. The Department completed its graduate program review in spring 2021, including a visit by an external reviewer.

Mission*: The overall mission of our undergraduate and graduate programs is to educate the*

next generation of scholars, professionals and citizens so that they are prepared to meet the biological, environmental and technological challenges of the future.

3. RESPONSE TO PREVIOUS PROGRAM REVIEW

The previous Undergraduate Program Review was completed in spring 2017. The external reviewer (Dr. Brian Livingston, Chair, Biological Sciences, California State University, Long Beach) focused on capacity to satisfy student needs and how those aligned with curricular changes that had been instituted in 2010. The Self-Study and External Review guided the program's development of an Action Plan in 2019. The main issue identified in the action plan focused on assessing curricular changes implemented in 2010, including effectiveness of secondary criteria associated with a declaration of impaction, impact of restructuring the curriculum on student progress, and offering of many degree options with limited faculty membership. Other specific issues raised revolved around advising, staffing, and limited resources and time for the Chair to undertake predictive enrollment and student success analysis.

The driving force behind many concerns in the previous program review was a reorganization of the curriculum implemented in 2015/2016 and the limited faculty and staff resources to offer the curriculum even under impaction. This continues to be a concern for the Department and is directly related to budgetary struggles that were precipitated by the 2009 recession and exacerbated by an unprecedented drop in student enrollment since the onset of the pandemic.

Currently, the curriculum for majors consists of two tiers of broad introductory courses. The lower division tier consists of one semester of Cell Biology and Genetics and one semester of Diversity and Ecology. This is followed by an additional two class upper-division core sequence with one semester of more advanced Ecology and Evolution and one semester of more advanced Molecular Biology, Cell Biology and Physiology, in which we strive to integrate basic concepts presented in the lower division courses with a more in-depth investigation of contemporary fields in the biological sciences.

Concerns were raised by the previous external reviewer regarding the restructuring of the curriculum that had been implemented just prior to the last program review.

> "Despite the department's efforts in reorganizing the curriculum, there are still some areas where student progress can become stalled…
>
> d. The tiered two-year introductory sequence of four courses, each of which is offered only once/year. The first two courses are required for the second two courses. Multiple students indicated that if a single course was missed it resulted in a delay of a complete year in progress towards their degree." - Brian T. Livingston, Chair, Biological Sciences, California State University, Long Beach

Analysis of graduation rates of First Time Freshmen from 2014, prior to implementation of the new curriculum, through 2020 do not indicate a significant bottle neck has been created by the new curriculum as graduation rates for both our BS majors and our BA majors has been maintained at similar levels, oscillating between 35% - 45% (See FIG. 1).

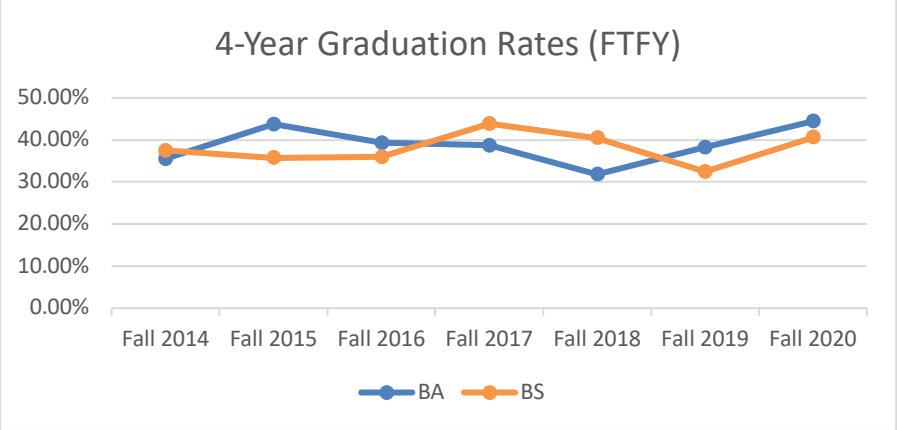

Fig. 1: Graduation rates of FTFY student cohorts immediately prior to implementation of the revised curriculum (2014) and after (2015-20).

However, one-on-one summer advising of transfer students with a subsequent analysis of 2-Year graduation rates for transfer students highlighted an unintended bottleneck that was created by the upper-division core courses. Implementation of the two-tiered core requirement created a barrier to a two-year path to graduation for a majority of our transfer students (see FIG. 2). In 2017 this was partially off-set by use of course substitutions and permission codes provided to the small cohort of transfer students. However, it has become apparent this mechanism is not sustainable given a increased number of transfer students we have received over the past several years.

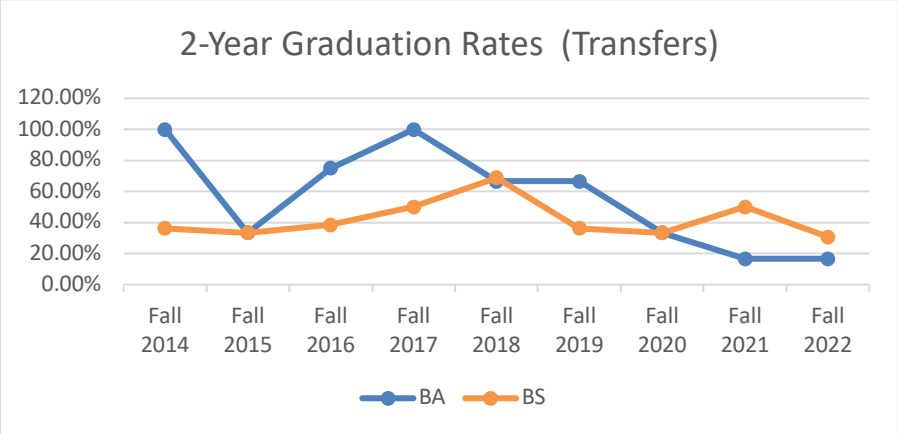

Fig. 2: Graduation rates of transfer student cohorts immediately prior to implementation of the revised curriculum (2014) and after (2015-20).

In addition to the curriculum revision undertaken in 2010 and implemented in 2015, the Biology program declared impaction in 2011/2012 in an attempt to better serve the growing number of applications for admission to Sonoma State University as a Biology major. This allowed the program to limit the incoming freshmen class to meet projected capacity in introductory majors courses, and to accommodate them in subsequent upper-division courses. By stabilizing capacity in the program at approximately 400 majors, our ability to offer courses on a regular cycle improved. While considered a necessary move by the previous external reviewer, there were concerns raised with respect to the effectiveness of secondary admissions criteria at increasing

student success developed. While we attempted to assess and modify admissions criteria over several years, we ultimately decided to withdraw our declaration of impaction beginning 2022/2023. This was driven in part by concerns over declining enrollments across the University combined with a change in how impaction would be managed system wide by the Chancellor's Office. Since withdrawing impaction, our numbers have returned to historical targets (~ 400 majors), allowing us to better anticipate needs for course offerings based on historical enrollment data.

With respect to staffing, the program has undergone several changes in the permanent faculty with the current number of eleven full-time permanent faculty, with a 12th member projected to join the Department in Fall 2025. Although the number of permanent faculty members has not decreased, there has been an increase in the need for part-time lecturers since 2017, particularly in non-majors courses that serve the greater University, while tenure-track faculty members continue to take on more administrative roles within the University. Thus, the Department is still working on finding a balance between staffing needs for non-majors courses, offering a diverse set of upper division courses for our majors, and meeting the permanent faculty's time commitment to teaching, research, and service.

4. CURRICULUM

The Biology program offers an undergraduate curriculum, supported by physical sciences and mathematics, to provide students with a well-rounded exposure to the breadth of inquiry in the biological sciences. Combining breadth with in-depth instruction allows students to develop intellectual foundations and skills needed to deal with the specific biological issues of today and the flexibility to meet future needs within the profession.

Consistent with the University's mission, the Department of Biology maintains excellence in its programs of instruction, which are grounded in the mission of a liberal arts and sciences institution. The lower and upper division curricula are structured such that students are challenged to develop skills of critical analysis, reasoning, creativity and self-expression. Since the biological sciences encompass a wide variety of specific sub-disciplines, each with its own terminology, research approach, and professional organization, the Department offers a broad-based curriculum with discipline-based options through degree concentrations. Below is a description of major changes the program undertook since the last program review.

The current lower division core sequence consists of two semesters (8 units) of introductory biology: BIOL 130 (Introductory Cell Biology and Genetics) and BIOL 131 (Biological Diversity and Ecology). Upper division courses in the major require completion of both. The current upper division core sequence replaced our previous requirements in four upper-division core areas (Organismal Biology, Physiology, Molecular & Cell Biology, and Ecology & Evolutionary Biology) for a total of 16 units, with two upper-division core courses, BIOL 320 (Ecology & Evolution – An Integrated Approach) and BIOL 321 (Molecular Biology, Cell Biology & Physiology) for a total of 8 units. BIOL 320 was intended to expose students to fundamental concepts of ecology and evolution while integrating across the two disciplines. BIOL 321 provides students with a strong foundation in contemporary molecular, cellular and physiological processes and their regulatory mechanisms. The course was intended to be highly

integrative between molecular biology, cell biology and physiology and was expected to prepare students to understand structure- based function at all levels and address issues regarding how organisms respond to changing environment. This course is required for completion of the degree and a pre-requisite for most of our upper-division courses in the molecular and cell biology (MCB) area and is taught once a year in the spring semesters. Due to a relatively high drop-fail-withdraw (DFW) rate, this course created a significant bottleneck in the major, especially for transfer students that needed to complete it prior to enrolling in MCB upper-division courses. In addition to the upper-division core series, students are required to completed one course that satisfies an organismal/ diversity requirement and additional elective courses to fulfill upper-division unit requirements.

4.1. Program Curriculum Revision

After analysis of student success trends in our major core courses, DFW rates in our upper division courses, and progression of transfer students through our major, the Department decided to undertake a program revision and have spent the last two years revising the undergraduate curriculum. The Department has completed revisions to the B.A. and B.S. degrees and this program revision is currently working its way through faculty governance for implementation in Fall 2025. The rationale for revisions came from student feedback and faculty discussion that arose after the Chancellor's Office launched the Graduation 2025 Initiative. Analysis of student success in the lower division, including course repeats, DFW levels, and student retention trends reinforced faculty concerns regarding the success of students within the major, particularly within upper-division courses served by BIOL 130, our current introductory course in Cellular and Molecular Biology. Currently, the five courses within the major with the highest DFW rates are associated with subject areas anchored in the discipline of cell and molecular biology; BIOL 344 - Cell Biology, BIOL 480 - Immunology, BIOL 380 - Genetics of Human Disease, BIOL - 340 General Bacteriology, BIOL - 130 Intro cell and Molecular Biology, BIOL - 343 Stem Cell Biology (see Fig. 3). The course with the highest DFW percentage is a non-majors service course for pre-nursing and Kinesiology majors (BIOL 220 – Human Anatomy).

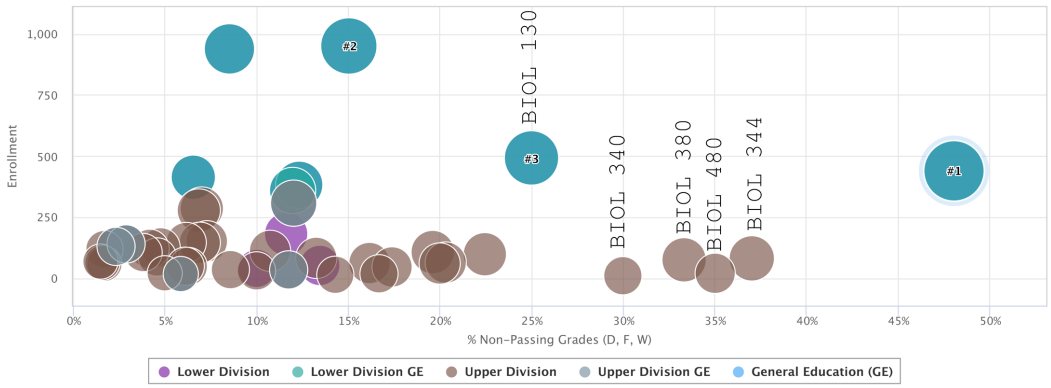

Fig. 3: Percentage of students receiving a grade of D, F, or W in courses taught by Biology faculty over the last three years.

Furthermore, the inability to provide a clear two-year graduation roadmap for our transfer students provided significant additional incentives for a curricular revision. The Department approached this revision process as an opportunity to incorporate information obtained through a

campus wide academic master planning initiative to better position the Department to to guide students towards a concentration that best prepares them to achieve their professional objectives. The curricular revision encompassed three main components, the first two being common to the B.A. and the B.S. degree plans, while the fourth is specific to the B.S. degree:

1. Restructuring the lower division and upper division core curriculum;
2. Modifying concentrations; and
3. Modifying the capstone research experience.

4.1.1. Restructuring of the lower division and upper division core curriculum

The first round of revision focused on improvements to student retention in the lower-core sequence. This revision redistributed subject material across a three-semester sequence, with delivery of molecular and cellular biology principles occurring in the third semester. The proposed new lower division core sequence consists of three semesters (12 units) of introductory biology: BIOL 130 (Diversity, Structure, and Function), BIOL 131 (Genetics, Evolution, and Ecology), and BIOL 232 (Molecular and Cell Biology). By redistributing subject material, and moving foundational material for cell and molecular biology to the sophomore year, we will provide students greater opportunity to 1) gain critical study skills during their freshman year in subject material they have historically performed better in; 2) gain competency in general chemistry principles prior to exposure to MCB concepts that rely on these principles; and 3) allow MCB material to be taught with a smaller class size, twice a year, affording students the opportunity to gain a solid foundation in these areas prior to undertaking upper division coursework.

Additionally, to streamline student pathways into upper division course sequences, the two-course, core sequence was removed and replaced with a single upper-division required course that satisfies upper-division General Education area B2 (life science, now UD Area 5) requirement. Importantly this new course will not serve as pre-requisite for upper-division courses, allowing students, especially transfer students, to enroll in upper division courses earlier in their studies.

4.1.2. Modifying concentrations

In the prior curriculum revision, several concentrations were removed in an effort to streamline the undergraduate offerings during the early stages of the budget crisis imposed on the California State University. Since then, several concentrations were reconstituted and revised with reduced course requirements to attract and retain quality students while allowing flexibility in course offerings that will still allow students to complete concentration requirements in a timely manner. In this most recent revision, we have refined our concentrations to balance offerings across the BA and BS degrees, provide more substance to the concentrations, and re-brand some existing concentrations to better reflect the needs and interests of incoming students.

The following concentration options listed in Table 1 are currently provided:

Table 1.

B.A.	
Zoology	13-16 units of specified UD courses (no required courses, chose from approved lists)
B.S.	
Molecular Cell Biology	17 units of specified UD courses (3 required courses)
Physiology	16 units of specified UD courses (No required courses, choice of four from a list of approved courses)
Marine Biology	17 units of specified UD courses (1 required course + choice of 4 courses from a list of approved courses)
Ecology and Evolutionary Biology	8 units of specified UD courses (2 required courses)

Table 2 provides the revised Concentration offerings.

Table 2.

B.A.	
Zoology	13-16 units of specified UD courses (no required courses, chose from approved lists)
Marine Biology	17-19 units of specified UD courses (2 required courses + choice of 3 courses from a list of approved courses)
B.S.	
Biomedical Sciences**	16 units of specified UD courses (4 required courses)
Ecology and Evolutionary Biology	12 units of specified UD courses (2 required courses)
Molecular Cell Biology	17 units of specified UD courses (3 required courses)
Physiology	16 units of specified UD courses (No required courses, choice of four from a list of approved courses)

** New Concentration

- Within the B.A., experience has demonstrated that the Zoology concentration is a key factor in retaining highly qualified students that we lost to other programs or campuses in the past. We frequently field questions from potential incoming students regarding the experiences the Zoology program will offer with respect to interaction with animal species. The current concentration has specific upper division course requirements that range from 13-16 units depending on the choice of courses taken from an approved list. This concentration has remained unchanged.
- The Marine Biology concentration was moved from the B.S. to the B.A degree plan as the coursework more closely mirrors the Zoology concentration. Some recent hires in Biology provide new expertise and the existing curriculum contains extensive coursework in marine topics. Therefore, this concentration was revised to leverage faculty expertise and proximity to the California coast and improve our ability to recruit and retain highly qualified students. We have added an additional course requirement to this concentration bring this concentration into better alignment with the number of required courses in other concentrations.
- Within the B.S. degree program, we developed a new concentration in Biomedical Sciences that we feel will be particularly attractive to students interested in pursuing career opportunities within biomedical research and biotechnology fields This concentration will help focus student experience in the major on biomedical related topics and applications. This concentration has four required courses.
- A Molecular Cell Biology concentration. The Department serves many students interested in applying of molecular approaches to questions anchored in the fields of organismal biology, and ecology and evolution. Future students interested in basic research topics in molecular and cellular biology, as well as students interested in integrative biological questions, should be attracted to this. This concentration has remained unchanged.
- A revised Physiology concentration (B.S.). This concentration was historically one of the most popular concentrations in the biology curriculum and was a frequent choice among many of pre-health professions students. The concentration attracts a broad array of students with interest in comparative physiology, physiological ecology, conservation physiology and evolution. To provide a concentration with greater flexibility, students in this concentration are required to complete four courses from a list of recommended courses with careful advising to match their interests and preparation for graduation.

4.1.3. Modified the capstone research experience

Within any term, 20% or more of all majors were registered as seniors in the B.S. which requires a capstone research experience. Students could choose between two primary options; one or two semesters of BIOL 494 (Independent Research, 3 units) or an Honors Thesis, a two-semester research experience (BIOL 496A and 496B, 3 units). The large number of majors aiming to complete their research experience in their final year has led to students settling for a research experience that did not match their interests or students changing to the B.A. degree to be able to graduate. Additionally, we found that few students chose to complete the BIOL 496 Honors thesis sequence, with a large majority opting for BIOL 494. Discussions among faculty members led to an understanding we needed a two-semester sequence for hands-on research for students interested in research in areas the current faculty could mentor them in. Additionally, to address the problem of not enough capacity in faculty laboratories for student research, and student interests that lie outside current faculty expertise, the Department needed a mechanism for students to engage in primary literature and data analysis outside of hands-on research. We have

modified the two routes to complete the capstone research requirement. The Honors Thesis sequence has been revised into a two-semester research experience, Thesis Research (BIOL 496A and 496B, for a minimum 3 units), for students interested in a hands-on experience on a project within the research area of a faculty mentor. We also revised BIOL 494 into a Research Synthesis Paper for students who either do not have a strong interest in undertaking a two-semester research project, or simply wish to gain deeper insights in a research area not covered by our faculty. In this one-semester course, students work under the guidance of a Biology faculty member to develop a research topic and undertake a comprehensive literature review along with small meta-analysis when appropriate. Students are then expected to generate a synthesis paper that integrates primary literature and knowledge from upper division coursework through several rounds of draft revision guided by the faculty mentor.

4.2. Learning Objectives

The Department attempts to meet its program learning objectives in a manner consistent with the University's mission. The Department seeks excellence in its program of instruction grounded in the context of liberal arts and sciences. Students are challenged to develop skills of critical analysis, reasoning, creativity and self-expression in our General Education curriculum, service courses, and the Biology major. Because the biological sciences encompass a wide variety of sub- disciplines, each with its own terminology, research approach, and professional organization, a broad-based curriculum is provided. Therefore, the program learning objectives are supported through course- specific methodologies and assessment, and through the structure of the curriculum. Prior to the last program review, the Department reviewed and refined learning objectives. Four of the original 12 learning objectives clearly rose to the top of faculty preference, providing the current approved list of program learning objectives. The faculty next examined their upper-division courses (for juniors and seniors), and using the program learning objectives (PLOs), gave input on specific student learning outcomes (SLOs) that are covered within their courses. The responses were then summarized and generalized into 14 department approved student learning outcomes for the degree as follows:

PLO1: Continue development of quantitative and analytical tools

I. Students will collect, interpret and graphically represent data.
II. Students will perform appropriate calculations to analyze data for addressing specific questions.
III. Students will analyze biological data using a variety of statistical approaches/tools.
IV. Students will apply inductive and deductive reasoning to experimental information and data.

PLO2: Increase understanding of the critical role of evidence-based hypotheses testing

V. Students will appraise published data in evaluating models, hypotheses, or theories.
VI. Students will design appropriate experiments to evaluate hypotheses.
VII. Students recognize how experimentation leads to understanding mechanistic processes.
VIII. Students will critique concepts and data in written and oral form.

PLO3: Deepen awareness of structure-function relationships and emergent properties at various scales

IX. Students are able to describe components of biological structure/complexity at

multiple levels of organization

X. Students are able to explain how biological function arises from structure at both the same and higher level of organization.

XI. Students will explain the mechanistic reasons behind biological processes.

PLO4: Expand understanding of the integrative nature of biology

XII. Students will dissect complex problems into key components.

XIII. Students will explain complex problems from different, integrative perspectives.

XIV. Students understand the roles various components within organisms play in development or interaction with the environment.

It is important to note that no single course covers all student learning outcomes, or even all four program learning outcomes. However, by the time of graduation, the faculty feels that a student will have experienced sufficient course material to be proficient in knowledge covered by the program learning outcomes (see map: Appendix 1).

4.3. Meeting Learning Objectives

In general, the program learning objectives are supported using the following methodologies:

a. Conceptual, factual, and visual lecture content that integrates information from laboratories and other methodologies.
b. Hands-on laboratory experience that features methodologies and conceptual content that integrates with lecture content.
c. Electronic resources such as course web pages, eReserve or Moodle.
d. Computer simulation and modeling.
e. Data management, statistical analysis, and results presentation using computer software.
f. Experiences at field sites, research facilities or museums.
g. Training and mentorship of paid laboratory instructors.
h. Involvement of undergraduate or graduate student instructional assistants in the laboratory or field.
i. Assignments requiring students to draw on external resources (e.g. research literature or community engagement) to satisfy course requirements.

The general methodologies outlined above are integrated into features of the curriculum to aid student obtainment of knowledge and experience within biology.

4.3.1. Hands-on laboratory experiences in the curriculum

Laboratory courses are designed to provide students with the conceptual framework to understand and participate in scientific developments in diverse areas of biology, and the practical framework to gain hands-on experience in modern laboratory techniques in the biological sciences. Courses emphasize techniques in recombinant DNA technology; applications of DNA sequence analysis for molecular geneticists, biomedical researchers, and evolutionary biologists; techniques in advanced microscopy; gross anatomical dissection techniques; acquisition and analysis of physiological or other biological data. Students also conduct group research projects and independent research as a part of many Biology courses. These projects involve use of various library resources and laboratory facilities. Some courses require that students present their research as a part of a laboratory course component; others

require preparation of an independent research paper. Students also gain hands on experience in experimental design, statistical analysis, and computer-based methods using laptop computers in the classroom. In past years, faculty members have obtained educational and research grants which have been used to modernize and upgrade laboratory facilities for teaching and research. The equipment purchased through external funding has enhanced the ability of Biology faculty to offer instruction using modern biological research tools. In addition, the School of Science & Technology has an older, but still well-equipped Microanalysis Laboratory (William Keck Microanalysis Laboratory) available for use in teaching and student research.
This laboratory houses advanced microscopic imaging equipment including, an environmental scanning electron microscope, atomic force microscope, and epifluorescence and laser scanning confocal microscopes.

4.3.2. Field experiences in the curriculum

Field courses offer students the opportunity to learn about the high diversity of organisms that live in the rich natural environment surrounding Sonoma State University. Field trips provide students with direct exposure to vernal pools, oak woodlands, coastal marine habitats, thermal springs and geothermal stream fields near campus. Many field trips are taken to the School of Science and Technology's Nature Preserves. In several Biology courses, students also gain experience regarding local environmental problems, including demographic problems associated with the decline of the Western Pond Turtle, factors affecting the diversity and abundance of aquatic macroinvertebrates, and the threat of invasive introduced species, including the pathogen causing Sudden Oak Death.

The Department maintains extensive collections of vertebrates, vascular plants, insects, marine invertebrates, and bacteria. Specimens are made available to students, members of the community, and scientific researchers. Collections are also used for outreach purposes. For example, students participating in the Biodiversity Outreach Program bring displays of animals, plants and live insects to public events and classrooms to enhance awareness of the diverse ways that species interact with humans. This program, which has been supported internally through the Instructionally Related Activities program and external sources promotes more ecologically sound methods for managing populations of insects, and it emphasizes the importance of native species for the health of natural habitats (e.g. streams and vernal pools). Students participate in the program as presenters.

instruction.

4.3.3. Service-learning

Faculty members also use Service-learning to achieve curricular objectives. Students receive points for serving a community partner or University entity for several hours. The Service-learning activity is designed to help achieve the learning objectives of the course. For example, students in BIOL 323 (Entomology) participate in activities organized by the Biodiversity Outreach Program.

4.3.4. Special courses

A number of course are offered on an “as needed” basis and are open to all qualified students. All faculty are involved in offering one or more of these classes. As such, the offerings vary yearly in content, objectives, and student need. The courses fall into three categories (see Appendix 3 for course descriptions):

a. **Specialized classes to cover topics not available in the curriculum (BIOL 385, 497).** These classes provide opportunities for the department to offer students insights into a broad range of issues in biology. All are open to any faculty member to participate and all can be repeated by students as the topics change. These courses can be listed as one to three units. BIOL 385 provides faculty the opportunity to offer a General Education class on a trial basis, while BIOL 497 provides the opportunity to offer a major's class on a trial basis. The Department may decide to incorporate trial classes into the regular curriculum.
b. **Professional development style classes (BIOL 398, 498).** These courses can be taken for one to four units. They give students the ability to gain experience assisting instructors to teach other students specialized topics in biology or biology education.
c. **Internships (BIOL 499).** This course can be taken for one to four units. It provides students opportunities to work with a community partner or university entity to gain real-world experience in a laboratory, a professional office, or a field station. A popular internship for students is to work with the Center for Environmental Inquiry on land management or naturalist educational programs at the Fairfield Osborn Preserve, the Galbreath Wildlands Preserve or other natural areas managed by the University.
d. develop professional skills along with opportunities to apply their knowledge within an academic, professional, or community-based experience.
e. **Professional development style classes (BIOL 398, 498, 499).** These courses can be taken for one to four units. They give students the ability to develop professional skills along with opportunities to apply their knowledge within an academic, professional, or community-based experience.
f. **Research courses (BIOL 393, 494, 495 and 496A/B).** Students seeking research experience under the guidance of a faulty member take these one to four unit courses. BIOL 494 OR 496A/B are required courses providing the research experience in the B.S. degree.

4.4. General Education and Service Courses

The Department of Biology offers multiple courses that serve the University in fulfilling General Education requirements and/or service for particular majors. Table 3 below provides an overview of the courses and students served on a yearly basis.

Table 3.

General education and service courses in the Department of Biology. Data represent AY 2023/24

Course	Description	GE Area	Students Served Yearly
BIOL 110 Biological Inquiry	Lower-division, non-majors, lecture-lab, 4 units	B2	305
BIOL 115 Introduction to Biology	Lower-division, non-majors, lecture, 3 units	B2	335
BIOL 130 Introductory Cell Biology and Genetics	Lower-division, majors, lecture-lab, 4 units	B2	179
BIOL 131 Biological Diversity and Ecology	Lower-division, majors, lecture-lab, 4 units	B2	129
BIOL 218 Biology of Aging	Lower-division, non-majors, lecture, 3 units	E	149
BIOL 220 Human Anatomy	Lower-division, non-majors, lecture-lab, 4 units		192
BIOL 224 Human Physiology	Lower-division, non-majors, lecture-lab, 4 units		192
BIOL 240 Medical Microbiology	Lower-division, non-majors, lecture-lab, 4 units		72
BIOL 308 Environmental Toxicology	Upper-division, non-majors, lecture, 3 units	B3	Offered occasionally
BIOL 309 Biology of Cancer	Upper-division, non-majors, lecture, 3 units	B3	Offered intermittently
BIOL 311 Sexually Transmitted Diseases	Upper-division, non-majors, lecture, 3 units	B3	Offered occasionally
BIOL 315 Plants and Society	Upper-division, non-majors, lecture, 3 units	B3	40

The lower-division GE courses are offered to non-majors in a combined lecture/lab format (BIOL 110) or lecture only (BIOL 115). Students taking the lecture only option are often majors in the sciences and have GE lab courses within their major.

The 200 series courses are service courses for Nursing and Kinesiology majors. If seat space is available, other students with pre-requisites are permitted to register. Both Nursing and Kinesiology are impacted majors and one reason for their impaction is limitation on available seats in Biology 200 series courses. This is especially an issue with BIO 220, which requires specific expertise. The Department utilizes a part-time faculty member whose schedule is filled with this one course. Since BIOL 220 and 224 are General Education courses in area B3, they do not fulfill a required area in GE, but they are options for students to take additional science related (area B) units.

Upper-division GE courses tend to be offered less frequently as most fall into the B3 area. Biology of Aging (BIOL 218) is offered in both semesters as it fulfills GE area E (Lifelong

Learning and Self Development) and is a high-demand course as it is sought after by students wishing to pursue a career in health services. As part of the new GE patterns associated with the California General Education Transfer Curriculum Cal-GETC, GE area E courses will no longer be required, and as such, this course will now become available as a general elective for all students.

5. ASSESMENT AND FINDINGS

5.1 Program Assessment via Student Learning Objectives

In the Fall of 2016, the Department agreed upon four program learning outcomes and 14 student learning objectives (see Curriculum section). From discussions at Department meetings, the Department decided to use an embedded assessment approach to gather data on student performance in the major. Faculty reviewed 14 student learning objectives and matched, where appropriate, learning objectives with in-class exam or quiz questions, projects, or other forms of class assessment. The total points for an in-class assessment were scaled to a range of 10 (providing equal scaling across questions and courses). Within in a course, a class average was calculated for individual learning objectives that were assessed multiple times. Following collection of SLO data, the Department discussed levels of achievement to be used in the assessment. The agreed upon scale follows:

8.5 - 10.0	highly developed
6.6 - 8.4	developed
5.5 - 6.4	developing
0 - 5.4	not developed

Table 4 below provides the outcome of our assessment of Program SLO's based on high value assignments and exam questions in Upper Division courses from 2017 to 2023.

Table 4.

	Mean	S.D.	Median	n
SLO 1	7.7	2.6	8.7	359
SLO II	7.3	2.9	8.6	260
SLO III	8.7	1.0	8.8	99
SLO IV	7.2	2.9	8.2	273
SLO V	8.2	2.5	9.2	197
SLO VI	8.7	1.8	9.5	91
SLO VII	8.3	2.2	9.4	122
SLO VIII	8.2	2.3	9.2	120
SLO IX	7.8	2.3	8.3	494
SLO X	7.7	2.6	8.3	474
SLO XI	7.8	2.4	8.3	696
SLO XII	7.5	2.6	8.3	303
SLO XIII	7.6	2.3	8.0	353
SLO XIV	7.5	2.5	8.1	525

In our last program review, assessment of the curriculum showed at least 72% of students demonstrated developed or highly developed levels of learning on 13 of 14 learning objectives, and 50% or more students demonstrate a highly developed level of learning on 10 of 14 learning objectives. Based on the most recent analysis of assessment data, at least half of students are demonstrating a developed level of learning in all 14 SLOs. However, the number of SLOs that 50% or more of our students are demonstrating a highly developed level of learning has declined to only 7 of 14 SLOs (SLO I, II, III, V, VI, VII, VIII).

The first four SLOs are associated with the PLO on development of quantitative and analytical tools. The assessment indicates students are performing well on collecting, calculating, interpreting, and analyzing biological information (SLOs I, II, and III), but are not able to apply inductive and deductive reasoning as well (SLO IV). SLO IX-XIV involve structure function relationships and integration of biological principles towards a more complex understanding of biological information.

The process of assessment has been over-ambitious, attempting to assess all courses offered in a given semester. This may have hampered our attempts to understand the high DFW rates in some of our upper-division MCB courses as assessment scores for the majority of courses in this area were not available at the time of this analysis. Moving forward, the Department will continue to encourage all faculty to collect SLO information in upper- division courses from final exams, projects, papers, etc. (embedded assessment from end of the course) while undertaking a review of our assessment protocols to determine if there is a more efficient process to collect the necessary data to understand student success in our programs.

6. STUDENT BODY

6.1 Enrollment

Majors: Over the last six years, enrollment for the University as a whole has declined significantly and has been slow to recover. From peak enrollment numbers in Fall 2018 to Fall 2021, enrollment of first-time First-year (FTFY) students declined by roughly 55%. Over the past three years enrolment numbers have been slow to recover, with Fall 2024 enrollment of FTFY students hovering around 60% of those recorded in Fall 2018. Early enrollment declines in the Biology major mirrored the broader university trends. However, enrollment numbers within the major appear to be recovering faster than the University as a whole, with Fall 2024 FTFY enrollments nearing 80% of peak enrollment numbers seen in Fall 2018 (Table 5). The more rapid recovery from steep declines in 2020 was likely aided by the decision to remove impaction in 2022/23. Importantly, the number of incoming students declaring Biology as their major is reflective of the size of freshman classes (~100 – 130) observed over the period covered in the previous program review.

Table 5.

	First-time First-year enrollment				
Term	**SSU**	**BA**	**BS**	**Dept. of Biology Totals**	**% of Total SSU Enrollment**
Fall 2018	1540	43	82	125	8.12%
Fall 2019	1314	36	81	117	8.9%
Fall 2020	777	15	34	48	6.18%
Fall 2021	681	29	38	67	9.84%
Fall 2022	766	47	41	88	11.49%
Fall 2023	899	21	57	78	8.67%
Fall 2024	919	42	59	101	10.99%

The transfer student population adds approximately 40 to 60 students per year. Transfer students are both external (i.e., community colleges, other 4-year institutions, see Table 6 below) and internal to SSU (declaring or changing major).

Table 6.

External transfer student enrollment, Biology majors					
Term	**FALL**		**SPRING**		**Totals**
	BA	**BS**	**BA**	**BS**	
AY 2019-20	6	9	2	5	22
AY 2020-21	3	11	2	6	22
AY 2021-22	3	10	2	7	22
AY 2022-23	10	26	2	12	50
AY 2023-24	6	23	1	6	36
AY 2024-25	14	20			34

The number of majors varies between 350 to 430, and averaged 382 over the past 5 years. Within the program, approximately 38% of majors are declared as a B.A. and 62% as a B.S (Table 7). The full-time equivalent students served over the past 5 years has averaged 407.3 for the fall and 342 for the spring term. With proper scheduling, the program has reduced wait lists in major's courses to a minimum. One notable issue is the continued need to serve a large number of B.S. majors requiring completion of the B.S. capstone research experience.

Table 7.

Biology majors by term									
Term	**BA**				**BS**				**Totals**
	Freshman	Sophomore	Junior	Senior	Freshman	Sophomore	Junior	Senior	
FA 2018	51	28	28	60	91	51	37	88	434
FA 2019	45	32	30	51	90	44	59	82	433
FA 2020	24	23	35	57	47	52	54	74	366
FA 2021	28	23	32	67	46	38	53	89	376
FA 2022	47	21	37	66	54	40	48	89	402
FA 2023	35	18	27	60	74	30	51	70	365
FA 2024	45	19	35	47	57	59	54	67	383

The number of graduates in the Biology program has been slowly increasing over the past several years. In the AY 2013-14 academic year, 67 majors graduated, while we have averaged ~90 graduates over the last five years (Table 8).

Table 8.

Biology major graduates, by degree			
Term	**BA**	**BS**	**Totals**
AY 2013-14	31	36	67
AY 2014-15	40	32	72
AY 2015-16	50	35	85
AY 2016-17	36	39	75
AY 2017-18	41	54	95
AY 2018-19	57	37	94
AY 2019-20	43	45	88
AY 2020-21	51	42	93
AY 2021-22	40	42	82
AY 2022-23	49	48	97

Minors: The number of minors has steadily decreased (see table below). In fall 2011, approximately 100 students declared a Biology minor. More recently, the number has dropped to less than 15. Several factors likely led to this decline, including changes in the GE pattern leading to an increase in the number of required GE units, changes in the curriculum and course offerings in the Department of Geography, Environment and Planning (GEP), which have made it more difficult for students in that major to achieve a minor without extending time to graduation, and the removal of impaction in Biology, which when in placed, resulted in a substantial number of students enrolling in the minor as a pathway to admission to the major.

6.2 Diversity

The student body in Biology has consistently trended towards a higher female to male ratio with ~70% of our student body identifying as female. Currently, 75% of our majors identify as female. During the previous program review the ethnicity of majors ranged between 54-49% white, followed next by a 22-27% proportion of Hispanics and 6-9% Asian. The demographics of our student body has changed dramatically over the past seven years. Over 50% of majors now identify as an underrepresented minority, with the largest portion of our population of majors (~44%) identifying as Hispanic/Latinx (Fig 4).

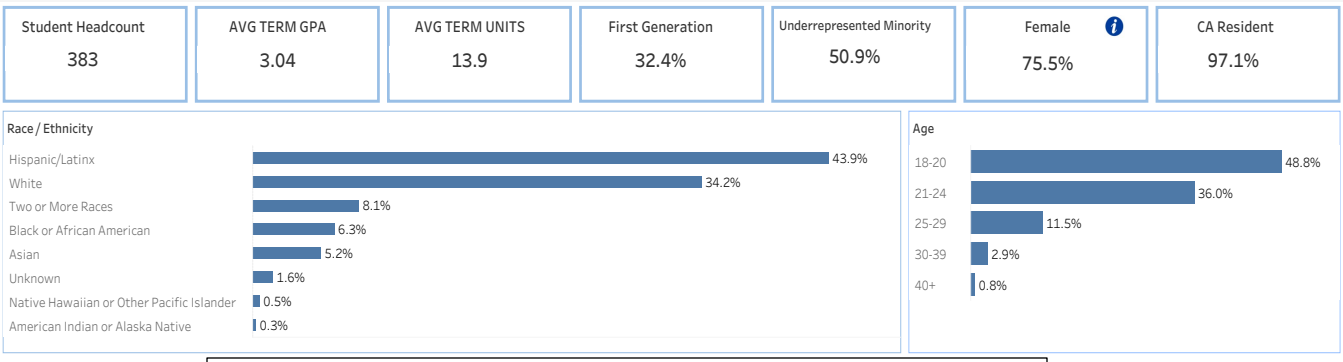

Fig. 4: Student demographics within the Department of Biology Fall 2024.

To serve the student population, the program is actively involved in increasing participation of underrepresented groups in research activities and other educational programs. Programs in place at Sonoma State University that integrate with Department goals of increased inclusion include the California State University Louis Stokes Alliance for Minority Participation (LSAMP), the McNair Scholars National Graduate Student Achievement Program (NoGAP) and the Mathematics, Engineering, Science Achievement (MESA) program. The Department participates actively in these programs by providing faculty, staff, and facilities to increase research training and life-long learning for underrepresented groups. Faculty also recruit minority students for participation in NSF-funded research projects, especially since the University qualifies for Research at Undergraduate Institutions status.

6.3 Advising

The Department maintains a web page (http://www.sonoma.edu/biology/) of general information for the department and its programs, faculty profiles including research areas, course descriptions, class schedule, updates on registration, student resources, departmental news and announcements, and descriptions and links to natural preserves and other programs. The Department strongly encourages majors to develop an ongoing advising relationship with a faculty member whose area of expertise matches the student's interest. The Department Chair prepares and updates a list of biology majors with assigned advisors. This list is updated on the University's Central Management System (PeopleSoft). The Department Chair is needed for general advising, including GE advising, throughout the year and typically participates, along with one or two other faculty members, in freshmen orientation during summer.

The Biology portion of the University catalog contains advising information such as: list of Biology degree concentrations (for both B.A. and B.S. tracks), sample prerequisite courses for applying to various health professions schools, information about degree unit requirements, and sample four year programs for prospective majors (Appendix 2).

The California State University System has implemented the Graduation Initiative 2025 plan, https://www2.calstate.edu/graduation-initiative-2025, which has a goal of increasing 4-year graduation rates within the system and eliminating the achievement gap of underrepresented students. Sonoma State submitted the campus plan for achieving its goal of increasing 4-year graduation rates from 29% to 54%, and 2-year (transfer) graduation rates from 52% to 64%, and

eliminating the 8% achievement gap. A major aspect of the SSU plan, both for the short- and long-term, is a greater emphasis on advising. The first of these is graduation advising of majors after reaching 90 units (Junior status). This advising would help each student plan out a two-year schedule to graduation, and to gather data from all students so programs would be aware of potential impediments to graduation and institute proactive measures.

A second advising plan for SSU is to institute summer advising for students early in the major, especially URM students, who are not on a 4-year plan (less than 15 units per semester). Advisors would not only aid students in building graduation pathways as well as direct financial resources to summer or intersession coursework for students with demonstrated financial need.

Both advising plans require additional resources (staff or summer faculty). Given the large number of students requesting information about the Biology Program, the Department Chair has often been called upon to fulfill the role of providing this information, especially during the summer months. Additionally, the Chair is needed to be on-call during freshmen summer orientation/registration to approve adjusting seat availability in the large-enrollment major's and non-major's courses. Finally, prospective students and their parents visit SSU during the summer months and the Chair is needed to explain the program.

In the past, the Biology Program had a 12-month chair appointment to cover summer advising and outreach. The budget crisis of 2009 removed this position, and the Dean has since funded 10 days of a summer chair position. With the CSU emphasis on aiding students to meet their graduation goals within 4 years, it is becoming increasing clear to the program that a return to a 12-month Chair position would be the most beneficial approach to serve the program's ~400 majors and potential majors. A department Chair has more direct knowledge of the program and schedules than either staff advisors or other faculty, and the program feels is the most viable option to serve students.

7. FACULTY

7.1 Pedagogy

The program maintains a commitment to preparing majors to be capable of pursuing fulfilling careers in biology in a changing and competitive world. With this in mind, the program employs a comprehensive research-based instructional program in scientific inquiry encompassing observation and interpretation of experimental results. In addition, the curriculum is designed to be accessible to California's growing and diverse student population and meet the occupational needs of the state's technology-based economy. The faculty are actively engaged in externally funded research and are extremely competent in training students in scientific methods as well as recent scientific and technological advances. Currency within the discipline is further maintained through active scholarship and professional activities. Outcomes of these activities are typically incorporated into our curriculum planning and individual courses. The department always recruits faculty who are committed to teaching and scholarship in their areas of expertise. All tenured/tenure-track faculty CVs are provided in Appendix 4.

The faculty continue to maintain excellence in scholarship and teaching. Last year, Dr. Daniel Crocker, was awarded the prestigious Wang Family Excellence Award for Outstanding Faculty

Scholarship while he and Dr. Nathan Rank has previously been recognized with the Bernie and Estelle Goldstein Award for Excellence in Scholarship. Our junior faculty members have also marked noteworthy accomplishments within the last year. Dr. Lisa Hua was recently awarded a 5-year NIH research grant and Dr. Lisa Bentley received funding from a NSF-CAREER grant. Dr. Brent Hughes and his students published separate studies in the prestigious journals of Science and Nature. Many faculty members participate in pedagogical enhancement activities to improve their effectiveness in their course offerings and approach to teaching. Most recently five TT faculty (Drs. Mackenzie Zippay, Lisa Bentley, Derek Girman, Dan Crocker, and Sean Place) and two lecturers (Dr. Shannon Lee and Ms. Wendy St. John) participated in a NSF funded grant aimed at Transformative Inclusion in Postsecondary STEM (TIPS) education. Furthermore, for the last five years, a few Biology faculty (Drs. Lisa Bentley, Shannon Lee and Mackenzie Zippay, and Wendy St. John) have developed and participated in the Sonoma Mountain Connection (SMC) program. This privately funded program, which will sunset at the end of this academic year, is meant to improve retention, graduation rates of first- generation STEM majors, and minimize GPA gap. Specifically, SMC has improved the success of underserved students in STEM early in their university studies by integrating three high-impact education practices focused on cohorting, research experience and outdoor learning. SMC combines research experiences with social immersion in the outdoors, while easing the transition to college life. Students develop a social rapport with each other and their instructors by building a network that supports them through the challenges of university life and providing a strong sense of belonging. Although our cohorts are small, students in the SMC program have a slightly higher retention rate of 79% compared to the university retention of 75.6%.

7.2 University Service

The Department of Biology has a strong history of participation in university governance (Appendix 5). Many Biology instructors have been elected as representatives of the School of Science and Technology to seven committees of the Senate, with four serving in leadership positions (chair or coordinator). Many faculty members have been actively involved in University committees such as the Animal Care Committee, Scholarship Committee (appointed by President), University RTP committee, Academic Planning and Resource Committee, College RTP committee, the newly formed Institutional Biosafety Committee, and the Faculty Subcommittee on Sponsored Programs.

Several faculty members have also played a leading role in various professional organizations that have direct impact on the campus, department, and faculty professional growth and development. These organizations include COAST (Council on Ocean Affairs, Science and Technology), on which Dr. Place recently served as the Chair of the executive committee, CSUPERB (California State University Program for Education and Research in Biotechnology), Dr. Rank has served as President of the Pacific Coast Entomological Society, and CeNCOOS (Central and Northern California Ocean Observing System – SSU signatory).

7.3 Professional Accomplishments

Faculty members in Biology actively engage in externally funded research and publishing in peer reviewed journals. Since 2017, external funding of over $5.4 M has been received from a wide variety of agencies, including the National Science Foundation, National Institutes of Health, US Fish & Wildlife Service, USDA Forest Service, National Parks Service, Office of Naval Research, National Environment Research Council (UK), California Sea grant, as well as

CSUPERP, and COAST. These funds support faculty/student research, department educational activities and purchasing equipment for core facilities. Results from faculty and student research has produced over 100 publications in peer- reviewed journals.

The faculty continue to build local, regional, national and international research collaborations, including the Sonoma County Water Agency, Sonoma Land Trust, the Presidio Trust, Golden Gate National Recreation Area, Point Reyes National Seashore, UC Davis, UC Berkeley, UC Riverside, Santa Clara University, Cornell University, Northwestern University, North Carolina State University, Indiana University, Stockholm University, University of Helsinki, and Okinawa Institute of Science & Technology.
Collaborative efforts and grants with other institutions support purchase of equipment used extensively in the delivery of delivering the undergraduate curriculum, and provide students future graduate/professional opportunities.

The level and breadth of the program's faculty has been called upon to serve the academic community in manuscript reviews and editorial boards. In addition to the numerous manuscripts reviewed since 2017, faculty members have served as editors, associate editors, or on editorial boards for many publications, including Proceedings of the Royal Society B, Genes, BMC Genomics, AoB Plants, Biological Invasions, Journal of Plant Research, Marine Biology, Functional Ecology, Physiological and Biochemical Zoology, Frontiers in Aquatic Physiology, and PloS One.

The department offers several supervision/contract courses which are designed to enhance student professional development, career goals and interest in research. Department faculty (tenured and tenure-track) participate in these courses with different levels of involvement reflecting student interests, faculty expertise and other aspects of faculty workload. During the last five years, Biology faculty supervised 302 undergraduate students in their senior research projects, 32 in independent [research] studies, and 63 in supervised internship courses. Because of the Department's success in attracting external funding, many opportunities exist for undergraduate majors to participate in funded, original and publishable research projects through Special Studies electives or paid summer internships. Many of the experiences provided to the majors often lead to placements at research institutions, agencies, or graduate programs.

8. INSTITUTIONAL SUPPORT

8.1 Physical Facilities

The Department consists of 8 teaching laboratories, 10 faculty research laboratories (CSU classification, instructional support space), 2 stock/lab preparation rooms, a combined museum (herbarium, vertebrate, insect), a walk-in cold room containing a recirculating cold seawater system, a small animal room, and a greenhouse complex of three houses. Office space consists of a main department office and 16 offices allocated to full time and part time faculty, and one dedicated to graduate student office space.

8.2 Financial Resources

Previously, the program relied on the Department operating budget and modest laboratory fees (appendix 6), supplemented by community donations of supplies and faculty research grants, to support operating and instructional laboratory expenses. The operating budget for the

Department is $23,524 per year for the past five years. This covers office, laboratory and field supplies. Historically, the Provost's Office provided a small level of support for field trips expenses, primarily tied to rental vehicle costs. These funds were eliminated in 2018, and the department has relied on a generous donor fund for undergraduate field experiences ($5000 – $10,000/ year) to cover the growing costs associated with course field trips in recent years. Through the Office of Administration and Finance, faculty and staff are provided computer refresh opportunities every 5-7 years, on average. Instructionally Related Activities support has provided students opportunities to work on museum collections and outreach activities.

8.3 Human Resources

The Department has a workload policy for tenure/tenure track faculty of a minimum of 18 Weighted Teaching Units (WTU) of direct class instruction per year and a maximum of 6 WTU of supervisory coursework per year. The Department identifies this approach has the "9+3" model, with 9 WTU per semester of direct instruction plus 3 WTU of supervisory instruction. The supervisory instruction is needed in support of the research-based graduate program, and required capstone research experience for the B.S. degree. The Department Chair and Curriculum Committee are responsible for enforcement of workload. Faculty often carry several units of assigned time for School and University service, including Department Chair (16 WTU/year), Radiation Safety Officer (4 WTU/year) Health Professions Advisory Committee Chair (2 WTU/year), or have buyout from grants or reassigned time for School or University service. Assigned time is reimbursed to the School and comes back to the Department as part of the temporary faculty budget. Finally, all faculty are assigned 6 WTU per year to cover non-teaching associated workload such as advising (typical advising load of 33:1, students:faculty) and university governance.

The Department workload policy is a mechanism to insure a balance between direct instruction, assigned time, and supervision. Although the workload policy identifies up to 6 WTU per year for supervisory courses, demand can push the averages over this amount as several faculty carry a heavy supervisory load to meet the needs of students in the B.S. degree track.

The Department has two temporary faculty members on 3-year contracts. Historically, these faculty are critical in staffing lower division General Education courses (BIOL 110, 115). For the past several years, these faculty have also regularly contributed to our lower-division majors courses as well as upper-division elective courses popular with our students. Both have been with the Department for more than 10 years and have consistently received highly favorable student, peer and annual reviews of their teaching effectiveness. The Department relies on several part-time lecturers when budgets permit. Like the 3-year contract lectures, they are utilized in lower division GE courses, service courses (BIOL 220, 240) and for gaps in the upper division. The Department also utilizes graduate student teaching associates in the lower division (BIOL 110, 130, 131) laboratories and upper-division core discussions (BIOL 320, 321). The use of TA's allows an efficiency of offering large lecture sections and smaller laboratory/discussion sections.

The number of full-time tenure/tenure-track (TT) faculty in the Department over the past 5 years has ranged from 10 to 12. With faculty service and reassignments, the full-time equivalents for TT faculty is still below demand for student needs despite the decrease in FTES. Thus, the Department has maintained dependance on a consistent pool of lectures to offset this demand. As

long-term lecturers retire or move on, we have been met with challenges in replacing them and providing consistency of instruction in some of our courses. Expected TT hiring in targeted areas will provide much needed stability in these areas of our curriculum. The program is able to staff lower-division laboratory and discussion sections with a robust graduate student population as Teaching Associates. Even with these additions, the program's student-faculty ratio (SFR) has remained one of the highest in the University (see Table 9 below).

Table 9.

Faculty full-time equivalents (FTEF), student full-time equivalents (FTES), and student-faculty ratio (SFR). Lec = part-time faculty lecturers, TA = graduate teaching associates, TT = full-time, tenure/tenure track faculty.

Term	Total FTEF	Lec FTEF	TA FTEF	TT FTEF	TT Head Count	Total FTES	Dept. SFR
FA 2019	16.92	2.0	3.5	11.41	12.5	379.8	22.4
SP 2020	15.72	3.5	3.8	8.42	12.5	316.5	21.1
FA 2020	15.42	2.2	2.7	10.52	11.5	369.2	23.9
SP 2021	13.63	3.3	2.9	7.43	11.5	330.9	24.27
FA 2021	15.38	3.4	3.1	8.88	12.5	369.0	24.0
SP 2022	13.54	2.33	2.5	8.71	12.5	302.3	22.3
FA 2022	13.05	2.91	2.5	7.64	12.5	343.5	26.3
SP 2023	14.93	3.33	3.0	8.60	12.5	294.6	19.7
FA 2023	12.73	2.41	2.7	7.62	11.0	298.2	23.4
SP 2024	13.96	3.33	2.3	8.33	11.0	293.7	21.0
FA 2024	13.92	2.41	2.6	8.91	11.0	297.0	21.33

The Department has 1.5 Administrative Coordinators to cover all administrative aspects of the Department, and to serve the School's Health Professions Advisory Program. The Department also has 2 FTE for Instructional Support Technicians who oversee the preparation and set up of over 40 laboratory sections per semester. They are also responsible for general maintenance of the Department's physical facilities, including safety oversight.

9. ACTION PLAN

The past two years have seen major revisions to the undergraduate curriculum, linked to changes in the status of the budget, the student body and the faculty. With a renewed curriculum and greater focus of the CSU on student success and graduation, the program must monitor the progress of majors and assess their success in meeting the program learning objectives. The program should also be vigilant in examining how well the breath of biology is represented and presented to majors, identifying programmatic deficiencies, and using the information in guiding future changes and/or faculty hires and space needs. The program maintains its commitment to successfully use the teacher-scholar model in ensuring faculty maintain currency in their fields and provide students a capstone experience in their degree – a proven high impact practice "based on evidence of significant educational benefits for students who participate in them—including and especially those from demographic groups historically underserved by higher education." (AAC&U).

Therefore, the continued success of the program will involve undertaking the following:

- Evaluate impact changes in the lower division sequences has on efficacy and student success in upper-division courses.
- Evaluate efficacy and student demand and success in the revised B.A. and B.S. concentration options.
- Continued Evaluation of student demand and success in the B.A. and B.S. degree options.
- Continued development of assessment activities, including within the core sequences. Monitor outcomes from the above points and use the results in guiding future tenure-track faculty hires and space needs.