Current unit requirements for program:

The MS 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.

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

Required Courses:

- (2 units) **BIO 220.** Introduction to Scientific Inquiry. **Units:** 2.0
- (2 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 units) **BIO 221A.** Cell and Molecular Methods and Techniques. **Units:** 2.0
- **OR** **BIO 221B.** Methods in Ecology, Evolution, and Conservation. **Units:** 2.0
- (3 units) **BIO 282.** Evolution. **Units:** 3.0
- (6 units) **BIO 299.** Problems in Biological Sciences.
- (4 units) **BIO 500.** Master’s Thesis. **Units:** 4.0

(11 units) of approved elective course work in Biological Sciences. Note: two additional units of BIO 294 A/B can be taken. No more than 6 total 299 units can be counted towards 30 units. 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):

Elective Courses:

- **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

Most graduate courses are taught once per year or once every other year.

With approval from their advisory Committee, students may choose electives from a select number of 100-level courses.
Criterion 1: Quality of Curriculum, Instructional Personnel, and Curriculum Delivery

Contemporary Curriculum and Curriculum Rigor: The Overall Curriculum in the M.S. no concentration spans the spectrum of multiple disciplines in the Biological Sciences. Students interested in being a Generalist can take courses across the disciplines of BioSci, however, most of our students enrolled in the General M.S. choose the majority of their electives within one area of specialization. As many of our graduate courses are offered once every two to four semesters for budgetary reasons, the no concentration option provides significantly more flexibility for our students in their course selection options, and can therefore decrease their time to graduation. Additionally, it provides for newly identified cross-discipline research. Several of our current graduate students are using molecular applications to answer environmental and ecological questions. This new and growing contemporary concept is provided in our program through the flexibility of our M.S. General Concentration.

Biological Sciences is a dynamic field. Therefore each of the courses offered in our program is regularly revised and updated to reflect the changes in the discipline. The majority of our graduate courses require that the students read the current primary literature in research journals, to synthesize the material provided in those articles, and to critically evaluate the science presented therein. Thus our graduate courses have an inherent contemporary and rigorous nature to them. We have also recently revised the course offerings in our program to better meet budgetary constraints as well as the changes in biological sciences. This can be observed in our new BIO 221A and BIO 221B techniques/skills -based courses (established Jan 2010) that focus on a different experimental question each time the course is offered. In BIO 221A: “Students learn both cell and molecular techniques in the context of hypothesis-driven research to answer questions relating to a specific gene and cellular system.” In BIO 221B: “Students learn field and laboratory techniques with a variety to taxa in a range of local ecosystems. Students work with several faculty conducting research projects. Topics will include developing hypotheses, experimental design, study implementation, and statistical analyses.” As well as our new BIO 294A/BIO 294B seminar courses (approved Jan 2011) in which students are required to review and discuss the primary literature and present individual seminars based upon the specific contemporary topic in Biological Sciences chosen for the course that semester.

The Student Evaluations for our graduate courses requests that the students address both the rigor of the course as well as the contemporary nature of the information provided. These two areas are regularly rated with high marks in student evaluations (average 4.5-5.0 on a scale from one to five with 5.0 being highest). Additionally, regarding grade distribution as evidence of course rigor, according to The Fact Book although the majority of our graduate students earn A and B course grades, 3-4% of our students earned C and D grades. Interestingly, this number has decreased as we increased our requirements for entrance into our graduate program.

Faculty Qualifications: All FT/PT faculty that have taught graduate courses in Biological Sciences since 2006 have a Ph.D. in specializations aligned with their teaching assignment. Most faculty members also have post-doctoral experience and professional training directly related to their area of specialization within the biological sciences. The data for all of our graduate courses for the 2010-2011 academic year is as follows: the total number of full-time and part-time WTUs devoted to non-supervisory graduate courses in Biological Sciences was 36 (18 WTUs each semester). Of those, 30 WTUs were taught by full-time faculty and 6 WTUs by part-time faculty. Therefore, 83% of all of our non-supervisory graduate courses were taught by Full-Time faculty (FactBook, Fall 2011 Appendix A). Note: Of the 6 Part-time WTUs, 3 were in the area of Cellular & Molecular Biology, and 3 were in the area of Ecology. Both courses benefited from having a professional working in the discipline teach the course (e.g. BIO 273: Advanced Fishery Biology and Management was taught by a Senior environmental scientist from the California Department of Fish and Game).

Use of Technology: Advanced molecular technologies including conventional and epifluorescent microscopy, flow cytometry, real-time PCR, and bioinformatic programs. Advanced field technologies include GPS, remote sensing, and complex graphical analyses programs, real-time digital data gathering and sharing systems. The majority of our instrumentation was obtained in the last three years through competitive extramurally funded grants.

Program Name: (M.S. Biological Sciences, General Biology)
## Criterion 2: Clearly Developed Learning Outcomes

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Activities that Contribute to Acquisition of Learning Outcomes</th>
<th>Methodologies to Assess Learning Outcomes</th>
</tr>
</thead>
<tbody>
<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: Thesis preparation</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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<tr>
<td>2. Students will demonstrate acquisition of discipline-specific knowledge</td>
<td>2. Graduate Coursework; Proposal and Thesis preparation.</td>
<td>2. Course grades reflecting knowledge; Advancement and Exit seminars; written proposal and thesis</td>
</tr>
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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/BIO 221B established in 2010 from assessment specifically for acquisition of this LO</em>; <em>BIO297A</em>; laboratory or field work for thesis research</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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<tr>
<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</em>; laboratory or field work for thesis research</td>
<td>4. Course grades reflecting acquisition of skills; Interaction with Major Professor &amp; Supervisory Committee</td>
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<tr>
<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</em>; <em>BIO 167</em> in EEC area; <em>BIO 224</em> in MCB area; <em>BIO 297A</em>; laboratory or field work for thesis research</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 Thesis)</td>
</tr>
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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, original data, and content-based information in graduate coursework; thesis preparation; presentation at scientific meetings</td>
<td>6. Initial assessment in BIO 220; 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 thesis.</td>
</tr>
</tbody>
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Criterion 3: Advising Program and Graduation Success

{add response here}
Criterion 4: Strength of Teaching Performance

We have a twenty-five page Departmental RTP document that was revised Fall 2006, and then again last year through an arduous but successful process with a Departmental Committee of the whole. Our new revised document has just been approved by the UARTP committee.

As detailed in the previous IPP, unless the faculty member is a Full Professor, all faculty members, PT and FT and regardless of experience, are required to have all classes evaluated by students every semester. Full Professors are required to have at least two courses evaluated each year, although most continue to evaluate every course they teach. Several of our faculty include additional course assessments during the course of the semester to inform the effectiveness of their teaching methods in the course. This is especially important for our new courses. This information is not included in a WPAF.

In addition to our RTP committee, our department also has a Faculty Development Committee that meets individually with faculty during the course of the academic year.
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

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

Regarding faculty productivity. Over the last six years, eighteen of our twenty-two faculty in the Department of Biological Sciences have actively participated as a graduate advisor in our graduate program. Including just these eighteen faculty in the Department of Biological Sciences that have participated as a major professor in our graduate program, forty-one manuscripts have been published, and eighty-three scientific presentations have been made at professional society meetings between Jan 2006 and Jan 2012. It is important to note that the majority of these faculty have been teaching a full 12-unit teaching load, with no assigned time for research during this six year period, and no WTUs provided for either 199 or 299 units. Imagine what the productivity would be if there was resource allocation to our faculty for this purpose. All eighteen faculty included in these statistics also participate in the teaching the coursework required in our graduate program. As the General M.S. program incorporates faculty in all areas of Biological Sciences, both for teaching and for research, all eighteen faculty were included in these calculations.

Service to the University and to the Community is regarded as a top priority for a number of the faculty in our department. The following is data obtained exclusively from those faculty that teach in our graduate program. It includes the programdepartment in the University followed by the number of faculty involved in collaborations with that program/department in parentheses: Center for Teaching and Learning (2), Community engagement Center (2), Graduation Initiative (1), Office of Global Education (3), Science Educational Equity (2), Chemistry (3), Criminal Justice (1), Environmental Studies (3), FACS (1), Geology (2), Nursing (1), Philosophy (1), Physical Therapy (1), Physics (1), Teacher Training (1), Sociology (1).

Service to the Community includes both service in professional societies and editorial and grant review boards as well as service to the non-scientific community as a resource for scientific information. The eighteen full-time faculty that teach in the Biological Sciences graduate program together are involved in over twenty-six different professional societies, have served twenty-three different organizations in the community, and reviewed manuscripts and/or grants for over twenty different journals and funding agencies.

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

With regard to contextualization of Criterion 12 for our General M.S. degree program.

The Data and information that was provided for Criterion 12 in the original General M.S. IPP document is highly representative of this area, as the eighteen faculty that participate in the teaching of our Department Graduate program are each equally likely to teach and to mentor students in this General M.S. program as they would a program within their specialization. Additionally, students in the General M.S. are equally likely to take one class as they are any other 200-level course offered by our department, with the exception of the core curriculum that all of our students in the graduate program take. Thus, the generalizations made in the original document that discuss costs and needs, are particularly relevant to our General M.S., perhaps even more so than to any other graduate degree program we offer in the Biological Sciences.