Program Name: General MA in Biological Sciences

Current unit requirements for program: The MA degree requires completion of 30 units of coursework with a minimum 3.0 GPA. The 30 units must include a minimum of 18 units of 200-level seminar courses.

Each student who receives a Master of Arts degree from the Department of Biological Sciences must submit a written project based on a research problem in biology under the supervision of a graduate advisor. The project is based on a Grant Proposal: a research proposal in the format required by a state or federal granting agency (e.g., National Science Foundation, National Institutes of Health) based on a novel hypothesis that addresses a biological problem.

Listing of all required and elective courses for program (specify which):

Required Courses:

(2 units) **BIO 220.** Introduction to Scientific Inquiry. Units: 2.0
(1 units) **BIO 294A.** Seminar in Molecular and Cellular Biology. Units: 1.0
  OR **BIO 294B.** Seminar in Ecology, Evolution and Conservation. Units: 1.0
(2-3 units) **BIO 221A.** Cell and Molecular Methods and Techniques. Units: 2.0
  OR **BIO 221B** Methods in Ecology, Evolution, and Conservation. Units: 2.0
  OR **BIO 221C** Exploration of Biological Methodology. Units: 3.0
(2 units) **BIO 299** Problems in Biological Sciences.
(2 units) **BIO 502** Masters Project. Units: 2.0

Elective Courses (20-21 units):
20-21 units of approved elective course work in Biological Sciences.

Note: Two additional units of BIO 294A /BIO 294B can be taken. Two additional units of BIO 299 may be taken. Up to six units of upper division (100-level) coursework can be taken as approved by from their advisory Committee. Elective courses may be chosen from any of the following available BioSci graduate courses (Note: some of the courses listed below are required core courses in other BioSci M.S./M.A. concentrations):

**BIO 222.** Molecular Biology. Units: 3.0
**BIO 223.** Human Molecular Genetics. Units: 3.0
**BIO 224.** Genomics, Proteomics, and Bioinformatics. Student Units: 3.0
**BIO 225.** Stem Cell Biology and Manufacturing Practices. Units: 1.0
**BIO 245.** Host/Pathogen Interactions. Units: 3.0
**BIO 247.** Contemporary Topics in Immunology. Units: 2.0
**BIO 260.** Advanced Ecology. Units: 3.0
**BIO 269.** Behavioral Ecology. Units: 3.0
**BIO 273.** Advanced Fishery Biology and Management. Units: 3.0
**BIO 279.** Conservation Biology and Wildlife Management. Units: 3.0
**BIO 282.** Evolution. Units: 3.0
**BIO 283.** Biogeography Units: 3.0
**BIO 285.** Topics in Biology. Units: 3.0
**BIO 293.** Research Conference. Units: 2.0
**BIO 297A.** Teaching Biology Seminar. Units: 1.0
**BIO 297B.** Laboratory Teaching. Units: 1.0

All graduate courses in the Biological Sciences are on a once per year or once every other year cycle.
Criterion 1: Quality of Curriculum, Instructional Personnel, and Curriculum Delivery

The M.A. no concentration is one of our newest programs, established at the same time as our MA Stem Cell concentration. Our first set of students for the General MA matriculated into the university Fall 2009, with our first student graduating Spring 2011. The General MA program was established with the working professional in mind, including High School teachers that are seeking a master’s degree to enhance their eligibility to teach at the Community College-level. Therefore, we concomitantly dramatically enhanced our two-course (BIO297a/BIO297b) graduate teaching assistantship program. Rather than our previous seminar-based approach to teaching the course, BIO 297a now actively engages our students in a significant amount of pedagogical research and assessment training along with hands-on training in the classroom (BIO 297b).

In addition to these programs, we created two new team-taught research methods courses (BIO 221a, BIO221b) that our students take in their first year. Taking this course is particularly important for our General MA students as it is the only time that they will have formal training for hands-on science skills acquisition in our program (outside of science pedagogy). It is in BIO 221 that students are presented with opportunities to learn new technological methods, particularly in the BIO 221a Molecular and Cellular-based course where students learn advanced molecular technologies including conventional and epifluorescent microscopy, flow cytometry, real-time PCR, and bioinformatic programs. These courses use all state-of-the art instrumentation much of which was obtained by our faculty through competitive national grant awards.

In response to the needs of our General MA students, we recently included the new BIO 221c. Exploration of Biological Methodology course which is a cross-discipline based approach for a student interested in multiple technical aspects of approaching a scientific question. As stated in the new course description, “this course explores a selected topic from multiple scientific perspectives. A discovery-based laboratory project using cell and molecular techniques complimented with lectures, discussions and field trips that investigate the ecological, environmental, and evolutionary aspects of the same topic. The laboratory project will focus on a current biological topic (such as genetically modified organisms) in accordance with the instructor's interests and expertise. One hour lecture, six hours lab per week.” Although we are excited about this new course, which is perfectly pitched for the new general M.A., with budget cuts, we have not yet had the funding to teach it.

Finally, with regard to rigor, it is important to note the following. There was great concern on the part of some of our faculty in approving this program. They expressed concern that it would be a “second class” program. In other words, some thought that it would not be as rigorous as an M.S., and would perhaps act as an “out” for students that didn’t have the aptitude for a traditional M.S. thesis-based program. In order to prevent currently matriculated M.S. students who were not thriving in their thesis program requirements from switching to an M.A., we mandated that all students would be required to go through the traditional application process and be accepted in to the M.S. degree program. What has transpired since our M.A. program began almost three years ago is quite unexpected. To date we have graduated one M.A. student. This was a student that subsequently earned his law degree, and is planning to patent his M.A. project ideas for drug development. Additional evidence for the program’s rigor is that we have had no students request to move into the M.A. from the M.S., but rather two M.A. students have successfully transferred to the M.S. program. Both students are in the EEC area (Ecology, Evolution and Conservation) and had become so enamored with their project proposal, as they were going through the grueling process of advancement, that they have chosen to switch to the M.S. thesis program so that they can perform the research that they have proposed and see their project to the end.
### Criterion 2: Clearly Developed Learning Outcomes

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<th>Learning Outcomes</th>
<th>Activities that Contribute to Acquisition of Learning Outcomes</th>
<th>Methodologies to Assess Learning Outcomes</th>
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<tr>
<td>1. Students will demonstrate critical thinking through their ability to effectively search the scientific literature; read, understand and critically evaluate that literature; and draw appropriate conclusions from that literature.</td>
<td>1. <em>BIO 220: Introduction to Scientific Inquiry,</em> Presentations &amp; Critical Analysis of Primary literature in graduate coursework: Project preparation. <em>This is a major LO activity for MA-general</em></td>
<td>1. <em>BIO 220</em> grade; Course grades reflecting acquisition of skill; Interaction with Major Professor &amp; Supervisory committee</td>
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<td>2. Students will demonstrate acquisition of discipline-specific knowledge</td>
<td>2. Graduate Coursework; Proposal and Project preparation. <em>This is a major LO activity for MA-general</em></td>
<td>2. Course grades reflecting knowledge; Advancement and Exit seminars; written adv. proposal and final written project</td>
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<td>3. Students will be able to design original experiments, or conduct observations, with appropriate controls that test alternative hypotheses.</td>
<td>3. Methods and Techniques courses <em>BIO 221A/221B/221C established in 2010 &amp; 2011 from assessment specifically for acquisition of this LO; This is the ONLY acquisition for MA-general</em></td>
<td>3. <em>BIO 221</em> grade, Interaction with Major Professor &amp; committees; written documents and seminars required for both Advancement &amp; Exit</td>
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<td>4. Students will be able to collect experimental data using appropriate theoretical, laboratory or field techniques and/or instrumentation.</td>
<td>4. Methods and Techniques courses <em>BIO 221/BIO 221B established in 2010 from assessment for acquisition of this LO; This is the ONLY acquisition for MA-general</em></td>
<td>4. Course grades reflecting acquisition of skills; Interaction with Major Professor &amp; Supervisory Committee</td>
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<td>5. Students will be able to analyze and evaluate scientific data using appropriate statistical and other analytical tools (e.g., phylogenetic, bioinformatic, and/or mathematical software)</td>
<td>5. Methods and Techniques courses <em>BIO 221A/BIO 221B; BIO 167 in EEC area; BIO 224 in MCB area; These courses are the primary activities for this LO acquisition for MA-general</em></td>
<td>5. Course grades reflecting acquisition of skills; Interaction with Major Professor &amp; Supervisory Committee; Presentation of Results for Advancement and Exit (Written and oral Proposal and Project)</td>
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<td>6. Students will be able to communicate science and particularly their own scientific discoveries through a variety of media, including oral communication (e.g., presentations, seminars), visual communication (e.g., graphs, figures, posters) and written communication</td>
<td>6. <em>BIO 220: Introduction to Scientific Inquiry (revised to meet GWAR Fall 2010)</em>; Written and oral presentation of primary literature, and content-based information in graduate coursework; project preparation. <em>This is a major LO activity for MA-general</em></td>
<td>6. Initial assessment in <em>BIO 220</em>; Course grades; Mid-level Assessment by Committees during written and oral presentation required for Advancement to Candidacy. Final Committee Assessment during oral Exit seminar and evaluation of written Project.</td>
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Program Name: (M.A. Biological Sciences, General Biology)
Criterion 3: Advising Program and Graduation Success

As detailed in the previous IPP, each of our students must first obtain a project advisor/mentor before they can matriculate into our General MA program. This provides an effective one-on-one advising system with inherent student accountability. Within their first year, students select an advisory Committee from the faculty in the Biological Sciences Department, and may include an expert outside of the department on that committee with the approval of the major professor. The major professor helps the student in their project proposal topic selection and design, and assists in graduate course selection appropriate to the chosen project.
Criterion 4: Strength of Teaching Performance

{add response here}
Criterion 5: Program History and Development Status
{add response here}

Criterion 6: Impact, Justification and Centrality to University Mission
add response here

Criterion 7: External Demand for the Program

In addition to the quantifiable numbers presented in the original IPP document which provided a table of data taken directly from the Bureau of Labor Statistics, Occupational Outlook Handbook, 2010-11 Edition http://www.bls.gov/oco/ocos047.htm, it is important to note the following.

The 2008 Sacramento Regional Workforce Forecast highlights “Employers in the Sacramento Region’s key industries cite a critical need for managers across all disciplines. This shortage is becoming even more evident as retirees are increasingly moving out of positions at all management levels.” Further evidence is made for the need for Master’s level training in the sciences. We developed our general M.A. program for the working professional to meet this need. Specifically for individuals that required a Master’s level education to move into managerial positions in the Biotech industry, or at local State Agencies. Additionally, the general M.A. was designed to train Middle school and High School teachers interested in obtaining the minimum degree required for teaching at the community college level.

The general MA program is relatively new, established Fall 2009. We graduated our first student Spring 2011. This student was a professional who subsequently also obtained his law degree from McGeorge School of Law. Currently matriculated students in our general MA include students interested in Community College teaching, as well as professionals from local state agencies.

Criterion 8: Program Size, Scope
{add narrative here}

Criterion 9: Internal, Non-major Demand for the Program
{add narrative here}

Criterion 10: Quality of Program and Resource Utilization
{add narrative here}

Criterion 11: Revenue and Other Resources Generated by Program
{add narrative here}
Criterion 12: Costs and Other Expenses of Program

The following is a better Contextualization of information from the original IPP document

What steps have been taken to improve efficiency? The General MA is a new program. Students matriculated into this program Fall 2009, with first student graduating 2 years later Spring 2011. The Department has significantly changed its admission requirements for all of its graduate programs, streamlining by requiring supplementary information, instituting a process to match students with available faculty/resources, and limiting applications to once/year. This has improved faculty support and advising and enhanced student progress to degree throughout our graduate program. We were pleased that our first student accepted into the general MA program graduated in two years. Curricular changes that were implemented in the new MA include an increase in the number of required research (Bio 299) units to reflect the actual time graduate students dedicate to their project writing, and reduce required non-supervisory units. A new team-taught research methods course (BIO 221) is taken by combined cohorts of first year students in our various graduate programs including the general MA. Courses that our general MA students take have been merged and revised, and there is a formalized 2-year course schedule for all graduate courses. Finally, to allow students to benefit from expertise beyond its own faculty, we revised our policy on composition of a student’s supervisory committee to include an “outside” member who has earned a Ph.D. in Biological Sciences or a related field and who is not a tenured or tenure-track faculty member in the Dept. of Biological Sciences at CSUS.

What kind of investment is needed to improve the program? The department has the following high-priority concerns that directly influence the quality of curricular offerings to general MA students:

- **3 units Assigned time/semester for a graduate coordinator.** This is the most important need for the general MA. A nexus for all graduate student contact and information, this person facilitates student retention and time to graduation. They coordinate and oversee all activities from student acceptance into our program, and advancement to candidacy (which includes proposal presentation and evaluation), to thesis/project review and exit seminars, and graduation. Furthermore, they are the conduit between our Dept. and the Office of Graduate Studies, and the contact person for all prospective graduate students. It is a Herculean effort to attempt to do this job effectively while concomitantly teaching a full 12-unit load in the Biological Sciences. We used to have assigned time for this position; we need it back, or the program and/or the faculty will rapidly deteriorate.

- **Modern facilities** – we desperately need a new building with modern labs/equipment/classrooms and study area for enhanced peer teaching and learning.

It is important to note that our faculty essentially teach and advise in the general MA program for free. No compensation for WTU, etc.