



Wildlife Biology Program 2022 Assessment Report

All areas shaded in gray are to be completed by the department/program.

This document will be posted online and must be [accessible electronically](#) (including appendices).

MISSION STATEMENT

The Wildlife Biology Program has a focus on the ecology and conservation of free-living organisms and their habitats. We seek to provide the highest quality program contributing to the knowledge and conservation of wildlife in Montana, the region, and the world. To accomplish this, we (1) teach and administer B.S., M.S., and Ph.D. programs concerned with the biological, ecological, and social/political issues underlying the conservation of wildlife and the habitats in which they live; (2) advise and prepare undergraduate and graduate students for their careers and future education; (3) link basic and applied wildlife research contributing to the information needs of resource management agencies, science-based government and non-government agencies and organizations, and the general public for research-based information; and (4) serve the university, profession, and public.

DEPARTMENT ALIGNMENT WITH PRIORITIES FOR ACTION

After listing each departmental objective, indicate which of the five [Priorities for Action](#) the objective supports. In this section, you may also briefly describe any innovative or noteworthy programs/initiatives that support the Priorities for Action.

- 1. Strive to be the best:** Maintain a top-ranked wildlife biology program at UM that emphasizes excellence. A top-ranked program allows UM to recruit and retain the best fish and wildlife scientists in the world as faculty, and in turn, attract high-caliber students from Montana and across North America [*Priorities for Action: 1) Place student success at the center of all we do; 2) Drive excellence and innovation in teaching, learning, and research; 5) Proudly tell the UM story*]
- 2. Prioritize experiential learning and professional development:** Provide students with opportunities for development of field skills and professional exposure through classes, internships, independent research, senior thesis projects, jobs, and advice from faculty mentors and the program's undergraduate advisors. [*Priorities for Action: 1) Place student success at the center of all we do; 2) Drive excellence and innovation in teaching, learning, and research; 3) Embody the principle of "Mission First, People Always"; 4) Partner with place*]
- 3. Deliver a comprehensive wildlife biology curriculum:** Support classes in the physical, biological, ecological, and social sciences. Offer upper-level undergraduate courses and advanced graduate courses that synthesize knowledge across these sciences and teach principles, theories, and applied techniques for managing and conserving fish and wildlife. [*Priorities for Action: 1) Place student success at the center of all we do; 2) Drive excellence and innovation in teaching, learning, and research; 4) Partner with place*]
- 4. Advance science through research:** Ensure UM is on the cutting edge of wildlife science. Conduct rigorous basic and applied research to enhance student education and advance knowledge used to manage and conserve fish and wildlife. [*Priorities for Action: 1) Place student success at the center of all we do; 2) Drive excellence and innovation in teaching, learning, and research; 4) Partner with place; 5) Proudly tell the UM story*]
- 5. Emphasize diversity, equity, and inclusion:** Enhance diversity, equity and inclusion within all aspects of the Wildlife Biology Program with an emphasis on expanding educational opportunities for Native American

students. Modify pedagogy through incorporation of more inclusive instruction. [*Priorities for Action: 1) Place student success at the center of all we do; 2) Drive excellence and innovation in teaching, learning, and research; 3) Embody the principle of "Mission First, People Always"; 4) Partner with place*]

UNDERGRADUATE PROGRAM

STUDENT LEARNING OUTCOMES and MEASUREMENT TOOLS

Student Learning Outcomes	Exams (Written Evaluation within Class)	Oral Evaluation within Class	Major Paper within Class	External Evaluation of Students (S), Program Review (P)	Surveys (e.g., Alumni, Student, other)
1. Understand the biotic and abiotic environment as applied to wildlife conservation, including competencies in physical sciences, biological sciences, ecology, and specialized animal sciences.	X	X	X	X (P)	X
2. Increase ability to effectively communicate fish and wildlife science and issues in writing and speech to other scientists and the broader public.	X	X	X	X (P)	X
3. Ensure students learn field skills and have experiential learning opportunities (field trips, methods classes, internships, independent studies, and jobs).				X (S,P)	X
4. Acquire knowledge of quantitative and qualitative analysis to apply scientific methods to wildlife conservation issues, including research design, calculus, and statistics, with application to fish and wildlife.	X	X	X	X (P)	X
5. Develop basic understanding of social science and policy and cultivate a respect and understanding for the multiple values associated with wildlife conservation.	X	X	X	X (S, P)	X
6. Learn how to synthesize the variety of scientific knowledge and skills to solve problems in fish and wildlife sciences.		X	X	X (S, P)	X
7. Acquire knowledge about the wildlife profession and career opportunities through participation in extracurricular professional learning activities, student groups, seminars, independent studies, internships, and senior thesis projects.			X	X (P)	X
8. Develop greater cultural awareness and an	X	X	X	X (P)	X

Student Learning Outcomes	Exams (Written Evaluation within Class)	Oral Evaluation within Class	Major Paper within Class	External Evaluation of Students (S), Program Review (P)	Surveys (e.g., Alumni, Student, other)
appreciation for the need to diversify wildlife and natural resource professions to responsibly and inclusively serve society.					

RESULTS and MODIFICATIONS

Student Learning Outcomes results	Modifications made to enhance learning
There continues to be a wide variance in writing skills among our students. Some upper division students are not reaching the desired competency level for science writing.	There is a clear need to reestablish intermediate-level science and technical writing courses at UM for students pursuing STEM disciplines. Hopefully this will become a possibility at UM in the near future. It is not easy to meaningfully address science writing deficiencies in upper division writing courses within the wildlife biology curriculum. These courses are often oversubscribed (i.e, 30-40 students in a class intended for ~25). This has hampered wildlife faculty's ability to address writing deficiencies in advanced wildlife courses. As far as modifications, we repurposed a TA to provide upper division writing courses with additional TA support where possible. We also routinely encourage students to use the writing center. Additionally, we provide advanced students who complete senior theses with focused, one-on-one writing support as they complete their theses, but this does not address writing needs of most students in the program.
Need for greater math and statistics instructional capacity.	Reduced instructional capacity in math and statistics has become an acute concern that must be addressed if wildlife biology is to meet its program priorities listed above. All measurement tools consistently suggest a need for students to have better access to math and statistics support and smaller class sizes. Both total number of math and stat courses, and sections within a course, are inadequate due to declines in math/stat faculty at UM. Wildlife faculty have attempted to address some of these needs by adding an additional section of bio-statistics (WILD 240) and by periodically teaching a statistics computer programming course (Program R) when instructional capacity can be identified. However, the need will only meaningfully be met when UM can hire more math and statistics instructors/professors.
Need for expanding instruction on wildlife human dimensions	We have put forth efforts in recent years to expand instruction in social science and help students cultivate a respect and understanding for the multiple values associated with wildlife conservation. During this assessment period, employers increased their calls for universities to incorporate human dimensions courses into the wildlife curriculum. There were also journal papers published on the need for future wildlife professionals to have expanded education in social science, policy and leadership. To adequately meet this learning outcome, we made the decision to incorporate "Wildlife Human Dimensions" as a curriculum requirement for all students within the wildlife biology degree program. The class is being offered at the 200 level.
There is insufficient capacity to accommodate current numbers of terrestrial wildlife biology students in curriculum	Large numbers of students in the wildlife biology terrestrial option have caused required curriculum classes to be

Student Learning Outcomes results	Modifications made to enhance learning
<p>classes. Instructors of oversubscribed curriculum classes are challenged to effectively meet learning outcomes.</p>	<p>oversubscribed. Simply, instructional capacity has not kept pace with student growth in upper-division wildlife and biology courses for students pursuing the terrestrial degree option. The problem was exacerbated during the past few years when several wildlife faculty were selected for campus administration roles. These promotions of wildlife faculty speak highly of the program, but it reduced teaching capacity further. Fortunately, in response, we were able to hire three new faculty members in wildlife biology in 2022 (two are general-funded lines and one is externally funded through a private donor). These new faculty members will begin employment in 2023. We are optimistic that these additional positions will help us meet challenges of oversubscribed curriculum classes and an over-extended wildlife faculty.</p>
<p>Enhanced capacity in fisheries, aquatic ecology, and aquatic field techniques</p>	<p>We implemented steps over the past five years to increase capacity in fisheries and aquatic ecology. Students pursuing the aquatic degree option are provided high-quality learning opportunities in the classroom and field. Aquatic students experience optimal student:faculty ratios as well. With that said, there is untapped potential for enrollment growth in the aquatic degree option. The wildlife program has implemented steps to increase marketing of the fisheries/aquatic degree option, but it hasn't resulted in enrollment growth. Moving forward, we believe there is a need for UM marketing and communications to emphasize fisheries in its marketing strategies for wildlife biology. The wildlife biology program could readily accommodate more students in the aquatic option yet continues to experience growth in the terrestrial option where there isn't as much capacity. As background, we implemented steps to increase capacity in our aquatic option following external program reviews indicating the need to expand in fisheries. We are presently raising private funds to support an endowed fisheries chair at UM. UM's top ranking in wildlife biology is based heavily on its terrestrial wildlife program. However, many key observers evaluate wildlife program strength across the entire aquatic-terrestrial spectrum. Thus, growth in fisheries is essential for UM's wildlife biology program to be widely viewed as the top program in the U.S.</p>
<p>Students benefitting from enhanced capacity in policy and public administration.</p>	<p>Several years ago, the wildlife program worked collaboratively with partners both on and off campus to expand learning options in wildlife policy and public administration. Most notably, the wildlife program partnered with the public administration program (within the law school) to offer a 4+1 degree program where students can earn a B.S. in Wildlife Biology and a Masters in Public Administration in five years. It was the first program of its kind in the U.S. At the same time, our endowed Boone and Crockett Professor of Wildlife Conservation created the Demmers' Scholar Program at UM, which gives students the opportunity to complete a wildlife and natural resource policy internship in Washington, D.C. To our knowledge, only two other universities in the U.S. offer something similar for wildlife and natural resource students. These efforts have paid off. One graduate of these programs was just elected as a Representative to the Montana Legislature, where he represents a Missoula district (House District 96). Another was offered a prestigious internship through the White House Council on Environmental Quality (he was also offered a policy internship with The Wildlife Society in D.C.). All students pursuing these opportunities have rated the</p>

Student Learning Outcomes results	Modifications made to enhance learning
	programs as exceptional learning opportunities and consider them transformative.
Students benefitting from enhanced coursework and experiential learning associated with hunting and wild sustenance.	Several of our wildlife faculty in coordination with students have put forth considerable effort to expand educational and hands-on learning opportunities about hunting and wild sustenance in response to a desire from students to learn more about these topics and to gain direct exposure and experience. Students have rated these experiences very highly. The wild sustenance course would not be possible without partner support, most notably from the Rocky Mountain Elk Foundation, who provided \$250,000 to develop the wild sustenance class. UM's marketing and communications team did a story and social media releases on the wild sustenance program this past fall and plan to do additional marketing of the program. After hearing about the course, a legislator from Maine is currently advancing a bill in the Maine Legislature that would require universities and colleges within Maine to offer a similar course! While perhaps extreme, it speaks to the attention University of Montana is receiving for its efforts in this realm. The wildlife program also offers a course titled "Hunter Check Station" (WILD 374), where students work alongside Montana Fish, Wildlife and Parks at hunter check stations during the fall. The class continues to be popular, and during this assessment period, a professor from Minnesota reached out to UM with plans to develop a similar course at University of Minnesota.
Need for expanded emphasis on diversity, equity and inclusion	Wildlife Biology has made a concerted effort over the past five years to become more diverse, equitable, and inclusive. Steps included establishment of a Wildlife Biology DEI committee, diversifying faculty, and enhancing learning opportunities for BIPOC students while broadening the education of white students. The work is long overdue on many levels and is likewise necessary to meet employer needs.
Academic advisors playing pivotal role for students	In recent years, we increased the amount of dedicated, professional academic advising support for wildlife biology undergraduates to ~1.2 FTE. The support is critical for student success, allowing faculty mentors to focus on experiential learning.

FUTURE PLANS FOR CONTINUED ASSESSMENT

Wildlife Biology Program will continue to assess its overall effectiveness across a number of areas as described below.

1. Curriculum. We will continue to examine our curriculum relative to standards put forth by professional societies (The Wildlife Society and American Fisheries Society) and employers (e.g., federal and state agencies, non-governmental organizations). It is important students graduate with the knowledge, skills, and training necessary for employment and for certification as professional biologists. Some federal fisheries and wildlife jobs identify a comprehensive set of coursework that applicants must have completed in order to meet minimum qualification standards. It is especially important that we evaluate our coursework relative to these hiring standards. During the most recent assessment period, employer input prompted us to incorporate "Wildlife Human Dimensions" as a new curriculum requirement for both the aquatic and terrestrial degree options. The curriculum modification is currently undergoing the approval process.
2. External Program Review. The Wildlife Biology Program is a professional program, and therefore, undergoes periodic programmatic review. This review includes an assessment of the depth and breadth of teaching, the exposure to professional development and placement of our undergraduate and graduate students, as well as the

rigor of our research and impact to the field of fish and wildlife management and conservation. Our most recent external program review occurred in AY 19-20), which provided invaluable insights and recommendations into nearly every aspect of our program. We are still in the process of following up on the recommendations associated with this most recent program review.

3. Technical and Science Writing. We will continue to assess our students' writing through upper division writing assignments within our curriculum, especially given elimination of Intermediate-level technical and science writing course offerings.
4. Classroom evaluations. We will maintain a robust and rigorous evaluation of student achievement via exams, laboratory reports, writing assignments, oral presentations, and other class assignments to ensure our subject-matter learning outcomes are achieved.
5. Enrollment. We will continue to track our enrollment numbers, which is a good indicator of overall program effectiveness relative to recruiting, retaining, and educating students. As noted above, we continue to be highly successful in attracting and retaining terrestrial wildlife biology students but have room for growth within the aquatic wildlife biology option.
6. Capacity. We will monitor wildlife biology enrollment relative to our capacity to enroll students in curriculum classes. We currently have more students than we can accommodate in certain classes, leading to key bottlenecks in the curriculum that delay student progress. Such monitoring will help us make strategic decisions to align course offerings with enrollment.
7. Undergraduate surveys. We will survey our undergraduate students prior to graduation to understand their experience relative to academic advising, curriculum content, experiential learning, and other aspects of our program.
8. Alumni surveys. We have not formally conducted an alumni survey specifically for the Wildlife Biology Program in a decade. This represents a clear need that we failed to address once again. We developed a survey during the most recent assessment period but realized we needed to develop an effective sampling strategy to get the most from the effort. We made progress in working with the alumni association and developing a sampling design to achieve desired outcomes. Now we just need to make it happen!

GRADUATE PROGRAM

STUDENT LEARNING OUTCOMES and MEASUREMENT TOOLS

Student Learning Outcomes	Research (Proposal and Field/Lab Work)	Graduate Course Exams and Teaching Assistantships	External Evaluation of Students (S), Program Review (P)	Comprehensive Written/Oral Exams (PhD)	Oral Seminar	Thesis/ Dissertation
1. Understand the biotic and abiotic environment as applied to wildlife conservation, including competencies in physical sciences, biological sciences, ecology, and specialized animal sciences.	X	X	X (P)	X	X	X
2. Increase ability to effectively communicate fish and wildlife science and issues in writing and speech to other scientists and the broader public.	X	X	X (P)	X	X	X
3. Ensure students learn necessary field skills and have experiential learning opportunities (field research).	X		X (S, P)		X	X
4. Acquire knowledge of quantitative and qualitative data analyses to apply science-based methods to wildlife conservation issues, including research design, calculus, statistics, modeling and application of these analytical techniques to fish and wildlife research and management questions.	X	X	X (P)	X	X	X
5. Develop basic understanding of social science and cultivate a respect and understanding for the multiple values associated with wildlife conservation.	X	X	X (S, P)	X	X	X
6. Learn how to synthesize the variety of scientific knowledge and skills to solve problems in fish and wildlife sciences.	X	X	X (S, P)	X	X	X
7. Acquire knowledge about the wildlife profession and career opportunities through participation in professional meetings and societies, student groups, seminars, and thesis/dissertation research.	X		X (P)		X	X

Student Learning Outcomes	Research (Proposal and Field/Lab Work)	Graduate Course Exams and Teaching Assistantships	External Evaluation of Students (S), Program Review (P)	Comprehensive Written/Oral Exams (PhD)	Oral Seminar	Thesis/ Dissertation
8. Develop greater cultural awareness and an appreciation for the need to diversify wildlife and natural resource professions to responsibly and inclusively serve society.		X	X (P)			

RESULTS and MODIFICATIONS

Student Learning Outcomes results	Modifications made to enhance learning
<p>The UM Wildlife Biology Program is considered a top-ranked wildlife program in North America based on its research accomplishments (publications, citations, grant dollars, awards). Graduate student research accomplishments are key to the program's success. Graduate students are frequently first author on many of the publications that led to the top ranking.</p>	<p>The Wildlife Biology Program has attracted some of the top fish and wildlife researchers in the world as faculty, which in turn has allowed the program to attract extremely high caliber graduate students. Most recently, the program secured \$6 M in private funding to establish an endowed chair in Waterfowl Ecology. This chair will further enhance research and graduate education. Research is the core of the graduate student's learning process. High quality research leads to high quality education.</p>
<p>Our current graduate program size is ~65 students, and student attrition rates are very low. Most wildlife biology graduate students at UM excel as students, teachers, and researchers. These students graduate successfully and have nearly 100% placement rates in subsequent graduate, post-graduate, or professional positions. On rare occasion, however, a student who enters our graduate program fails to perform satisfactorily and ultimately fails to graduate. The performance failure may relate to field or lab work, interaction with collaborators, data analyses, work ethic, mental health struggles or a combination of factors. During this 2-year assessment period, we did not have any wildlife biology students drop entirely from the graduate program. However, we had one student transition out of the Wildlife Biology graduate program into the Resource Conservation graduate program. We also had a number of students experience delays in degree progress due to the pandemic.</p>	<p>Rigorous screening procedures have been put in place by faculty so that only highly competent and qualified students are selected to pursue graduate programs. The Wildlife Biology Graduate Admissions Committee separately reviews application materials for all students applying to graduate school in WBIO at UM. A student must be approved by both the graduate advisor and the Graduate Admissions Committee before acceptance into the program. Any student failing to meet a minimum qualification must be approved by the entire wildlife biology faculty prior to acceptance into the program.</p>
<p>As alluded to above, the Coronavirus pandemic negatively impacted some students' progress due to isolation challenges and altered or canceled field seasons. By extension, some of our graduate students struggled to meet stated timelines for completion of their research proposals and comprehensive exams, which delayed their degree progress. Normally, students who miss a deadline for a milestone would be placed on probation. However, we placed few students on probation because most of the delays were beyond control of the students. We also recognized that many graduate students are facing mental health challenges that were exacerbated by the pandemic and rising cost of housing in Missoula.</p>	<p>A Wildlife Biology Graduate Evaluations Committee was put in place to annually evaluate each graduate student's progress toward degree completion. Students who fall behind are given warnings and placed on probation until they complete the necessary requirements to get back on track. This process has worked very well for keeping students on track with graduate requirements and for quickly identifying and remedying problems when they occur. Appropriate accommodations were made for students whose research progress was negatively impacted by the pandemic and/or mental health stressors. Multiple wildlife faculty also attended a UM graduate student mentoring training during Spring 2022 that was made possible by the UM Graduate School. This training demonstrates a commitment by wildlife biology faculty to quality mentoring, especially as it ties to mental health.</p>

Student Learning Outcomes results	Modifications made to enhance learning
<p>Comprehensive oral and written exams for PhD students continue to be an important measurement tool for identifying any deficiencies in broad-based knowledge of fish and wildlife science or analytical thought processes. Consistent with expectations, some students during the assessment period passed both comprehensive and oral exams with “flying colors”, demonstrating a high degree of competency. Other students were assigned additional obligations to address noted deficiencies. No PhD students outright failed their oral or written exams during this assessment period.</p>	<p>Rigorous screening procedures are put in place so that only highly competent and qualified students are selected to pursue PhD programs, minimizing the potential for selecting individuals with significant deficiencies. When one or more key deficiencies are identified in exams, students are assigned follow-up actions to ensure the deficiencies are satisfactorily addressed before a student is allowed to defend his/her dissertation and graduate. This process has worked extremely well for the program and represents the pinnacle of academic assessment.</p>
<p>Students frequently express need for additional graduate course offerings, especially in graduate level statistics.</p>	<p>Graduate courses are sometimes not offered given needs for faculty to teach required undergraduate curriculum courses. In the wildlife biology graduate program, the most acute concerns are focused on a lack of graduate-level statistics course offerings. The mathematics department is no longer in a position to offer graduate level courses in statistics that are commonplace at our peer institutions. This deficiency is negatively impacting the quality of graduate education at UM. Wildlife Biology faculty have attempted to increase its quantitative course offerings at the graduate level, but ultimately, learning will only be meaningfully enhanced when UM can return to offering graduate level statistics courses.</p>
<p>We continued our commitment during this assessment period to increasing diversity within our graduate program. Eight Native American graduate students were in our graduate program during this assessment period. Thus, ~12-15% of our graduate student body was comprised of indigenous students, which far exceeds the typical percentages of indigenous students enrolled in STEM graduate programs. In fact, UM's support of indigenous graduate students in wildlife biology is leading the nation presently. We also created a diversity, equity, and inclusion committee within wildlife biology to place an emphasis on creating and fostering a welcoming, inclusive environment for indigenous students and other students from underrepresented groups.</p>	<p>In recent years, our faculty took a number of steps to be intentional about expanding graduate education opportunities for Native Americans and other students from underrepresented groups. Much of this work revolved around establishing and cultivating relationships with Native American scholars, Tribal colleges, and Tribal wildlife management programs. During the current assessment period, the most significant step we took was to eliminate GREs as an admission requirement. We also made additional changes to our graduate admissions procedure to make it more inclusive. As part of that, we adopted a more standardized scoring metric for evaluating applicants to our graduate program.</p>
<p>Wildlife graduate student cohesion and sense of community at UM is traditionally strong. However, the global Covid-19 pandemic impacted students greatly by preventing face-to-face gatherings. Additionally, graduate students faced health concerns while attempting to meet demanding graduate program requirements. A number of students reported loneliness and a reduced sense of community during the pandemic. Fortunately, all indicators suggest we emerged from the pandemic well and that students reestablished the strong sense of community during 2022. At a recent alumni reception in Spokane, WA, multiple “newer” alumni (i.e. recent graduates) reported to me how much they miss their graduate experience at UM. Most of these alumni had completed MS degrees in wildlife biology at UM and were now in PhD programs at other universities. Simply put, they do not believe their current graduate programs at other universities have near as strong of a graduate community as what we have at UM.</p>	<p>Wildlife biology graduate students self-organize the Wildlife Biology Graduate Student Association (WBGSA). Officer positions include an Administrator, Graduate Seminar Coordinator, Faculty Liaison, and Undergraduate Liaisons (Aquatic and Terrestrial). Students regularly communicate among themselves during weekly graduate seminar. Additionally, the WBGSA completed a “Wildlife Biology Graduate Student Survival Guide: <i>A guide for grad students by grad students.</i>” The Guide demonstrates the unity and collaborative spirit prevalent among our graduate students. Our WBGSA, working in close collaboration with faculty, hold a number of events and socials to encourage a strong sense of community. As one example, at the start of each year the Wildlife Biology Program Director hosts a wild game barbeque that is well-attended by both graduate students and faculty. Our students frequently reference how much they enjoy the event, and how it helps newly admitted students build community with existing students in the program. Individual wildlife biology faculty members also support robust graduate labs, providing an immediate sense of community and family for newly admitted students.</p>
<p>Mental wellbeing, as referenced above, has become a central focus within our graduate program. It is well-established that graduate students nationwide are experiencing high rates of mental stress. One factor commonly cited among graduate students as leading to mental health issues is financial stress</p>	<p>We formed an ad-hoc mental health committee within the wildlife program to address these issues. The committee was comprised of faculty, a post-doctoral student and graduate students. The committee made considerable progress on a number of fronts, especially as it pertains to summarizing and</p>

Student Learning Outcomes results	Modifications made to enhance learning
<p>and inadequate health care. Unlike our peer institutions, we do not provide health coverage for graduate students as a standard practice, nor do we provide competitive teaching assistantships. Based on a survey of wildlife biology graduate students, we learned that those experiencing financial stress were less capable of dealing with key “stress points” during a graduate degree program than their counterparts who did not report financial stress.</p>	<p>highlighting mental health resources available to graduate students. The committee was also instrumental in working with wildlife biology graduate students and faculty and peers across campus to call for higher graduate stipends and health coverage. The most significant modification made by the Wildlife Biology Program during this assessment period was to repurpose privately-funded wildlife biology graduate fellowships to address low stipends. Instead of providing these fellowships competitively, we instead used them to increase salaries for students on generally-funded teaching assistantships and on under-funded research assistantships. All students in wildlife biology now receive a minimum stipend of \$9560 per semester (MS) or \$10,650 per semester (PhD). Moving forward, it will be important for UM to pursue viable strategies to increase general-fund support for graduate students.</p>
<p>Our orientation procedure for new graduate students continues to be effective and well-received by students. The orientation is done in collaboration with other grad programs in the Franke College of Forestry and Conservation (FCFC).</p>	<p>Beginning five years ago, the wildlife biology program held a more comprehensive “new student” orientation in coordination with FCFC. During the current assessment period, small tweaks and adjustments were made based on feedback in an attempt to optimize the orientation. It presently includes a detailed review of graduate program policies and procedures, introductions to key staff, how to complete travel paperwork, timesheets and other paperwork, overview of grant and accounting procedures, library resource orientation, and social gatherings with faculty and other graduate students.</p>
<p>Arguably the biggest challenge for our graduate students has been insufficient staff administrative support. Since all students conduct research and are dependent on funding, sufficient administrative support is key to their learning success. Without adequate support, students and their faculty advisors spend considerable hours dealing with contracts, paychecks, health care coverage, among other issues that take them away from their focus on coursework, research, and teaching. During this 2-yr assessment period, we once again had a significant number of students miss at least one paycheck, which caused considerable duress to those students. Some of our indigenous graduate students in particular are dependent on those paychecks to survive. When paychecks are missed, students report skipping meals, relying on foodbanks, missing rent payments and defaulting on other bills. Needless to say, this creates a significant barrier to graduate degree progress.</p>	<p>UM institutionally is struggling to hire and retain staff. Key vacant staff positions are unable to be filled with qualified candidates. Several key staff positions that support the wildlife graduate program turned over during this assessment period, in some cases more than once. Staff reductions (due to budget cuts), vacancies, and staff turnover within FCFC, UM’s Office of Sponsored Programs, Financial Aid, and other campus units has created a challenging situation. While not ideal, existing staff have stepped up to try and address shortfalls due to understaffing. We have also relied more heavily on work study and temporary staff positions to address needs when permanent staff cannot be hired or retained.</p>

FUTURE PLANS FOR CONTINUED ASSESSMENT

The Wildlife Biology Program will continue to assess its overall effectiveness across a number of areas as described below.

1. Graduate Student Committees. Graduate student committees form the bedrock of our graduate student assessment. Graduate committees evaluate student performance at each step of the program, from course selection and project development to final defense of the thesis or dissertation.
2. Graduate Admissions Committee. A robust, rigorous, and inclusive process for selecting top-tier graduate students is critically important for the program’s overall success and efficiency with graduate education. The Graduate Admissions and DEI Committees recently modified the admissions process in an attempt to remove barriers for

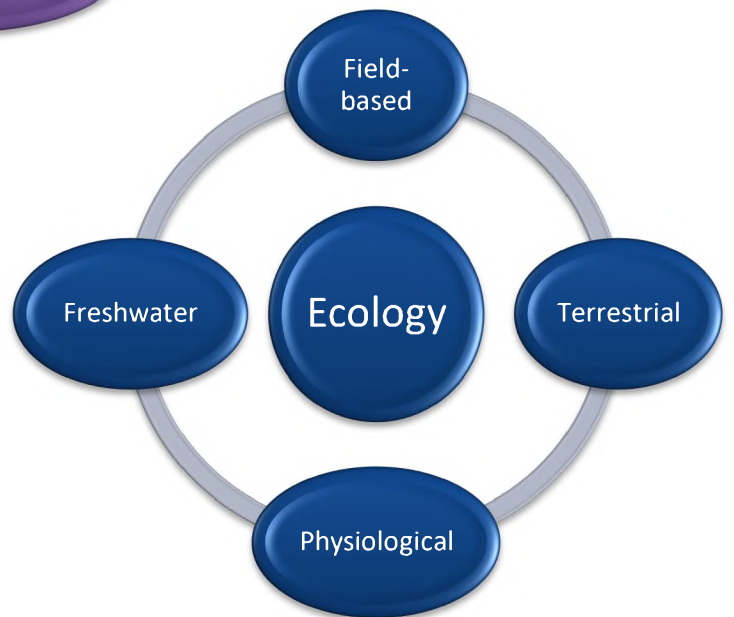
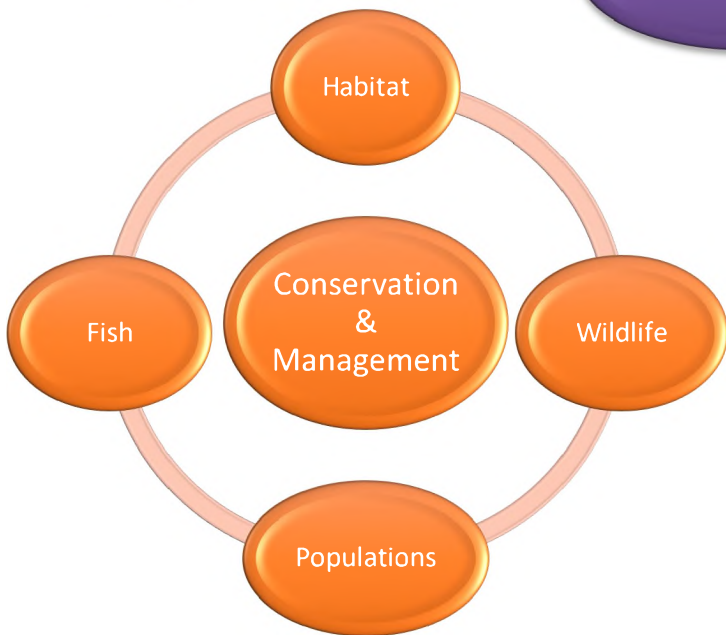
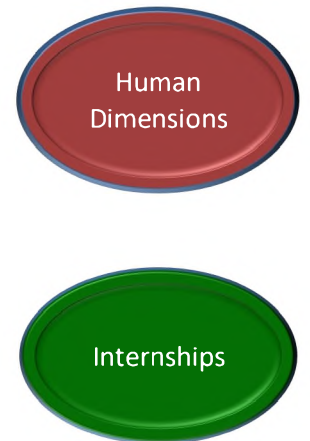
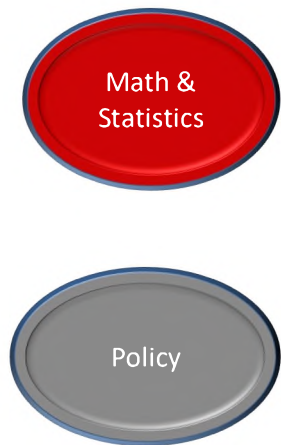
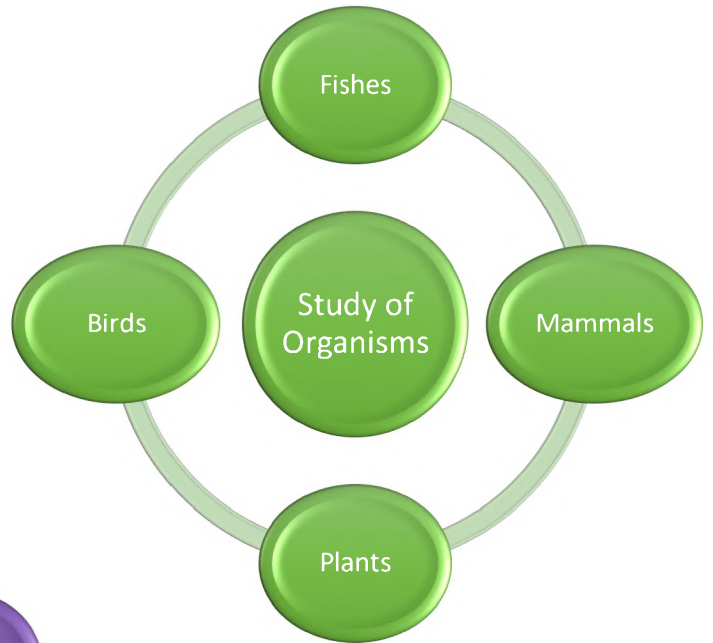
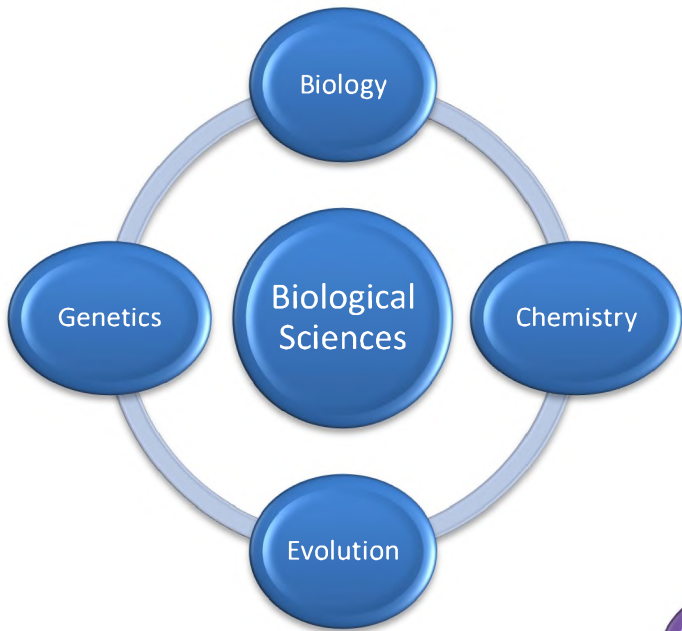
students from underrepresented groups. Future monitoring will be key to determine effectiveness of these changes.

3. Student evaluations and assessments. We will maintain a robust and rigorous evaluation of graduate student performance relative to research proposal development and defense, graduate courses, teaching, research, presentations at professional meetings and in graduate seminar, comprehensive examinations, and preparation/defense of theses and dissertations.
4. Graduate Evaluations Committee. Our graduate evaluations committee is key to monitoring progress of our graduate students from start to finish.
5. External Program Review. The Wildlife Biology Program is a professional program, and therefore, undergoes periodic programmatic review. This review includes an assessment of the depth and breadth of teaching, the exposure to professional development and placement of our undergraduate and graduate students, as well as the rigor of our research and impact to the field of fish and wildlife management and conservation. Our most recent external program review occurred in 2019-2020.
6. Enrollment. We will continue to track our graduate student enrollment, which is a good indicator of overall program strength and effectiveness in securing external research funding.
7. Alumni surveys. We have not formally conducted an alumni survey specifically for the Wildlife Biology Program in a decade. This represents a clear need that we failed to address once again. We developed a survey during the most recent assessment period but realized we needed to develop an effective sampling strategy to get the most from the effort. We made progress in working with the alumni association and developing a sampling design to achieve desired outcomes. Now we just need to make it happen!

APPENDICIES

1. Graphical Depiction of Undergraduate Curriculum
2. Undergraduate Curriculum Map
3. Educational requirements to become a Certified Wildlife Biologist by The Wildlife Society
4. Educational requirements to become a Certified Fisheries Biologist by the American Fisheries Society
5. Minimum education requirements for federal Wildlife and Fishery Biologist positions
6. Policies and Procedures (Graduate Regulations) for Graduate Students in Wildlife Biology at UM
7. Graduate-level courses available to graduate students

Appendix 1. Graphical Depiction of Undergraduate Curriculum



Appendix 2. Undergraduate Curriculum Map – Connecting Learning Goals to Courses in the Curriculum

Learning Goals:

- 1) Understand the biotic and abiotic environment as applied to wildlife conservation, including competencies in physical sciences, biological sciences, ecology, and specialized animal sciences.
- 2) Increase ability to effectively communicate fish and wildlife science and issues in writing and speech to other scientists and the broader public.
- 3) Ensure students learn necessary field skills and have experiential learning opportunities (field trips, methods classes, internships, independent studies, and jobs).
- 4) Acquire knowledge of quantitative and qualitative analysis to apply scientific methods to wildlife conservation issues, including research design, calculus, and statistics, with application to fish and wildlife.
- 5) Develop basic understanding of social science and cultivate a respect and understanding for the multiple values associated with wildlife conservation.
- 6) Learn how to synthesize the variety of scientific knowledge and skills to solve problems in fish and wildlife sciences.
- 7) Acquire knowledge about the wildlife profession and career opportunities through participation in extracurricular professional learning activities, student groups, seminars, independent studies, internships, and senior thesis projects.
- 8) Develop greater cultural awareness and an appreciation for the need to diversify wildlife and natural resource professions to responsibly and inclusively serve society.

For each table below, column headings numbered 1-7 correspond to the program's learning goals stated above. An 'X' in a column indicates that the corresponding learning goal is met by the specified course.

Freshman Year

Course	1	2	3	4	5	6	7	8
BIOB 160	X							
BIOB 161	X							
CHMY 121	X							
WRIT 101		X						
WILD 180	X				X		X	X
M 162				X				
CHMY 123	X							
CHMY 124	X							

Sophomore Year

Course	1	2	3	4	5	6	7	8
BIOB 260	X							
STAT 216 / WILD 240				X				
COMX 111		X						
Experiential Learning			X				X	X
BIOB 272	X							
WILD 280 – Aquatic only	X		X					
BIOO 335	X							
NRSM 200 / WRIT 325 ^A		X						
WRIT 201 ^B		X						

^ANRSM 200 and WRIT 325 were eliminated as part of UM budget reduction implemented in AY 2016-17. We were able to provide a one-time offering of WRIT 325 in collaboration with Davidson Honors College, but that is not a sufficient or sustainable solution. They are included in this table only to emphasize our desire to have these courses in the curriculum.

^BThere is insufficient capacity in WRIT 201 for all wildlife biology students. Presently, wildlife biology students are allowed to take any intermediate level writing requirement that is approved by UM. However, many of these classes (e.g., creative writing, poetry) do not meet our learning goals.

Junior Year – Terrestrial Option

Course	1	2	3	4	5	6	7	8
BIOE 370	X							
BIOE 371	X	X	X					
WILD 346	X							
BIOO 470	X	X	X			X		
WILD 370	X		X		X	X		
NRSM 360 / FORS 347	X		X					

Senior Year – Terrestrial Option

Course	1	2	3	4	5	6	7	8
BIOO 340 / BIOO 475	X	X	X			X		
WILD 470	X	X		X		X		
WILD 410 / NRSM 422		X		X	X			X
WILD 480 / NRSM 379 / BIOB 480 / BIOM 460 / PTRM 300 ^A		X	X		X	X	X	X
WILD 494		X				X	X	X

^AThis set of course options allows students to select a more specialized, upper-level course that most directly aligns with their interests in fish and wildlife (Applied Wildlife Management, Collaborations in Natural Resource Decision Making, Conservation Genetics, Ecology of Infectious Diseases, Recreation Behavior). As mentioned in our report, we do not have space within our curriculum to require each of these classes.

Junior Year – Aquatic Option

Course	1	2	3	4	5	6	7	8
BIOO 320	X	X						
BIOO 340	X		X	X		X		
BIOE 370	X							
BIOE 371	X	X	X					
WILD 346	X							
BIOM 427 / BIOE 406 / BIOO 462 / WILD 485	X		X	X				
NRSM 385	X		X			X		

Senior Year – Aquatic Option

Course	1	2	3	4	5	6	7	8
BIOE 428	X	X	X	X				
WILD 408	X		X	X				
WILD 410 / NRSM 422		X		X	X			
WILD 480 / NRSM 379 / BIOB 480 / WILD 491 / PTRM 300 ^A		X	X		X	X	X	X
WILD 494		X				X	X	X

^AThis set of course options allows students to select a more specialized, upper-level course that most directly aligns with their interests in fish and wildlife (Applied Wildlife Management, Collaborations in Natural Resource Decisions, Conservation Genetics, Ecology of Infectious Diseases, Recreation Behavior). As mentioned in our report, we do not have space within our curriculum to require each of these classes.

Appendix 3. Educational Requirements to become a Certified Wildlife Biologist by The Wildlife Society

- A. Wildlife Management and Biology, *minimum 12 semester hours*
 - a. Courses emphasizing the principles and practices of wildlife management and an understanding of the biology of wildlife species and their habitat relationships as the basis for management.
- B. Ecology, *minimum 3 semester hours*
 - a. Courses in general plant or animal ecology (excludes human ecology).
- C. Zoology, *minimum 9 semester hours*
 - a. Courses in the taxonomy, biology, behavior, physiology, anatomy, and natural history of vertebrates and invertebrates.
- D. Botany, *minimum 9 semester hours*
 - a. Courses in general botany, plant anatomy, plant genetics, plant morphology, plant taxonomy, plant physiology, and other botany courses.
- E. Physical Sciences, *minimum 9 semester hours*
 - a. Includes courses such as chemistry, physics, geology, or soils with at least two disciplines represented.
- F. Basic Statistics, *minimum 3 semester hours*
 - a. Course(s) in basic statistics.
- G. Quantitative Sciences, *minimum 6 semester hours*
 - a. Courses in calculus, biometry, college algebra, advanced algebra, trigonometry, systems analysis, mathematical modeling, sampling, computer science, or other quantitative science. Elementary algebra, remedial algebra, and introductory personal computing courses do not count in this category. Geographical Information Systems courses may count if they incorporate analytical components through data collection, analysis, and interpretation.
- H. Humanities and Social Sciences, *minimum 9 semester hours*
 - a. Courses such as economics, sociology, psychology, political science, government, history, literature, or foreign language.
- I. Communications, *minimum 12 semester hours*
 - a. Courses designed to improve communication skills such as English composition, technical writing, journalism, public speaking, or use of mass media.
- J. Policy, Administration, and Law, *minimum 6 hours*
 - a. Courses that demonstrate significant content or focus on natural resource policy and/or administration, wildlife or environmental law, or natural resource/land use planning will apply in addition to courses that document contributions to the understanding of social, political, and ethical decisions for wildlife and natural resources management.

Notes:

- Course semester hours may be divided, but not duplicated, among two categories when a course covers material in more than one category.
- Comparable experience may be substituted for educational experience, however, the applicant must have at least one college or university course in each category.

(Source: The Wildlife Society, https://wildlife.org/wp-content/uploads/2022/03/CWB-Certification_March-2022.pdf, accessed January 11, 2023)

Appendix 4. Educational requirements to become a Certified Fisheries Biologist by the American Fisheries Society

- A. **Fisheries and Aquatic Sciences.** Four (4) courses; three of which must be directly related to fisheries science. At least one course must cover principles of fisheries science and management and one course must cover fisheries and/or aquatic sampling techniques or its equivalent.
- B. **Other biological sciences courses.** When added to the above courses must total 30 semester or 45 quarter hours.
- C. **Physical sciences courses.** Must total 15 semester or 22 quarter hours.
 - a. Physical sciences category courses include chemistry, physics, soils, geology, hydrology, earth science, astronomy, and meteorology.
- D. **Mathematics and statistics courses.** 6 semester or 9 quarter hours. Must include one calculus and one statistics course, or two statistics courses.
 - a. Must include one calculus and one statistics course, or two statistics courses.
- E. **Communications courses.** Must total 9 semester hours.
 - a. Must total 9 semester or 13 quarter hours in communication courses that require oral and written communication skills. A minimum of 3 semester hours or 4 quarter hours must be completed in oral communications and a minimum of 3 semester hours or 4 quarter hours must be completed in written communications. The remaining semester or quarter hours can be in either oral or written communications. Communication intensive courses, if officially designated as such by the college or university, can be applied in this category. However, if such courses are used in this category, they cannot be counted in another category (e.g., Category A).
- F. **Human dimensions courses.** Must total 6 semester or 9 quarter hours.
- G. **Work experience.** (e.g., seasonal job, internship, formal volunteer position)
 - a. Work experience may be used in lieu of formal course credits in each of the subject areas to satisfy credit requirements. A maximum of up to 6 semester or 9 quarter hours of work experience may be counted for professional certification, with no more than 3 semester or 4.5 quarter hours counted towards each subject area. Experience gained through a research assistantship as part of a graduate degree will not be considered for a discount.

(Source: American Fisheries Society, <https://fisheries.org/membership/afs-certification/>, accessed January 11, 2023)

Appendix 5. Minimum education requirements for federal Wildlife and Fishery Biologist positions.

A. Wildlife Biology Series, 0486

- a. *Non-research positions*: Requires a degree in biological science that included:
 - i. At least 9 semester hours in such wildlife subjects as mammalogy, ornithology, animal ecology, wildlife management, or research courses in the field of wildlife biology; and
 - ii. At least 12 semester hours in zoology in such subjects as general zoology, invertebrate zoology, vertebrate zoology, comparative anatomy, physiology, genetics, ecology, cellular biology, parasitology, entomology, or research courses in such subjects (Excess courses in wildlife biology may be used to meet the zoology requirements where appropriate.); and
 - iii. At least 9 semester hours in botany or the related plant sciences
- b. *Research positions*: Requires a degree with major in wildlife biology, zoology, or botany that included at least 30 semester hours of course work in biological science and 15 semester hours in the physical, mathematical, and earth sciences. This course work must have included:
 - i. At least 9 semester hours of training applicable to wildlife biology in such subjects as mammalogy, ornithology, animal ecology, wildlife management, principles of population dynamics, or related course work in the field of wildlife biology; and
 - ii. At least 12 semester hours in zoological subjects such as invertebrate zoology, vertebrate zoology, comparative anatomy of the vertebrates, embryology, animal physiology, entomology, herpetology, parasitology, and genetics; and
 - iii. At least 9 semester hours in the field of botany and related plant science; and
 - iv. At least 15 semester hours of training in any combination of two or more of the following: chemistry, physics, mathematics, statistics, soils, and/or geology

(Source: <https://www.opm.gov/policy-data-oversight/classification-qualifications/general-schedule-qualification-standards/0400/wildlife-biology-series-0486/>, accessed January 11, 2023)

B. Fish Biology Series, 0482

- a. *Non-research positions*: Requires a degree in biological science that included:
 - i. At least 6 semester hours in aquatic subjects such as limnology, ichthyology, fishery biology, aquatic botany, aquatic fauna, oceanography, fish culture, or related courses in the field of fishery biology; and
 - ii. At least 12 semester hours in the animal sciences in such subjects as general zoology, vertebrate zoology, comparative anatomy, physiology, entomology, parasitology, ecology, cellular biology, genetics, or research in these fields. (Excess course work in aquatic subjects may be used to meet this requirement when appropriate.)
- b. *Research positions*: Applicants must show that they have a degree with major study in biology, zoology, or biological oceanography that included at least 30 semester hours in biological and aquatic science and 15 semester hours in the physical and mathematical sciences. This course work must have included:
 - i. At least 15 semester hours of preparatory training in zoology beyond introductory biology or zoology in such courses as invertebrate zoology, comparative anatomy, histology, physiology, embryology, advanced vertebrate zoology, genetics, entomology, and parasitology; and

- ii. At least 6 semester hours of training applicable to fishery biology in such subjects as fishery biology, ichthyology, limnology, oceanography, algology, planktonology, marine or fresh water ecology, invertebrate ecology, principles of fishery population dynamics, or related course work in the field of fishery biology; and
- iii. At least 15 semester hours of training in any combination of two or more of the following: chemistry, physics, mathematics, or statistics.

(Source: <https://www.opm.gov/policy-data-oversight/classification-qualifications/general-schedule-qualification-standards/0400/fish-biology-series-0482/>, accessed January 11, 2023)

Appendix 6. Policies and Procedures (Graduate Regulations) for Graduate Students in Wildlife Biology at UM

**GRADUATE PROGRAM IN WILDLIFE BIOLOGY
AT THE UNIVERSITY OF MONTANA
POLICIES AND PROCEDURES FOR GRADUATE STUDENTS**

(Approved September 2000 by WBIO faculty – Revised Fall 2018)

I. DESCRIPTION OF PROGRAM

The Wildlife Biology Program (WBIO) at The University of Montana is a joint program of the College of Forestry and Conservation (CFC), the Division of Biological Sciences (DBS), and the Montana Cooperative Wildlife Research Unit. This interdisciplinary makeup provides broad exposure to diverse viewpoints and approaches. The Program is housed within the College of Forestry and Conservation and has a Director (from either DBS or CFC) who reports to the Dean of CFC. Graduate degrees offered through WBIO include the Master of Science in Wildlife Biology (Thesis and Non-thesis Options) and the Doctor of Philosophy in Fish and Wildlife Biology (offered by The University of Montana-Missoula in collaboration with Montana State University-Bozeman).

The graduate program in WBIO emphasizes the theoretical foundations, scientific research techniques, and general biological understanding necessary for graduates to pursue further research or to seek employment as wildlife biologists, managers, administrators, and academicians. Types of research questions addressed in WBIO graduate programs include theoretical and applied aspects of specific species and species groups, biological systems, and socio-political systems as they relate to conservation of wildlife.

Complete applications must include:

- A. completed application form (available on-line from the Graduate School);
- B. 1 official transcript of all college and university courses;
- C. a short statement (1-2 pages) of your interests and goals;
- D. a resume detailing work experience from college entry to present;
- E. 3 letters of recommendation (submitted separately or through CollegeNet);
- E. GRE scores for verbal, quantitative, and analytical;
- F. nonrefundable application fee (\$60); and
- G. Test of English as a Foreign Language (TOEFL) scores (foreign students only)

NOTE: No special application form is required for financial assistance: financial assistance is considered for all acceptable applicants.

Submit application materials to:

Wildlife Biology Program
W. A. Franke College of Forestry and Conservation
The University of Montana
Missoula MT 59812

II. ADMISSION REQUIREMENTS

Application to the Wildlife Biology Program is very competitive and we must turn down many applicants who meet the minimum criteria (below).

THE WILDLIFE BIOLOGY FACULTY SPECIFICALLY WARNS THAT ENROLLMENT IN GRADUATE NON-DEGREE STATUS DOES **NOT** PROVIDE FAVORED STATUS TOWARD ACCEPTANCE TO ANY WILDLIFE BIOLOGY DEGREE PROGRAM.

A. M.S. (Thesis Option). Admission under this option normally requires a bachelor's degree in Wildlife Biology or related field. Major course work deficiencies will be made known to the applicant at the time action is taken on the application. To enter the program without major deficiencies, the candidate should present the following course work: mathematics (at least an introductory course in calculus and at least 1 course in statistics); chemistry (at least 1 year of college chemistry, including organic chemistry); and appropriate course work in biological science and management/conservation. Knowledge of a foreign language is not required for this degree, but candidates anticipating a future doctoral program are encouraged to study an appropriate foreign language.

Preliminary decisions regarding acceptance into the M.S. program are made using the following criteria:

1. minimum grade point average (GPA) of 3.0 in undergraduate work;
2. Graduate Record Examination (verbal, quantitative, and analytical) is required of all applicants before admission. GRE scores at the 50th percentile are considered minimums for students from English speaking countries, and any scores below 50th percentile trigger more stringent evaluation; and
3. minimum TOEFL score of 92 (Internet-Based Test for applicants from non-English speaking nations).

Further evaluation is based on letters of recommendation, the applicant's statement of specific interests and goals, and a resume detailing work experience from college entry to the present. The statement of specific interest is used to identify faculty members whose interests most closely match those of the applicant. The final criterion for accepting an applicant is the explicitly-stated willingness of a faculty member to serve as Graduate Advisor ("Major Professor"). *Under no conditions are applicants accepted without the agreement of a faculty member to serve as the major professor.* Applicants are therefore encouraged to communicate with potential advisors before applying.

The Graduate Admissions Committee determines acceptability of applicants based on the above criteria, and any exceptions to stated minimums must be approved by a vote of the WBIO faculty. Students must enroll in the semester stated in their acceptance letter.

B. M.S. (Non-thesis option). The non-thesis M.S. Option is available only to established wildlife professionals who wish to update their qualifications and to students in the Peace Corps Program. Students who enter the WBIO Graduate Program under the thesis option cannot change to the nonthesis option. The professional paper is an extensive work relating directly to management issues the student deals with in a professional capacity. A resource management plan for a region (historical review, inventory analysis, evaluation of options, action plan, etc.) could be appropriate. Other aspects of admission requirements are the same as for the M.S. Thesis option.

C. Ph.D. Degree. Most applicants to the Ph.D. program have completed or are completing M.S. degrees, but students without M.S. degrees are considered if they demonstrate outstanding potential to complete a Ph.D. program. Successful applicants usually have at least 1 degree in Wildlife Biology or a closely related field; students with other backgrounds may be accepted depending on overall potential.

Preliminary decisions regarding acceptance into the Ph.D. program are made using the following

criteria:

1. minimum grade point average (GPA) of 3.0 in undergraduate work and 3.5 in graduate work;
2. Graduate Record Examination (verbal, quantitative, and analytical) is required of all applicants before admission. GRE scores at the 60th percentile are considered minimums for students from English speaking countries, and any scores below 60th percentile trigger more stringent evaluation; and
3. minimum TOEFL score of 92 (Internet-Based Test for applicants from non-English speaking nations).

Further evaluation is based on letters of recommendation, the applicant's statement of specific interests and goals, and a resume detailing work experience from college entry to the present. The statement of specific interest is used to identify faculty members whose interests most closely match those of the applicant. The final criterion for accepting an applicant is the explicitly-stated willingness of a faculty member to serve as Graduate Advisor ("Major Professor"). *Under no conditions are applicants accepted without the agreement of a faculty member to serve as the major professor.* Applicants are therefore encouraged to communicate with potential advisors before applying.

The Graduate Admissions Committee determines acceptability of applicants based on the above criteria (any exceptions to stated minimums must be approved by a vote of the WBIO faculty). Students must enroll in the semester stated in their acceptance letter.

III. ADVISORS AND COMMITTEES

The Graduate Advisor and the student will work together closely throughout the student's tenure. The advisor must approve all proposal and thesis materials before they are circulated to the rest of the committee, and notify the WBIO Office of the time, date, and place of the final examination. The advisor is also responsible for helping the student choose committee members and for helping develop the research topic.

A. M.S. Degrees (Thesis and Non-thesis options). The M.S. Graduate Committee consists of 3 faculty members (the advisor as chair and 2 others), including representatives from both CFC and DBS. Federal employees of the Montana Cooperative Wildlife Research Unit may serve as either DBS or CFC Faculty in this context. In all cases, a majority of committee members must be UM Wildlife Biology faculty members. This Committee assumes the general sponsorship and control of the student's program. Non-UM faculty may serve on the Committee in addition to the 3 UM faculty members when appropriate, but may not vote on committee actions unless they possess Faculty Affiliate or Adjunct Faculty status at The University of Montana.

The Graduate Committee must be assembled by the end of the *first semester* in residence and must meet by that time to discuss course work. After discussion with the advisor about appropriate committee members, the student is responsible for obtaining verbal commitment to serve from prospective committee members. The advisor will then e-mail a list of the committee members to the Wildlife Biology Office. The Director of the Wildlife Biology Program, after checking to make sure the committee meets the above criteria, forwards it to the Graduate Dean, who notifies the program of the committee's appointment. Makeup of the committee may change as the research proposal develops, but the Director of Wildlife Biology must be notified of, and approve, any such changes.

Duties of the M.S. Graduate Committee are:

1. Evaluate the schedule of courses presented for the degree;
2. Evaluate the proposal for thesis or professional paper;
3. Insure that all Graduate School requirements are met;

4. Provide direction and supervision for the candidate;
5. Evaluate the Master's thesis or professional paper and attend related seminars; and
6. Evaluate the candidate's performance on the defense.

B. Ph.D. Degree. The Ph.D. Dissertation Committee consists of the major professor as chair and 4 other members. A majority of committee members must be UM Wildlife Biology faculty, with at least 1 faculty member from DBS and 1 faculty member from CFC. Federal employees of the Montana Cooperative Wildlife Research Unit may serve as either DBS or CFC Faculty in this context. Members of the committee must have attained a Ph.D., and any exceptions require approval by the Director of Wildlife Biology and the Dean of the Graduate School. Non-UM faculty may serve on the Committee in addition to the UM faculty members, when appropriate, but will not vote on committee actions unless they possess Faculty Affiliate or Adjunct Faculty status at The University of Montana. The Dissertation Committee assumes general sponsorship and control of the student's program.

The Dissertation Committee must be assembled by the end of the *first semester* in residence, and must meet by that time to discuss course work and the research statement. After discussion with the advisor about appropriate committee members, the student is responsible for obtaining verbal commitment to serve from the prospective committee members. The advisor will then e-mail a list of the committee members to the Wildlife Biology Office. The Director of the Wildlife Biology Program, after checking to make sure the committee meets the above criteria, forwards it to the Graduate Dean, who notifies the program of the committee's appointment. Makeup of the Dissertation Committee may change as the research proposal develops, but the Director of Wildlife Biology must be notified of and approve any such changes. Duties of the Ph.D. committee are the same as those listed above for the M.S. committee, with the additional requirement of conducting the written and oral comprehensive exam (see X).

IV. COURSE WORK AND ACADEMIC STANDARDS

All students must be familiar with the requirements and procedures established by the Graduate School for their particular degree, as published on the Graduate School website, www.umt.edu/grad. Students on a Research or Teaching Assistantship must register for at least 6 credits each semester during the academic year. All students must maintain a cumulative grade point average ≥ 3.0 . Upon completion of course requirements, degree candidates must register for at least the minimum number of research or thesis credits required by the Graduate School (www.umt.edu/grad) each fall and spring semester until graduation. Some circumstances will require students to register for a different number of credits; students must consult with their advisor to determine the appropriate number for them. All graduate students must enroll in WBIO 594, Graduate Seminar, for at least 2 semesters, and must attend during every semester in residence (see VI-A).

A. M.S. Thesis Option. The minimum requirement for the M.S. Degree, Thesis option, is 30 graduate semester credits beyond the Bachelor's degree. Of these, at least 20 must be in formal classes, and at least half of the course work credits must be at the 500 level or above. Up to 10 of the 30 credits may be taken as research and/or thesis credits. The majority of course work normally is taken in WBIO, Biology, and Forestry, but the Graduate Committee may require work in other departments.

A copy of the approved course work outline must be approved prior to the end of the first semester in residence; it will then be placed in the student's file in the WBIO office.

B. M.S. Non-thesis Option. Minimum requirement for the M.S. Degree, Non-thesis Option, is 36 graduate semester credits. Of these, at least 29 must be in formal course work and at least half of the course work credits must be at the 500 level or above. Up to 7 of the 36 credits may be taken as professional paper credits.

C. Ph.D. Degree. Primary emphasis in the Ph.D. program is on professional development, stimulation of intellectual curiosity, and competency in science, rather than on a specified set of courses.

However, certain course work requirements must be completed successfully:

1. the Ph.D. student must obtain a minimum of 60 graduate semester credits beyond the bachelor's degree. A dissertation committee may require more, depending on the student's background for the proposed Dissertation research program;
2. of the 60 semester credits, 20 may be thesis credits;
3. of the remaining 40 credits, at least 20 must be numbered > 500;
4. at least 30 semester graduate credits must be taken at UM;
5. up to 30 semester masters degree credits, 10 of which may be for thesis, research, or independent study courses, may be applied to the 60 credit requirement;

Required course work is geared toward preparing the student to develop sound scientific knowledge and to facilitate the incorporation of that knowledge into conservation practice. Hence, required course work may include aspects of theory, applications, biology and ecology, socio-political aspects of conservation, and statistical and other quantitative methods. The course work package is developed, in consultation with the Dissertation Committee, to assist the student in planning, conducting, and writing the dissertation.

A course work outline must be approved by the dissertation committee prior to the end of the first year in residence. A brief statement followed by the signatures of the committee members will serve as evidence of committee approval. The committee and student may make reasonable amendments to the course work outline if later evaluation shows that further course work is needed. Copies of the approved course work outline and approval are placed in the student's file in the WBIO office.

The WBIO Ph.D. Program has no foreign language requirement, but the Graduate Committee may require competence in a foreign language when appropriate for the student's area of research.

V. CONTINUOUS REGISTRATION, LEAVES OF ABSENCE AND TENURE

The Graduate School requires that graduate students register for credits every fall and spring semester. The number of credits should be that deemed commensurate with use of facilities and faculty time, but is at least 3 credits per semester (6 for students on Teaching or Research Assistantships). Students must apply for a leave-of-absence if they do not plan to be continuously registered. Students who do not register for at least 3 credits per semester for 2 or more semesters without such approval will be dropped from the program by the Graduate School. Re-admission is allowed through petition only.

Maximum time limits allowed for completion of degrees are set at 5 years for M.S. and 7 years for Ph.D. programs by the Graduate School and the Wildlife Biology Program. Students may petition, with support of their committee, for a *1-TIME*, 1-year extension, although granting of the petition is not guaranteed. A 6-month extension will be granted for petitions based on issues covered under the family medical leave act. Petitions for extensions must provide careful justification for not finishing in the already-generous time limit and **MUST** provide a specific timeline of thesis/dissertation chapter completion dates in the extension period. These timelines must be met to continue in the program. Petitions for extensions must first be approved by the student's graduate committee and then will require a vote by the Wildlife Biology Program faculty who may not agree with the committee. No further extensions are allowed and if the student does not finish, they will be dropped from the program. Such students can re-apply to the Wildlife Biology Program through the Graduate School, but may be faced with new degree requirements. No student is eligible for further TA support, programmatic scholarships or awards after reaching maximum time limits.

VI. WILDLIFE BIOLOGY GRADUATE SEMINAR SERIES (WILD 594)

A. Purpose and Participation. The purpose of WILD 594 is to encourage the regular (weekly)

exchange of scientific ideas among Wildlife Biology faculty and students and to promote improved communication skills. All graduate students must enroll for at least 2 semesters of WILD 594 and attend during every semester they are in residence. A few class meetings each year will focus specifically on improving the skills needed for presenting quality seminars, and students and faculty will present seminars during the remaining meetings. Seminar attendance is mandatory when enrolled.

B. Timing of Seminars. Both M.S. and Ph.D. students must present both a proposal seminar and a thesis or dissertation seminar. The maximum time allowed for each seminar is 40 minutes (enforced) to allow ample time for questions and discussion.

The proposal seminar should be presented early in the student's development of the thesis or dissertation topic (see XIII for details on timeline). Although it must be done absolutely no later than the time that the student's committee approves the proposal (i.e. proposal approval is contingent on a completed public proposal seminar), students are encouraged to present the proposal early enough to facilitate input to development of the proposal.

The proposal and thesis or dissertation defense seminars are usually presented on the same day as the student's defense with the committee, but may be presented up to 2 weeks prior to the defense.

For both seminars, students should note that prior planning is important. Scheduling seminars will prioritize thesis and dissertation defenses over other types; cancellations are strongly discouraged and must be approved by the student's committee. Ph.D. students are required to present a seminar once every 2 years during their residence.

VII. RESEARCH PLANNING AND PROPOSALS

A. Research Statement. As soon as possible after the graduate committee is formed, students must prepare a statement that generally describes their research projects and *preliminary* ideas and questions. The student must then arrange a formal committee meeting, no later than the end of the first semester in residence. At this meeting, committee members will evaluate the research statement and the proposed course work outline, provide feedback, and either approve them or recommend modifications.

B. Research Proposal. Each student is required to complete a formal research proposal that presents the conceptual and empirical framework within which the study will be conducted. The proposal should consist of a title, an introduction to the research problem, an explanation of how the problem fits into a broader conceptual framework defined by existing literature, a justification of its importance, the specific objectives, methods (including details about design and proposed methods of analysis), a timetable, and a budget.

M.S. candidates must defend their thesis proposal in a committee meeting and receive committee approval of their proposal by the end of their second semester in residence and prior to collecting data for their thesis research. Students who will begin collecting data for their thesis research after 1 semester of enrollment must defend their thesis proposal in a committee meeting and receive committee approval of their proposal by the end of their first semester in residence and prior to collecting data for their thesis research.

Doctoral students must obtain committee approval of a preliminary research proposal. The preliminary proposal builds on the research statement, providing more detail on concepts, questions, study design, and data. Its purpose is to demonstrate progress toward a full Ph.D. proposal. Committee approval must be obtained no later than the end of their second semester in residence and

prior to collecting data for their dissertation research. Students must defend their full proposal in a committee meeting by the end of their third semester in residence and receive final committee approval of the proposal no later than the end of their fourth semester. Students who will begin collecting data for their dissertation research after 1 semester of enrollment (e.g., students who begin in the spring semester and will conduct fieldwork the following summer) must get approval of the preliminary research proposal by the end of that semester, prior to collecting data. Such students must defend their dissertation proposal in a committee meeting by the end of their third semester and receive final committee approval of their proposal no later than the end their fourth semester. In the case of students that convert from a M.S. to Ph.D. program before completing the M.S., the dissertation proposal must be defended to the committee by the end of their fifth semester in residence and receive final committee approval no later than the end of their sixth semester. We suggest that Ph.D. proposals be structured in the format of an NSF Dissertation Improvement Grant.

Both M.S. and doctoral students must present a formal and detailed public presentation on their thesis or dissertation proposals. This presentation will be given during a regularly scheduled WBIO graduate seminar time slot (see VI-B). Following this presentation, students will meet with their committee for the oral defense of their proposal. After approval by the committee, a committee-signed copy of the proposal (including a statement that the proposal seminar was successfully completed) must be placed in the student's file in the WBIO office. Doctoral students must also submit an advisor-signed copy, timeline included, to the Dean of the Graduate School (see www.umt.edu/grad/).

In approving the proposal, the advisory committee agrees that successful completion of the proposed research will likely result in a satisfactory thesis or dissertation. Any substantive changes made after committee approval must be brought back to the committee for discussion, and documented as a revised and signed proposal in the student's WBIO file. All graduate students are encouraged to meet with all of their committee members at least annually to keep them informed of progress.

VIII. TEACHING REQUIREMENT AND TEACHING ASSISTANTSHIPS

All Ph.D. students, including those whose primary support is an RA, must engage in supervised teaching activities and must teach the equivalent of a regular TA assignment for at least 2 semesters. Non-UM teaching experience will be considered for substitution for the teaching requirement. Each semester that a student is a TA, they must ensure that the Professor for the course prepares a teaching evaluation (see under Annual Review of Student Progress below) and submits it to the Wildlife Biology office, with a copy to the major professor (advisor).

Teaching assistantships are awarded annually on a competitive basis; students with a cumulative GPA ≤ 3.0 will receive lowest priority for teaching assistantships. Initial support is contingent upon the nature and quality of completed course work, GRE scores, letters of recommendation, and other evidence of scholarship filed with the student's application for admission. Renewed support is contingent upon satisfactory progress toward degree requirements and quality of teaching performance. An individual graduate student may not receive more than 4 semesters of support on a Teaching Assistantship.

IX. ANNUAL REVIEW OF STUDENT PROGRESS

Students are required to maintain a cumulative GPA ≥ 3.0 and to complete certain tasks by specified deadlines. The WBIO Student Evaluation Committee and the full faculty evaluate student GPA and progress every spring based on a form completed by the student and major professor by April 1 every year (see Appendix). Any deficiencies are identified and the student is placed on probation and given 1 semester to rectify these deficiencies. The Student Evaluation Committee will conduct a follow-up

evaluation by 1 December to determine whether students have rectified deficiencies. Students on probation who do not fulfill requirements in the following semester will then become ineligible for TA or RA support in the next semester. A formal meeting of the student's committee will then be held to determine whether additional conditions need to be set (e.g., discontinuation of field work until deficiency is corrected). If deficiencies are still not rectified by the end of the second semester after being identified, the student will be dropped from the program.

Each semester the student is a TA, the student is responsible for having the professor in charge of the class submit to the WBIO office (with a copy to the major professor), a short evaluation that ranks the student from 1 (poor) to 5 (excellent), with any comments appended as desired on the following 6 criteria:

- 1) Preparedness/organized?
- 2) Positive interaction with students
- 3) Independent creativity in teaching
- 4) Enthusiasm
- 5) Student evaluations
- 6) Overall assessment

Note that the major professor must sign the form. If the student is on an RA, the professor in charge of the RA must attach a brief evaluation statement.

X. COMPREHENSIVE EXAMINATION GUIDELINES (Ph.D. Students Only)

The comprehensive exam will be completed by the end of the doctoral student's 4th semester. In the case of students that convert from a M.S. to Ph.D. program before completing the M.S., the comprehensive exam must be completed before the end of the sixth semester.

- 1) At least 1 month before the beginning of the exam, the student must:
 - a) provide a copy of these regulations to all examination committee members
 - b) convene a committee meeting at which an examination committee chair is selected and examination topics are discussed. The comprehensive examination committee chair is normally a member of the Wildlife Biology faculty and the student's committee, but not the student's major professor.
- 2) At least 2 days before the beginning of the exam, the examination committee must meet to approve the examination. Given the diversity of faculty in the Wildlife Biology Program, a formal meeting is required to ensure consistency in application of the examination to different students. The student will be informed as to how the examination will be administered.
- 3) The written portion of the comprehensive examination will consist of up to 8 hours of open and/or closed book questions from each committee member, at the discretion of each committee member, typically answered by the student over 5 consecutive days. At least 1 committee member will ask biologically oriented questions and at least 1 committee member will ask policy- or management oriented questions. Most wildlife conservation and management involves biology as well as social/political/legal/economic aspects; the intent here is to ensure that doctoral candidates have been exposed to and have knowledge in both.
- 4) At least 3 (and no more than 10) calendar days after completion of the written examination, faculty will communicate to the examination chair their evaluation of the student's answers. The rating will be 1 of the following:
 - a) Pass – Student progresses to the oral exam.
 - b) Marginal – The examination demonstrates weakness in 1 or more areas. The committee will meet to discuss the next step, but it may require some or all of the exam to be re-written and may

postpone for a reasonable time the oral examination.

c) Fail – A complete fail of the written exam will require termination of the student’s program.

5) The oral examination explores in depth the areas presented in the written questions, but is not restricted to those areas. The oral examination is restricted to 3 hours in length. The examination is open to all members of the faculty of The University of Montana, though all except committee members are excused before the vote.

6) Normally, the vote for admission to candidacy will occur at the end of the oral examination. Each examination committee member will rate the student’s performance across both portions of the examination in 1 of 3 categories:

a) Pass – No further work is necessary. Student progresses to candidacy.

b) Conditional pass – The examination demonstrates weakness in 1 area. The student is required to make up for this deficiency before progressing to candidacy. At the examination, the comprehensive examination committee will specify the tasks required for the student to progress to candidacy, and the criteria for evaluating their completion. Typically, students in this category are required to take an additional course or complete additional written work.

c) Fail – The examination may be rescheduled if the student fails, but the Comprehensive Exam Committee retains the right to recommend termination of the student’s program upon majority opinion at any time.

After each committee member states their opinion, the committee discusses the vote. At least 75% must vote in favor of a “Pass” or “Conditional pass” or the student has failed the exam.

XI. ADMISSION TO CANDIDACY

At least 6 months before the M.S. or Ph.D. degree is awarded, and after successful completion of the comprehensive exam (for Ph.D. students), the student must submit to the Graduate School 1 copy of the Application for Graduation Form (available from <http://www.umt.edu/grad/> or the Wildlife Biology Office). One copy must also be submitted to the WBIO Office.

XII. COMPLETION AND DEFENSE OF M.S. THESIS OR Ph.D. DISSERTATION

A. Content. The thesis or dissertation must embody the results of independent research by the candidate. It must be an original contribution to knowledge, appropriate for publication in peer-reviewed journals. Many WBIO students write their thesis or dissertation as a series of papers, and some submit such papers to journals before graduating. A paper that is accepted by a journal does not, however, automatically constitute acceptance by the committee for the thesis/dissertation. We strongly encourage students to receive approval for manuscripts from their committees *prior* to submission to journals.

B. Deadlines and approvals. Copies of the dissertation or thesis draft (edited and approved by the advisor as being ready for defense) are provided to the rest of the committee, and a meeting for all committee members is scheduled for a vote on approval no less than 10 calendar days after the committee received the draft. These important steps cannot be circumvented by having the student visit faculty to collect signatures individually. After the committee unanimously approves the thesis for defense, or > 75% of the committee approves the dissertation for defense, the student submits it to the WBIO faculty for their review at least 10 calendar days prior to the defense date, (note: this means that students must provide copies of their dissertation or thesis to their committee at least 20 calendar days before their defense). The signatures of the committee members on the title page of the review copy of the thesis or dissertation indicate that at least 75% of the members of the committee have agreed that it is ready to defend. Students must also provide the Graduate School an

electronic copy of the committee-approved defense draft of the dissertation or thesis prior to their defense date (see www.umt.edu/grad/); the Graduate School reviews this draft for formatting only. Public notice of the defense should be posted 7 calendar days prior to the defense date.

C. Defense. Masters and doctoral students are required to conduct a public 40-minute seminar presentation of the research findings to the advisory committee and any other interested persons followed by a 10-minute question and answer period (see VII-B). This should be done during the WBIO seminar series. The 1 (M.S.) or 2 (Ph.D.) hour defense, which normally occurs immediately following the seminar but may occur up to 2 weeks thereafter, is open to all faculty members of the University. The student is expected to answer questions specific to the research and those of a more general conceptual nature. Additionally, the student is required to “defend” the approach, methods, analysis, and conclusions of their research. Earlier draft thesis copies that were marked by committee members, as well as copies of the proposed final draft, must be brought to the defense for reference. The exam is passed with no committee votes to fail on the M.S. Defense and with no more than 1 committee vote to fail on the Ph.D. Defense. In the case of failure, 1 repeat defense examination is permitted, following a suitable interval as determined by the committee. Students who are unable to finish during the academic year must return the following fall for the defense. No summer defenses are allowed because faculty usually have other summer commitments, and the campus community is generally not available for what is a public defense.

D. Thesis and Dissertation Copies. For guidance in preparing and submitting a thesis or dissertation, as well as deadlines, forms, and procedures required for graduation, students will need to consult the Graduate School website www.umt.edu/grad/. The major professor or the Wildlife Biology Office will submit the final copy of the thesis or dissertation to the Graduate School in an electronic format. The student submits her or his final to the Mansfield Library and must submit a paper copy to be bound or a bound copy of their thesis or dissertation to the Wildlife Biology Office and is encouraged to have an additional copy of the thesis bound by a commercial binding service for the advisor.

XIII. Timeline

	M.S.	Ph.D.
Committee membership submitted to WBIO Office	By end of 1st semester	
Committee-approved coursework to WBIO	By end of 1st semester	
Committee-approved research statement	By end of 1st semester	
Committee-approved preliminary proposal	N/A	Prior to end of second semester, before collecting data for dissertation research (see VII-B); by end of 1 st semester when data collection begins after 1 semester of residence.
Research proposal presented orally and successfully defended	Prior to collecting data for thesis research, defended and committee approved by the end of 2 nd semester. Where data collection begins after 1 semester, defended and committee approved by the end of the 1 st semester.	Prior to collecting data for dissertation research, by end of 3 rd semester

Successful completion of comprehensive exam		4 th semester
Application for admission to candidacy	6 months before degree awarded	
Committee-approved dissertation proposal		By end of 4 th semester
Draft thesis or dissertation certified by committee as ready for defense	10 calendar days before defense	
Electronic copy of draft thesis to Graduate School	Typically ≥ 7 calendar days before defense (check www.umd.edu/grad)	
Successful defense	Within 5 academic years of start date	Within 7 academic years of start date
Submit final electronic copy of thesis or dissertation to Graduate School	Typically 4 weeks after the end of semester of successful defense (check www.umd.edu/grad)	
Submit final copy of thesis or dissertation electronically to Mansfield Library	Typically 4 weeks after the end of semester of successful defense (check www.umd.edu/grad)	

Annual Progress Form for Graduate Students in Wildlife Biology – *Appendix*
[Must be turned in each year to Wildlife Biology Office by April 1]
(Attach full CV)

NAME and EMAIL: _____ **M.S./Ph.D. (Circle one)** **DATE:** _____
CUM. GPA: _____ **DATE FIRST ENROLLED:** _____ **ADVISOR:** _____

I. State whether each of the following has been completed, and if so, the date completed, or the date you plan to complete each item (see regulations):

	DATE PLANNED	DATE ACCOMPLISHED
<input type="checkbox"/> Enrolled in WILD 594	_____	_____
<input type="checkbox"/> Committee submitted to WBIO office	_____	_____
<input type="checkbox"/> Committee approves course work	_____	_____
<input type="checkbox"/> Committee approves research plan	_____	_____
<input type="checkbox"/> Research proposal approved	_____	_____
<input type="checkbox"/> Committee reviews dissertation proposal (Ph.D. only)	_____	_____
<input type="checkbox"/> Complete comprehensive exam (Ph.D. only)	_____	_____
<input type="checkbox"/> Draft certified as ready for defense	_____	_____
<input type="checkbox"/> Defense	_____	_____

II. Attach a brief evaluation statement(s) from TA/RA professor(s).

Professor that you were a TA/RA (circle one) for last spring semester: _____
Professor that you were a TA/RA (circle one) for last fall semester: _____

- Each semester the student is a TA, the professor in charge of the class needs to complete a short evaluation that ranks the student from 1 (poor) to 5 (excellent), with any comments appended as desired on the following 6 criteria. This must be submitted to the Wildlife Biology office, with a copy to the major professor.
 - 1) preparedness/organized?;
 - 2) positive interaction with students;
 - 3) independent creativity in teaching;
 - 4) enthusiasm;
 - 5) student evaluations;
 - and 6) overall assessment
- Each semester the student is an RA, the student’s major professor needs to complete a short evaluation.

III. Record the following for work completed SINCE LAST APRIL 15

Publications In Press or published only (give full citation):
Proposals Submitted (list all PI’s in order, amount, and granting organization). Say if funded or not:
Presentations at Conferences or other professional outlets:
Awards for Research Excellence (e.g., best paper, fellowships, etc):

Management/Conservation Impacts of research:
Other Professional Activities (including graduate student service):

IV. A brief statement by the major professor on progress:

SIGNATURE OF BOTH STUDENT AND MAJOR ADVISOR IS REQUIRED

Student Signature

Advisor Signature

Appendix 7. Graduate-level courses available to graduate students.

CLASS	TITLE	INSTRUCTOR(S)	CREDITS	SEMESTER
WILD 594	Graduate Seminar	Robinson	1	AUT & SPR
Research Design and Communication				
WILD 540/ WILD 541	Research Design and Design R lab	Various	3 & 1	AUT
WILD 595	Communicating Science	Luis	2	SPR-EVEN
Conservation and Human Dimensions				
NRSM 574	Perspectives in Human Dimensions	Metcalf	3	SPR
NRSM 513	Natural Resource Conflict Resolution	Johnson	3	AUT
NRSM 515	Collaborative Skills for Natural Resource Leaders	Johnson	3	SPR
NRSM 571	International Conservation and Development	Bosak	3	AUT
NRSM 579	Collaborative Conservation: Practicum	McKinney and Johnson	3	AUT & SPR
NRSM 595	Tribal Natural Resources Management	Harrington	1	AUT & SPR
BIOB 452	Conservation Ecology	Luikart	3	SUM
Ecology and Population Biology				
WILD 470	Conservation of Wildlife Populations	Luis & Lukacs	4	AUT & SPR
BIOB 435	Comparative Animal Physiology	Woods	3	SPR
BIOM 460	Ecology of Infectious Diseases	Luis	3	SPR
WILD 595	Integrated Population Modeling	Lukacs	3	AUT-ODD
WILD 542	Statistical Applications in Wildlife Biology	Lukacs	1	SPR
WILD 571	Estimation of Demographic Parameters	Lukacs	4	AUT-EVEN
WILD 591	Theoretical Ecology	Luis	4	AUT-ODD
WILD 563	Topics in Habitat Ecology	Hebblewhite	1	AUT & SPR
WILD 568	Topics in Aquatic Ecology	Eby & Whiteley	1	AUT & SPR
WILD 562	Wildlife Habitat Modeling	Hebblewhite	4	SPR-ODD
BIOB 518	Plant-Consumer Interactions	Maron	3	SPR
BIOB 524	Physiological Plant Ecology	Sala	3	AUT-EVEN
FORS 595	Landscape Ecology	Dobrowski	3	SPR EVEN
BIOB 506	OBEE Core 2 - Ecology	Lowe, Good et al.	4	AUT - ODD
BIOS 532	Ecosystem Ecology	Cleveland	4	AUT
BIOS 534	Integrated Systems Ecology	Kimball	3	SPR
ST: BIOB 595	Ecological Models and Data	Robert Hall	3	SPR
Evolution and Genetics				
BIOB 480	Conservation Genetics	Whiteley	3	SPR
BIOB 483	Phylogenetics and Evolution	Miller	3	AUT
BIOB 486	Genomics	Good	3	SPR
BIOB 595	Population Genetic Data Analysis	Luikart	3	SEPT
WILD 595	Applied Population Genetics	Whiteley	3	SPR-ODD

BIOB 595	Advanced Population Genomics	Luikart	3	AUT-EVEN
BIOB 561	Population Genetics Seminar	Luikart or Whiteley	1	AUT & SPR
BIOB 505	OBEE Core 1 Evol and Genetics	Good et al.	4	AUT-EVEN
ST: BIOB 595	Online: Landscape Genetics	Erin Landguth	3	SPR - EVEN
BIOB 505 - OBE Core Course - Genetics and Evolution. 4 Credits.				
Offered every other autumn. Prereq., graduate standing. Exploration of the fundamental concepts and approaches in evolutionary biology, functional biology and evolutionary genetics with evolutionary ecology woven throughout. Lectures and discussions, with an emphasis on primary literature, classic and contemporary. Level: Graduate				
BIOB 506 - OBE Core Course - Ecology. 4 Credits.				
Offered alternate years. Prereq., graduate standing. Broad overview of population and community ecology. Lectures and discussions, introducing theoretic foundations and exploring classic and more recent empirical tests of ecological theory with relevant topics in evolutionary ecology and functional biology woven throughout. Level: Graduate				

CLASS	TITLE	INSTRUCTOR(S)	CREDITS	SEMESTER
Math and Statistics				
STAT 422	Mathematical Statistics	Bardsley	3	SPR
STAT 421	Probability Theory	Instructor	3	AUT
STAT 542	Applied Linear Models	Instructor	3	AUT-EVEN
STAT 451	Statistical Methods I	Sulock or Graham	3	AUT
STAT 457	Computer data analysis I	Sulock or Graham	1	AUT
STAT 452	Statistical Methods II	Sulock or Graham	3	SPR
STAT 458	Computer data analysis II	Sulock or Graham	1	SPR
MATH 445	Statistical, Dynamical, and Computational Modeling	Bardsley	4	AUT ODD
MATH 461	Data Science Analytics	Alvaro	3	AUT
STAT 543	Applied Multivariate Statistical Analysis	Harrar	4	SPR-EVEN
STAT 549	Applied Sampling	Patterson	3	AUT-EVEN
MATH 561	Advanced Data Science Analytics	Alvaro	3	AUT
FOR 505	Sampling Methods	Affleck	3	SPR
FORS 538	Applied Statistic Models for Ecology	Dobrowski & Affleck	3	AUT
BIOB 595-4	Using R for Biostatistics	Woods	2	SPR
Current Catalog...				
STAT 421 - Probability Theory. 3 Credits.				
Offered autumn. Prereq., M 273 or consent of instructor (STAT 341 recommended). Fundamentals of probability; discrete and continuous random variables; expected value; variance; joint, marginal, and conditional distributions; conditional expectations; applications; simulation; central limit theorem; order statistics. Level: Undergraduate-Graduate				
STAT 422 - Mathematical Statistics. 3 Credits.				
Offered spring. Prereq., STAT 421. Introduction to the theory of point estimation, interval estimation, and hypothesis testing. Level: Undergraduate-Graduate				
STAT 451 - Statistical Methods I. 3 Credits.				
Offered autumn. Prereq., one year of college mathematics including M 115 or equiv. course in probability or consent of instr. May not be counted toward a major in mathematics, except toward the mathematics education concentration. Intended primarily for non-mathematics majors who will be analyzing data. Graphical and numerical summaries of data.				

elementary sampling, designing experiments, probability as a model for random phenomena and as a tool for making statistical inferences, random variables, basic ideas of inference and hypothesis testing. Level: Undergraduate-Graduate			
STAT 452 - Statistical Methods II. 3 Credits.			
Offered spring. Prereq., STAT 451. Continuation of STAT 451. Multiple regression, experimental design, analysis of variance, other statistical models. Level: Undergraduate-Graduate			
STAT 457 - Computer Data Analysis I. 1 Credit.			
Offered autumn. Coreq., STAT 451 or consent of instr. An introduction to software for doing statistical analyses. Intended primarily for students in STAT 451. Level: Undergraduate-Graduate			
STAT 458 - Computer Data Analysis II. 1 Credit.			
Offered spring. Coreq., STAT 452 or consent of instr. Continuation of STAT 457. Intended primarily for students in STAT 452. Level: Undergraduate-Graduate			
M 445 - Statistical, Dynamical, and Computational Modeling. 4 Credits.			
Offered autumn odd-numbered years. Prereq., consent of instr. An interdisciplinary course on the integration of statistical and dynamical models with applications to biological problems. Linear and nonlinear models, estimation, systems of ordinary differential equations, numerical integration, bootstrapping, MCMC methods. Intended both for students in mathematics and the natural sciences. Level: Undergraduate-Graduate			
M 461 - Data Science Analytics. 3 Credits.			
Offered autumn. Prereq., STAT 341, and one of M 221 or M 273, or consent of instructor. This is a methods course supporting the Big Data Certificate Program. The course provides the students with the essential tools of data analytics. The content consists of data dictionaries and data mappings, distributed computing, and related methods. Other topics may include data visualization, regression, and cluster analysis. This course may be used to satisfy the course requirements of the Big Data Certificate Program. Level: Undergraduate. Co-convenes with M 561.			