

**Intent to Plan**  
**Master of Science / Arts in Biology**

**West Liberty University**



Prepared: May 2015

May, 2015

## INTENT TO PLAN

### **Master of Science/Arts Degree in Biology**

**5.2 Projected Date of Submission:** October 2015

**Projected Date of Implementation:** August 2016

**West Liberty University Mission:** To provide our students the opportunity for a high quality undergraduate, graduate, and professional education.

#### **5.2. a Statement of Objective:**

The West Liberty University Master of Science/Master of Arts in Biology program will prepare professionals in the field of biology for a career in research, industry, biological monitoring, and for doctorate-level education.

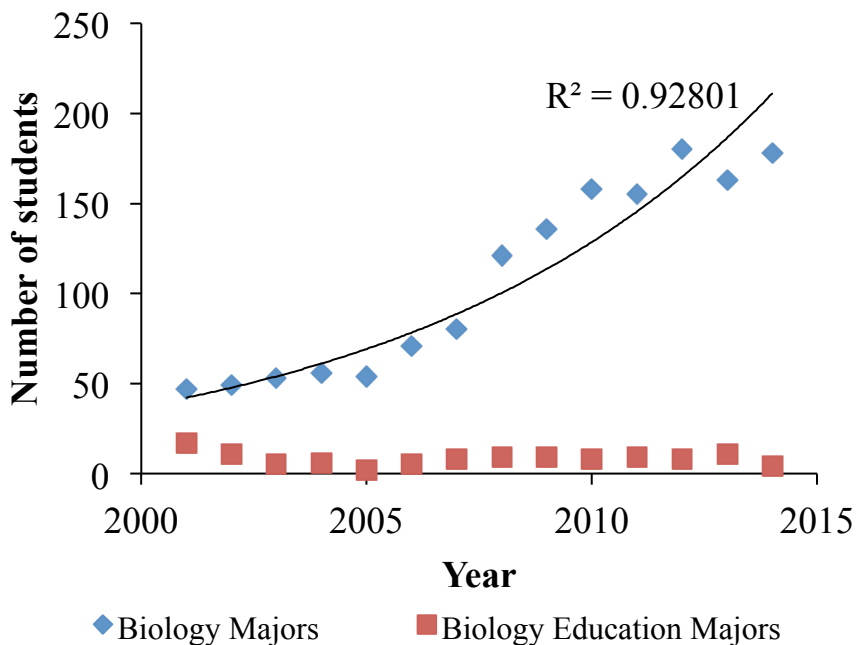
Since the early 1900's, West Liberty University has demonstrated a long standing tradition of providing a quality undergraduate education in the natural sciences. Specific to biology, West Liberty University has provided educational opportunities prerequisite to the creation of physicians, dentists, health professionals, and environmental scientists, as well as academics. The vast majority of northern West Virginia's secondary education biology instructors received their tutelage in biology at West Liberty University as well. Over the past decade, West Liberty's biology program course offerings have doubled, allowing for more focused instruction specific to biological sub-disciplines (microbiology, ecology, molecular biology, etc.) and increased recruiting of students to the program. Along with the addition of new courses, West Liberty's biology program also has witnessed a strong dedicated research effort, resulting in inclusion of research dollars, publications, and the associated culture that follows research in higher education.

Examples of West Liberty's Biology department's commitment to student research are many. During the 2014/2015 academic year, eight of nine (90%) of the biology program faculty secured

research dollars, resulting in the acquisition of \$456,000.00 dedicated to research. Each of the aforementioned faculty maintains an active research culture in their laboratory. At present 65 biology majors work on these projects, each of which usually has their own dedicated research question to which they are pursuing answers. Results of this work are presented at scientific meetings, and written for peer reviewed articles. West Liberty University undergraduate student highlights for the 2014/2015 academic year include one of our students winning best poster out of a field of 120, including Ph.D. and master's students as competition, in the Southern Division of the American Fisheries society meeting held in Savannah, Georgia, three students winning best overall research presentation in the fields of Organismal Biology, Cellular and Molecular Biology, and Health Sciences at the national Alpha Chi research competition in Chicago, Illinois, and two West Liberty biology majors, one of whom won best oral presentation and another winning best undergraduate poster presentation at the 2015 West Virginia Academy of Science meeting. Moreover, three undergraduates were bestowed travel awards for their research presented at the 2015 Mid-Atlantic Microbial Pathogenesis Meeting in Virginia. In addition to participation at meetings, West Liberty University undergraduates are frequently coauthors on peer-reviewed publications. Since January of 2014, WLU biology faculty have published 24 peer reviewed journals in 9 different periodicals; students were coauthors on nearly all of these publications. At present, with this increase in course offerings and dedicated research effort, an allied increased enrollment has occurred as well. A natural evolution for the current program is the inclusion of graduate education opportunities.

### West Liberty University Undergraduate Biology Enrollment Statistics

	<u>Biology Majors</u>	<u>Biology Education Majors</u>
2001	47	17
2002	49	11
2003	53	5
2004	56	6
2005	54	2
2006	71	5
2007	80	8
2008	121	9
2009	136	9
2010	158	8
2011	155	9
2012	180	8
2013	163	11
2014	178	4



Additionally, several faculty members who will be integrally involved in the MS/MA Biology program currently serve on thesis and dissertation committees for students at other institutions of higher education (West Virginia University, Marshall University, Appalachian State University, San Angelo State University, Indiana University of Pennsylvania, and Duquesne University) and are well versed in thesis-associated requirements.

### **5.2.b Program Description:**

The Biology Program, within the Department of Natural Sciences and Mathematics, currently offers a Bachelor of Science Degree in Biology with several different majors. A student may currently choose a B.S. degree program in Biology from one of the following majors: Ecology, Evolution, and Organismal Biology, General Biology, Microbiology, Pre-Medicine, Pre-Professional, D.E.A.P. (pre-dental early acceptance to dental school), Human Biology, or Environmental Stewardship and Education. Students may also choose a B.A. degree in Biology to teach at the secondary level. Our Biology Program was recognized by the Board of Governors of the state of West Virginia as a Program of Excellence in December 2005. **West Liberty University possesses the only Biology Program in West Virginia to have received this honor.** Moreover, Dr. Zachary Loughman, Assistant Professor of Biology, was named the West Virginia Professor of the Year for 2014. Dr. Loughman's research program, leadership, and expertise are integral to the success of the proposed Master of Science/Arts in Biology program.

With the strength of the current program, our natural next step is to develop a graduate level program in biology. We propose a program with three curricular options ending in either a Master of Arts in Biology or a Master of Science in Biology. The most innovative framework of graduate curriculum for an M.S. in biology comprises "the 3 plus 2" curriculum. Here, incoming undergraduate freshmen can declare that they want to enter the 3+2 program and would graduate with both a B.S. and M.S. in Biology after 5 years. In the first three years of the student's matriculation through our undergraduate program, they would take a more intensive course-load and would finish their B.S. requirements in three academic years. Years 4 and 5 would be spent fulfilling the requirements of the graduate degree. Ideally in year 4, students will complete their coursework, and during year 5, students will finish the necessary research, write, and defend their thesis. Financially, we propose to spread the cost of a traditional 4-year BS degree and 2-year MS degree over the course of 5 years. In other words, the 3+2 plan would bring in as much revenue as a standard BS and MS, but in less time. Therefore, this configuration will result in an overall revenue increase each year.

In addition to the 3+2 plan, we also propose a more traditional M.S. paradigm. Our proposed M.S. would also allow students with an appropriate 4-year Bachelor's degree to enter. These students would take coursework, conduct research, write and defend their thesis over the two years enrolled in the M.S. in Biology program.

The third option would be for a non-thesis Master of Arts in Biology. Rather than conduct research and write a thesis, these students would complete additional coursework. In addition

these students would be required to pass a comprehensive examination in the field of biological sciences.

The Master of Science/Arts in Biology will prepare graduates for a number of careers and future education options. For example, students receiving an MS in Biology could seek a career involving environmental monitoring, working as a laboratory technician, or working as a scientist at a pharmaceutical company. Moreover, students with an MS in Biology from West Liberty will be prepared for entrance into Biology PhD programs. The MA in Biology from West Liberty will better prepare students entering professional schools (such as medical or dental), teaching biology courses as an instructor at the collegiate level, or for a professional career that requires a graduate degree.

### **Program layout**

#### M.S. Degree Requirements

- Students must complete at least 32 hours of Biology graduate coursework, including the thesis. A maximum of 12 credit hours may be earned for the thesis.
- Candidates for the M.S. degree must register for and participate in at least six hours of Graduate Seminar (seminar will be 2 credit hours per semester) during each of the semesters while they are actively enrolled in the graduate program. No more than 6 hours of seminar may be used to complete the 32 credit hour requirement.
- Students must complete 14 credit hours in graded graduate Biology courses.
- Students may take up to 9 credit hours of “Independent Study” per semester. However, no more than 4 credit hours in “Independent Study” may be used to complete the 32-hour requirement. Moreover, these Independent Study credits may only be applied beyond the required 14 hours in Biology graduate credits.
- Successful completion of the program in Biological Sciences requires a GPA of 3.0 or higher, and no more than 6 credit hours of “C” grades may be applied to the total hours for graduation. Upon completion of course requirements and the thesis, M.S. candidates must pass a comprehensive oral examination.

#### M.A. Degree Requirements

- Students who select the M.A. option must complete a minimum of 36 hours of graduate coursework. MA students are permitted to take Graduate Seminar (2 credits per semester). No more than 6 hours of seminar may be used to complete the 36 M.A. in Biology credit hour requirement.

- M.A. candidates do not conduct thesis research. The Graduate Seminar, Graduate Biology courses, Independent Study/Special Problems, GPA, “C” grades, and comprehensive oral exam requirements are as stated for the M.S. degree.

#### Example Course Schedule for MS in Biology

##### **Semester 1**

<u>Course</u>	<u>Credits</u>
Seminar	2
Graduate Aquatic Ecology BIO509	4
Graduate Research Skills BIO5XX	3

##### **Semester 2**

<u>Course</u>	<u>Credits</u>
Seminar	2
Graduate Evolutionary Biology BIO528	3
Graduate Conservation Biology BIO540	4

##### **Semester 3**

<u>Course</u>	<u>Credits</u>
Seminar	2
Independent Study BIO5XX	7

##### **Semester 4**

<u>Course</u>	<u>Credits</u>
Thesis	12

#### Example Course Schedule for MA in Biology

##### **Semester 1**

<u>Course</u>	<u>Credits</u>
Seminar	2
Advanced Molecular Biology BIO560	4
Advanced Genetics BIO501	4

##### **Semester 2**

<u>Course</u>	<u>Credits</u>
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Seminar		2
Advanced Cell Biology	BIO572	3
Graduate Microbial Pathogenesis	BIO562	3
Graduate Human Genetics	BIO507	3

### Semester 3

Course		Credits
Seminar		2
Graduate Histology	BIO532	4
Graduate Epidemiology	BIO521	3

### Semester 4

Course		Credits
Graduate Virology	BIO565	3
Graduate Pathophysiology	BIO523	3
Independent Study		3

#### 5.2.c Assurance of Quality:

The institution will assure high quality standards through the employment of faculty who hold the terminal degree in the field of biology or a related expertise. Currently, all nine biology faculty hold terminal degrees in their field of study. There is no national accreditation body for a Master's degree in Biology. Program goals and student learning outcomes will be aligned with University standards. Additionally, all programs at the University are required to complete a systematic program review process every five years. This process provides continuing assessment for quality. The undergraduate biology program maintains a robust assessment plan that focuses on entrance, mid, and end point evaluation. The graduate program in biology will be no different. Every didactic course will have a major assessment (research papers, presentations, posters, pre/post examinations). Comprehensive oral examinations and thesis review will constitute program end point assessments of student learning. Indirect measures of program effectiveness and student satisfaction will also feed into the assurance of program quality. Student performance including publication, job placement, or doctoral program placement will also be tracked as data measuring program effectiveness.

#### 5.2.d State Master's Programs in Biology:

Currently, none of the small primarily undergraduate institutions in the state of West Virginia offer a Master's in Biology. The only schools offering such a degree in our state are West Virginia University and Marshall. Approximately 90% of WLU biology graduates in the past 5 years that we have sent to graduate school are choosing programs out of state because the

programs in-state do not offer the areas of interest or the atmosphere the students desire (small, highly interactive and flexible). Of universities in close proximity to West Liberty University in neighboring states, only Chatham University, the University of Pittsburgh, Indiana University of Pennsylvania, and Youngstown State University offer a Master's in Biology. Therefore, competition is minimal, and substantial opportunity exists to develop a graduate offering in a program with a proven record in preparing students for graduate and professional opportunities, establishing robust, supported research opportunities, and monitoring and maintaining quality academic opportunities.

#### **5.2. e. Demand for a Master's in Biology:**

There are currently five Biology majors (Juniors) at West Liberty University who stated that they would enroll in an M.S. Biology program here if we were to offer one. In addition, many students who have not initially been accepted into medical or physician assistant school indicate that an M.A. program would be a viable option for them until they ultimately achieve their original goal.

The increase of Shale drilling has indicated a demand for individuals having earned an M.S. in Biology. These professionals would work for environmental consulting firms to ensure the environmental impact, safety, and legality of drilling procedures.

Some grant funding opportunities are currently not available to West Liberty University Biology faculty because we do not have graduate students. Offering an M.S. would make us eligible for these funds and have a positive impact on the institution and the biology program. Within the biology program, the benefits of increased funding opportunities will continue to strengthen undergraduate experiences and opportunities while providing a new population of students opportunities which are limited in our region.

#### **5.2.f Additional Resources:**

For the proposed Master's program in Biology to be successful, we will need to replace the current faculty vacancy in Biology with an individual committed to developing/continuing research appropriate to the Biology program at West Liberty University. This faculty search is underway with those goals in mind. In addition we will need to hire one additional biology faculty member with a strong emphasis in research, the potential to mentor graduate students, and the ability to obtain extramural grant funding. Moreover, we will need a full-time department secretary to administer the thesis requirements, thesis defense scheduling, and paper work requirements of each graduate student and of the faculty.

With the addition of the new faculty hires, current faculty course loads will not change much as graduate courses will be dual-listed with undergraduate courses. However, mentoring of a graduate student will be equivalent to 3 course credit hours. The maximum number of graduate mentorship credits that a faculty can accrue is 6 (although there is no cap for the number of mentees per faculty).



In reference to the dual-listing of courses, all 400-level Biology courses will be listed as 400/500-level courses. Undergraduates and graduate students will enroll in the same course with different expectations. Learning outcomes for the graduate students in dual-listed courses will clearly delineate greater expectations, and additional requirements of graduate students, appropriate to the field of study. Examples of greater expectations may include that graduate students show development of independent critical thinking and evaluation of course material, and that graduate students present the evidence of their original critical analysis. Examples of additional assignments might include significant research papers, oral presentations of research on course assignments, and/or the demonstration of more sophisticated laboratory skills than those required of students in the undergraduate course.

Additional equipment and supplies needed to offer the Master's in Biology are minimal. We will require an additional autoclave that will be used to sterilize materials and biological waste generated by graduate student researchers. A budget increase that reflects the increased enrollment upon implementation of the proposed master's should suffice for other associated costs.

#### **5.2. g Instructional Delivery Methods:**

For the M.S. in Biology, students are required to complete 14 hours of coursework, with 18 research and thesis hours to complete the requirements for the degree. The intended instructional delivery method for the MS program will be onsite instruction and mentor-guided research. For the M.A., students will complete 36 hours of coursework delivered via onsite instruction.