WSU Five-Year Program Review
Self-Study

Cover Page

Department/Program: Zoology

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A. Brief Introductory Statement

The Department of Zoology serves diverse roles at WSU. This self-study document summarizes those roles in the context of curriculum and undergraduate education. Courses in the Department include those that meet the life-science general-education requirement, those that are service courses for students pursuing careers in medicine, and courses for science majors, with emphasis (of course) on zoology majors (section D). All courses (section C) are designed and delivered in a manner consistent with the Zoology mission statement (section B) and measurable learning outcomes (section D). Thus, courses are diverse and emphasize both important zoological content and practical skills relevant to biological fields. Coursework serves as the formal venue for zoological study, but many students also engage in independent study. These students typically work with faculty members in research projects. Many such projects produce professional-quality results and give students substantial education and experience. Faculty members are well qualified and students overall indicate teaching in the department is better or much better than average (section F). Advising in the Department is organized by potential career path, so very specialized and relevant career advice is available to the large majority of zoology majors and pre-professional students (section E). Faculty members are active in research and community service (sections G & H), which enriches their teaching and, especially, independent work with students (section D). Support for the Department in general is good, with old or inadequate laboratory facilities being the most significant limitation. Over the last five years, the Department has experienced consistent success and faculty members are working hard to ensure this success will continue and, hopefully, expand.

B. Zoology Mission Statement

The Department of Zoology educates undergraduate students for diverse careers as biologists and for entry into graduate and professional schools. Broad faculty expertise is reflected in courses that explore animal biology at molecular, cellular, organismal, and ecological levels. Written, oral, and laboratory exercises that develop skills fundamental to success in all fields of biology are integrated throughout the curriculum. Particular emphasis is placed on creativity, and critical thinking, written and oral communication, laboratory and field experience, computer proficiency, and understanding scientific literature. Students are encouraged to work closely with faculty on research projects. Student-centered research opportunities are widely available and provide high-impact learning experiences such as independent study credit, completion of an undergraduate-research thesis, and publication and presentation of research findings at professional meetings. The Department recognizes its special responsibility as a center of pre-professional training in medical science at Weber State University. Faculty instruct and advise such students from departments and programs across the University. Finally, the Department and its faculty offer general-education and honors courses that give all Weber State students a chance to better understand human biology and better appreciate and respect animal life.

C. Zoology Curriculum

The Department of Zoology serves majors with interests in a variety of biology-related careers. The curriculum is designed to give a basic background in all aspects of biology from molecular biology to ecology. The emphasis is on animal biology, but subjects are generally applicable all aspects of biology. The curriculum also reflects the diverse interests and expertise of faculty members. This is particularly true with regard to upper-division elective courses.

As described below, the curriculum builds on several central themes that are introduced in Principles of Zoology I and II. These themes recur in subsequent classes in greater detail and intensity. At the same time, important scientific skills are also introduced in Principles of Zoology I and II, recurring as well in subsequent classes. Thus, a student enrolled in any Zoology course will gain some exposure to important zoological concepts and scientific skills and a student that proceeds through the entire curriculum will have ample opportunity to fully understand each theme and develop a suite of complementary skills relevant to careers in all biological sciences.

Zoology Curriculum Map: core courses required for Zoology major
Emphasis Ratings: I = Introduced, E = Emphasized, U = Utilized, A = Assessed Comprehensively

			Zoology Learning Outcomes									
Number	**Title**	**Hours**	**1a**	**1b**	**1c**	**1d**	**1e**	**1f**	**1g**	**2**	**3**	**4**
Required courses												
ZOOL 1110	Principles of Zoology I	4	E	E	I		I	I	I	I		E
ZOOL 1120	Principles of Zoology II	4	I	E	E	E	E		E	E		U
ZOOL 3200	Cell Biology	4	A	E	A		E				U	A
ZOOL 3300	Genetics	4	A	A			U				E	A
ZOOL 3450	Ecology	4	A	A	E	E	A	A	A	E	E	A
ZOOL 3600	Comparative Physiology	4	A	E	U	A	A		E	E	I	A
ZOOL 3720	Evolution	3	A	A	A	A	E	I	U	I	I	U
ZOOL 4990	Seminar	1	A	E	E	E	E	E	E	E	A	A
Elective courses (12 hours required)												
ZOOL 3470	Zoogeography	3	U	E			U	I			I	U
ZOOL 3500	Conservation Biology	3	A	A	A		A	A	A	A	U	A
ZOOL 4050	Comparative Vertebrate Anatomy	4	U	A	I	A	I		A	A	U	A
ZOOL 4100	Vertebrate Embryology	4	U	A	U	A	I		A	A	U	A
ZOOL 4120	Histology	4	E	I	I	E			A	A	U	A
ZOOL 4210	Advanced Human Physiology	4	A	I	I	U	I	I	U	I	U	A
ZOOL 4300	Molecular Genetics	4	A	I	I				E		A	A
ZOOL 4350	Animal Behavior	4	A	A	E		E	E	A	U	E	A
ZOOL 4470	Wildlife Ecology	4	A	A	U		A	A	A	A	A	A
ZOOL 4480	Aquatic Ecology	4	U			I	E	U		U	E	U
ZOOL 4640	Entomology	4	I	E	E	A	E	I	E	E	I	
ZOOL 4650	Ichthyology	4	U	E	E	E	I	I		U	E	U
ZOOL 4660	Herpetology	4	U	E	E	E	U	E	E	E	E	E
ZOOL 4670	Ornithology	4	A	A	U	A	A	U	U	A	U	A
ZOOL 4680	Mammalogy	4	A	A	A	A	A	A	U	A	U	A
ZOOL 4900	Advanced Human Anatomy	3	E	E	E	E	U		E		I	A

D. Zoology Student Learning Outcomes and Assessment

Measureable Learning Outcomes in Zoology

1. At the end of their study at WSU, students in Zoology will understand seven basic principles:
    a. The nature of scientific inquiry in the study of biology;
    b. The role of evolution as the major unifying principle in biology;
    c. The relation of genetic and evolutionary continuity to animal diversity;
    d. The relation of anatomical structure and function to taxonomic organization of animals;
    e. The taxonomic organization of life from molecules and cells to organisms and ecosystems, with emphasis on how interactions among levels shape the biosphere;
    f. The ecological relations between humans and other organisms and the increasingly significant impact of human activities on the biosphere;
    g. The role of zoological study in the study of human biology.
2. Students will appreciate the ecological, aesthetic, economic, and scientific value of animals.
3. Students will become aware of career opportunities available to a zoology graduate and prepare themselves for employment and for professional or graduate school.
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory and field research techniques, written and oral communication, and reading and critically evaluating scientific literature.

Evidence of Learning: Courses within the Major including implementation of High-Impact and Service-Learning approaches

Required Course Summary Information:

ZOOL 1110, PRINCIPLES OF ZOOLOGY I:

Principles of Zoology I is designed to introduce science majors to four main biological areas: (1) cell biology, (2) genetics, (3) evolution, and (4) ecology. It also introduces students to science in general and animal science in particular (see curriculum map above). Test scores serve as main evidence of learning in this course (see Appendix A). More focused assignments include article reviews of primary scientific literature and lab reports based on in-lab experiments. These assignments and examples in lecture give students a substantial introduction to scientific literature. Lab reports are a challenge for students and many struggle, but their use in this course is a critical first-exposure that helps prepare students for similar assignments in upper-division classes. Nevertheless, laboratory professors continually work to find ways to make important aspects of lab-report assignments as straightforward and accessible to students as possible. Students in Principles of Zoology I are also required to maintain a semester-long laboratory notebook that tracks their learning progress.

ZOOL 1120, PRINCIPLES OF ZOOLOGY II:

Principles of Zoology II is designed to introduce Zoology majors and pre-medical students to the animal kingdom, animal taxonomy, and principles of animal evolution. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). Test scores serve as main evidence of learning in this course (see Appendix A). More focused assignments include article reviews of primary scientific literature and lab reports based on in-lab experiments. These assignments and examples in lecture give students a substantial introduction to scientific literature. Lab reports are a challenge for students and many struggle, but their use in this course is a critical early-exposure that helps prepare students for similar assignments in upper-division classes. Nevertheless, laboratory professors continually work to find ways to make important aspects of lab-report assignments as straightforward and accessible to students as possible. Laboratories in Principles of Zoology II also require many animal dissections and students must learn to identify major animal taxa and their diagnostic anatomical features.

ZOOL 3200, CELL BIOLOGY:

Cell Biology is designed to introduce Zoology majors and pre-medical students to cellular structures and processes. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). Test scores serve as main evidence of learning in this course (see Appendix A). Cell Biology is challenging for students, but is critical within the Zoology curriculum and for preparing students for medical school. In this regard, it is notable that student performance on lab reports in Cell Biology (76%) is substantially improved over that in Principles of Zoology II (69%). This is partly attributable to the fact that better students on average advance to Cell Biology. It also could reflect differences in lab-report specifics and instructional style. Nevertheless, better performance on lab reports in Cell Biology suggest the Zoology curriculum encourages student improvement over time in conducting and reporting scientific projects.

ZOOL 3300, GENETICS:

Genetics is designed to introduce Zoology majors and pre-medical students to the biology of inheritance and evolution. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). Test scores serve as main evidence of learning in this course (see Appendix A). More focused, assessments conducted in Genetics lab include laboratory reports and notebooks. Use of student lab notebooks is also required in Principles of Zoology I, so this assignment furthers the emphasis on students as independent investigators. As noted above for Cell Biology, student performance on lab reports in Genetics (also 76%) is substantially improved over that in Principles of Zoology II (69%). This is partly attributable to the fact that better students on average advance to Genetics. It also could reflect differences in lab-report specifics and instructional style. Nevertheless, better performance on lab reports in Genetics suggest the Zoology curriculum encourages student improvement over time in conducting and reporting scientific projects.

ZOOL 3450, ECOLOGY:

Ecology is designed to introduce Zoology majors to the biology of ecosystems and there is also an emphasis on resource management and conservation. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). There has been no recent assessment of learning in this course, so it is a high priority for future assessment.

ZOOL 3600 COMPARATIVE PHYSIOLOGY:

Comparative Physiology is designed to introduce Zoology majors to commonalities and evolutionary adaptations in physiological processes within the animal kingdom. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). There is substantial evidence of learning in this course (see Appendix A). Focused learning assessments include lab reports, student-led discussions, and oral reports. There are many focused laboratory activities that lead students to make hands-on comparisons among types of animals, relate animal physiology to human physiology, and gain experience in laboratory procedures. Also, student performance on lab reports in Comparative Physiology (85%) exceeds that in Cell Biology and Genetics (76%), which suggests students proceeding to this level in the Zoology curriculum have become generally proficient in conducting and reporting scientific projects.

ZOOL 3720, EVOLUTION:

Evolution is designed to provide Zoology majors with a broad overview of animal evolution and introduce students to the scientific literature (see curriculum map above). Test scores serve as main evidence of learning in this course (see Appendix A). However, this course includes several focused assignments including term projects and group discussions. Many assignments and discussion topics give students experience with scientific methods and introduction to careers and practices in biology.

ZOOL 4990 SEMINAR:

Zoology Seminar is a "capstone" course for Zoology majors. There is tremendous variety within this course because subject matter and emphases are determined each semester by the professor(s) who teaches it. The common theme is for the course to provide an intimate, discussion-format setting (enrollment is normally capped at 15). Often, professors select a topic that is timely and relevant to careers in Zoology, but also integrates a suite of emphases that cause students to apply and integrate knowledge from their previous coursework. There has been no recent assessment of learning in this course because it varies each semester. However, there may be opportunity to use this course in the future to assess overall learning of Zoology majors nearing graduation.

Elective Course Summary Information:

ZOOL 3470, ZOOGEOGRAPHY:

Zoogeography is designed to introduce Zoology majors to the interface of evolution, ecology, and the environment. It also introduces students to relevant scientific literature and basic methods of biogeography (see curriculum map above). There is substantial evidence of learning in this course (see Appendix A). Focused, learning assessments include a semester-long research project that proceeds through multiple steps. Each step requires an oral presentation upon completion. Completion of all steps results in a poster presentation. Students cannot complete this presentation or pass the class without success at each step along the way. Article reviews of related studies, in-class discussions and presentations of methods by the professor (who also completes a project), and in-class time for project development emphasize teamwork, individuality of biogeographers as professionals, and importance of biological findings as hypotheses for testing.

ZOOL 3500, CONSERVATION BIOLOGY:

Conservation Biology is designed to introduce Zoology majors to societal issues of resource management with emphasis on survival of animal species and preservation of global animal diversity and to introduce students to the scientific literature (see curriculum map above). This class has a strong focus on environmental ethics and civic engagement (see Appendix A). Students engage with the professor in regular in-class discussions and must complete a semester-long project that includes a connection to the community or to conservation efforts "at large". This course is an excellent example of the use of community-based learning within the Department.

ZOOL 4050, COMPARATIVE VERTEBRATE ANATOMY:

Comparative Vertebrate Anatomy is designed give Zoology majors detailed experience with anatomical diversity among animals, evolutionary anatomy, and to introduce students to basic laboratory methods and the scientific literature. Students cannot succeed without developing proficiency in dissection and intimate knowledge of animal functional anatomy (see Appendix A).

ZOOL 4100, VERTEBRATE EMBRYOLOGY:

Vertebrate Embryology is designed give Zoology majors detailed experience with developmental biology from a comparative and evolutionary standpoint, and to introduce students to basic laboratory methods and the scientific literature. This class includes laboratory dissections and detailed microscopy (see Appendix A). Students also must participate in discussions and complete in-class presentations.

ZOOL 4120, HISTOLOGY:

Histology is designed give Zoology majors detailed experience with animal tissues, and to introduce students to basic laboratory methods and the scientific literature. This class includes a strong emphasis on detailed microscopy and importance of tissue research in human biology and medical science (see Appendix A).

ZOOL 4210, ADVANCED HUMAN PHYSIOLOGY:

Advanced Human Physiology is designed to give Zoology majors and pre-medical students detailed experience with physiological processes of humans. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). A semester-long project in this course ensures students experience scientific methods first hand. There is also emphasis on writing and data analysis (see Appendix A).

ZOOL 4300, MOLECULAR GENETICS:

Molecular Genetics is designed to give Zoology majors detailed experience with molecular aspects of genetics and evolution. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). Evidence of learning in this course includes test scores, laboratory reports, and laboratory notebooks (as also required in Principles of Zoology I and Genetics; see Appendix A). Student performance on lab reports in Molecular Genetics (80%) exceeds that in Cell Biology and Genetics (76%), which suggests students proceeding to this level in the Zoology curriculum have become generally proficient in conducting and reporting scientific projects.

ZOOL 4350, ANIMAL BEHAVIOR:

Animal Behavior is designed to introduce Zoology majors to behavioral aspects of animal biology. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). The Animal Behavior laboratory includes a semester-long, independent research project that requires students to develop and test a scientific hypothesis. Final project results are presented orally and in writing.

ZOOL 4470, WILDLIFE ECOLOGY:

Wildlife Ecology is designed to introduce Zoology majors to the biology of wildlife management. It also introduces students to basic laboratory methods and the scientific literature. There has been no recent assessment of learning in this course, so it is a high priority for future assessment.

ZOOL 4480, AQUATIC ECOLOGY:

Aquatic Ecology is designed to introduce Zoology majors to aspects of ecology and conservation from an aquatics perspective. It also introduces students to basic laboratory methods in aquatic ecology and related scientific literature (see curriculum map above). There is substantial evidence of learning in this course (see Appendix A). Lecture periods are focused on in-class discussion based on readings. Students must produce writings that apply readings to water management issues. As part of the Aquatic Ecology laboratory, students complete semester-long projects that require collection of field data, identification of aquatic invertebrates in the lab, and presentation of findings based on analysis of field and laboratory data. There is a strong emphasis on practical application of ecological concepts and connection to local water-management activities and entities.

ZOOL 4640, ENTOMOLOGY:

Entomology is designed to give Zoology majors detailed experience with insects. It also introduces students to basic laboratory methods and the scientific literature (see curriculum map above). The Entomology laboratory includes a semester-long, independent research project that requires students to prepare a 100-specimen insect collection based on individual field collections, specimen identification, and specimen preparation.

ZOOL 4650, ICHTHYOLOGY:

Ichthyology is designed to give Zoology majors detailed experience with fishes. It also introduces students to basic laboratory methods in ichthyology and related scientific literature (see curriculum map above). Evidence of learning (see Appendix A) is based on a series of writing assignments associated with in-class discussion and semester-long laboratory projects that require collection of field data, laboratory analysis of field data, and presentation of findings. There is a strong emphasis on practical application of fish biology in connection to fish management and conservation.

ZOOL 4660, HERPETOLOGY:

Herpetology is designed to give Zoology majors detailed experience with amphibians and reptiles. It also introduces students to basic laboratory methods in herpetology and related scientific literature (see curriculum map above). Along with traditional exams, learning is assessed through group and individual discussions, team presentations about local amphibians and reptiles, experience in field collecting amphibians and reptiles, and hands-on curatorial activities with the WSU amphibian and reptile collection (see Appendix A).

ZOOL 4670, ORNITHOLOGY:

Ornithology is designed to give Zoology majors detailed experience with birds. It also introduces students to basic laboratory methods and the scientific literature. There has been no recent assessment of learning in this course, so it is a high priority for future assessment.

ZOOL 4680, MAMMALOGY:

Mammalogy is designed to give Zoology majors detailed experience with mammals, to introduce students to basic laboratory methods and to the scientific literature (see curriculum map above). This class has a strong focus on evolution, mammal diversity, and civic engagement (see Appendix A). Students engage with the professor in regular in-class discussions and must complete a semester-long project that includes a connection to the community or to conservation efforts "at large". This course is an excellent example of the use of community-based learning within the Department.

ZOOL 4900, ADVANCED HUMAN ANATOMY:

Advanced Human Anatomy is designed to give Zoology majors and pre-medical students detailed exposure to and teaching experience in the realm of human anatomy. The course includes extensive laboratory work and intensive assessment because students use laboratory work to prepare and deliver lesson plans for the Human Anatomy course (see Appendix A). Students must excel in Human Anatomy and be selected via an application process to enroll in this course. This course is an excellent example of high-impact learning within the Department.

Evidence of Learning: Zoology "Service" Courses

ZOOL 2100, HUMAN ANATOMY:

Human Anatomy is designed to introduce students from a diversity of human-related fields to the structure and function of the human body. The course also introduces students to basic laboratory methods. Although this course is not required for Zoology majors and is not a general education course, it has a high annual enrollment (~600 students) and also has a high profile as an important course for students in all medical fields. Thus, the course has great potential to introduce students to aspects of science and Zoology (see Appendix B). Students who excel in this course are often recruited as instructors for labs in subsequent semesters. These students are often in the pre-med program, and the lab-instructor program gives them a unique opportunity to study the human body in detail and develop interpersonal and laboratory skills.

ZOOL 2200, HUMAN PHYSIOLOGY:

Human Physiology is designed to introduce students from a diversity of human-related fields to physiological processes of the human body. The course also introduces students to basic laboratory methods. Although this course is not required for Zoology majors and is not a general education course, it has a high annual enrollment (~600 students) and also has a high profile as an important course for students in all medical fields. Thus, the course has great potential to introduce students to aspects of science and Zoology (see Appendix B). Laboratory activities give students a variety of experience with common lab procedures and scientific methodologies.

Natural Sciences General Education Program

Mission Statement

The mission of the natural sciences general education program is to provide students with an understanding and appreciation of the natural world from a scientific perspective.

Science is a way of knowing. Its purpose is to describe and explain the natural world, to investigate the mechanisms that govern nature, and to identify ways in which all natural phenomena are interrelated. Science produces knowledge that is based on evidence and that knowledge is repeatedly tested against observations of nature. The strength of science is that ideas and explanations that are inconsistent with evidence are refined or discarded and replaced by those that are more consistent.

Science provides personal fulfillment that comes from understanding the natural world. In addition, experience with the process of science develops skills that are increasingly important in the modern world. These include creativity, critical thinking, problem solving, and communication of ideas. A person who is scientifically literate is able to evaluate and propose explanations appropriately. The scientifically literate individual can assess whether or not a claim is scientific, and distinguish scientific explanations from those that are not scientific.

The Life Sciences Learning Outcomes

Students will demonstrate their understanding of the following characteristics of life:
1. Levels of organization: All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.
2. Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.
3. Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life.
4. Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.

Evidence of Learning: General Education Courses

ZOOL 1010, ANIMAL BIOLOGY:

Animal Biology is a general education course with an emphasis on main principles of biology and survey of animal diversity and evolution. The course is generally taught in a basic lecture format. Course grades provide primary evidence of learning for this course (see Appendix C).

ZOOL 1020, HUMAN BIOLOGY:

Human Biology is a general education course with an emphasis on main principles of biology in the context of human anatomy and physiology. The course is generally taught in a basic lecture format. Course grades provide primary evidence of learning for this course (see Appendix C). Course assessments include writings and work with case studies.

ZOOL 1010, THE NATURE OF SEX:

The Nature of Sex is a general education course with an emphasis on the evolution of sexual reproduction. The course is generally taught in a basic lecture format. Course grades provide primary evidence of learning for this course (see Appendix C). Course assessments include writings and work with case studies.

Evidence of Learning: High Impact or Service Learning outside the classroom

INDEPENDENT STUDY COURSES:

ZOOL 4800, PROBLEMS IN ZOOLOGY:

ZOOL 4830, READINGS IN ZOOLOGY:

Student who enroll in independent study courses demonstrate learning in various ways. Strong direct evidence of learning comes from those students who present findings in on-campus venues, complete a senior thesis, secure funding for their research, or participate in professional, off-campus activities. During the assessment period, 97 students were involved in some aspect of independent study in Zoology that resulted in at least one research product (see list below and Appendix D).

WEBER STATE UNIVERSITY UNDERGRADUATE RESEARCH SYMPOSIUM & CELEBRATION, SPRING 2008-SPRING 2011:

This annual event gives students engaged in independent study a ready outlet for presenting their findings in a professional environment. During the assessment period, there were 50 presentations given by students at this event (Appendix D). This is 12.5 per year (the symposium was not held in 2012). The total number of students involved was 51 (some were coauthors, some authored multiple presentations). All faculty members were involved as mentors.

WSU DAY AT THE CAPITOL (POSTERS AT STATE CAPITOL), SPRING 2009-SPRING 2012:

The WSU Office of Undergraduate Research and Community Involvement Center provide support for students to disseminate their research, creative works, and Community-Based Learning projects as posters to legislators at the Utah State Capitol. During the assessment period, there were 13 presentations given by students at this event (Appendix D). This is 3.3 per year (the event was initiated in 2009). The total number of students involved was 18 (some were coauthors, some authored multiple presentations). Five different faculty members were involved as mentors.

NATIONAL CONFERENCE ON UNDERGRADUATE RESEARCH, SPRING 2008-SPRING 2012:

This event occurs annually, but was held at Weber State University in 2012 when it superseded the annual WSU Undergraduate Research Symposium & Celebration. This provided students with a larger than usual, on-campus outlet for presenting their findings in a professional environment. During the assessment period, there were 20 presentations given by students at this event (Appendix D). This is 4.0 per year, although all but four were given in 2012, when the conference was held at WSU. The total number of students involved was 24 (some were coauthors, some authored multiple presentations). Ten different faculty members were involved as mentors.

ZOOL 4970, ZOOLOGY THESIS, FALL 2007-SPRING 2012:

Students engaging in independent study for multiple semesters may choose to complete a senior thesis following guidelines set by the Department. The Senior Thesis experience is designed to represent an undergraduate version of a graduate-student thesis. During the assessment period, there were three theses completed by Zoology students (Appendix D). Two different faculty members were involved as mentors.

WEBER STATE UNIVERSITY UNDERGRADUATE RESEARCH GRANT PROPOSALS FUNDED, FALL 2007-SPRING 2012:

The WSU Office of Undergraduate Research offers grant funding and travel awards for students who are engaged in independent study. To receive a grant, students must devise a study, prepare a proposal for necessary funding, and compete for available monies. This provides an opportunity for first-hand experience with the scientific method and procedures for procuring research support. To receive a travel award, students must complete an application explaining travel expenses and needs. This provides support for students who have successfully completed a research project and are motivated to present their research off campus.

During the assessment period, there were 69 grants awarded to Zoology students (Appendix D). This is 13.8 per year. The total number of students involved was 54 (some authored multiple grants). All faculty members were involved as mentors. The total amount awarded to students from the Department of Zoology was $162,487. This comes to $32,497 per year.

ERGO: WEBER STATE UNIVERSITY UNDERGRADUATE RESEARCH JOURNAL ARTICLES, FALL 2007-SPRING 2012:

Ergo accepts full-length articles and meeting-conference abstracts. Full-length articles are < 2000 words or eight journal pages, including all text and graphics. Students from all departments at WSU are encouraged to submit articles. Full-length articles are not required to have been presented at a conference. Meeting-conference abstracts are < 350 words and must have been presented at an off-campus conference. During the assessment period, there were 18 articles and abstracts published by Zoology students in ERGO (Appendix D). This is 3.6 per year. The total number of students involved was 38 (some were coauthors, some authored multiple presentations). Ten different faculty members were involved as mentors.

PROFESSIONAL ACTIVITIES CONDUCTED BY ZOOLOGY STUDENTS OFF CAMPUS, FALL 2007-SPRING 2012:

Particularly motivated Zoology students often present research findings off campus in professional outlets such as professional meetings and publications in professional journals. During the assessment period, there were 58 off-campus presentations made by Zoology students (Appendix D). This is 11.6 per year. The total number of students involved was 20 (some were coauthors, some authored multiple presentations). Ten different faculty members were involved as mentors. Students traveled throughout North America and some traveled internationally to locations such as Mexico, the Netherlands, France, and Japan. Also, students were lead authors on 11 peer-reviewed, professional publications.

ZOOL 4890, COOPERATIVE WORK EXPERIENCE, FALL 2007-SPRING 2012:

Students engaging in Cooperative Work Experience gain Zoology credit for assisting professionals in their chosen fields. This not only provides "real-world" experience for students, but also creates an interface between the Department and external communities.

Twenty-two Zoology students engaged in Cooperative Work Experience during the assessment period. Examples of organizations providing Cooperative Work Opportunities:

1. Coldwater Animal Hospital
2. McKay Dee Hospital
3. Farr West Animal Hospital
4. Wildlife Rehabilitation Center of Northern Utah
5. Utah Division of Wildlife Resources
6. Wyoming Department of Fish and Game
7. Bear River Migratory Bird Refuge
8. U.S. Forest Service
9. Ogden Nature Center
10. Hogle Zoo
11. etc.

E. Academic Advising

Advising Strategy and Process

Pre-health-profession advising:

Students may decide to major or minor in zoology for a variety of reasons. Many choose to major in zoology due to its relevance to human-health related professions including medical doctors, dentists, optometrists, chiropractors, podiatrists, pharmacists, physical and occupational therapists, and physician assistants. These students arrive on campus with a pre-conceived goal and are commonly directed to a specific advisor who has expert knowledge in these fields. This type of advising is not specific to the Department of Zoology, because graduates with a variety of majors may apply to enter post-graduate professional schools. However, Dr. Barb Trask is the pre-medical, pre-optometry, pre-chiropractic, and pre-podiatry advisor. Other pre-health-profession advisors are members of other departments.

The pre-medical program has high importance in the Department of Zoology, College of Science, and (indeed) across campus because so many students aspire to become doctors. Further, the pre-medical program has distinguished itself for many years by achieving a high rate of acceptance into medical school for Weber State University pre-med graduates. As part of the pre-med program, Dr. Trask receives a half-time reduction in her teaching load. This allows her to participate in conferences and trainings that keep her abreast of trends in pre-medical education. This also provides her extra time to devote to meeting with students individually and providing them with detailed and personalized guidance. Much of the success of pre-med students is certainly attributable to opportunities afforded by the half-time reduction and the dedication of Dr. Trask to pre-med advising. Further, Markey Healy recently donated a $2 million endowment to the pre-medical program, naming the program the “Ezekiel R. Dumke Family Premedical Professional Program”. The endowment provides funding to support clerical staff to facilitate students' applications to professional training programs. Pre-med students as a group have had significant recent success in being admitted to medical school (acceptance of WSU pre-med graduates was 81% in 2007, 57% in 2008, 90% in 2009, 56% in 2010, and 66% in 2011).

Pre-med students in general and pre-med zoology majors in particular form a prominent part of the student body in most, if not all, zoology-major classes. The Zoology major serves as exceptional preparation for medical school. The rate of acceptance to medical school is consistently higher for Zoology majors than for students overall (acceptance of zoology pre-med graduates was 83% in 2007, 78% in 2008, 100% in 2009, 67% in 2010, and 75% in 2011).

Pre-veterinary advising:

Other students choose to major in zoology due to an interest in animals. Some of these students are interested in becoming veterinarians and are advised by Dr. Ron Meyers. As advisor, Dr. Meyers discusses the courses required by veterinary schools as well as the best elective classes to take. He also supervises the Pre-Vet club and reviews student applications and personal statements. Recent students have been accepted by veterinary schools at Washington State University, Utah State University, University of Missouri, and Ross University.

Wildlife and Conservation Ecology advising:

Other students interested in animals may be interested in wildlife and natural resources. These students are advised by Dr. John Cavitt. State and federal agencies employ people with college training in zoology as wildlife managers, biologists, and conservation officers. Similarly, non-governmental organizations, private industry and environmental consulting firms hire college graduates trained in zoology. Recent WSU graduates have secured positions as wildlife biologists with the Utah Division of Wildlife Resources, Utah State Parks, Utah Geological Survey, Wyoming Game and Fish, US Department of Defense, US Fish and Wildlife Service, US Department of Agriculture, Environmental Consulting Firms, Kennecott Utah Copper, and Rio Tinto.

Students work with Dr. Cavitt to develop their course plan. In addition, he advises them on career options in the area of wildlife and conservation biology. Position openings are emailed to students as they are received and posted. As part of this advising Dr. Cavitt regularly hosts wildlife biologists to discuss their career and provide guidance on securing positions. For example, Suzanne Fellows, US Fish and Wildlife Service provided workshop in November 2012 to instruct students on navigating the USA Jobs website, which is used to apply for wildlife careers in the federal government.

Mentoring via Independent Study and Undergraduate Research activities:

Many students with Zoology majors and some students with majors in other departments engage in independent study courses and/or undergraduate research projects with members of the Zoology faculty. These students receive much informal advising via the professional relationship they establish with their mentors. In addition to their many individual accomplishments that prepare them well for post-graduate endeavors (detailed above in the "Evidence of Learning: High Impact or Service Learning outside the classroom" section), these students also benefit from the guidance and advice of their mentors. In these cases, the student-mentor relationship is actually a major, if not dominant, source of advice. All Zoology faculty members are actively engaged in mentoring students who are conducting independent study and undergraduate research (see above).

Graduate School advising:

Students with interest in academic careers in zoology and natural resource management are often interested in pursuing graduate degrees. These students are advised by Dr. Ron Meyers. As advisor, Dr. Meyers discusses the best way to find a graduate program and how to contact prospective graduate research mentors. Recent graduates have attended the University of Utah, Utah State University, University of Nevada-Las Vegas, and Quinnipiac University.

General zoology major advising:

Zoology students who do not choose to pursue any of the above avenues fall under the general zoology advisors. General zoology advisors provide guidance for students regarding possible career opportunities, curriculum choices, etc. Students are assigned alphabetically (by last name) to a designated zoology faculty member. These assignments are as follows:

- Dr. Brian Chung: Last name beginning with letters A through D;
- Dr. Jon Clark: Last name beginning with letters E through H;
- Dr. Chris Hoagstrom: Last name beginning with letters I through L;
- Dr. Jon Marshall: Last name beginning with letters M through P;
- Dr. Michele Skopec: Last name beginning with letters Q through T;
- Dr. Robert Okazaki: Last name beginning with letters U through Z.

Zoology minor advising:

Students pursuing science degrees in other departments may choose Zoology as a minor. Dr. Nicole Berthélémy serves as the advisor for such students. She ensures that students are aware of minor requirements and discusses curriculum options with them as it relates to their academic and career goals.

Bachelor of Integrated Studies advising:

Students pursuing a Bachelor of Integrated Studies (BIS) degree may choose Zoology as one of their areas of emphasis. The BIS degree is interdisciplinary. BIS majors select three areas or emphases (this is somewhat equivalent to having three minors). Students must work out a contract of courses to be taken for each area of emphasis by working with an advisor for each representative department. Dr. Brian Chung serves as BIS advisor for Zoology. His role is to help BIS majors determine courses that fit best with their other areas of emphasis and with their career goals.

BIS students must complete a capstone project that is relevant to all three areas of emphasis. Any student who chooses Zoology as an area of emphasis must select a faculty member from the Department of Zoology to serve as a member of the Capstone committee. Most members of the Zoology faculty have served on a BIS committee at one time or another. Such faculty members help BIS students design and complete their capstone project. They also review the capstone project report and attend an oral defense of the student. The oral defense is modeled after a thesis defense of a graduate student. At the oral defense, the student is awarded a final grade for the capstone project.

Biotechnician Program advising:

Students interested in an Associate Degree may choose to enter the Biotechnician Program. This technology-focused program places emphasis on providing opportunities for hands-on laboratory experiences that qualify students for jobs in the biotechnology industry. Students complete a three-year training program in which they earn an Associate of Science degree after two years and a Biotechnician Certificate in the third year. Dr. Jon Clark serves as the Zoology advisor for these students.

College of Science, General Education advising:

Students interested in science who have not yet declared a major are advised by Jane Stout of the College of Science Academic Advisement Office. The mission of this office is to teach the purpose and value of higher education through one-on-one appointments, open orientation classes, and provide opportunity for peer mentors through student clubs and organizations. At the time when a student shows a specific interest in zoology or a zoology-related field, Jane and her staff direct those students to the appropriate advisor within the Department of Zoology.

Graduation Sign Off:

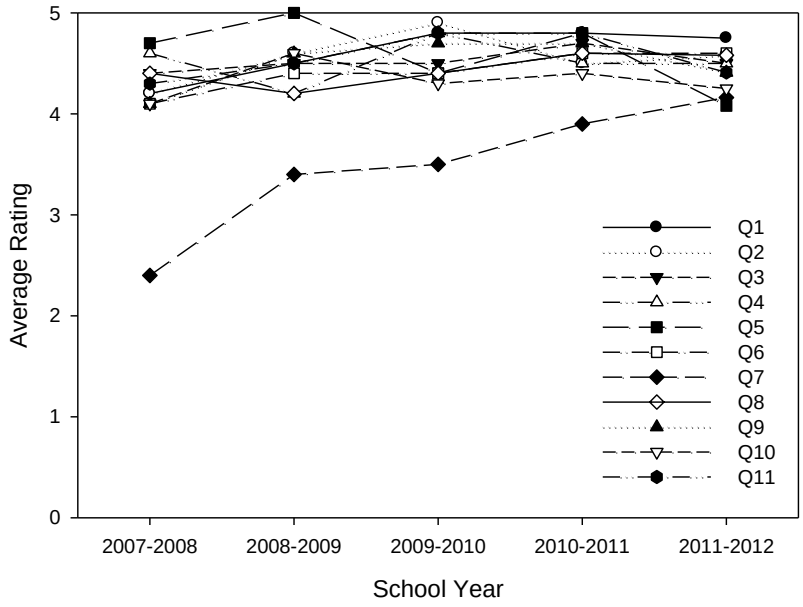
The Department of Zoology chair meets with all students early in the semester in which they graduate. This tradition serves as a last-call for advising. The chair ensures the student is qualified to graduate and discusses plans for attending graduation and for future endeavors. Information on future plans is recorded and students are encouraged to keep in touch as their future unfolds.

Effectiveness of Advising

One means of assessing advising is an exit-interview survey conducted for graduates. The survey includes 11 questions:

1. After completing my degree, my knowledge of the scientific method is:
2. After completing my degree, my knowledge of evolution is:
3. After completing my degree, my knowledge of genetics is:
4. After completing my degree, my knowledge of the structure and function of animals is:
5. After completing my degree, my knowledge of the organization of life, from molecules to ecosystems is:
6. After completing my degree, my knowledge of ecology and the effect of humans on the biosphere is:
7. My education in zoology has provided me with an awareness of career opportunities available in zoology:
8. My education in zoology has prepared me for employment or for graduate or professional school;
9. My education in zoology has provided me with an understanding of how scientific ideas are communicated:
10. My education in zoology has enhanced my oral and written communication skills;
11. My education in zoology has enhanced my critical thinking abilities.

Each of the questions is responded to using a five-point scale in which the number 5 represents strong agreement or substantial improvement. Overall, students give very high ratings in response to each question (see figure below). The main exception has been the responses to question 7, which refers to awareness of career opportunities (see list above). However, ratings in response to this question have steadily improved from year to year. Thus, this survey instrument suggests advising and teaching are effective for Zoology majors.



Average rating given in response to 11 survey questions (Q1 through Q11, listed above) by graduating Zoology majors for the five most recent school years. Rating scale is from 1 to 5, with 5 being the most favorable rating possible.

Students have also used the Putting Student Through (PST) program to recognize faculty. The PST Program enables WSU graduates to recognize those who have helped make their graduation possible through their support - moral, financial, or otherwise. Students have honored Dr. Clark in this way twice (2001, 2007).

Another measure of advising and teaching effectiveness is post-graduate success. Although it is difficult to track the progress of graduates, anecdotal evidence indicates the majority of students find zoology-related jobs (Appendix E). Others who do not are often working and in some cases it is possible their personal situation (e.g., family commitments) prevents them from pursuing a career in a zoology-related field. However, a bachelor's degree in zoology is likely to benefit these students too, especially over a lifetime. Further, some students leave the Department prior to graduation to attend pharmacy school or dental school. Entry into these pre-professional schools is a sign of educational success even though these students do not earn a Bachelor of Science in Zoology.

Past Changes and Future Recommendations

There have been no appreciable changes in the last five years to the process of advising in the Department of Zoology. Given the large number of options for students and depending on their career goals, there is ready access to a specialized advisor for students with virtually any interest. The program for pre-medical advising is most involved and has the best evidence for success for several reasons. The program is multi-disciplinary (not just for Zoology majors), pre-med students are relatively abundant and motivated, and the pre-

med advisor (Dr. Trask) has a course reduction and a dedicated staff (funded through external support) to support her efforts. It is likely that other advising programs could be improved were the responsible faculty members provided with similar levels of support, but the lower number of students with interest in these majors and lack of external support seem to preclude this. Thus at this time, there are no future recommendations.

F. Faculty

Faculty Demographic Information

The Department of Zoology includes 12 full-time tenured or tenure-track faculty members (see below). These individual represent the breadth of topics in zoology from molecular, cellular, and physiological subjects to organismal and ecological ones. All faculty members are quite experienced with two junior-most individuals up for review for tenure and promotion at this time. Of the remaining 10 faculty, six are fully promoted professors and four are associate professors. All 12 full-time faculty have earned Ph.D.s, representing 12 different North American universities (see table below).

Between 2007 and 2012, the Department maintained between 250 and 300 majors. Of these, 17 to 37 graduated with a degree in zoology per year (see table below). The overall ratio of students to professors in classes (Student/Faculty ratio) is around 20. Thus, it can be said that the Department of Zoology is moderate in size and maintains a moderate student-to-faculty ratio overall. However, student emphases and class sizes vary greatly, so students may receive more or less personal direction depending on their area of emphasis and courses they select.

Departmental Teaching Standards

To quote from the Department of Zoology Mission Statement: "The Department of Zoology educates undergraduate students for diverse careers as biologists and for entry into graduate and professional schools." Having high teaching standards is paramount to this mission. Because this mission is inherent within the Department, teaching standards have not been formalized beyond this point. In fact, a wide variety of teaching methodologies are used among different courses and faculty members. Each individual is expected to hold themselves to a high standard in order to fulfill this mission and it is a matter of personal and professional judgment by which each individual does so. The strength of the Department is based on personal commitment, individual expertise, enthusiasm for subject matter, and dedication to students. Campus-wide recognition of teaching excellence by Zoology faculty members (see below) provides evidence that the Department standard is high.

Although there are no formal, written standards, certain educational values are generally adhered to. Student engagement is a high priority and a variety of methods are used to accomplish this. Class activities often emphasize skills fundamental to success in all fields of biology, such as computer proficiency, experience with standard laboratory and field practices, written and oral communication, and use of scientific literature. The majority of

courses address these goals in one way or another (see above under "Zoology Student Learning Outcomes and Assessment").

Beyond this, there is a common desire among faculty to establish personal relationships, not only as teachers, but as advisors, mentors, collaborators, and advocates. For this reason (for example), the boundary between teaching and research is often blurred as students may gain interest in research through course laboratories and lectures. Such relationships that begin in the lab or classroom frequently blossom into full-scale research endeavors. Similarly, other courses are more applied toward a specific career goal and help students connect with their discipline of choice. Finally, there are also courses that provide less "traditional" learning opportunities, such as those that employ service learning and connect students with their community.

As discussed above, the average student-to-faculty ratio is moderate (~20, see table below). However, student credit hours have been increasing over the last five years (see table below). This is of interest because increasing enrollment ultimately increases faculty loads and may influence teaching approaches.

Department of Zoology Full Time, Tenured or Tenure-Track Faculty

Name	Rank	Ph.D. granted by	Research & Teaching Emphasis
Berthélémy, Nicole	Associate Professor	University of California, Davis	Environmental Contaminants & Human Physiology
Cavitt, John	Professor	Kansas State University	Avian Ecology & Wildlife Management
Chung, Brian	Assistant Professor	University of Calgary	Gastrointestinal Development & Human Anatomy
Clark, Jonathan	Professor	Ohio State University	Molecular, Evolutionary Genetics
Hoagstrom, Christopher	Associate Professor	South Dakota State University	Aquatic Ecology & Vertebrate Zoology
Marshall, Jonathon	Assistant Professor	Brigham Young University	Evolutionary Genetics & Herpetology
Meyers, Ron	Professor	Brown University	Vertebrate Evolution & Functional Morphology
Mull, John	Professor	Utah State University	Insect Ecology & Invertebrate Zoology
Okazaki, Robert	Professor	University of California, Santa Barbara	Physiological Ecology & Invertebrate Zoology
Skopec, Michele	Associate Professor	University of Wisconsin	Mammal Nutrition & Toxicology & Human Physiology
Trask, Barbara	Associate Professor	Washington University, Saint Louis	Molecular Cell Biology
Zeveloff, Sam	Professor	University of Wyoming	Mammalian Ecology & Conservation

Student and Faculty Statistical Summary

	2007-08	2008-09	2009-10	2010-11	2011-12
Student Credit Hours Total	9,745	8,930	9,303	10,514	11,397
Student FTE Total	324.83	297.67	310.10	350.47	379.90
Student Majors	296	276	264	277	285
Program Graduates Bachelor Degree	37	36	26	23	17
Student Demographic Profile	296	276	264	277	285
Female	129	116	118	136	151
Male	167	160	146	141	134
Faculty FTE Total	14.77	14.93	15.61	16.81	17.49
Adjunct FTE	3.22	3.3	3.43	4.63	5.75
Contract FTE	11.55	11.63	12.18	12.18	11.74
Student/Faculty Ratio	21.99	19.94	19.87	20.85	21.72

Note: Data provided by Institutional Research

Faculty Qualifications

All full-time Zoology faculty members have earned a Ph.D. from an accredited institution and are teaching within their areas of expertise (see table above). All have, at a minimum, five years teaching experience and have been through teaching reviews at WSU (see below). Further, all faculty members have been awarded tenure and promotion on schedule (to date) and are presently promoted to the highest level possible given their years of service. This indicates satisfactory teaching performance as determined by the WSU review and teaching-evaluation process (see below).

Several faculty members also periodically teach courses in the WSU Honors Program. These include Jon Clark, Chris Hoagstrom, John Mull, Michele Skopec, and Sam Zeveloff. This opportunity is a privilege based on the needs and preferences of the Honors Program Director. The reputation of faculty, quality of ideas for honors courses, and past performance are all considered when proposed honors courses are scheduled. Notably, Dr. Mull was selected as the Honors Eccles Faculty Fellow in 2004-05 based on his teaching abilities, research, and excellence in his selected field of study. Further, Dr. Skopec was invited, in 2010, to be one of three WSU faculty to team teach a book-seminar honors course for the Altehia Scholarship Program that sought to retain excellent freshman students at WSU.

Four faculty members in the Department of Zoology (Gloria Wurst, 1991, emeritus; John Mull, 2004; Sam Zeveloff, 2008; Michele Skopec, 2010) have been recognized as Nye Cortez Professors of the Year in the Honors Program. The Nye/Cortez Professor is nominated and voted on by the Honors students each spring to recognize excellence in teaching within the Honors Program (based on the experience and opinions of the Honors students). Criteria for the award are: knowledge and academic expertise, involvement with Honors students and participation in Honors activities, and student friendliness/willingness to advise and mentor students.

Several faculty members have been recognized for their achievements as teachers. Three Zoology faculty members have received the WSU College of Science Dr. Spence L. Seager Distinguished Teaching Award. These were Sam Zeveloff (2000), Jon Clark (2007), and Bob Okazaki (2009). Jon Clark was given the George and Beth Lowe Innovative Teaching Award in 2008. Bob Okazaki was one of five finalists for the Rodney H. Brady Crystal Crest Master Teacher Award in 2011.

Two faculty members (Sam Zeveloff, 2006; John Cavitt, 2010) have been recognized as Presidential Distinguished Professors. The Weber State University designation of Presidential Distinguished Professors recognizes and rewards faculty members who have displayed an incredible dedication to teaching and education. Thus, these members of the Department serve both as indicators of excellent teaching and as highly qualified reviewers of the teaching efforts of their peers.

One active faculty member (Sam Zeveloff, 1993) and two retired faculty members (Gloria Wurst, 1995, emeritus; Kent Van de Graaff, 2004, deceased) have been awarded the John S. Hinckley Award for Teaching. The Hinckley Fellow award, in part, recognizes excellent teaching via evidence of student success, peer reviews, innovations, teaching awards, and regional/national impact as a teacher. The fact that three Zoology faculty have received this award (initiated in 1991) demonstrates the respect faculty of the Department have

garnered as teachers within the WSU community. Although two of these winners are no longer in the department, their legacy lives on and the remaining winner, Sam Zeveloff, served as department chair until Fall 2012 and during his 20-plus years as chair, clearly set a high teaching standard for all department faculty (given the number of teaching awards he has received and his excellent leadership and management style). Thus, given that faculty members collaborate, mentor each other, and provide periodic peer-review for each other, it appears that zoology faculty are very well qualified, especially because so many have received special recognition from outside the Department for their teaching activities.

Evidence That Instruction Meets Departmental Teaching Standards

Full-time Tenured or Tenure-Track Faculty:

Policies instituted across campus at WSU and within the College of Science dictate a variety of means by which the level at which each faculty member meets teaching standards are determined.

First, students are asked to evaluate faculty instruction and indicate their general level of satisfaction within zoology courses. For tenure-track faculty, it is required that student evaluations be conducted for every course and section taught. For tenured faculty, it is required that each faculty member select two courses within which to be evaluated every fiscal year. The department chair must agree to these courses. The department chair reviews the student evaluations received by each faculty member as part of the annual review process (see below).

The questions included in student evaluations, number of students participating, and department-wide results are provided below by semester. As a department, student evaluations of teaching were very good. Each semester, average student ratings for all questions exceeded 4 on a 7-point scale (7 being most satisfactory). On no question and in no semester did the standard deviation of student ratings ever dip below 3, which represents a "poor" rating. This indicates clearly that during the last five years, most students found teaching within the department to be above average. Further, the average student rated the teaching between "average" and "good" (a higher rating). Finally, many students rated teaching higher, showing they were very pleased and that only rare students were seriously disappointed, despite the challenging subject matter and rigorous teaching approaches characteristics of the discipline.

It is also worth noting that the department was rated particularly highly on questions 1, 2, 4, 5, 6, 8, and 9. These questions have to do with course organization, course rigor, and instructor interest and openness, and overall instructor rating (see table below). For these questions, average student ratings were between 5 (good) and 6 (very good) in all semesters (see figure below) and standard deviations of the average ratings rarely dipped below 4 (average). This provides strong feedback that students as a group are challenged by and impressed with their zoology instructors.

Second, all full-time faculty members in the College of Science are reviewed annually. The annual review process requires documentation of teaching effectiveness and efforts to update or improve teaching that are carried on in a given fiscal year. This includes a summary of student evaluations along with other evidence of teaching innovations,

teaching-related trainings, etc. The department chair and college dean both review the faculty annual-review documents. The chair provides a rating (unsatisfactory, satisfactory, good, or excellent) with specific regard to teaching. Faculty also set goals for the upcoming fiscal year, which may include goals to improve teaching.

Third, all tenure-track faculty members undergo a 2nd-year review by the department chair. At this time, as with annual reviews, faculty members must demonstrate teaching effectiveness. However, this review requires additional documentation, including a statement of teaching philosophy, examples of teaching approaches (e.g., syllabi, example assessments, example assignments), along with a summary of student evaluation scores. At this time, the department chair evaluates the early progress of the faculty member and provides recommendations to ensure adequate progress toward tenure and promotion.

Fourth, all tenure-track faculty members undergo a 3rd-year review by all levels of the Weber State University administration. The 3rd-year review follows the same procedures as the subsequent (6th-year) review for tenure and promotion. In the 3rd-year review, the faculty member must complete an autobiographical form that includes detailed information on teaching approaches used in all classes and specific efforts to improve teaching effectiveness. There is also a detailed presentation of student evaluation scores. During the 3rd-year review process, the teaching effectiveness of each faculty member is first evaluated by a peer-review committee formed by other faculty members, usually peers within the department of zoology (but sometimes including faculty members from other departments). Peer reviewers typically attend classes taught by the faulty member under review. They also review teaching materials provided by the faculty member, such as syllabi, tests, assignments, etc. in order to comprehensively assess teaching effectiveness. Following peer review, each faculty member is reviewed separately and in sequence by the Department of Zoology Rank and Tenure Committee, the College of Science Rank and Tenure Committee, the Dean of the College of Science, and the Provost of Weber State University. At each level of review, the reviewers consider evidence provided in the autobiographical form (including teaching-related material) and the ratings provided by reviewers at lower levels. Thus, this process provides intensive review from several different levels/perspectives and based on detailed documentation of teaching performance. At each level of review, the teaching performance of the faculty member is rated (unsatisfactory, satisfactory, good, or excellent). The main purpose of this review is to determine whether the faculty member is making adequate process toward tenure and promotion and, if not, to provide feedback and opportunity to improve prior to the 6th-year review.

Fifth, all tenure-track faculty members undergo a 6th-year review for promotion and tenure. During this intensive review, it is determine whether the faculty member will receive tenure and be promoted from assistant to associate professor. This review follows the same process as the 3rd-year review (described above). Thus, at the point when a faculty member is awarded tenure, each individual has (1) received student evaluations for all courses and sections taught, (2) been reviewed annually by the department chair and college dean, (3) undergone a detailed 2nd-year review by the department chair, (4) undergone an intensive 3rd-year review involving review by peers and all hierarchical levels of supervision within the university, and (5) undergone an equally intensive 6th-year review. A faculty member is not awarded tenure at Weber State University without at least earning a "satisfactory" rating in teaching during their 6th-year review and this rating level is only sufficient if ratings in scholarship and service are satisfactory or higher. Thus, there is a great deal of regular oversight of teaching effectiveness during the tenure-track process. Once a faculty

member earns tenure, there is the expectation that the level of teaching will be maintained. However, tenured faculty members still undergo annual review (described above) and are required to receive student evaluations annually (described above).

Finally, tenured faculty are intensively reviewed when they apply for promotion to professor. This review process is university-wide and comparable to that described above for the 3rd- and 6th-year review process. However, standards for promotion to professor are higher than for promotion to associate professor. In this case, faculty members must earn at least a "good" rating in teaching, and this is sufficient to warrant promotion only if ratings in scholarship and service are satisfactory or higher. Thus, this final promotion indicates an even higher level teaching effectiveness, which fully promoted faculty members are expected to maintain or improve upon. Nonetheless, fully promoted faculty members are still reviewed annually (see above) and are still required to receive annual evaluations from students in at least two courses (see above).

All data are compiled from these evaluations with the results being given to the faculty and kept on file by the appropriate administrators.

Adjunct Faculty

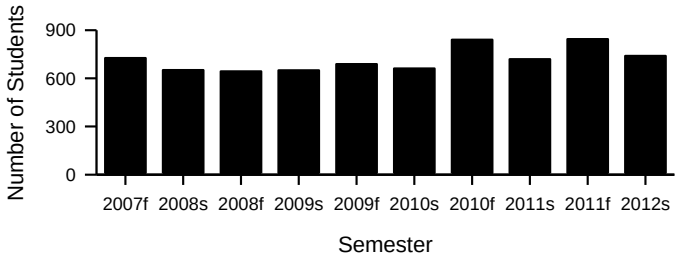
Part-time, adjunct faculty members are subject to student evaluations for every course taught, using the same procedure as for tenure-track faculty members (see above). The department chair reviews the results of these evaluations and also corresponds periodically with adjunct faculty concerning their teaching approach. The chair determines the teaching schedule for adjunct faculty members and oversees their recruitment, hiring, ongoing professional development and regular evaluation. However, adjunct faculty members are appointed by the college academic dean for a specific period of time (usually based on a recommendation by the chair). At present, adjunct faculty in Zoology (see table below) are hired on a semester-by-semester basis. Hiring is based on qualification, ability, and need.

Department of Zoology Part-Time, Adjunct Faculty

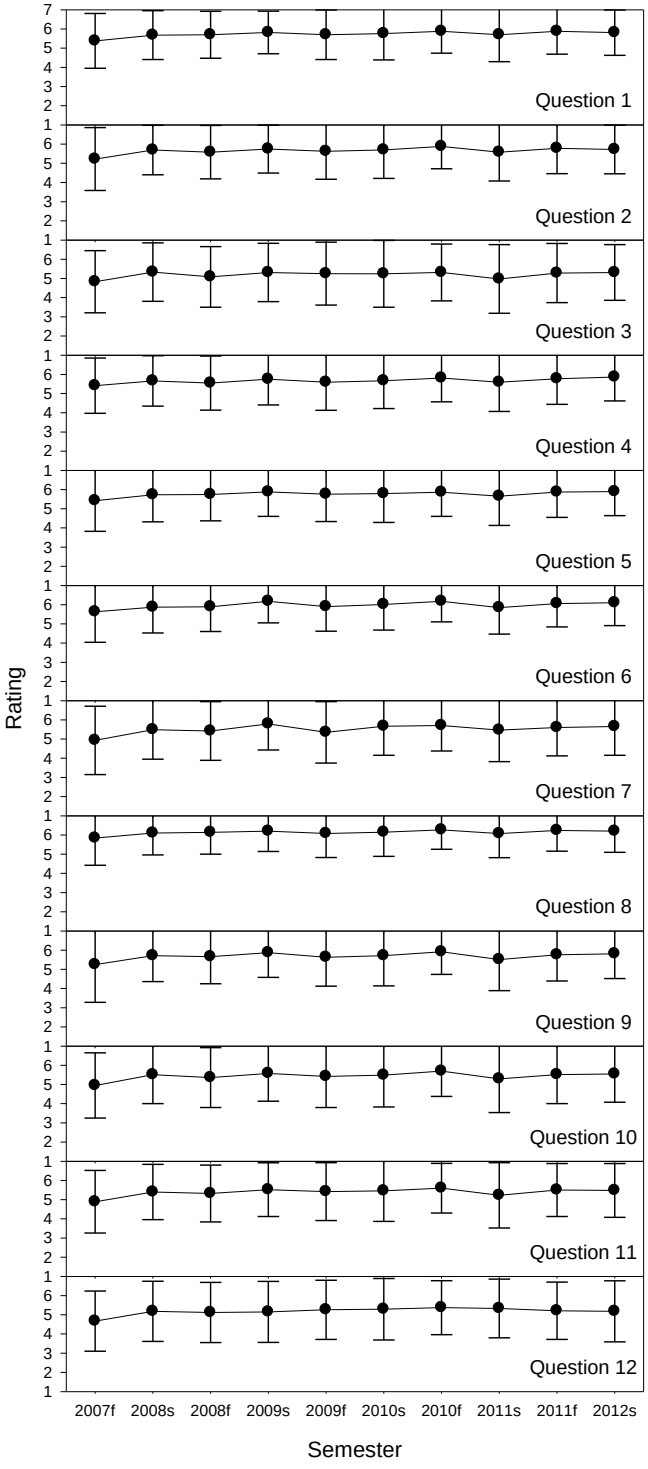
Name	Highest Degree	Years Teaching	Areas of Expertise
Brian Barber	Ph.D.	11	Ecology, Evolution
Benton Bramwell	B.S. & N.D.	7	Naturopathic Medicine, Zoology
Susan Gurr	B.S.	6	Microbiology, Chemistry
Melissa Jacobsen	M.S.	10	Botany
Walter Prothero	M.A. & M.S.	15	Wildlife, English
Ami Robinson	Ph.D.	14	Zoology

Survey questions used for student evaluation of courses in the WSU Department of Zoology between Fall Semester 2007 and Spring Semester 2012.

Question	Number
Rate agreement between course objectives and topic coverage.	1
Rate the organization and use of class periods.	2
Were the teaching methods and techniques effective?	3
Does the instructor stimulate and challenge you to think and question?	4
How interested is the instructor in helping you to understand the subject being taught?	5
How receptive is the instructor to questions or discussion during class?	6
Rate the fairness and effectiveness of the grading policies and procedures.	7
Rate the interest of the instructor in the teaching of this course.	8
Considering all the above items, what is your overall rating of this instructor?	9
Rate this instructor in comparison with all other you have had at the university?	10
Overall, what is your evaluation of this course?	11
How was the coordination between the lectures and laboratories?	12



Number of students completing student evaluations by semester from fall 2007 (2007f) through spring 2012 (2012s).



Department of Zoology average student evaluations (with standard deviation) by semester from fall semester 2007 (2007f) through spring semester 2012 (2012s). Each graph represents a specific survey question (see table above). Rating scale is from 1 (extremely poor) to 7 (extremely good). Number of students participating is provided on the previous page (see figure above).

Mentoring Activities for new Faculty

New tenure-track faculty members are supported in several ways. First, they are traditionally assigned only a partial teaching load during their first semester, during which they can establish themselves in one or two courses and have time to start preparing for others they will teach. There is no formal mentoring program, but new faculty members typically work closely with more experienced faculty that teach the same or related courses. For example, professors who teach introductory courses for Zoology majors (i.e., Zool 1110 and 1120) team teach every semester and collaborate with each other. Labs in these courses are set and correspond with a laboratory manual that has been prepared and published by department faculty. Thus, new faculty members work closely with their colleagues throughout their first semester teaching these courses. Similarly, faculty members teaching Zool 2100, 2200, 3200, 3300, 3450, 3600, and 3720 share similar goals and regularly communicate regarding course content, laboratory exercises, etc. All faculty members in the Department of Zoology are involved in one or more of these courses, so they have immediate and continued opportunities to collaborate with and be mentored by more experienced and established peers.

Beyond this, the spirit of support and collegiality within the Department ensures that every faculty member has diverse opportunities to be assisted and mentored whenever desired. Faculty members commonly discuss teaching strategies and approaches, opportunities for trainings, challenges, etc. Also, as noted above, the high standard maintained throughout the department, as recognized by student evaluations and special recognition for the efforts of individual faculty, maintains a strong culture of teaching excellence.

Diversity of Faculty

The diversity of faculty in the Department of Zoology has already been summarized above under the heading "Faculty Demographic Information". Further, faculty diversity is evident above within the detailed analysis of evidence of student learning and the summary of courses taught. In short, faculty members were originally selected to fulfill diverse roles and in all cases they continue to serve in diverse capacities with regard to courses taught as well as with regard to research emphases and service activities. The faculty includes individuals with notable expertise in all levels of biological organization (from molecules to ecosystems) and in many major groups of animals.

Ongoing Review and Professional Development

Procedures for review of faculty-member performance have already been explained above in the "Evidence That Instruction Meets Departmental Teaching Standards" section. Professional development is generally an independent process navigated separately by each faculty member. There are a variety of training opportunities on campus and many committee-led endeavors are also related to topics of professionalism. Further, faculty members maintain active connections with professional, off-campus organizations that pertain to their individual areas of interest. These groups are important sources of information and training opportunities that keep each person abreast of their own field. This is a key role of research within the department and the active research program of each Zoology faculty member (as exemplified within the detailed analysis of evidence of

student learning) ensures that each zoology professor is engaged and continuing to grow within their discipline.

G. Support Staff, Administration, Facilities, Equipment, and Library

Adequacy of Staff

The Department of Zoology includes a full-time professional staff person (Laboratory Manager) and a full-time classified staff member (Secretary II; see table below). Each has excellent credentials and is responsible for diverse, critical activities. The Department also hires students as part-time lab assistants and work-study employees. These students assist the Laboratory Manager with routine laboratory preparation and maintenance activities and, sometimes, they help the Secretary or faculty members for general maintenance of department facilities and resources or for special department projects.

The Laboratory Manager (Susan Gurr) is responsible for ensuring lab rooms are properly equipped and maintained and that lab supplies are always on hand. As part of her responsibility, Susan handles the majority of department purchasing and manages budgetary paperwork associated with purchasing. She is the primary accountant for the office budgets and she assists the chair with budget planning. She also oversees the live animal facility where animals are kept and must be cared for to be available for laboratory activities. Some live animals are also maintained in certain laboratory classrooms. Susan assists faculty members as requested. She makes sure all classroom technology is maintained and properly serviced. Susan also organizes visits and tours from community organizations, such as schools and clubs. She supervises part-time (student) lab assistants who help her with these activities. She also is advisor for the Zoology Club.

The Secretary (Lani Shepard) is the interface for students visiting, calling, or emailing the Department for information or for clerical assistance. She can answer basic questions for students and direct them to proper individuals or resources. She helps student with various clerical needs including helping them declare a major or minor in Zoology, helping them with class registration, etc. Lani also handles a plethora of clerical duties and assists the chair with important tasks such as course scheduling, meeting scheduling, tracking course enrollment, and tracking applications for graduation. She is the department expert on most campus software and assists faculty and students with their use of it.

The chair evaluates the staff informally with input from other faculty. Formal annual reviews are based upon the university's Performance Review and Enrichment Program (PREP) system; the process and forms used in this evaluation system are available at http://departments.weber.edu/hr/PREP/forms.htm.

Ongoing Staff Development

Staff members keep up with upgrades and changes to relevant university procedures and software. When training is necessary or desired, staff members are encouraged to take advantage. In many cases, staff members act as a liaison between training opportunities, faculty members, and the chair. Staff members are also encouraged to take advantage of other university support services at their disposal.

Department of Zoology Full-time Staff

Name	Title	Years of Employment	Areas of Expertise
Lani Shepard	Secretary II	6	BS, Zoology AS, Exotic Animal Training & Management
Susan Gurr	Laboratory Manager	12	BS, Microbiology

Adequacy of Administrative Support

Administration for the Department of Zoology includes the chair (Sam Zeveloff until 2012, Chris Hoagstrom at present), the Dean of the College of Science (David Matty), and the WSU Provost (Michael Vaughan). The Chair oversees routine personnel, budgetary, and curricular issues. The Dean works closely with all department chairs in terms of budgetary and policy issues. He also provides direction with regard to curriculum development, student recruitment, advising, and retention. The Provost and Dean also sometimes provide support for various expenses when funding is available (see next section).

Funding and expenditures for the Department have remained relatively stable over the last five years (see table below). However expenditures per student have fallen, particularly over the last four years. This suggests funding is not keeping pace with enrollment.

The College of Science has many additional support staff members including a Science Advisor (Jane Stout) who guides students taking general-education courses and a liaison in the university's Development Office (Lisa Largent), who is instrumental in obtaining donations and gifts. The College of Science Computer Specialist (Matthew Cain) is available to assist with various computing needs and a web-site designer/coordinator (Adam Salazar) is available to help with web site construction and maintenance. The liaison to the Office of Sponsored Projects (Nancy Jarvis) assists with proposal development and contract administration.

Financial Analysis Summary for the Department of Zoology

Department	2007-08	2008-09	2009-10	2010-11	2011-12
Undergraduate Student FTE	325	298	310	350	398
Expenditures					
Direct Instructional Expenditures	1,145,018	1,222,511	1,169,794	1,180,517	1,194,680
Cost per Student FTE	3,525	4,107	3,772	3,368	3,002
Funding					
Appropriated Fund	1,111,895	1,178,078	1,135,761	1,150,070	1,149,377
Special Fees/Differential Tuition	33,122	44,434	34,033	30,447	45,302
Total	**1,145,018**	**1,222,511**	**1,169,794**	**1,180,517**	**1,194,680**

Note: Data provided by Provost's Office

There are additional sources for funding and research both on campus and elsewhere. These funds support research that often involves undergraduate students and also often pays for supplies and equipment that can be used in subsequent work. For example, the WSU Faculty Senate has a Research, Scholarship, and Professional Growth standing committee that provides funding for research and travel. In the period January 2008 through December 2012, Zoology faculty members were awarded a total of $79,881 from this source (~$15,976 per year). During the same period, Zoology faculty members were also awarded $58,328 from other WSU sources (e.g., special research grant opportunities, ~$11,666 per year). Finally, some faculty members secure external funding from granting agencies or institutions. Between January 2008 and December 2012, $1,856,423 of external funding was awarded to faculty members in Zoology, some of which is used to supplement faculty pay, cover costs of supplies, equipment, and travel, and cover costs of student assistants. In short, these additional sources of funding provide substantial additional revenue to the department and are especially significant for facilitating research efforts.

Adequacy of Facilities and Equipment

The Department is the primary user of one classroom in the Lind Lecture Hall (LL 130). The Department maintains the facilities in LL 130 including a projector hooked up to a computer and other audio-visual equipment. Most major general-education and introductory-major lecture courses are held in this room. Some larger lectures (e.g., Human Anatomy, Zool 2100) are held elsewhere in Lind Lecture Hall due to the need for a larger room that fits more students or, sometimes, due to scheduling conflicts. The Department has four major laboratory classrooms and a laboratory preparation area on the 4th floor of the Science Lab Building, the area where the main Department office is located. One

laboratory classroom also serves as a student computer lab when classes are not in session. Students have access to such software as SigmaPlot, Respiratory Physiology, PowerPoint, and JMP Statistics on seven computers. When possible, existing computers are upgraded, but there is no dedicated funding for this facility. Models and specimens for laboratories are housed in (1) a small room for specimen storage, (2) storage areas, cabinets, and shelves in the preparation area, and (3) cabinets and shelves in laboratory classrooms. Individual faculty members maintain fairly extensive collections of animals within their area of expertise including mammals, birds, reptiles, amphibians, fishes, and insects. With the exception of the bird collection (see below), these collections are housed in the specimen-storage room or in one of the laboratory classrooms.

Another laboratory classroom is located in the Engineering Technology Building, where some faculty offices and laboratory spaces are housed. This is a main headquarters for Ecology (Zool 3450) and Ornithology (Zool 4670) and the Avian Ecology Laboratory (organized and run by John Cavitt) is housed there. The Avian Ecology Laboratory is where bird specimens used in Ornithology are held. Other courses are periodically taught in this facility depending on availability and need.

The Department has a teaching laboratory for Human Anatomy (Zool 2100), which serves over 600 students per year. This lab is located in a side-room within Lind Lecture Hall. Laboratory sections for Human Anatomy run continuously on Tuesday, Wednesday, and Thursday, with lab sections beginning from 8 or 8:30 am to 4 or 4:30 pm. Students receive sophisticated anatomical training on cadavers that are in various stages of "prosection" and on other models. Purchase of four cadavers each year (two per semester, one female, one male) is made possible with funding support from a local surgeon.

The Department has an animal research facility on the 6th floor of the Science Lab building (SL 616) that recently underwent an $80,000 upgrade. It is managed by Susan Gurr and has provided many students and faculty from within the Department and from other departments (e.g., Microbiology, Psychology) the opportunity to conduct animal research following scientific, humane, and ethical principles. It features a controlled environment for care and maintenance of animals used in student and faculty research and in classroom laboratory activities of many courses, including the Zool 1110, 1120, 3600, and 4210 courses. The facility includes two animal-housing rooms, a cage-wash area, and a storage area. One animal-housing room has an air-handling unit for 70 individually ventilated cages and a ventilated cabinet that allows multiple species to be held within one room and complies with housing standards required for USDA-covered species.

The Department also houses a DNA Laboratory on the ground floor of the Science Lab building, which serves as a hi-tech teaching laboratory for Molecular Genetics (Zool 4300) and some Genetics (Zool 3300) labs. The laboratory also facilitates student research projects in molecular genetics (a broad and burgeoning field) and is available to faculty and students from other departments, such as Microbiology. The DNA laboratory was largely funded through a National Science Foundation instrumentation grant with matching university funding. The Department provides supplies and occasionally equipment upgrades for this vital facility. It is a focal point for several faculty members (especially Jon Clark, who is the lab Director, and Jon Marshall, both of whom teach genetics) and many students.

There is no dedicated budget or replacement schedule for classroom or laboratory equipment. This equipment is maximized through proper care and routine maintenance. To replace equipment it is important to capitalize on funding opportunities, write grants as necessary, and watch for available surplus equipment from elsewhere.

When money is available, the Department has makes a concerted effort to upgrade its equipment holdings. The following equipment has been purchased in the last five years:

Summary of major equipment & infrastructure purchases, 2007 to 2012.

Equipment	Funding Source	Cost ($)
Biopac System for Human Physiology	Willard L. Eccles Charitable Foundation	4090
Shallow-water research boat, motor, & trailer	Zoology Department	12,287
Biopac Equipment for Human Physiology	Zoology Lab Fees	4170
Light Cycler Real-time PCR	WSU Provost	33,170
Lab Chairs (12)	Zoology Lab Fees	3400
Entomology Microscope	Zoology Lab Fees	3500
Classroom Dissecting Microscopes	Zoology Lab Fees	4650
Classroom Laptop Computers	Zoology Lab Fees	3112
Lab Stools (23)	Zoology Lab Fees	5168
Classroom Projectors (2)	Zoology Lab Fees	1506
Boat upgrades	Zoology Department & Dean	3331
Hydraulic cadaver gurneys	Zoology Lab Fees	8808
Lyophilizer, Drying Chamber, & Pump	Zoology Department	10774
DNA sequencing analysis station	WSU ARCC Dee Family Technology Grant	5958
SMART Technology for Zoology Classrooms	WSU ARCC	8100
Animal-Care Facility Remodel & Equipment Purchase	Dean	80,000
Biopac Equipment for Human Physiology	Zoology Lab Fees	8030
Classroom Laptop Computers	Zoology Lab Fees	3016

Department faculty members not directly affiliated with the DNA lab are provided small research laboratory spaces where they can house laboratory equipment and field equipment along with computer facilities for scientific equipment and workspaces for student researchers. These laboratories have been outfitted over the years via equipment and funding sometimes available in the department, meager "startup" funds available to new faculty in some cases, grants received by faculty (internal and external), and excess or donated equipment from elsewhere. Each faculty member has been responsible for outfitting their own research space. Although faculty receive no special recognition or dedicated support for this, clearly the greater amount of undergraduate research that occurs within the Department (see above) would not be possible without it.

Research laboratory space is distributed among the Science Lab, Engineering Technology, and Lind Lecture Hall buildings. Depending on location, some laboratory spaces are more or less technologically advanced (spaces in the Engineering Technology Building are most

recently renovated). Some research in the Science Lab or Lind Lecture Hall is prone to being compromised by lack of consistent air temperature control or contaminated by poor air quality. This can also affect preserved materials used in class laboratories, reducing their quality and making them more hazardous to students. Air circulation is also sometimes a concern.

Department faculty members are also each provided an office space. Most offices are on the 4th floor of the Science Lab Building, but two are on the 4M floor (which is the Botany Department office floor) and one is in the Engineering Technology Building (in association with research space and the classroom housed there). The College of Science provides each individual with a new office computer every five years. Other office furniture and supplies are generally handed down from one "office dweller" to the next. It is also possible to get furniture from WSU surplus (property control). There is no dedicated budget for furniture replacement or upgrade and most furniture is quite old. When possible, available department money is used in cases of individual need. Also, funds are sometimes made available from the College of Science for carpet cleaning, painting, or other routine repairs.

Adequacy of Library Resources

The Library's holdings are adequate to support the Zoology mission. There is money budgeted to buy new books annually and the availability of online journals is relatively good. Some high-quality journals are prohibitively expensive and it would of course be nice if more money was available for them. However, the inter-library loan staff effectively and rapidly fulfills requests for resources not available on campus and the inter-library loan process has been streamlined electronically in recent years, so this to a degree overcomes lack of direct access to some journals. The Library's science representative (JaNae Kinikin) works closely with the Department to efficiently use resources available for subscriptions to biological resources, cancelling subscriptions that are little used and using "freed-up" resources to subscribe to other journals value more highly by Department faculty members. JaNae also sometimes provides library training for students and faculty members.

H. Relationships with External Communities

Interfaces between the Department of Zoology and external communities are loosely coordinated through the Department Chair's office, but are not organized in a formal sense and are largely driven by individual faculty members. Some faculty members have been active participants in establishment and development of the Community Involvement Center at WSU. John Cavitt served on the Task Force for Service Learning and Community Based Research (2007-2009). Chris Hoagstrom was a Community Involvement Center Faculty Fellow in 2011-2012. Also, two Mammalogy (Zool 4680) students, under guidance of Sam Zeveloff, created a rhino art auction, which secured art donations from galleries, WSU students, faculty, and a local elementary school. The exhibit in the Student Union Art Gallery (November 2011) received favorable attention and generated $870 that were donated to the International Rhino Foundation.

Relationships with Primary & Secondary Schools

Department faculty and staff members support regional primary and secondary schools. School groups sometimes tour Zoology facilities to view animal specimens, live animals, the anatomy teaching laboratory, etc. Tours also often make use of the WSU Museum of Natural Science.

Faculty members commonly cooperate with the WSU Center for Science and Mathematics Education. For example, John Mull taught a workshop on Invertebrate Zoology for secondary-school teachers in 2007.

Zoology faculty members provide evening seminars as part of the S4 "Science Seminars for Superior Students" program (Hoagstrom, 2012), for the Science Saturdays program (Hoagstrom, 2009; Mull, 2009, 2010; Marshall, 2010; Trask, 2010), Science Moms (Trask, 2012), and for the Sigma XI Science Lecture Series (Zeveloff, 2009; Hoagstrom, 2011).

Faculty and staff members frequently serve as judges for the regional science fairs and participate in the Science Olympiad. Beyond this, there are many examples of faculty members and their students visiting and working with individual schools and classes (see table below).

Zoology Faculty & Student Visits to Primary & Secondary Schools

School	Purpose	Faculty Member	Year(s)
Davis High, Davis	Science Olympiad advice	Mull	2008
Fremont High, Weber	Science Fair advice	Mull	2008
Grandview Elementary, Ogden	Great Salt Lake Ecology	Cavitt	2007
Highland Junior High, Ogden	Careers in Wildlife Biology	Cavitt	2009
Legacy Junior High	Student volunteer	Marshall	2011
Mound Fort Middle, Ogden	Ogden Migratory Bird Program	Zeveloff	2012
Mount Ogden Junior High, Ogden	Science Fair advice	Trask	2010
Ogden High	The Galapagos: a Natural History	Zeveloff	2011
Shadow Valley Elementary, Ogden	School Wildlife Habitats	Zeveloff	2012
Venture Academy	Field Expert	Hoagstrom	2011-12
Venture Academy	Field Expert	Marshall	2012

Community Connections for Zoology Students

The Dr. Ezekiel R. Dumke Family Premedical Program, which is housed in the Department, facilitates interactions with various external communities. This program has developed and administers the Preceptorship Program, in which students "shadow" physicians to learn directly about what they do on a daily basis. The Premedical Program is an active participant in the Hope Alliance through which students and medical practitioners travel to disadvantaged countries to provide medical assistance. Students attempt to raise money to support this effort in the local community. The Department serves as the host of various student organizations affiliated with the Premedical Program, such as the university chapter of Alpha Epsilon Delta (the premedical honor society). This organization invites speakers from the region's medical community, providing yet another vehicle through which the Department connects with this group.

Also, as described above, students enrolled in Zool 4890 (Cooperative Work Experience) make direct connections with a wide variety of community organizations and businesses. Examples include hospitals, veterinary clinics, zoos, and government agencies. Further, many courses feature connections with community organizations. Recent examples are listed below:

Zoology Student Connections with Community Organizations

Organization	Connection	Faculty Member	Year(s)
Bear River Migratory Bird Refuge	Conservation Biology Zool 3500	Zeveloff	2009
Brigham Young University	Genetics Zool3300	Marshall	2008
Hawkwatch International	Student Research	Zeveloff	2011
McKay-Dee Hospital	Pre-med Program	Trask	2010
Ogden Migratory Bird Program	Conservation Biology Zool 3500	Zeveloff	2012
Ogden Nature Center	Problems in Zoology Zool 4800	Hoagstrom	2009-10
Utah Division of Wildlife Resources	Ichthyology Zool 4650	Hoagstrom	2008
Weber Basin Water Conservancy District	Aquatic Ecology Zool 4480	Hoagstrom	2008
Utah Linking Communities, Wetlands, & Migratory Birds	Avian Ecology	Cavitt	2010

Other Community Service by Faculty Members

Faculty members are commonly involved in community organizations and events with links to biology and education. In one excellent example, Jon Marshall is a grant partner for the Creating Pathways to College Initiative (College Access Network of Utah). He participates in the College Summer Summit, helping students from underrepresented populations prepare for college via events that create a stronger connection to the university. Jon is also Family School Partnership Science Liaison. The Partnership creates pathways to higher education for students from underrepresented populations.

In another example, John Cavitt served as organizer and coordinator of the Utah Linking Community, Wetlands, and Migratory Birds program that included a partnership with the Universidad Autónoma de Nayarit. This program resulted in several students from Nayarit coming to study avian ecology in the Great Salt Lake. Further, 23 WSU Zoology majors traveled to Nayarit to study wintering shorebirds in 2010. The Department also donated ~100 zoological specimens to the Universidad for educational purposes.

Many more examples of Zoology-Community relations exist and are listed in the table below.

Zoology Involvement in Community Programs

Program	Individual	Year(s)
Bear River Migratory Bird Refuge	Cavitt	2008
Boy Scouts of America	Mull	2007
Brigham City Library	Zeveloff	2010
Friends of Bear River Migratory Refuge	Cavitt	2007-10
Girls Scouts of American	Mull	2007
Girls Exploring Medicine	Trask	20091-11
Great Salt Lake Interest Group	Berthélémy, Cavitt	2007-2008
Great Salt Lake Advisory Council	Cavitt	
Great Salt Lake Avian Productivity Working Group	Cavitt	2005-
Great Salt Lake Bird Festival	Cavitt	2008-09
Great Salt Lake Issues Forum	Cavitt	2012
Health Occupation Students of America	Chung	2010-12
Ogden Family Support Center	Trask	2008-09
Ogden Migratory Bird Program	Cavitt	2011-12
Ogden Nature Center	Cavitt	2006-08
Ogden Nature Center	Berthélémy	2008-11
Ogden Nature Center	Hoagstrom	2011-12
Physician Heros Luncheon	Trask	2009
Utah Education Network	Marshall	2011
Utah Linking Communities, Wetlands, & Migratory Birds	Cavitt	2009-10
Utah State University	Hoagstrom	2011
Venture Academy	Hoagstrom	2011-12
Wild Aware Utah	Shepard	2011-12

Animal Care, Use, & Resource Conservation & Management

The Department plays the lead role in a University administrative-standing committee, the Animal Care and Use Committee. This group oversees the use of animals in research and teaching projects. Its members include a local veterinarian and a representative from the area's clergy. The committee chair (Barb Trask until Fall 2012; Brian Chung at present) meets with and responds to the directives of a United States Department of Agriculture employee charged with assessing the institution's activities in this area. Thus, by its involvement in the committee (which normally at least consists of having a Zoology faculty member serve as its chair and having our laboratory manager serve on it), the Department interacts with yet another segment of its external community.

One of the most frequent ways in which the Department is involved with the local community is by its faculty and staff responding to questions and concerns about animals. The Zoology Secretary fields such calls and directs them to the appropriate faculty member. In this same vein, faculty members often serve as commentators, scientific experts, or cooperator with animal-related government agencies or with interested community organizations (see below).

Zoology Faculty Member Involvement in Animal Care, Use, & Resource Conservation & Management

Entity	Purpose	Faculty Member	Year(s)
Deseret News	Interview	Zeveloff	2008
Deseret News	Op-Ed Article	Hoagstrom	2011
Farmington Bay Water Quality Tech. Advisory Comm.	Nutrient loading protection	Cavitt	2004-10
Legacy Nature Preserve	Preserve development	Cavitt	2005-08
Legacy Nature Preserve	Preserve development	Hoagstrom	2008-11
Salt Lake Tribune	Op-Ed Article	Mull	2007
Ogden Standard Examiner	Interview	Zeveloff	2008
Utah Division of Water Quality	Selenium WQ Standards	Cavitt	2005-10
Utah Division of Wildlife Resources	Regional Advisory Council	Cavitt	
Utah Division of Wildlife Resources	Trout distribution surveys	Hoagstrom	2009-11
Utah Division of Wildlife Resources	River otter conservation	Zeveloff	2007
Utah Division of Wildlife Resources	Bat specimen database	Zeveloff	2007
Utah Ornithological Society	Annual Meeting	Cavitt	2008-09

External Community Involvement Financial Contributions to the Department of Zoology

The Department of Zoology is fortunate to receive routine donations from several private sources (see table below). These donations largely have a dedicated purpose, such as to fund scholarships for Zoology students or to provide resources for specific courses.

External Community Involvement Financial Contributions to the Department of Zoology

Organization	Amount ($)	Type
Dr. Earl W. Smart Memorial Fund	~1658 per year	Endowment
Orson Whitney Young Memorial Scholarship	~483 per year	Endowment
Liston Anatomy Lab (cadaver) Donation	~4100 per year	Donation
Zoology Department Gift Fund	~1373 per year	Donation
Dr. Kent M. Van de Graaff Pre-medical Application Award Fund	~1159 per year	Donation
Zoology Scholarship Fund	~270 per year	Donation
GIK-Zoology Department Fund	~912 per year	Donation

I. Results of Previous Program Reviews

Problem Identified	Action Taken	Progress
Issue 1: Review & revise the current mission statement & program learning outcomes.	Zoology mission statement & program learning outcomes were reviewed & revised.	Revised mission statement & program learning outcomes are established & have been reviewed by department faculty.
Issue 2: Integrate learning outcomes into individual courses & include on syllabi.	Zoology faculty were encouraged over time to focus more specifically on program learning outcomes.	
Issue 3: Assist faculty in expanding the use of active learning pedagogies & diverse assessment in individual courses.	Zoology faculty are progressive & active in revising teaching approaches & integrating alternative approaches.	**2007-2008:** Service learning: ZOOL 3450 (Grandview Elementary) ZOOL 4650 (WSU Museum of Natural Sciences) Advanced Human Anatomy (ZOOL 4900) used from this point on to train ZOOL 2100 lab instructors Honors Course based on book "Omnivores Dilemma" taught Honors Course "Nature & Art" taught **2008-2009:** In-class demonstrations used in ZOOL1020 Honors Course "Environmental Ethics" taught Laboratory protocols in ZOOL 2200 revised to intensify student engagement **2009-2010:** Semester writing portfolio incorporated into ZOOL 3470 Honors Course based on book "Omnivores Dilemma" taught **2010-2011:** Service learning: HNRS 1510 (WSU Museum of Natural Sciences) Honors Course "Extinction & Human Enterprise" taught ZOOL 4480 students present semester findings at WSU Undergraduate Research Symposium Wimba (web enhanced) Classroom incorporated in ZOOL 2200

I. Results of Previous Program Reviews

Problem Identified	Action Taken	Progress
		2011-2012: Service learning: ZOOL 4680 (Rhino conservation) Expeditional Learning approach used in ZOOL 3470 ZOOL 4650 students present semester findings at National Conference on Undergraduate Research New emphasis on problem solving in ZOOL 3300 Incorporation of the National Conference on Undergraduate Research in ZOOL 3300 Student-led herpetological identification in ZOOL 4600 Neuroscience laboratory developed (Neur 2050) Honors Course based on book "Omnivores Dilemma" taught **Continuous:** Active learning approaches are used in all laboratories Many faculty routinely incorporate timely & topical readings (books, articles) & guest lecturers into lectures & labs John Mull member of Museum of Natural History working group for teachers Chris Hoagstrom member of WSU Faculty Writing Initiative
Issue 4: Review & revise program, advising, & marketing materials to reflect a balanced emphasis for students seeking jobs in zoology & graduate studies with those seeking pre-professional studies.	Advising in the College of Science & Department of Zoology remained focused on catering to needs of individual students. Various opportunities for zoology majors are emphasized depending on the interests & qualifications of each individual.	

I. Results of Previous Program Reviews

Problem Identified	Action Taken	Progress
Issue 5: Provide for peer evaluation of teaching for newer faculty earlier in the tenure process & promote peer evaluation as a constructive tool.	Peer evaluation is conducted multiple years throughout the tenure process as a routine practice within the College of Science. Tenure-track faculty also receive student evaluations for every course taught. Also, all department faculty complete an annual report each year, after which they are evaluated by the chair. Finally, the chair met candidates for tenure & promotion in Fall 2012, as recommended by the program-review committee.	**2008:** John Cavitt promoted to Professor Chris Hoagstrom completes 2nd year review Michele Skopec completes 2nd year review **2009:** Brian Chung completes 2nd year review Jon Marshall completes 2nd year review Chris Hoagstrom completes 3rd year review Michele Skopec completes 3rd year review Nicole Berthélémy completes 5th year review Barb Trask awarded tenure & promoted to Associate Professor **2010:** Brian Chung completes 3rd year review Jon Marshall completes 3rd year review Nicole Berthélémy awarded tenure & promoted to Associate Professor **2012:** Brian Chung completes 5th year review Chris Hoagstrom awarded tenure & promoted to Associate Professor Michele Skopec awarded tenure & promoted to Associate Professor
Issue 6: Provide for a more consistent, targeted approach to mentoring new faculty.	See response to issue 5 above.	See response to issue 5 above.

APPENDICES

Appendix A

Evidence of learning for courses within the Zoology major

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Principles of Zoology I ZOOL 1110					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. In-class discussion & literature examples in lectures 2. Reading of primary literature & article reviews 3. Laboratory reports with detailed rubric focused on scientific formatting	1. Students earning C- or higher 2. Students earning a C- or better on article-review assignments. 3. Students earning C- or better on lab report.	1. 75% of students earned C- or higher during FYs 2008-2012 2. Average score on four article reviews in Spring 2012: 79.7%. 3. Results unavailable	1. Students are gaining exposure to the nature of scientific inquiry 2. Students are gaining general familiarity with scientific literature.	1. Develop more direct methods to measure learning 2. Continue focused article reviews. 3. Assess success of laboratory report assignment.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1g. Students will understand the role of zoological study in the study of human biology.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. In-class discussion & in-depth laboratory examples 2. Reading of primary literature & article reviews 3. Laboratory reports with detailed rubric focused on scientific formatting	1. Students earning C- or higher 2. Students earning a C- or better on article-review assignments. 3. Students earning C- or better on lab report.	1. 75% of students earned C- or higher during FYs 2008-2012 2. Average score on four article reviews in Spring 2012: 79.7%. 3. Results unavailable	1. Students are gaining exposure to the nature of scientific inquiry 2. Students are gaining general familiarity with scientific literature.	1. Develop more direct methods to measure learning 2. Continue focused article reviews. 3. Assess success of laboratory report assignment.

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Principles of Zoology II ZOOL 1120					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. In-class discussion & literature examples in lectures 2. Reading of primary literature & article reviews 3. Laboratory reports with detailed rubric focused on scientific formatting	1. Students earning C- or higher 2. Students earning a C- or better on article-review assignments. 3. Students earning C- or better on lab report.	1. 75% of students earned C- or higher during FYs 2008-2012. 2. Average score on four article reviews in Spring 2012: 80.4%. 3. Average score on lab reports in Spring 2012: 69%	1. Students are gaining exposure to the nature of scientific inquiry 2. Students are gaining general familiarity with scientific literature. 3. Students struggle to rigorously apply scientific method & formatting rules.	1. Develop more direct methods to measure learning 2. Continue focused article reviews. 3 Continue lab reports with efforts to make more accessible.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Not a major course emphasis
1g. Students will understand the role of zoological study in the study of human biology.	1. In-class discussion & in-depth laboratory examples	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Not a major course emphasis
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. In-class discussion & in-depth laboratory examples 2. Laboratory dissections & study of specimens of animal diversity	1. Students earning C- or higher	1. 75% of students earned C- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Principles of Zoology II ZOOL 1120					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. In-class discussion & in-depth laboratory examples 2. Reading of primary literature & article reviews 3. Laboratory reports with detailed rubric focused on scientific formatting	1. Students earning C- or higher 2. Students earning a C- or better on article-review assignments. 3. Students earning C- or better on lab report.	1. 75% of students earned C- or higher during FYs 2008-2012. 2. Average score on four article reviews in Spring 2012: 80.4%. 3. Average score on lab reports in Spring 2012: 69%	1. Students are gaining exposure to the nature of scientific inquiry 2. Students are gaining general familiarity with scientific literature. 3. Students struggle to rigorously apply scientific method & formatting rules.	1. Develop more direct methods to measure learning 2. Continue focused article reviews. 3 Continue lab reports with efforts to make more accessible.

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Cell Biology ZOOL 3200					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Laboratory exercises in cell biology. 3. Discussions of current research, including experimental design. 4. Written laboratory reports in the style of scientific paper.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 70% of students earned C- or higher 2. 76% average on laboratory report.	1. Students are learning about the process of inquiry. 2. Students have first-hand experience with the scientific method.	1. Continue emphasis on how we know as well as what we know. 2. Maintain and update laboratory exercises.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Discussions of current research in cell biology as it relates to evolution. 3. Discussions of chemical evolution and its contribution to cells.	1. Students earning C- or higher	1. 70% of students earned C- or higher	1. Students are learning about the role of evolution.	1. Continue discussion of cell biology as it relates to evolution. 2. Continue to discuss current research in class.
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades 2. Laboratory exercises in cell biology. 3. Discussions of current research in these areas. 4. Written laboratory reports.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 70% of students earned C- or higher 2. 76% average on laboratory report.	1. Students are learning about the organization of life. 2. Students have first-hand experience with characterization of molecules and cells.	1. Maintain and update laboratory exercises. 2. Continue to discuss current research in class.
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades 2. Laboratory exercises in cell biology. 3. Discussions of current research in these areas.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 70% of students earned C- or higher 2. 76% average on laboratory report.	1. Students are learning the material needed to master the subject 2. Students have first-hand experience with the techniques used to study cells.	1. No changes as this is not a major focus of this course.
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Laboratory exercises in cell biology. 3. Discussions of current research in these areas. 4. Written laboratory reports.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 70% of students earned C- or higher 2. 76% average on laboratory report.	1. Students are exposed to all of the major techniques used to study cells. 2. Students learn to collect, analyze, and present their experimental data in appropriate ways.	1. Continue emphasis on relevant skills associated with cell biology research. 2. Continue to stress the experimental nature of cell biology.

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Genetics ZOOL 3300					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Laboratory exercises in genetics. 3. Discussions of current research, including experimental design. 4. Written laboratory reports in the style of scientific paper. 5. Student laboratory notebooks	1. Students earning C- or higher 2. Grade on laboratory report. 3. Grade on lab notebook.	1. 78% of students earned C- or higher 2. 76% average on laboratory report. 3. 85% average on lab notebook.	1. Students are learning about the process of inquiry. 2. Students have first-hand experience with the scientific method. 3. Students are able to collect and analyze data.	1. Continue emphasis on how we know as well as what we know. 2. Maintain and update laboratory exercises.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Discussions of current research in genetics as it relates to evolution.	1. Students earning C- or higher	1. 78% of students earned C- or higher	1. Students are learning about the role of evolution.	1. Continue discussion of genetics as it relates to evolution. 2. Continue to discuss current research applications.
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades 2. Laboratory exercises in genetics, form molecules, to cells, to organisms, to populations. 3. Written laboratory reports.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 78% of students earned C- or higher 2. 76% average on laboratory report.	1. Students are learning about the organization of life. 2. Students have first-hand experience with characterization of molecules and cells.	1. Maintain and update laboratory exercises. 2. Continue to discuss current research in class.
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades 2. Laboratory exercises in genetics. 3. Discussions of current research in these areas.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 70% of students earned C- or higher 2. 76% average on laboratory report.	1. Students are learning the material needed to master the subject 2. Students have first-hand experience with the techniques of genetics.	1. No changes as this is not a major focus of this course.
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Laboratory exercises in genetics. 3. Discussions of current research in these areas. 4. Written laboratory reports. 5. Student laboratory notebooks	1. Students earning C- or higher 2. Grade on laboratory report.	1. 70% of students earned C- or higher 2. 76% average on laboratory report. 3. 85% average on laboratory notebook.	1. Students are exposed to all of the major techniques used to study cells. 2. Students learn to collect, analyze, and present their experimental data in appropriate ways.	1. Continue emphasis on relevant skills associated with genetic research. 2. Continue to stress the experimental nature of genetics.

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Comparative Physiology Zool 3600					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Multiple laboratory activities that involve hypothesis testing, data collection analysis and interpretation culminating in full lab reports scored using a rubric. 3. Discussion leader assignment where each student chooses a peer-reviewed primary article on an assigned topic for the entire class to read. The discussion leader writes 4-5 questions for each student to answer prior to class and then leads a discussion about the article. Students are graded both by their peers and instructor using a rubric. (This assignment also used to measure learning outcomes 1c-g, and 2-4)	1. Students earning C- or higher 2. Students write complete lab reports that correctly report and interpret the results of laboratory activities. 3. Students properly choose peer- reviewed primary articles. Students write clear and thought provoking discussion questions. Students are able to engage peers in a thoughtful discussion.	1. 98% of students earned C- or higher 2. 85% of students earn C- or higher on lab reports. 3. 100% of students earn a C- or higher on discussion leader assignment.	1. Students have rigorous exposure to the nature of scientific inquiry. 2. Many students excel at scientific inquiry but 15% struggle with following scientific inquiry from hypothesis to dissemination. 3. Students are able to identify primary research articles and discuss the relative merits of the studies and relate the topic of the paper to concepts learned in class.	1. Continue emphasis on the importance of scientific inquiry to study comparative physiology. 2. Increase the use of peer-review in writing of lab reports to allow students who excel at scientific inquiry to serve as examples for students who struggle. 3. Continue the discussion leader assignment in current form.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades	1. Students earning C- or higher	1. 98% of students earned C- or higher	1. Students have decent exposure to importance of evolution in biology	1. Continue emphasis on the importance of evolution for shaping the physiology of animals.
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades 2. Short essay questions on exams directing students to discuss how physiological differences in animals may have arisen. Student answers are scored using a rubric.	1. Students earning C- or higher 2. Students correctly describe how genetic differences lead to physiological differences.	1. 98% of students earned C- or higher 2. 80% of students receive more than 2/3 or points available for exam questions.	1. Students have decent exposure to importance of evolution in biology 2. ~ 20% of students struggle with describing how genetic differences lead to animal diversity.	1. Continue emphasis on the importance of evolution for shaping the physiology of animals. 2. Continue using essay question format on exams.
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades 2. Laboratory activity using protein comparison to construct phylogenetic tree culminating in full lab report written by groups of 3-4 students scored using a rubric. 3. Short essay questions on exams requiring students to compare and contrast organ structure and function between classes of animals. Students answers are scored using a rubric.	1. Students earning C- or higher 2. Students correctly report and interpret the results of the laboratory activity . 3. Students correctly describe similarities and differences in organ structure and function between different groups of animals.	1. 98% of students earned C- or higher 2. 100% of students earn C- on lab report. 3. 80% of students receive more than 2/3 or points available for exam questions.	1. Students have extensive exposure to the relation of anatomical structure and function to taxonomic organization of animals. 2. Students understand the significance of evolution in shaping physiology. Students gain experience writing a scientific report in a group setting. 3. Students are able to draw connections between different organ structure and function and the relatedness of animals.	1. Continue emphasis on the relation of anatomical structure and function to taxonomic organization of animals. 2. Continue use of laboratory activity that helps students directly link differences in physiology to phylogeny. 3. Continue using essay question format on exams.

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Comparative Physiology Zool 3600					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades 2. Multiple laboratory activities investigating the differences in metabolic rates (ie how fast animals use macromolecules) between animals. Worksheets and lab reports scored using a rubric. 3. Short essay questions on exams requiring students to compare and contrast how animals use molecules to form cellular structures. .	1. Students earning C- or higher 2. Students are able to accurately measure, calculate and discuss the differences in metabolic rates in animals. 3. Students correctly describe similarities and differences in how animals use the same molecules to form cellular structures.	1. 98% of students earned C- or higher 2. 85% of students earn C- on lab report. 3. 80% of students receive more than 2/3 or points available for exam questions.	1. Students have extensive exposure to taxonomic organization of life from molecules to organism level with specific emphasis on taxonomic differences in cellular and organ structure and function 2. Students have strong understanding on how metabolic rates differ between animals and how those differences lead to differences in physiology. 3. Students are able to draw connections between how all animals use the same macromolecules in both similar and different ways.	1. Continue emphasis on taxonomic organization of life from molecules & cells to organisms. 2. Continue emphasis on metabolic rate differences in animals. 3. Continue using essay question format on exams.
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades 2. The importance of comparative physiology in understanding human physiology is discussed the first day of class and emphasized throughout the semester, especially during the discussion leader assignment.	1. Students earning C- or higher 2. Students are able to make links to why it is important to understand physiological differences between humans and model species during class discussions.	1. 98% of students earned C- or higher 2. Students understand the importance of comparative physiology in the study of human biology.	1. Students have an understanding that zoological study is important to the study of human biology. 2. Need to formalize assessment of this learning objective.	1. Continue to make links on how zoological study is important for the study of human biology. 2. Incorporate short essay questions on exams to formally test students ability to link comparative physiology to human biology.
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Course grades 2. End of the semester oral presentation on a specialized physiological adaptation of an animal. Students are graded both by their peers and instructor using a rubric.	1. Students earning C- or higher 2. Students present organized and interesting presentations about a specialized physiological adaptation of an animal.	1. 98% of students earned C- or higher 2. 100% of students receive a C- or higher.	1. The ecological, aesthetic, economic and scientific values of animals is emphasized. 2. Students are able to put together coherent presentations that often incorporate multiple concepts learned throughout the semester.	1. Continue emphasis on the ecological, aesthetic, economic and scientific animals. 2. Continue using an end of the semester oral presentation assignment.
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades	1. Students earning C- or higher	1. 98% of students earned C- or higher	1. Students have a valid idea of what comparative physiologists do.	1. Continue to introduce fields of study that use comparative physiology.

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Comparative Physiology Zool 3600					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Multiple laboratory activities that teach animal handling techniques, various laboratory techniques like gel electrophoresis and urinalysis, and statistical analysis most of which culminate in a laboratory report that is scored using a rubric. 3. Two oral presentations graded using rubrics. 4. Discussion leader assignment graded using rubric.	1. Students earning C- or higher 2. Students successfully complete laboratory activities and write laboratory reports. 3. Students present organized and interesting presentations. 4. Students receive points for being discussion leader as well as for participating in their peers discussions.	1. 98% of students earned C- or higher 2. 85% of students complete laboratory activities and receive C- or higher on lab reports. 3. 100% of students receive C- or higher 4. 100% of students receive C- or higher	1. Students gained valuable exposure to skills relevant to comparative physiology and related fields. 2. Students are able to follow detailed instructions and gain new laboratory skills. Students also gain valuable scientific writing skills. 3. Students gain experience in presenting scientific information orally. 4. Students gain experience in reading and discussing scientific literature.	1. Continue emphasis on relevant skills 2. Continue laboratory activities 3. Continue oral presentation assignments 4. Continue discussion leader assignment

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Evolution ZOOL 3720					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects. 4. Reading & reviewing popular book on evolution 5. Library video activities	1. Students earning C- or higher.	1. 95% of students earned C- or higher during FYs 2008-2012.	1. Students recognize the nature of scientific inquiry	May develop additional methods to measure learning; etc. for boxes in this column below.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects. 4. Reading & reviewing popular book on evolution 5. Library video activities	1. Students earning C- or higher 2. Pre and post class survey on opinions toward evolution, age of earth, etc.	1. 95% of students earned C- or higher during FYs 2008-2012 2. Change in distribution of opinions (more science based) toward evolution in post course survey	1. Students understand the role of evolution as the major unifying principle in biology. It is a principal aim of this course, & was the basis for its inclusion in the Zoology major's requirements.	1. Develop survey to include more feedback about reason the students attitude toward evolution changed
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects. 4. Reading & reviewing popular book on evolution 5. Library video activities	1. Students earning C- or higher	1. 95% of students earned C- or higher during FYs 2008-2012	1. Students understand the relation of genetic & evolutionary continuity to animal diversity.	
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects.	1. Students earning C- or higher	1. 95% of students earned C- or higher during FYs 2008-2012	1. Students understand the relation of anatomical structure & function to taxonomic organization of animals.	
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects.	1. Students earning C- or higher	1. 95% of students earned C- or higher during FYs 2008-2012	1. Students understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Evolution ZOOL 3720					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects.	1. Students earning C- or higher	1. 95% of students earned C- or higher during FYs 2008-2012	1. Students understand the role of zoological study, particularly of course, evolutionary biology, for the study of human biology.	
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects.	Attempt to have such appreciation occur, though this is not assessed.			
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades based on comprehensive & a variety of types of examinations. 2. Through group & individual discussions. 3. Term projects.	1. Students earning C- or higher	1. 95% of students earned C- or higher during FYs 2008-2012	Students acquire skills necessary for a successful career in biology, including written & oral communication, & reading & critically evaluating scientific literature.	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Zoogeography ZOOL 3470					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Semester-long research project with emphasis on continuous learning & revision	1. Students earning C- or higher 2. Student teams revise presentation, expand bibliography, & increase breadth of study in pre-determined stages	1. 100% of students earned C- or higher 2. 100% of student teams did so	1. Students have decent exposure to the nature of scientific inquiry 2. Students have experienced the process of scientific inquiry	1. Continue emphasis on process of doing biogeography 2. Continue use of expeditionary learning approach
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Student teams select monophyletic groups for use in research project	1. Students earning C- or higher 2. Student teams select groups appropriate for analysis	1. 100% of students earned C- or higher 2. 100% of student teams selected and used appropriate groups	1. Students have decent exposure to importance of evolution in biology 2. Students understand the significance of evolutionary relatedness for studying zoogeographic patterns	1. Continue emphasis on evolution in biogeography 2. Continue use of expeditionary learning approach
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades 2. Student teams must determine areas of endemism for research project	1. Students earning C- or higher 2. Student teams define areas of endemism based on animal distributions & geographic/environmental features	1. 100% of students earned C- or higher 2. 100% of student teams defined valid areas of endemism using meaningful criteria	1. Students have decent exposure to links of organisms to ecosystems 2. Students have recognized direct relations between animal distributions & ecosystem characteristics	1. Continue emphasis on ecological animal distributions 2. Continue use of expeditionary learning approach
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. Course grades 2. In-class discussions result in student questions about animal ecology & conservation	1. Students earning C- or higher 2. Frequent discussion of ecology & conservation with students exhibiting interest	1. 100% of students earned C- or higher 2. Students did show interest in ecology & conservation	1. Students likely gained some exposure to ecological impacts of humans 2. This is not a major course objective, so may not justify more formalized assessment	1. No action planned, priority is to maintain proper course focus
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades 2. In-class discussions result in student questions about authors & scientists we read	1. Students earning C- or higher 2. Frequent discussion of authors & scientists with students exhibiting interest	1. 100% of students earned C- or higher 2. Students did show interest in authors & their accomplishments	1. Students have a valid idea of what biogeographers do 2. Need to formalize assessment of this learning objective	1. Continue emphasis on biogeographers as authors & scientists 2. Consider a before & after survey to assess student interest in & understanding of zoogeography

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Zoogeography ZOOL 3470					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Semester-long project requires student teams to execute & present findings from three biogeographical methods	1. Students earning C- or higher 2. Student teams complete all analytical procedures & present valid results	1. 100% of students earned C- or higher 2. All student teams completed all analyses & presented valid results	1. Students gained valuable exposure to skills relevant to biogeography & related disciplines 2. Students gained first-hand experience gathering data, conducting analyses, & presenting results	1. Continue emphasis on relevant skills 2. Continue use of expeditionary learning approach

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Conservation Biology ZOOL 3500					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Part of the grade is based on a civic engagement project on an aspect of conservation (e.g., the lemurs in Madagascar). This also facilitates an understanding of the nature of scientific inquiry.	1. Students earning C- or higher . 2. Students collaborate on a presentation, based on this civic engagement project.	1. 100% of students earned C- or higher.	1. Students are exposed to the nature of scientific inquiry; scientific, political, ethical, & economic aspects of conservation are also considered.	
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades	1. Students earning C- or higher	1. 100% of students earned C- or higher. 2. Students are expected to understand evolutionary aspects of conservation biology, & its implications for this discipline.	1. Students are made aware of the relevance of evolutionary biology for the conservation of biodiversity. This is addressed during a portion of the course.	
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	See above box.	See above box.	See above box.	See above box.	
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades.	1. Students earning C- or higher 2. They are exposed to such material as they learn about biodiversity, as well as ecological principles for conservation biology.	1. 100% of students earned C- or higher.	1. Students are exposed to considerable material re: the links of organisms to ecosystems, etc.	
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. Course grades 2. Class discussions about animal ecology & conservation. Indeed this outcome is the focus of this course.	1. Students earning C- or higher 2. Via regular discussions about ecology & biodiversity conservation.	1. 100% of students earned C- or higher. 2. Students generally display a keen interest in ecology & conservation.	1. Students likely gain great exposure to information re: the ecological impacts of humans	Priority is to maintain this course focus.
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades.	NA	1. 100% of students earned C- or higher. 2. A substantial portion of the course relates studies to animals (e.g., on pollution, climate change) to issues for humans.	1. One can assume that students understand the role of zoological study for human biology.	
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Course grades. 2. In-class discussions re: the ecological, aesthetic, economic, & scientific value of animals.	NA	1. 100% of students earned C- or higher. 2. Portion of the curriculum is devoted to such analyses.	1. One can assume that students gain such an appreciation.	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Conservation Biology ZOOL 3500					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of**
3. Students will become aware of career opportunities available to a zoology graduate & will prepare themselves for employment & for professional or graduate school.	1. Course grades.	1. Students earning C- or higher	1. 100% of students earned C- or higher.	1. Students have a coherent idea about the types of careers conservation biologists pursue, & what their contributions are.	
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Semester-long project requires students to conduct work related to conservation biology. Recently (Spring '12), they worked with the Ogden Migratory Bird Program on projects with Mound Fort Elementary School (Ogden UT). These provided the chance to learn about work in environmental education.	1. Students earning C- or higher 2. Student teams collaborate on civic engagement projects.	1. 100% of students earned C- or higher 2. Student teams successfully completed various projects over this period.	1. Students gained first-hand experience in a novel type of project.	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Comparative Anatomy- Zoology 4050					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Dissections	1. Students earning C- or higher	1 & 2. 72% of students earned C or higher during FYs 2009-2012	1 & 2. Students understand nature of scientific inquiry	1 & 2. None
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Dissections	1. Students earning C- or higher	1. 72% of students earned C or higher during FYs 2009-2012	1. Students understand evolutionary processes	1. None
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades	1. Students earning C- or higher	1. 72% of students earned C or higher during FYs 2009-2012	1. Students understand evolutionary processes	1. None
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades 2. Semester-long dissection assignments	1. Students earning C- or higher 2. Successful completion of dissection	1 &2. 72% of students earned C or higher during FYs 2009-2012	1 & 2. Students have become proficient in relating anatomic structures & organization	1& 2. None
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades 2. Semester-long dissection assignments	1. Students earning C- or higher	1. 72% of students earned C or higher during FYs 2009-2012	1. Students understand systemic organization	1. None
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades 2. Dissections	1. Students earning C- or higher	1. 72% of students earned C or higher during FYs 2009-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Dissections	1. Students earning C- or higher	1. 72% of students earned C or higher during FYs 2009-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Student evaluation scores 2. Semester-long dissection assignment 3. In-class discussions	1. Student evaluation scores regarding "stimulating & challenging" 2. Assignments successfully completed 3. Successful application to professional programs	1. Above department & College averages during FY 2008-2012 2 & 3. GPA requirement of professional programs	1. Students are being challenged to think & develop critical thinking skills 2 & 3. Efforts are successful	1. Continue to pursue methods to develop problem-solving skills 2 & 3. Continue to measure student success rates
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. In-class discussion of scientific literature	1,2. Students earning C- or higher	1,2. 72% of students earned C or higher during FYs 2009-2012	1. Students are being challenged to think & develop critical thinking skills 2. Students are developing skills necessary for professional careers	1. Continue to pursue methods to develop problem-solving skills 2. Continue to measure student success rates

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Embryology, Zoology 4100					
Measurable Learning Outcome:	**Direct & Indirect Methods of**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Laboratory Exercises	1. Students earning C- or higher	1 & 2. 76% of students earned C or higher during FYs 2009-2012	1 & 2. Students understand nature of scientific inquiry	1 & 2. None
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Laboratory Exercises	1. Students earning C- or higher	1. 76% of students earned C or higher during FYs 2009-2012	1. Students understand evolutionary processes	1. None
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades 2. Laboratory Exercises	1. Students earning C- or higher	1. 76% of students earned C or higher during FYs 2009-2012	1. Students understand evolutionary processes	1. None
1d. Students will understand the relation of anatomical structure & function to taxonomic organization of animals.	1. Course grades 2. Laboratory Exercises	1. Students earning C- or higher 2. Successful completion of dissection	1 &2. 76% of students earned C or higher during FYs 2009-2012	1 & 2. Students have become proficient in relating anatomic structures & organization	1& 2. None
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades	1. Students earning C- or higher	1. 76% of students earned C or higher during FYs 2009-2012	1. Students understand systemic organization	1. None
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades 2. Laboratory Exercises	1. Students earning C- or higher	1. 76% of students earned C or higher during FYs 2009-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Laboratory Exercises	1. Students earning C- or higher	1. 76% of students earned C or higher during FYs 2009-2012	1. Students use animals and animal-derived materials in lab	1. Develop more direct methods to measure learning
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Student evaluation scores 2. Laboratory Exercises 3. In-class discussions 4. In-class presentations	1. Student evaluation scores regarding "stimulating & challenging" 2. Assignments successfully completed 3. Successful application to professional programs	1. Above department & College averages during FY 2008-2012 2 -4. GPA requirement of professional programs	1. Students are being challenged to think & develop critical thinking skills 2 & 3. Efforts are successful	1. Continue to pursue methods to develop problem-solving skills 2 & 3. Continue to measure student success rates
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. In-class discussion of scientific literature 3. In-class presentations	1,2. Students earning C- or higher	1,2,3. 76% of students earned C or higher during FYs 2009-2012	1. Students are being challenged to think & develop critical thinking skills 2. Students are developing skills necessary for professional careers 3. In-class presentations are analyses of recent research papers, presented to & graded by classmates	1. Continue to pursue methods to develop problem-solving skills 2. Continue to measure student success rates

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Histology - Zoology 4120					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Article assignments	1. Students earning C- or higher	1 & 2. 72% of students earned C or higher during FYs 2009-2012	1 & 2. Students understand nature of scientific inquiry	1 & 2. None
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Article assignments	1. Students earning C- or higher	1. 72% of students earned C or higher during FYs 2009-2012	1. Students understand evolutionary processes	1. None
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades	1. Students earning C- or higher	1. 72% of students earned C or higher during FYs 2009-2012	1. Students understand evolutionary processes	1. None
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades 2. Laboratory study of microscope slides (most of animal tissues)	1. Students earning C- or higher 2. Successful performance on lab quizzes	1 &2. 72% of students earned C or higher during FYs 2009-2012	1 & 2. Students have become proficient in relating anatomic structures & organization	1& 2. None
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades 2. Relevance of class content & laboratory slides to human biology	1. Students earning C- or higher	1. 94% of students earned C or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Laboratory study of microscope slides (most of animal tissues)	1. Students earning C- or higher	1. 94% of students earned C or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Student evaluation scores 2. Laboratory study of microscope slides	1. Student evaluation scores regarding "stimulating & challenging" 2. Success in lab practical exams 3. Successful application to professional programs	1. Above department & College averages during FY 2008-2012 2 & 3. GPA requirement of professional programs	1. Students are being challenged to think & develop critical thinking skills 2 & 3. Efforts are successful	1. Continue to pursue methods to develop problem-solving skills 2 & 3. Continue to measure student success rates
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades based on written exam answers 2. Inclusion of scientific literature on exams	1,2. Students earning C- or higher	1,2. 94% of students earned C or higher during FYs 2008-2012	1. Students are being challenged to think & develop critical thinking skills 2. Students are developing skills necessary for professional careers	1. Continue to pursue methods to develop problem-solving skills 2. Continue to measure student success rates

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Advanced Human Physiology ZOOL 4210					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Semester-long research project, with data collection, oral presentation	1. Students earning C+ or higher	1. 95% of students earned C+ or higher 2. 100% of student teams did so	1. Students have gained some exposure to scientific study 2. Students have experienced the process of scientific inquiry	1. Continue use of laboratory for semester-long team projects
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades	1. Students earning C+ or higher	1. 95% of students earned C- or higher 2	1. Students have learned the functions of the various organ system and can relate to clinical cases	Continue to introduce clinical cases and critical thinking
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades	1. Students earning C+ or higher	1. 95% of students earned C- or higher	1. Students have learned the functions of the various organ system and can relate to clinical cases	Continue to introduce clinical cases and critical thinking
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	Not measured but discussed	Students questions and comments	Students questions and comments	Students are very interested in their future and often ask questions	- frequent class discussion about opportunities
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	- Class grades - Oral presentations - Written reports - Laboratory exercises - Personal project - Scientific literature reading	- Adequate writing, analytical skills in order to function well on a job.	- Most students are computer literate - Writing and analytical skills vary widely but are improving	Use of the various assignments given in the class help students improve writing and analytical skills	- increase reading, writing and data analysis if time permits

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Molecular Genetics ZOOL 4300					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Laboratory exercises in molecular genetics. 3. Discussions of current research, including experimental design. 4. Written laboratory reports in the style of scientific paper. 5. Student laboratory notebooks	1. Students earning C- or higher 2. Grade on laboratory report. 3. Grade on lab notebook.	1. 92% of students earned C- or higher 2. 80% average on laboratory report. 3. 85% average on lab notebook.	1. Students are learning about the process of inquiry. 2. Students have first-hand experience with the scientific method. 3. Students are able to collect and analyze data.	1. Continue emphasis on how we know as well as what we know. 2. Maintain laboratory exercises.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Discussions of current research in genetics as it relates to evolution.	1. Students earning C- or higher	1. 92% of students earned C- or higher	1. Students are learning about the role of evolution.	1. Continue discussion of genetics as it relates to evolution. 2. Continue to discuss current research applications.
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades 2. Laboratory exercises in molecular genetics, from molecules, to cells, to organisms. 3. Written laboratory reports. 4. Discussion of population and ecosystem topics.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 92% of students earned C- or higher 2. 80% average on laboratory report.	1. Students are learning about the organization of life. 2. Students have first-hand experience with characterization of molecules and cells.	1. Maintain and update laboratory exercises. 2. Continue to discuss current research in class.
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades 2. Laboratory exercises in molecular genetics. 3. Discussions of current research in these areas.	1. Students earning C- or higher 2. Grade on laboratory report.	1. 92% of students earned C- or higher 2. 80% average on laboratory report.	1. Students are learning the material needed to master the subject 2. Students have first-hand experience with the techniques of genetics.	1. No changes as this is not a major focus of this course.
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Laboratory exercises in molecular genetics. 3. Discussions of current research in these areas. 4. Written laboratory reports. 5. Student laboratory notebooks	1. Students earning C- or higher 2. Grade on laboratory report.	1. 92% of students earned C- or higher 2. 80% average on laboratory report. 3. 85% average on laboratory notebook.	1. Students are exposed to all of the major techniques used to study cells. 2. Students learn to collect, analyze, and present their experimental data in appropriate ways.	1. Continue emphasis on relevant skills associated with genetic research. 2. Continue to stress the experimental nature of molecular genetics.

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Aquatic Ecology ZOOL 4480					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Semester-long research project with emphasis on comparison with a former study, continuous learning, revision, & presentation	1. Students earning C- or higher 2. Student teams revise presentation, expand bibliography, & increase breadth of study in pre-determined stages & in comparison with a previous study	1. 86% of students earned C- or higher 2. 100% of student teams did so & some students presented findings at the WSU Undergraduate Research Symposium	1. Students have gained some exposure to scientific study 2. Students have experienced the process of scientific inquiry	1. Need more focused assignments to link readings to scientific practices 2. Continue use of laboratory for semester-long team projects
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades 2. Student teams must identify aquatic insects using anatomical features in the context of ecological relations	1. Students earning C- or higher 2. Student teams accurately identify aquatic insects & understand their basic trophic ecology	1. 86% of students earned C- or higher 2. 100% of student teams made accurate identifications & interpreted ecological findings correctly	1. Students have gained some exposure to anatomical structure & function of aquatic animals 2. Students have first-hand experience using anatomical features to identify insects in an ecological context, but this is not an emphasis of the course	1. No action planned, priority is to maintain proper course focus 2. No action planned, priority is to maintain proper course focus
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades 2. Semester-long research project with emphasis on trophic interactions between stoneflies & trout	1. Students earning C- or higher 2. Student teams compare distribution & population structure of trout & stoneflies in Burch Creek	1. 86% of students earned C- or higher 2. 100% of student teams completed study & drew conclusions regarding trophic interactions	1. Students have gained some exposure to interactions among ecosystem levels 2. Students have recognized direct relations among animal distributions & ecosystem characteristics	1. Need more focused & direct assessments such as focused writings & reflective discussions 2. Continue use of laboratory for semester-long team projects
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. Course grades 2. Students required to write "management relevance" essays relating literature to water resource management, essays collected into final portfolio	1. Students earning C- or higher 2. Students earning B- or higher	1. 86% of students earned C- or higher 2. 67% of students earned B- or higher	1. Students have gained some exposure to human influence on ecosystems 2. Not all students could effectively link readings to management	1. Need more focused & direct assessments such as focused writings & reflective discussions 2. Need more direct assessment & a more focused rubric, integrating more student reflection in class & a before/after assignment could be beneficial
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Course grades 2. In-class discussions result in student questions about authors & scientists we read	1. Students earning C- or higher 2. Frequent discussion of authors & scientists with students exhibiting interest	1. 86% of students earned C- or higher 2. Students did show interest in authors & their accomplishments	1. Students have gained some exposure to valuation of animals 2. Need to formalize assessment of this learning objective	1. Need more focused & direct assessments such as focused writings & reflective discussions 2. Consider use of a before & after survey to assess student interest in zoogeography & understanding of what a zoogeographer does

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Aquatic Ecology ZOOL 4480					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades 2. In-class discussions & guest speakers result in student questions about authors & scientists we read & meet 3. Semester-long research project puts students in the role of an aquatic ecologist	1. Students earning C- or higher 2. Frequent discussion of speakers, authors, & scientists with students exhibiting interest 3. Completion of semester-long project	1. 86% of students earned C- or higher 2. Students did show interest in speakers, authors, & their accomplishments 3. 100% of students completed semester-long project	1. Students have gained some exposure to activities of aquatic ecologists 2. Need to formalize assessment of this learning objective 3. Students have conducted research analogous to that conducted by aquatic ecologists	1. Consider use of a before & after survey to assess student interest in aquatic ecology & understanding of what an aquatic ecologist does
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Semester-long project requires student teams to execute & present findings from data collection to analysis & presentation, they also much work as a team 3. Rubric for essay assignments is focused on basic essay structure (synthesis, clarity)	1. Students earning C- or higher 2. Student teams complete data collection, analysis, & present valid results 3. No obvious threshold based on assignment structure	1. 86% of students earned C- or higher 2. All student teams completed all data collection & analyses & presented valid results 3. Criteria too vague to evaluate in detail	1. Students have gained some proficiency with field-relevant skills 2. Students gained first-hand experience gathering data, conducting analyses, & presenting results 3. Outcome unclear	1. Continue incorporation of skills in class, target specific skills relevant to course & devise more direct assessments 2. Continue use of laboratory for semester-long research projects 3. Need more focused criteria & assessment to track student proficiency & improvement

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Ichthyology ZOOL 4650					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Semester-long research project with emphasis on comparison with a former study, continuous learning, revision, & presentation	1. Students earning C- or higher 2. Student teams revise presentation, expand bibliography, & increase breadth of study in pre-determined stages & in comparison with a previous study	1. 100% of students earned C- or higher 2. 100% of student teams did so & some students presented findings at the National Conference on Undergraduate Research	1. Students have gained some exposure to scientific study 2. Students have experienced the process of scientific inquiry	1. Need more focused assignments to link readings to scientific practices 2. Continue use of laboratory for semester-long team projects
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades 2. Five essay assignments emphasize various aspects of fish evolution	1. Students earning C- or higher 2. Students demonstrate in-depth understanding of fish evolution & the significance of evolutionary processes	1. 100% of students earned C- or higher 2. Grading rubric was not specific to this learning outcome	1. Students have decent exposure to importance of evolution in biology 2. Although students were asked to explore relevant evolutionary topics, an unfocused rubric precludes evaluation of assignment success	1. Continue emphasis on evolution in biogeography 2. Devise new assignment rubrics with focus on student understanding of evolution
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades 2. Five essay assignments emphasize various aspects of fish diversity & fish genetic & evolutionary relations	1. Students earning C- or higher 2. Students demonstrate in-depth understanding of genetic & evolutionary continuity in relation to animal diversity	1. 100% of students earned C- or higher 2. Grading rubric was not specific to this learning outcome	1. Students have decent exposure to genetic & evolutionary continuity in relation to animal diversity 2. Although students were asked to explore relevant topics, an unfocused rubric precludes evaluation of assignment success	1. Continue emphasis on genetic & evolutionary continuity in relation to animal diversity 2. Devise new assignment rubrics with focus on student understanding of genetics, evolution, & fish diversity
1d. Students will understand the relation of anatomical structure & function to taxonomic organization of animals.	1. Course grades	1. Students earning C- or higher	1. 100% of students earned C- or higher	1. Students have gained some exposure to anatomical structure & function of aquatic animals	1. Need more specific focus on this learning outcome
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades	1. Students earning C- or higher	1. 100% of students earned C- or higher	1. Students have gained some exposure to interactions among ecosystem levels but this is not a course emphasis	1. No action planned, priority is to maintain proper course focus

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Ichthyology ZOOL 4650					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. Course grades 2. Final essay assignment emphasizes value of fish as bioindicators	1. Students earning C- or higher 2. Students demonstrate in-depth understanding of value of bioindicators	1. 86% of students earned C- or higher 2. Grading rubric was not specific to this learning outcome	1. Students have gained some exposure to human influence on ecosystems 2. Although students were asked to explore relevant topics, an unfocused rubric precludes evaluation of assignment success	1. Need more focused & direct assessments such as focused writings & reflective discussions 2. Devise new assignment rubrics with focus on student understanding of genetics, evolution, & fish diversity
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Course grades 2. In-class discussions result in student questions about authors & scientists we read	1. Students earning C- or higher 2. Frequent discussion of authors & scientists with students exhibiting interest	1. 86% of students earned C- or higher 2. Students did show interest in authors & their accomplishments	1. Students have gained some exposure to valuation of animals 2. Need to formalize assessment of this learning objective	1. Need more focused & direct assessments such as focused writings & reflective discussions 2. Consider use of a before & after survey to assess student interest in ichthyology & understanding of what an ichthyologist does
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades 2. Semester-long research project puts students in the role of an ichthyologist	1. Students earning C- or higher 2. Completion of semester-long project	1. 100% of students earned C- or higher 2. 100% of students completed semester-long project	1. Students have gained some exposure to activities of aquatic ecologists 2. Students have conducted research analogous to that conducted by ichthyologists	1. Consider use of a before & after survey to assess student interest in ichthyology & understanding of what an ichthyologist does
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Semester-long project requires student teams to execute & present findings from data collection to analysis & presentation, they also much work as a team 3. Rubric for essay assignments is focused on basic essay structure (synthesis, clarity)	1. Students earning C- or higher 2. Student teams complete data collection, analysis, & present valid results 3. No obvious threshold based on assignment structure	1. 100% of students earned C- or higher 2. All student teams completed all data collection & analyses & presented valid results 3. Criteria too vague to evaluate in detail	1. Students have gained some proficiency with field-relevant skills 2. Students gained first-hand experience gathering data, conducting analyses, & presenting results 3. Outcome unclear	1. Continue incorporation of skills in class, target specific skills relevant to course & devise more direct assessments 2. Continue use of laboratory for semester-long research projects 3. Need more focused criteria & assessment to track student proficiency & improvement

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Herpetology ZOOL 4660					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher.	1. 100% of students earned C- or higher during FYs 2011.	1. Students recognize the nature of scientific inquiry	May develop additional methods to measure learning; etc. for boxes in this column below.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	1. Students understand the role of evolution as the major unifying principle in biology. It is a principal aim of this course, and was the basis for its inclusion in the Zoology major's requirements.	
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	1. Students understand the relation of genetic & evolutionary continuity to animal diversity.	
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	1. Students understand the relation of anatomical structure and function to taxonomic organization of animals.	
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	1. Students understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	1. Students make understand connection between humans & other organisms	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Herpetology ZOOL 4660					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	1. Students understand the role of zoological study, particularly of course, evolutionary biology, for the study of human biology.	
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	2. Students appreciate the ecological, aesthetic, economic, & scientific value of animals.	
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 100% of students earned C- or higher during FYs 2011.	1. Students aware of career opportunities.	
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades based on comprehensive and a variety of types of examinations. 2. Through group and individual discussions. 3. Team presentations of local amphibians and reptiles 4. Actual experience in field collecting amphibians and reptiles 5. Hands-on curatorial activities with amphibian and reptile collection	1. Students earning C- or higher	1. 95% of students earned C- or higher during FYs 2008-2012	1. Students acquire skills necessary for a successful career in biology, including written & oral communication, & reading & critically evaluating scientific literature.	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Mammalogy ZOOL 4680					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades. 2. Discussions about the history of, and research in this field. 3. Projects on aspects of mammalogy. These include various activities: e.g., research presentations; construction of skeletons; teaching lesson plans; and civic engagement projects.	1. Students earning C- or higher	1. 100% of students earned C- or higher.	1. Students gain exposure to scientific inquiry.	May use more assignments re: the nature of scientific inquiry.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades, which are in part based on essay questions about mammalian evolution, which is covered in-depth.	1. Students earning C- or higher (as a considerable portion of the exams is based upon mammalian evolution, as well as evolution within various mammalian groups, this outcome is significantly addressed.)	1. 100% of students earned C- or higher.	1. Students have extensive exposure to evolutionary concepts and findings pertaining to mammals.	
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades 2. This outcome is addressed as indicated for 1b.	1. Students earning C- or higher See 1b comments above.	1. 100% of students earned C- or higher	"	
1d. Students will understand the relation of anatomical structure & function to taxonomic organization of animals.	1. Course grades, which are in part based on essay questions about mammalian structures and functions, and how they are shaped by evolution. 2. A comprehensive hands-on laboratory section focuses on this outcome. The Dept. of Zoology has an outstanding mammal collection used in these labs.	1. Students earning C- or higher. See 1b comments above.	1. 100% of students earned C- or higher.	1. Students receive considerable exposure to material re: anatomical structures & functions of mammals.	
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades/exams.	1. Students earning C- or higher.	1. 100% of students earned C- or higher.	Students gain an understanding of the ecological roles of mammals.	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Mammalogy ZOOL 4680					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1f. Students will understand the ecological relations between humans & other organisms & the increasingly significant impact of human activities on the biosphere.	1. Course grades 2. Have recently incorporated a civic engagement project on mammalian conservation (e.g., the rhinoceros crisis, landscape conservation issues in Yellowstone National Park).	1. Students earning C- or higher. 2. Students, typically within groups, participate in a research/service project focusing on the conservation of a particular mammal or group of mammals.	1. 100% of students earned C- or higher.	1. Students gain exposure to human influences on species and ecosystems, and learn about ways to be civically engaged about such matters.	Continued use of this approach, topics will vary in the future.
1g. Students will understand the role of zoological study in the study of human biology.	Course topics have relevance to humans; this is especially addressed in the section on primates, as well as in our discussions re: conservation and wildlife management.	1. Students earning C- or higher.	1. 100% of students earned C- or higher.	1g. Students gain an appreciation for the role of mammalogy for understanding aspects of human biology.	
2. Students will appreciate the ecological, aesthetic, economic, & scientific value of animals.	1. Course grades 2. In-class discussions 3. The above described project.	1. Students earning C- or higher 2. Frequent discussion of conservation issues, as well as aesthetic aspects of mammals.	1. 100% of students earned C- or higher 2. Students display considerable interest in, and enthusiasm for, the civic engagement projects (e.g., a 2011 'rhino art auction'). They appear to develop a greater aesthetic appreciation for mammals.	1. Students gain exposure to the listed values of mammals, and complete projects requiring active involvement in their conservation.	
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	NA	Such opportunities for students are reviewed informally throughout the semester.		1. Students gain exposure to professions involving studies of mammalian biology.	
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Semester-long civic engagement projects require student teams to cooperate. They are also aimed at improving their writing and presentation skills.	1. Students earning C- or higher 2. Student teams complete projects which require various activities including analysis of political issues, as well as those pertaining to wildlife conservation. Writing and presentation skills are also assessed.	1. 100% of students earned C- or higher 2. All student groups successfully completed the aforementioned projects.	1. Students gain experience in learning how to address conservation issues as concerned citizens, work together in small groups, and recognize the biological and political bases for wildlife management decisions. There are several aspects re: written & oral communication, & reading & critically evaluating scientific literature in this process.	

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Advanced Human Anatomy - Zoology 4900					
Measurable Learning Outcome:	**Direct & Indirect Methods of**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	3. Course grades 4. Weekly assignments	1. Students earning C- or higher 2. Correct completion of assignments	1 & 2. 100% of students earned A- or higher during FYs 2008-2012	1 & 2. Students understand nature of scientific inquiry	1 & 2. None
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. Course grades	1. Students earning C- or higher	1. 100% of students earned A- or higher during FYs 2008-2012	1. Students understand evolutionary processes	1. None
1c. Students will understand the relation of genetic & evolutionary continuity to animal diversity.	1. Course grades	1. Students earning C- or higher	1. 100% of students earned A- or higher during FYs 2008-2012	1. Students understand evolutionary processes	1. None
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades 2. Semester-long dissection assignments	1. Students earning C- or higher 2. Successful completion of dissection	1 &2. 100% of students earned A- or higher during FYs 2008-2012	1 & 2. Students have become proficient in relating anatomic structures & organization	1& 2. None
1e. Students will understand the taxonomic organization of life from molecules & cells to organisms & ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course grades	1. Students earning C- or higher	1. 100% of students earned A- or higher during FYs 2008-2012	1. Students understand systemic organization	1. None
1g. Students will understand the role of zoological study in the study of human biology.	1. Course grades	1. Students earning C- or higher	1. 100% of students earned A- or higher during FYs 2008-2012	1. Students are gaining exposure to the nature of scientific inquiry	1. Develop more direct methods to measure learning
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment & for professional or graduate school.	1. Student evaluation scores 2. Semester-long dissection assignment 2. In-class discussions	1. Student evaluation scores regarding "stimulating & challenging" 2. Assignments successfully completed 3. Successful application to professional programs	1. Above department & College averages during FY 2008-2012 2 & 3. GPA requirement of professional programs	1. Students are being challenged to think & develop critical thinking skills 2 & 3. Efforts are successful	1. Continue to pursue methods to develop problem-solving skills 2 & 3. Continue to measure student success rates

Evidence of Learning: **Courses Within the Major including High-Impact & Service-Learning Courses**: Advanced Human Anatomy - Zoology 4900					
Measurable Learning Outcome:	**Direct & Indirect Methods of**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory & field research techniques, written & oral communication, & reading & critically evaluating scientific literature.	1. Course grades 2. Prerequisite interview process 3. Weekly quiz rubric 4. Students must teach lesson plans presented	1. Students earning C- or higher	1. 100% of students earned A- or higher during FYs 2008-2012 2. Interview process prepares students for professional program applications 3. Quiz rubrics train students to adhere to protocol & procedures 4. Students must prepare to teach the lesson plan to 2100 lab students	1. Students are being challenged to think & develop critical thinking skills 2 & 3. Students are developing skills necessary for professional careers 4. Students successful in teaching the lesson plan to 2100 lab students	1. Continue to purse methods to develop problem-solving skills 2 & 3. Continue to measure student success rates

Appendix B

Evidence of learning for "service" courses offered by the Department of Zoology

Evidence of Learning: **Zoology "Service" Courses including High-Impact & Service-Learning Courses**: Human Anatomy ZOOL 2100					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1. Course grades 2. Quiz results 3. Questions asked in class or e-mail	70% f students have a C- or more	80%	Students are learning the subject taught in class!!	There is always room for improvement: I am including videos, critical thinking by using clinical cases. I encourage the students to use the discussion board
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course grades 2. Strict ID of anatomic structures 3. Pre & post exam	1. Students earning C- or higher 2. Strict rubric pertaining to identification 3. Post-exam performance	1 &2. 70% of students earned C- or higher during FYs 2008-2012 3. 10% improvement in post-exam performance	1,2 & 3. Students are gaining exposure to the nature of scientific inquiry	1. Exposure to anatomic classification successful
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment and for professional or graduate school.	1. Student evaluation scores 2. Student applications to professional programs 3. "A" students apply to become lab instructors for subsequent semesters	1. Student evaluation scores regarding "stimulating & challenging" 2. Successful application to professional programs 3. Students are selected to become lab instructors for subsequent semesters	1. Above department & College averages during FY 2008-2012 2. GPA requirement of professional programs 3. Most successful students go on to become lab instructors	1. Students are being challenged to think & develop critical thinking skills 2. Efforts are successful 3. Efforts are successful	1. Continue to pursue methods to develop problem-solving skills 2. Continue to measure student success rates
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory and field research techniques, written and oral communication, and reading and critically evaluating scientific literature.	1. Class grades 2. Oral presentations 3. Written reports 4. Laboratory exercises 5. Personal project 6. Scientific literature reading 7. "A" students apply to become lab instructors for subsequent semesters	1. Adequate writing, analytical skills in order to function well on a job. 2. "A" students are selected to become lab instructors for subsequent semesters	1. Most students are computer literate 2. Writing and analytical skills vary widely but are improving	1. Use of the assignments given in the class help students improve writing & analytical skills 2. Students gain exposure to the nature of scientific inquiry, adherence to protocol & standards of practice	1. Increase reading, writing & data analysis if time permits

Evidence of Learning: **Zoology "Service" Courses including High-Impact & Service-Learning Courses**: Human Physiology ZOOL 2200					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1a. Students will understand the nature of scientific inquiry in the study of biology.	1.Course Grades 2. Laboratory activities that involve hypothesis testing, data collection, analysis and interpretation. Quizzes on the lab activities and protocols that require collected data to be reported, analyzed and interpreted are used as assessments.	1. Students earning C- or higher 2. Students earning scores of ≥10 out of 15	1. 90% of students earned a C- or higher 2. 95% of students earned scores ≥10	1. Students have exposure to the nature of scientific inquiry. 2. Students have in depth exposure to using scientific inquiry.	1. Continue emphasis on role of scientific inquiry in the study of physiology. 2. Continue the use of hands on laboratory activities employing scientific inquiry.
1b. Students will understand the role of evolution as the major unifying principle in biology.	1. In-class discussions result in student questions about why our bodies work in specific ways	1. Students exhibit interest in how humans' body systems evolved and ask further questions.	1. Students do show interest and ask further questions.	1. Students gained exposure to the evolutionary underpinnings of human physiology.	1. No action planned as this is not a major course objective.
1d. Students will understand the relation of anatomical structure and function to taxonomic organization of animals.	1. Course Grades 2. Weekly multiple choice quizzes taken online with immediate feedback. 3. Multiple choice exams with questions pertaining to the anatomical structure and function of humans. 4.Laboratory activities that involve hands on activities investigating the anatomical structure and function of humans. Quizzes on the lab activities and protocols that require collected data to be reported, analyzed and interpreted are used as assessments.	1. Students earning C- or higher 2. Students earning scores of ≥7 out of 10 3. Students earning scores of 70% or higher 4. Students earning scores of ≥10 out of 15	1. 90% of students earned a C- or higher 2. 85% of students earned a score >7 3. 80% of students earned scores of 70% or higher 4. 95% of students earned scores ≥10	1. Students have extensive exposure to the anatomical structure and function of humans. 2 -4. Students understand the anatomical structure and function of humans.	1-4. Continue emphasis, utilization and assessment of the anatomical structure and function of humans.
1e. Students will understand the taxonomic organization of life from molecules and cells to organisms and ecosystems, with emphasis on how interactions among levels shape the biosphere.	1. Course Grades 2. Weekly multiple choice quizzes taken online with immediate feedback 3. Multiple choice exams with questions pertaining to the interplay of molecules, cells, organs and organ systems within humans 4.Laboratory activities that involve hands on activities investigating the interplay of molecules, cells, organs and organ systems in humans. Quizzes on the lab activities and protocols that require collected data to be reported, analyzed and interpreted are used as assessments.	1. Students earning C- or higher 2. Students earning scores of ≥7 out of 10 3. Students earning scores of 70% or higher 4. Students earning scores of ≥10 out of 15	1. 90% of students earned a C- or higher 2. 85% of students earned a score >7 3. 80% of students earned scores of 70% or higher 4. 95% of students earned scores ≥10	1. Students have extensive exposure to the organization of humans from molecules to organism. 2 -4. Students understand the interactions between molecules, cells, organs and organ systems in the human body.	1-4. Continue emphasis, utilization and assessment of the organization of humans from molecules to organism.

Evidence of Learning: **Zoology "Service" Courses including High-Impact & Service-Learning Courses**: Human Physiology ZOOL 2200					
Measurable Learning Outcome:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1g. Students will understand the role of zoological study in the study of human biology.	1. Frequent examples given in class on how much of what we know about humans we have learned from studying other animals. 2. Organs from animals other than humans used for dissection in laboratory activities. Laboratory quizzes and protocols ask questions about how the animals' organ used in lab are similar or different from humans.	1. Students exhibit interest in the use of model species to study human physiology. 2. Students earning scores of ≥10 out of 15	1. Students do show interest and ask further questions. 2. 95% of students earned scores ≥10	1. Students gained exposure to the fact that model species are used to study human physiology. 2. Students get hands on experience on the importance of zoological study in the study of human biology.	1. No action planned as this is not a major course objective. 2. Continue using organs from non-humans for dissection.
3. Students will become aware of career opportunities available to a zoology graduate and will prepare themselves for employment and for professional or graduate school.	1. Career paths related to the study of physiology are introduced informally during class discussions. 2. Informal discussions among peers during laboratory activities about career plans.	1. Students exhibit interest in learning about physiology related careers and ask further questions. 2. Students share pertinent information with each other on preparation for career plans.	1. Students do show interest and ask further questions. 2.Student do share information with each other on preparation for career plans.	1. Students gain exposure to different fields related to the study of human physiology. 2. Students readily share information on preparation for career paths.	1&2. No action planned as this is not a major course objective.
4. Students will acquire skills necessary for a successful career in biology, including proficiency in computer applications, laboratory and field research techniques, written and oral communication, and reading and critically evaluating scientific literature.	1. Laboratory activities that require collection of physiological data from students, use of computer programs, and use of sophisticated laboratory equipment. Protocols that require collected data to be reported, analyzed and interpreted are used as assessments.	1. Students earning scores of ≥10 out of 15	1. 95% of students earned scores ≥10	1. Students get hands on experience collecting physiological data, using computer programs, sophisticated laboratory equipment and reporting, analyzing and interpreting data.	1. Continue using hands on laboratory activities.

Appendix C

Evidence of learning for General Education courses offered by the Department of Zoology

Evidence of Learning: **General Education Courses**: Animal Biology ZOOL 1010					
Measurable Learning Outcome: Students will demonstrate their understanding of the following characteristics of life:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1. Levels of organization: All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	1. Course grades	1. Students earning C- or better	1. 69% of students earn C- or greater	1. Students are gaining exposure to organization of life	1. Develop more direct methods to measure learning
2. Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	1. Course grades	1. Students earning C- or better	1. 69% of students earn C- or greater	1. Students are gaining exposure to organization of life	1. Develop more direct methods to measure learning
3. Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life.	1. Course grades 2. Library/lecture video exercises and research conference activity	1. Students earning C- or better 2. Students complete assignments and earn more than 75% of point total	1. 69% of students earn C- or greater 2. 79% of students completed	1. Students are gaining exposure to organization of life 2. Some student that scored low on traditional activities excelled at this alternative activity	1. Develop more direct methods to measure learning 2. Develop ways to encourage more participation from students
4. Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	1. Course grades 2. Library/lecture video exercises and research conference activity	1. Students earning C- or better 2. Students complete assignments and earn more than 75% of point total	1. 69% of students earn C- or greater 2. 79% of students completed	1. Students are gaining exposure to organization of life 2. Some student that scored low on traditional activities excelled at this alternative activity	1. Develop more direct methods to measure learning 2. Develop ways to encourage more participation from students

Evidence of Learning: **General Education Courses**: Human Biology ZOOL 1020					
Measurable Learning Outcome: Students will demonstrate their understanding of the following characteristics of life:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1. Levels of organization: All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	1. Course grades. 2. Semester-long discussions beginning with molecules and ending with ecology. 3. Quizzes and exams. 4. Written papers on these topics. 5. Use of case studies in class.	1. Students earning C- or better	1. 76% of students earn C- or greater	1. Students are gaining exposure to the organization of life. 2. Many students could correctly explain and identify the outcome.	1. Continue emphasis on the levels of biological organization. 2. Continue current assessment. 3. Develop more direct methods to assess learning. 4. Consider additional exercises that improve student understanding
2. Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	1. Course grades. 2. In-class discussions and questions. 3. Quizzes and exams. 4. Written papers on metabolism and homeostasis. 5. Use of case studies in class.	1. Students earning C- or better	1. 76% of students earn C- or greater	1. Students are gaining exposure to metabolism and homeostasis. 2. Many students could correctly explain and identify the outcome.	1. Continue emphasis on metabolism as the organizing principle of Human Biology. 2. Continue current assessment. 3. Develop more direct methods to assess learning. 4. Consider additional exercises that improve student understanding.
3. Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life.	1. Course grades. 2. In-class discussions and questions. 3. Quizzes and exams. 4. Written papers on genetics evolution. 5. Use of case studies in class.	1. Students earning C- or better	1. 76% of students earn C- or greater	1. Students are gaining exposure to genetics and evolution. 2. Many students could correctly explain and identify the outcome.	1. Continue emphasis on genetics and evolution. 2. Continue current assessment. 3. Develop more direct methods to assess learning. 4. Consider additional exercises that improve student understanding.
4. Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	1. Course grades 2. In-class discussions and questions. 3. Quizzes and exams. 4. Written papers on these topics. 5. Use of case studies in class.	1. Students earning C- or better	1. 76% of students earn C- or greater	1. Students are gaining exposure to ecological interactions. 2. Many students could correctly explain and identify the outcome. .	1. Continue emphasis on ecological interactions. 2. Continue current assessment. 3. Consider additional exercises that improve student understanding. 4. Consider additional exercises that improve student understanding.

Evidence of Learning: **General Education Courses**: The Nature of Sex ZOOL LS 1030					
Measurable Learning Outcome: Students will demonstrate their understanding of the following characteristics of life:	**Direct & Indirect Methods of Measurement**	**Threshold for Evidence of Student Learning**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
1. Levels of organization: All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	1. Course grades. These are based upon lengthy examinations, including a comprehensive final tests. There may be extra assignments based on learning about recent findings reported during the semester.	Students earning C- or better.	1. ~85% of the students earn C- or greater.	1. The large majority of students learn about the organization of life, and the levels involved.	
2. Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	1. Course grades; see above.	Students earning C- or better.	1. ~85% of students earn C- or greater.	1. The large majority of students are learning about metabolism and homeostasis.	
3. Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life.	1. Course grades; see above.	Students earning C- or better.	1. ~85% of students earn C- or greater.	1. The large majority of students gain an understanding of genetics and evolution.	
4. Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	1. Course grades; see above.	Students earning C- or better.	1. ~85% of students earn C- or greater.	1. The large majority of students learn about ecological interactions.	

Appendix D

Evidence of "high-impact" and "service-based" learning outside of formal courses within the Department of Zoology

WEBER STATE UNIVERSITY UNDERGRADUATE RESEARCH SYMPOSIUM & CELEBRATION, SPRING 2008-SPRING 2011:

This annual event gives students engaged in independent study a ready outlet for presenting their findings in a professional environment.

ZOOLOGY STUDENT PRESENTATIONS, (STUDENT NAMES IN BOLD TYPE, FACULTY MENTORS IN PARENTHESES):

1. **Ahmad, S., L. Allred, A.M. Uchida, J. Green,** F. Goller (R. Meyers). 2010. Effects of Androgen & Denervation of Zebra Finch Syrinx Morphology. Oral Presentation.

2. **Ahmad, T., T. Johnson** (B. Trask). 2011. Quantification of Collagen in Wilde-type and MAGP-2-Knockout Mice. Poster Display.

3. **Allred, L., S. Ahmad, A.M. Uchida, J. Green,** F. Goller (R. Meyers). 2010. Sexual Dimorphism of Syringeal Muscle Fibers in Male and Female Songbirds. Oral Presentation.

4. **Anderson, T.** (C. Hoagstrom). 2011. Fish in Your Backyard? Finding Trout in Wasatch Front Creeks. Poster Display.

5. **Asper, K.** (N. Berthélémy). 2008. Effects of Benzene on Brine Shrimp, *Artemia franciscana*. Poster Display.

6. **Buttars, P.** (B. Trask). 2010. Biological Function of the von Willebrand Domaine in Fibrillin-2. Poster Display.

7. **Buttars, P., J.J. Dennehy, T. Callahan, D.J. Harris,** M. Mika (J. Marshall). 2010. Academic Job Market, Case Study. Poster Display.

8. **Cole, L.** (J. Cavitt). 2008. Nest-site Selection of Shorebirds at Great Salt Lake: Implication for Development of Water Quality Standards. Poster Display.

9. **Cottrell, C.** (J. Clark). 2010. Metagenomic Analysis of Brine Fly Larvae from Great Salt Lake, an Extreme Environment. Poster Display.

10. **Cranney, M.** (C. Hoagstrom). 2009. Morphological Variation among Humpback Whitefish in Interior Alaska. Poser Display.

11. **Darger, K.** (M. Skopec). 2008. Does the Consumption of Whole Raw Eggs Induce a Biotin Deficiency in Lab Rats? Poster Display.

12. **Drysdale, F.** (J. Mull). 2008. Seed Dispersers of the Dwarf Bear-poppy. Poster Display.

13. **Eames, J., T. Healy, B. Galbraith** (C. Hoagstrom). 2010. History of Lahontan Cutthroat Trout in Spring Creek, Utah. Poster Display.

14. **Farrall, A.** (J. Mull). 2011. Seed Removal in the Dwarf Bear-Poppy (*Arctomecon humilis*). Poster Display.

15. **Fisher, A., J. Grundy, W. Mohn, J. Herman, E. Smith** (B. Chung). 2010. PCR Screening for Trimethyl Psoralen-Mutated Nematode *C. elegans*. Poster Display.

16. **Francom, C., J. Caldwell** (B. Trask). 2008. The Structure, Function, and Temporal Expression of Fibrillin in Zebrafish (*Danio rerio*). Oral Presentation.

17. **Francom, C.** (B. Trask). 2009. A Role for Microfibril-associated Glycoprotein-2 in Wound Repair. Oral Presentation.

18. **Geary, S.** (C. Hoagstrom). 2010. Habitat Research for Least Chub Refuge at the Ogden Nature Center. Poster Display.

19. **Gilbert, T.** (B. Chung). 2009. The Efficacy of Dietary Fiber and Prebiotics on Intestinal Recover. Oral Presentation.

20. **Gines, L.** (N. Berthélémy). 2010. Effect of Pramitol on the Great Salt Lake *Artemia*. Poster Display.

21. **Green, J., A. Uchida, S. Ahmad,** F. Goller (R. Meyers). 2009. Sexual Dimorphism of Syringeal Muscles in Songbirds. Poster Display.

22. **Green, S., J. Abbott** (C. Hoagstrom). 2011. Assessment of Stonefly Abundance and Body-Length Based on Rainbow Trout Abundance in Burch Creek, Ogden, Utah. Poster Display.

23. **Grundy, J., W. Mohn, J. Herman, E. Smith** (B. Chung). 2010. Predigested vs. Polymeric Food Source Does Not Determine Growth Rate. Oral Presentation.

24. **Gurr, K.** (J. Cavitt). 2010. Incubation Behavior of Snowy Plovers at Great Salt Lake. Poster Display.

25. **Ingraham, D.** (N. Berthélémy). 2008. *Artemia's* Physiological Response to Mercury Exposure. Poster Display.

26. **Hall, L.K.** (J. Cavitt). 2009. Dietary Analysis of Two Snake Species on Antelope Island. Poster Display.

27. **Hall, L.** (J. Cavitt). 2010. Comparative Study of Methods Used to Trap Nesting Snowy Plovers (*Charadrius alexandrinus*). Oral Presentation.

28. **Herman, J., W. Mohn, J. Grundy** (B. Chung). 2010. Growth/Development Rate Increase When More Work is Required in Digestion. Oral Presentation.

29. **Holmes, N.V.** (C. Hoagstrom). 2009. Ecomorphological Relations Between *Cottus* Species and Their Environment in Northeastern Utah. Oral Presentation.

30. **Hoskins, A.** (C. Hoagstrom). 2010. Conservation of the Least Chub (*Iotichthys phlegethontis*) Due to Negative Interactions with Non-native Species. Poster Display.

31. **Jepperson, J.** (N. Berthélémy). 2008. Effect of Selenium on the Brine Shrimp *Artemia*. Poster Display.

32. **Jepperson, J.** (N. Berthélémy). 2009. Effect of Selenium on the Brine Shrimp *Artemia*. Poster Display.

33. **Johnson, S.** (C. Hoagstrom). 2008. Relationship between stream habitat and the distribution and population structure of Paiute sculpin, *Cottus beldingii*. Poster Display.

34. **Knight, Z.** (C. Hoagstrom). 2011. Rainbow Trout Abundance and Habitat Conditions in Creeks Along the Wasatch Front. Poster Display.

35. **Leaptrot, M.** (R. Meyers). 2008. Myosin Heavy Chain Diversity in Birds. Oral Presentation.

36. **McClure, E.** (J. Mull). 2008. Ultraviolet Reflectance of Seeds and its Potential Influence on Ant Dispersal. Poster Display.

37. **Minear, K.** (J. Clark). 2010. DNA Barcoding Reveals the Diversity of GSL Brine Flies. Poster Display.

38. **Mohn, W., J. Herman, J. Grundy, E. Smith** (B. Chung). 2010. The Effect of Peptide Transporter on Growth Rates in *C. elegans*. Oral Presentation.

39. **Mohn, W., R. Stevens** (B. Chung). 2011. The effect of Monomeric and Polymeric Diets on Growth and Development. Poster Display.

40. **Neilsen, N.** (J. Clark). 2009. Phylogenetic Analysis of the Telomere-associated Gene (He T-A) in *Drosophila*. Poster Display.

41. **Nielson, J.** (J. Cavitt). 2010. Winter Habitat Selection of the Snowy Plover in Mexico. Oral Presentation.

42. **Schmalz, J.M.** (S. Zeveloff). 2011. Habitat Ecology of Pygmy Rabbits (*Brachylagus idahoensis*) in Northeastern Utah. Poster Display.

43. **Schulze, C.,** R. Schulze (S. Zeveloff). 2008. Evaluation of a Ground-Based Paintball Mark Re-Sight Survey of Mountain Goats (*Oreamnos americanus*). Oral Presentation.

44. **Stone, K.** (J. Cavitt). 2008. Nest Predator Identification at Great Salt Lake, Utah. Poster Display.

45. **Truong, A.** (J. Clark, N. Berthélémy). 2010. Population Genetic Analysis of Great Salt Lake Brine Shrimp, *Artemia*. Poster Display.

46. **Truong, A.** (J. Clark). 2011. Identification of *Wolbachia* associated with Great Salt Lake Brine Flies. Poster Display.

47. **Turner, C.E., IV** (B. Chung, B. Trask). 2010. Poison in a Peanut Butter Sandwich: Can Turmeric Protect Against Cirrhosis? Oral Presentation.

48. **Uchida, A.** (R. Meyers). 2008. Syringeal Muscle Fiber Organization in Female and Male Songbirds, Oral Presentation.

49. **Wangsgard, R.** (J. Mull). 2010. Ultraviolet Reflectance on Seeds and Eliosomes. Poster Display.

50. **Wood, J.C.** (B. Chung). 2009. The Comparison of Intestinal Amino Acid and Peptide Transport on Growth and Development. Oral Presentation.

WSU DAY AT THE CAPITOL (POSTERS AT STATE CAPITOL), SPRING 2008-SPRING 2011:

The WSU Office of Undergraduate Research and Community Involvement Center provide support for students to disseminate their research, creative works, and Community-Based Learning projects as posters to legislators at the Utah State Capitol.

ZOOLOGY STUDENT PRESENTATIONS, (STUDENT NAMES IN BOLD TYPE, FACULTY MENTORS IN PARENTHESES):

1. **Anderson, T.** (C. Hoagstrom). 2011. Fish in your backyard? Finding trout in Wasatch Front creeks.

2. **Andersen, T., M. Vanderpool** (C. Hoagstrom). 2012. Trout Occurrence and Persistence in Wasatch Front Creeks.

3. **Boom, J.** (C. Hoagstrom). 2011. Nocturnal Behavior of the Least Chub.

4. **Castonguay, R., C. Thomas, R. Stevens, J. Sones** (B. Chung, R. Okazaki). 2012. Using a Ribbon Worm as a Genetic Marker to Study Osmoregulation and Heat Shock Proteins.

5. **Hansen, S., D. Titmus** (B. Chung). 2012. Improving Therapies for Pediatric Intestinal Failure Through the Utilization of the Intestinal Peptide Transporter.

6. **Johnson, S.** (C. Hoagstrom). 2009. Relations between stream habitat, distribution, & population structure of Paiute sculpin, *Cottus beldingii*.

7. **Knight, Z.** (C. Hoagstrom). 2011. Trout Abundance and Habitat Conditions in Creeks Along the Wasatch Front.

8. **Merrell, E.** (B. Trask). 2010. The Physiologic Relevance of an Interaction Between MAGP-2 and TGF-B1 in Elastic Extracellular Matrices.

9. **Minear, K.** (J. Clark). 2010. DNA Barcoding Reveals the Diversity of Shore Flies from Great Salt Lake.

10. **Mohn, W., J. Herman, J. Grundy, E. Smith** (B. Chung). The Importance of Peptide Transporter on Growth Rates in *C. elegans*.

11. **Stevens, R., W. Mohn** (B. Chung). 2011. Analysis of Elemental versus Complex Protein-Based Diets on Growth and Development.

12. **Titmus, D.** (B. Chung). 2012. *C. elegans* growth and development research.

13. **Truong, A.** (J. Clark). 2011. Initial Characterization of the Endosymbiont *Wolbachia* in *Cirrula hians* from Great Salt Lake.

NATIONAL CONFERENCE ON UNDERGRADUATE RESEARCH, SPRING 2008-SPRING 2012:

This event occurs annually, but was held at Weber State University in 2012 and superseded the annual WSU Undergraduate Research Symposium & Celebration. This provided students engaged in independent study a larger than usual, on-campus outlet for presenting their findings in a professional environment.

ZOOLOGY STUDENT PRESENTATIONS, (STUDENT NAMES IN BOLD TYPE, FACULTY MENTORS IN PARENTHESES):

1. **Abbott, J., T. Anderson, J. Booth** (C. Hoagstrom). 2012. Population Structure and Habitat Analysis of a Rainbow Trout Population (*Oncorhynchus mykiss*) in Strong's Creek, Utah. Poster Display.

2. **Andersen, T., M. Vanderpool** (C. Hoagstrom). 2012. Trout Occurrence and Persistence in Wasatch Front Creeks. Poster Display.

3. **Bartlett, S.** (B. Trask). 2012. Apoptosis in Human Fibroblasts Exposed to Low Frequency Electromagnetic Fields. Poster Display.

4. **Christensen, L.** (R. Meyers). 2012. Effects of Denervation on Zebra Finch Syringeal Muscles. Oral Presentation.

5. **Cox, H.** (J. Clark). 2012. Comparative molecular genetics of the unusual chromosome telomeres of *Drosophila*. Poster Display.

6. **Earley, A.** (S. Zeveloff). 2012. Effects of Human Development and Recreation on Nest Occupancy and Breeding in a Population of Flammulated Owls (*Otus flammeolus*) in Snowbasin, Utah. Oral Presentation.

7. **Finklea, A.** (N. Berthélémy). 2007. Effect of Mercury on the Brine Shrimp *Artemia's* Survival. Poster Display.

8. **Funk, C.** (N. Berthélémy). 2012. Effect of Glyphosate on the Brine Shrimp *Artemia*. Poster Display.

9. **Goff, Z.** (J. Mull). 2012. The Role of UV Reflectance in Seed Dispersal by Ants. Poster Display.

10. **Green, S., T. Remkes, D. Van Leuven.** (C. Hoagstrom). 2012. Assessment of Age and Growth in Rainbow Trout (*Oncorhynchus mykiss*) in Strongs Creek, Ogden Utah. Poster Display.

11. **Hansen, S.** (B. Chung). 2012. Protein-based Diets Improve Growth over Pre-Digested Diets by the Utilizing the Intestinal Peptide Transporter OPT-2/PEPT-1. Oral Presentation.

12. **Jensen, B.** (R. Meyers). 2012. Hind Limb Muscle Fiber Type Composition of North American Raptors. Oral Presentation.

13. **Merrell, E.** (B. Trask). 2010. The Physiologic Relevance of an Interaction Between MAGP-2 and TGF-B1 in Elastic Extracellular Matrices. Oral Presentation.

14. **Minear, K.J.** (J. Clark). 2010. DNA Barcoding Reveals the Diversity of Shore Flies from Great Salt Lake. Poster Presentation.

15. **Neff, L.** (J. Cavitt). 2012. Physical Condition of Waterfowl at Great Salt Lake. Poster Display.

16. **Oney, B.** (J. Clark). 2007. Genetic Variation in Natural Populations of the Great Salt Lake Brine Fly, *E. cinerea*. Poster Display.

17. **Titmus, D.** (B. Chung). 2012. Examining the Influence of the Form of Dietary Protein on Growth and Intestinal Amino Acid Transporter Expression. Oral Presentation.

18. **Truong, A.,** M. Sandossi (J. Clark). 2012. Comparative genetics of the *Wolbachia* endosymbiont associated with Great Salt Lake brine flies. Oral Presentation.

19. **Weitzeil, M.** (R. Meyers). 2012. Morphological Development of the Syrinx in Male Zebra Finches. Poster Display.

20. **White, J., A. Truong.** (R. Okazaki). 2012. Genetic Analysis of Artemia Species from China and Great Salt Lake. Poster Display.

ZOOL 4970, ZOOLOGY THESIS, FALL 2007-SPRING 2012:

Students engaging in independent study for multiple semesters may choose to complete a senior thesis following guidelines set by the Department. The Senior Thesis experience is designed to represent an undergraduate version of a graduate-student thesis.

1. **Truong, A.** (J. Clark). 2012. Comparative Genetics of the *Wolbachia* Endosymbiont Associated with Great Salt Lake Brine Flies. Senior Thesis, Department of Zoology, Weber State University.

2. **Minear, K.J.** (J. Clark). 2010. Using DNA Barcoding to Study the Diversity of Shore Flies from Great Salt Lake. Senior Thesis, Department of Zoology, Weber State University.

3. **Holmes, N.V.** (C. Hoagstrom). 2010. Ecomorphology and Niche Segregation of Rocky Mountain *Cottus*. Senior Thesis, Department of Zoology, Weber State University.

WEBER STATE UNIVERSITY UNDERGRADUATE RESEARCH GRANT PROPOSALS FUNDED, FALL 2007-SPRING 2012:

The WSU Office of Undergraduate Research offers grant funding and travel awards for students who are engaged in independent study. To receive a grant, students must devise a study, prepare a proposal for necessary funding, and compete for available monies. This provides an opportunity for first-hand experience with the scientific method and procedures for procuring research support. To receive a travel award, students must complete an application explaining travel expenses and needs. This provides support for students who have successfully completed a research project and are motivated to present their research off campus.

ZOOLOGY STUDENT UNDERGRADUATE RESEARCH GRANTS AND TRAVEL AWARDS, (STUDENT NAMES IN BOLD TYPE, FACULTY MENTORS IN PARENTHESES):

1. **Ahmad, S.** (R. Meyers). 2009. Effects of Androgen and Denervation on Zebra Finch Syrinx Morphology. Travel Award: $2,500.00.

2. **Allred, L.** (R. Meyers). 2009. Sexual Dimorphism of Syringeal Muscles in the Female and Male songbirds. Research Award: $2,712.50.

3. **Bartlett, S.** (B. Trask). 2011. Apoptosis in Human Fibroblasts exposed to Low Frequency Electromagnetic Fields. Travel Award: $3,429.00.

4. **Boom, J.** (C. Hoagstrom). 2010. Nocturnal Behavior of the Least Chub (*Iotichthys phlegethontis*). Research Award: $3,500.00.

5. **Buttars, P.** (B. Trask). 2009. Multi-species Comparison and Evolutionary Origin and Fibrillin Protein Sequences. Travel Award: $2,170.00.

6. **Buttars, P.** (B. Trask). 2009. A Functional Analysis of Van Willebrand Factor Domain within Fibrillin. Research Award: $3,480.00.

7. **Buttars, P.** (J. Marshall). 2009. Survey of Academic Job Market in Ecology and Evolutionary Biology. Research Award: $810.00.

8. **Caldwell, J.** (B. Trask). 2007. Isolation and Sequencing of the Carboxyl Terminal End of Zebrafish MAGP. Research Award: $2,700.00.

9. **Campbell, Z.** (M. Skopec). 2011. Field and Lab Analysis of Woodrat Caching Behavior. Research Award: $2,700.00.

10. **Christensen, L.** (R. Meyers). 2010. Effects of Denervation on Zebra Finch Syrinx Morphology. Research Award: $2,712.50.

11. **Christensen, L.** (R. Meyers). 2011. Effects of Denervation on Zebra Finch Syrinx Morphology. Research Award: $2,821.10.

12. **Christensen, L.** (R. Meyers). 2010. Denervation and Testosterone Changes Muscle Fiber Types in the Zebra Finch Syrinx. Travel Award: $151.92.

13. **Clark, S.** (B. Chung). 2012 Dietary Protein Influences Growth Through a Complex Mechanism Coupling Proteolysis and Intestinal Peptide Transporter Expression. Travel Award: $998.45.

14. **Coombs, M.** (M. Skopec). 2011. Production of tanning binding proteins in Prairie Voles. Travel Award: $172.00.

15. **Cottrell, C.** (J. Clark). 2009. Travel to the Sigma Xi Annual meeting and research conference. Travel Award: $971.00.

16. **Cox, H.** (J. Clark). 2011. Comparative Genetic Analysis of *Drosophila* Telomeres. Research Award: $2,402.00.

17. **Cox, H.** (J. Clark). 2012. Phylogenetic Analysis of The Unusual Chromosomal Telomeres of *Drosophila*. Travel Award: $861.02.

18. **Cranney, M.** (C. Hoagstrom). 2008. Ecomorphological Comparison of Fish Faunas of three Alaskan Streams. Research Award: $3,204.00.

19. **Cranney, M.** (C. Hoagstrom). 2009. Morphological variation among humpback whitefish in three Alaskan creeks. Travel Award: $1,000.00.

20. **Darger, K.** (M. Skopec). 2007. Investigation of Biotin Deficiency Induced by Consumption of Raw Eggs. Research Award: $3,430.00.

21. **Davis, S.** (C. Hoagstrom). 2009. Habitat research for least chub refuge at Ogden nature center. Research Award: $2,877.19.

22. **Drysdale, F.** (J. Mull). 2009. Seed dispersaers of the endangered dwarf bear poppy (*Arctomecon humilis*). Research Award: $3,500.00.

23. **Eames, J.** (B. Trask). 2010. Regulation of afatoxin-induced liver damage in mice by curcumin. Research Award: $3,500.00.

24. **Earley, A.** (S. Zeveloff). 2011. Impact of Human Recreation on Flammulated Owls (*Otus flammeolus*) in Snowbasin and Mantua. Research Award: $2,825.48.

25. **Eccles, C.** (B. Trask). 2009. Generation of murine cells lacking the microfibril-associated Glycoprotein-2 (MAGP-2) gene. Research Award: $3,499.00.

26. **Farrall, A.** (J. Mull). 2010. Dispersal and predation of dwarf Bear Poppy seeds (*Arctomecon humilis*). Research Award: $3,500.00.

27. **Fisher, A.** (B. Chung). 2009. Analysis of the impact of intestinal peptide transport on growth. Research Award: $3,500.00.

28. **Francom, C.** (B. Trask). 2007. Recombinant Production and Isolation of Zebra Fish Fibrillin 1. Research Award: $2,998.50.

29. **Francom, C.** (B. Trask). 2008. Recombinant expressions, biochemical characterization and molecular interactions of MAGP-2. Research Award: $3,500.00.

30. **Francom, C.** (B. Trask). 2007. Travel and Presentation of "Structure and Function of Zebrafish Fibrillin". Travel Award: $1,000.00.

31. **Francom, C.** (B. Trask). 2008. A Role for Microfibril-Associated Glycoprotein-2 in Wound Repair? Research Award: $999.60.

32. **Gilbert, T.** (B. Chung). 2008. The Efficacy of Dietary Fiber and Prebiotics on Intestinal Recovery. Research Award: $3,500.00.

33. **Goff, Z.** (J. Mull). 2011. The Role of UV Reflectance in Seed Dispersal by Ants. Research Award: $2,838.80.

34. **Gurr, K.** (J. Cavitt). 2009. Foraging behavior of breeding snowy plovers at the Great Salt Lake. Research Award: $3,500.00.

35. **Hale, A.** (M. Skopec). 2010. Detoxification enzyme expression in nasal epithelium of woodrats. Research Award: $3,184.00.

36. **Hall, L.** (J. Cavitt). 2009. Comparative study of trapping methods used for snowy plovers. Research Award: $3,500.00.

37. **Hansen, S.** (B. Chung). 2011. Correlation of intestinal peptide transporter expression to indices of growth. Research Award: $2,950.00.

38. **Hansen, S.** (B. Chung). 2011. Differentiating the Developmental Benefits of Protein Digestion versus Peptide Absorption. Research Award: $3,462.50.

39. **Holmes, N.** (C. Hoagstrom). 2009. Ecomorphological relations between *Cottus* species and their environment in Utah. Travel Award: $934.00.

40. **Hoskins, A.** (C. Hoagstrom). 2009. Conservation of the least chub due to negative interactions. Research Award: $2,861.36.

41. **Jensen, B.** (R. Meyers). 2011. Hind Limb muscle fiber type composition of North American Raptors. Research Award: $2,948.00.

42. **Jepperson, J.** (N. Berthélémy). 2008. Effect of selenium on the brine shrimp, *Artemia*. Research Award: $3,500.00.

43. **Jeppesen, C.** (M. Skopec). 2011. Influence of Diet on Levels of CYP2B in Lab Rats. Research Award: $1,000.00.

44. **Johnson, S.** (C. Hoagstrom). 2007. Population Structure of Utah Fishes. Research Award: $3,101.44.

45. **Larsen, C.** (N. Berthélémy). 2007. Selenium-Sulfur Relationships and Bioaccumulation on Survival and Broods in Brine Shrimp *Artemia*. Research Award: $3,300.00.

46. **Leaptrot, M.** (R. Meyers). 2007. Development of Superfast Antibody from Rattlesnake Tailshaker Muscle. Research Award: $2,712.50.

47. **Linford, M.** (J. Mull). Ceramic/Science Educational Workshop. Research Award: $360.00.

48. **McClure, E.** (J. Mull). 2007. Ultraviolet Reflectance of Seeds and its Influence on Ant Dispersal. Research Award: $3,465.25.

49. **McCoy, H.** (J. Cavitt). 2008. Do water control structures serve as predator corridors? Research Award: $2,395.60.

50. **Merrell, E.** (B. Trask). 2009. Isolation and functional Analysis of Recombinant Microfibril-Associated Glycoprotein-2 (MAGP-2). Research Award: $1,220.00.

51. **Merrell, E.** (B. Trask). 2009. Isolation and functional Analysis of Recombinant Microfibril-Associated Glycoprotein-2 (MAGP-2). Research Award: $2,170.00.

52. **Minear, K.** (J. Clark). 2009. DNA barcoding of Great Salt Lake brine flies. Research Award: $2,364.00.

53. **Minear, K.** (J. Clark). 2009. Travel to the Sigma Xi Annual meeting and research conference. Research Award: $464.00.

54. **Mohn, W.** (B. Chung). 2010. Isolation and Purification of Opt-2 mRNA in *C. elegans*. Research Award: $1,872.50.

55. **Nebeker, C.** (M. Skopec). 2008. Biotransformation enzymes implicated in *Neotoma lepida's* ability to consume creosote. Research Award: $1,000.00.

56. **Schmalz, J.** (S. Zeveloff). 2011. Habitat Ecology of Pygmy Rabbits in Northeastern Utah. Research Award: $753.92.

57. **Schulze, C.** (S. Zeveloff). 2007. Willard Peak Mountain Goat Study Project. Research Award: $2,250.00.

58. **Shaney, K.** (J. Marshall). 2012. Investigating a Potential Hybrid Zone in Fence Lizards. Research Award: $910.00.

59. **Shaw, T.** (J. Mull). 2012. Pollinators of the Endangered Dwarf Bear-Poppy (*Arctomecon humilis*). Research Award: $3,495.50.

60. **Shepard, L.** (R. Meyers). 2007. Tinamous and the Evolution of Hindlimb Flight Posture in Birds. Research Award: $3,479.00.

61. **Titmus, D.** (B. Chung). 2011. Genetic Archiving of Two Intestinal Amino Acid Transporters. Research Award: $2,922.00.

62. **Truong, A.** (J. Clark). 2010. Identification of *Wolbachia* associated with Great Salt Lake brine flies. Research Award: $2,777.50.

63. **Truong, A.** (J. Clark). 2010. Characterization of *Wolbachia* in *Cirrula hians* from Great Salt Lake. Travel Award: $1,000.00.

64. **Truong, A.** (J. Clark). 2011. Analysis of GSL Brine Flies expands the Phylogenetic Diversity of *Wolbachia* Endosymbionts. Travel Award: $1,200.00.

65. **Turner, C.** (B. Trask). 2009. Inhibition of Tumor Growth and its implication in Latin America. Travel Award: $994.76.

66. **Uchida, A.** (R. Meyers). 2007. Syringeal Muscle Fiber Organization in Male and Female Red-Wing Blackbirds. Research Award: $2,500.00.

67. **Uchida, A.** (R. Meyers). 2008. Syrinx Morphology in Female and Male Zebra Finches. Research Award: $2,500.00.

68. **Weitzeil, M.** (R. Meyers). 2011. Development of Zebra Finch Syrinx Muscle Morphology. Research Award: $2,694.80.

69. **White, J.** (R. Okazaki). 2011. Genetic Analysis of *Artemia* Species from China and Great Salt Lake. Research Award: $1,980.50.

ERGO: WEBER STATE UNIVERSITY UNDERGRADUATE RESEARCH JOURNAL ARTICLES, FALL 2007-SPRING 2012:

Ergo accepts full-length articles and meeting conference abstracts. Full-length articles are < 2000 words, or eight journal pages including all text and graphics. Students from all departments at WSU are encouraged to submit articles. Full-length articles are not required to have been presented at a conference. Meeting-conference abstracts are < 350 words and must have been presented at an off-campus conference.

ZOOLOGY STUDENT UNDERGRADUATE ARTICLES AND ABSTRACTS IN ERGO, (STUDENT NAMES IN BOLD TYPE, FACULTY MENTORS IN PARENTHESES):

1. **Cole, L.** (J. Cavitt). 2009. Nest-site Selection of Shorebirds at Great Salt Lake: Implications for Development of Water Quality Standards. ERGO 3:108.

2. **Cottrell, C.,** M. Sondossi. (J. Clark). 2010. Metagenomic Analysis of Brine Fly Larvae from Great Salt Lake, an Extreme Environment. ERGO 4:125.

3. **Coombs, J.M.** (M. Skopec). 2011. Production of Tannin Binding Proteins in Prairie Voles (*Microtus orchrogaster*). ERGO 5:90.

4. **Cranney, M.D.** (C. Hoagstrom). 2010. Morphological Variation among Humpback Whitefish in Three Alaskan Creeks. ERGO 4:126.

5. **Farrall, A.** (J. Mull). 2011. Seed Removal in the Dwarf Bear-Poppy (*Arctomecon humilis*). ERGO 5:52-58.

6. **Finklea, A.** (N. Berthélémy). 2008. Effect of Mercury on the Brine Shrimp *Artemia's* Survival. Ergo 2:115.

7. **Francom, C., J. McBride, J. Caldwell** (B. Trask). 2008. The Structure, Function and Temporal Expression of Fibrillin in Zebrafish (*Danio rerio*). Ergo 2:116.

8. **Francom, C.,** T. Broekelmann, R. Knutsen, R.P. Mecham (B. Trask). 2008. A Role for Microfibril-Associated Glycoprotein-2 in Wound Repair. ERGO 3:107.

9. **Hall, L.K.** (S. Zeveloff). 2010. The Effect of Cheatgrass on Deer Mouse Abundance. ERGO 4:87-101.

10. **Holmes, N.V.** (C. Hoagstrom). 2010. Ecomorphological Relations between *Cottus* and Their Environment in Northeastern Utah. ERGO 4:124.

11. **Green, J., K. Minear** (N. Berthélémy). 2009. Effects of Herbicide and Pesticide on the Common Earthworm, *Lumbricus* sp. Ergo 3:70-77.

12. **McBride, J., C. Francom, J. Caldwell** (B. Trask). 2008. Developmental Expression of the Microfibrillar Proteins Fibrillin and MAGP in Zebrafish (*Danio rerio*). Ergo 2:117.

13. **Minear, K.J.** (J. Clark). 2010. DNA Barcoding Reveals the Diversity of Shore Flies from Great Salt Lake. ERGO 4:123.

14. **Nebeker, C.,** S.H. Haley, M.D. Dearing (M. Skopec). 2009. Quantification of Biotransformation Enzymes Implicated in *Neotoma lepida's* Ability to Consume Creosote. ERGO 3:109.

15. **Oney, B.** (J. Clark). 2008. Genetic Variation in Natural Populations of the Great Salt Lake Brine Fly, *E. cinerea*. ERGO 2:118.

16. **Shepard, L.S., J.C. McFarland** (R. Meyers). 2008. Hold 'em or Fold 'em: Hindlimb Flight Posture of Utah Shorebirds. Ergo 2:68-78.

17. **Stone, K**. (J. Cavitt). 2008. Incubation rhythm and behavior of Long-billed Curlew at Great Salt Lake. ERGO 2:119.

18. **Uchida, A.M., J. Green, S. Ahmad,** F. Goller. (R. Meyers). 2009. Sexual Dimorphism of Syringeal Muscles in Songbirds. ERGO 3:110.

PROFESSIONAL ACTIVITIES CONDUCTED BY ZOOLOGY STUDENTS OFF CAMPUS, FALL 2007-SPRING 2012:

Particularly motivated Zoology students often present research findings off campus in professional outlets such as professional meetings and publications in professional journals.

ZOOLOGY STUDENT PROFESSIONAL ACTIVITIES (STUDENT NAMES IN BOLD TYPE):

1. **Ahmad, S.R., L.M. Allred, A.M. Uchida, J. Green,** F. Goller, and R.A. Meyers. 2009. Effects of Androgens and Denervation on Zebra Finch Syrinx Morphology. Meeting of the Utah Ornithological Society, Salt Lake City, UT.

2. **Allred, L.M., S.R. Ahmad, A.M. Uchida, J. Green,** F. Goller, R.A. Meyers. 2009. Sexual Dimorphism of Syringeal Muscle Fibers in Male and Female Songbirds. Meeting of the Utah Ornithological Society, Salt Lake City, UT.

3. **Allred, L.M., L.A. Christensen,** R.A. Meyers, F. Goller. 2011. Denervation and Testosterone Changes Muscle Fiber Types in the Zebra Finch Syrinx. Integrative and Comparative Biology 51 (suppl. 1): e159.

4. **Allred, L.M., L.A. Christensen,** R.A. Meyers, F. Goller. 2011. Denervation and Testosterone Changes Muscle Fiber Types in the Zebra Finch Syrinx. Society for Integrative and Comparative Biology, Salt Lake City, UT.

5. **Cole, L.** (J. Cavitt). 2008. Nest-site selection of shorebirds at Great Salt Lake: implications for development of water quality standards. CUR Posters on the Hill, Washington, D.C.

6. **Coombs, J.M.,** M.M. Skopec. 2011. Production of Tannin Binding Proteins in Prairie Voles (*Microtus orchrogaster*). Society for Integrative and Comparative Biology Annual Meeting. Salt Lake City, UT.

7. **Cottrell, C.,** M. Sondossi, J.B. Clark. 2009. Metagenomic identification of bacteria associated with Great Salt Lake brine flies. Sigma Xi Annual Meeting and International Research Conference, Woodlands, TX.

8. **Cox, H.,** J.B. Clark. 2011. Comparative genetic analysis of the telomere-associated transposable element, HeT-A, in Drosophila. Sixth International Symposium on Molecular Insect Science, Amsterdam, Netherlands.

9. **Cox, H.,** J.B. Clark. 2011. Phylogenetic analysis of the unusual chromosome telomeres in Drosophila, a model genetic organism. Sigma Xi Annual Meeting and International Research Conference, Raleigh, NC.

10. **Cranney, M.D.,** C.W. Hoagstrom. 2009. Morphological variation among humpback whitefish in three Alaskan creeks. Western Division of the American Fisheries Society Annual Meeting, Albuquerque, NM.

11. **Edwards, C**., J.F. Cavitt. 2007. Great Salt Lake Snowy Plover Survey. Kansas Ornithological Society Meeting, Manhattan, KS.

12. **Edwards, C.,** G. Farley, J. Cavitt. 2008. Snowy Plover nesting success and nest density at Great Salt Lake, UT. Waterbird Society 32nd Annual Meeting. South Padre Island, TX.

13. **Edwards, C.,** G. Farley, J.F. Cavitt. 2010. Snowy Plover nesting success and nest density at Great Salt Lake. Association of Field Ornithologists Annual Meeting, Ogden, UT.

14. **Ellis, K.,** J.F. Cavitt. 2010. Incubation behavior of Snowy Plover at Great Salt Lake, Utah. Association of Field Ornithologists Annual Meeting, Ogden, UT.

15. **Emerson, R.L**., J.F. Cavitt. 2007. The effects of succession on American Avocet and Black-necked Stilt nest site selection at Great Salt Lake, UT. American Ornithologists' Union Annual Meeting, Laramie, WY.

16. **Francom, C.,** T. Broekelmann, R. Knutsen, R.P. Mecham, B.C. Trask. 2008. A Role for Microfibril-Associated Glycoprotein-2 in Wound Repair. American Society for Cell Biology annual meeting, San Francisco, CA.

17. **Francom, C., J. McBride, J. Caldwell,** E.C. Davis, B.C. Trask. 2007. The structure, function and temporal expression of fibrillin in zebrafish (*Danio rerio*). Gordon Research Conference on Elastin and Elastic Fibers, Biddeford, ME.

18. **Francom, C**. 2008, Rewards of Research. The Scalpel 78(2):11-14.

19. **Gurr, K.,** J.F. Cavitt. 2008. Foraging behavior of breeding Snowy Plover at Great Salt Lake. Annual meeting of the Utah Ornithological Society. Ogden, UT.

20. **Hale, A.,** M.D. Dearing, M.M. Skopec. 2011. Detoxification Enzyme Expression in Nasal Epithelium of Woodrats. Society for Integrative and Comparative Biology Annual Meeting, Salt Lake City, UT.

21. **Hall, L.,** J. Mull, J.F. Cavitt. 2009. Relationship between cheatgrass coverage and the relative abundance of snakes on Antelope Island, Utah. Western North American Naturalist 69:88-95.

22. **Hall, L**., J.F. Cavitt. 2009. Comparative study of methods to trap nesting Snowy Plovers. Utah Ornithological Society, Salt Lake City, UT.

23. **Hall, L.,** J.F. Cavitt. 2010. Comparative study of methods used to trap nesting Snowy Plovers. Association of Field Ornithologists Annual Meeting, Ogden, UT.

24. **Hall, L.,** J.F. Cavitt. 2011. *Coluber constrictor* Mormon and *Pituophis catenifer derticola* diet. Herpetological Review 42(2):285-286.

25. **Hall, L.,** J.F. Cavitt. 2012. Comparative study of trapping methods for ground-nesting shorebirds. Waterbirds 35(2):342-346.

26. **Hansen, S.A., D.B. Titmus,** A. Ashley, B.M. Chung. 2012. Dietary protein influences growth through a complex mechanism coupling proteolysis and intestinal peptide transporter expression. Digestive Disease Week, San Diego, CA.

27. **Hansen, S.A.** (B. Chung). 2012. *C. elegans* growth and development research. WSU Day at the Utah State Capitol.

28. **Holmes, N.V.,** C.W. Hoagstrom. 2009. Ecomorphology of sculpin in northeastern Utah. Western Division of the American Fisheries Society Annual Meeting, Albuquerque, NM.

29. **Holmes, N.V.,** C.W. Hoagstrom. 2009. Ecomorphology of sculpin, a native fish of northeastern Utah. Utah Conference on Undergraduate Research, Salt Lake City, Utah.

30. **Holmes, N.V.,** C.W. Hoagstrom. 2009. Ecomorphology of sculpin in northeastern Utah. Utah Chapter of the American Fisheries Society Annual Meeting, Moab, Utah.

31. **Ingraham, D.**, (N. Berthélémy). 2008. *Artemia*'s Physiological Responses to Mercury Exposure. Utah Conference on Undergraduate Research, Orem, UT.

32. **Ingraham, D.,** (N. Berthélémy). 2008. Effect of Mercury on the Brine Shrimp *Artemia*. International Society of Salt Lake Conference, Salt Lake City, UT.

33. **Linford, M., V. Frojker,** J. Cavitt. 2009. Western Colonial Waterbird Survey Northern Utah 2009 Report. Report to US Fish and Wildlife Service, Region 6, Denver, CO.

34. **Linford, M.S.,** J.F. Cavitt, S.I. Zeveloff, J.P. Ramirez-Silva, C. Villar Rodrigues. 2010. Strengthening conservation efforts through international research and service exchanges – Weber State University and Universidad Autonoma de

Nayarit – A Linking Communities partnership. Great Salt Lake Issues Forum, Salt Lake City, UT.

35. **Linford, M., V. Frojker,** J. Cavitt. 2010. Western Colonial Waterbird Survey Northern Utah 2009-2010. Report to US Fish and Wildlife Service, Region 6, Denver, CO.

36. **Linford, M.,** J.F. Cavitt. Intraspecific brood parasitism as a cost to coloniality: the occurrence and frequency of above-modal clutches on islands at Great Salt Lake. Association of Field Ornithologists Annual Meeting, Ogden, UT.

37. **McBride, J., C. Francom, J. Caldwell,** B.C. Trask. 2007. Developmental Expression of the Microfibrillar Proteins Fibrillin and MAGP in Zebrafish (*Danio rerio*). Gordon Research Conference on Elastin and Elastic Fibers, Biddeford, ME.

38. **McFarland, J.,** R.A. Meyers. 2008. Anatomy and histochemistry of hindlimb flight posture in birds. 1. The extended hindlimb posture of shorebirds. Journal of Morphology 269(8):967-979.

39. **Merrell, E.** (B. Trask). 2010. The Physiologic Relevance of an Interaction Between MAGP-2 and TGF-B1 in Elastic Extracellular Matrices. Hispanic Health Care Task Force Conference, Salt Lake City, UT, Poster Presentation.

40. **Minear, K.J.,** J.B. Clark. 2009. DNA Barcoding Reveals the Diversity of Shore Flies from Great Salt Lake. Sigma Xi Annual Meeting and International Research Conference, Woodlands, TX.

41. **Minear, K.J.,** J.B. Clark. 2010. Use of nuclear and mitochondrial genes to distinguish Great Salt Lake shore flies. National Conference on Undergraduate Research, University of Montana, Missoula, MT.

42. **Mohn, W.C., R.C. Stevens,** A. Ashley, R.K. Okazaki, B.M. Chung. 2010. *Caenorhabditis elegans* as a developmental model of intestinal peptide and amino acid transport. Gastroenterology 140:S-747-S748.

43. **Mohn, W.C., R.C. Stevens,** A. Ashley, R.K. Okazaki, B.M. Chung. 2011. *Caenorhabditis elegans* as a developmental model of intestinal peptide and amino acid transport. Digestive Disease Week, Chicago, IL.

44. **Nebeker, C.,** S.H. Haley, M.D. Dearing, M.M. Skopec. 2009. Quantification of Biotransformation Enzymes Implicated in *Neotoma lepida's* Ability to Consume Creosote. Society for Integrative and Comparative Biology Annual Meeting, Boston, MA.

45. **Neilsen, N.J.,** J.B Clark. 2009. An expanded phylogenetic view of the telomere-associated transposable element, HeT-A, in *Drosophila*. Society of Systematic Biologists Annual Meeting, Moscow, ID.

46. **Schmalz, J.,** B. Wachocki, M. Wright, S.I. Zeveloff. 2011. Habitat ecology of the pygmy rabbit in northeastern Utah. American Society of Mammalogists meeting, Portland, OR.

47. **Schulze, C.,** R. Schulze, S.I. Zeveloff. 2009. A ground-based paintball mark re-sight survey of mountain goats. Proceedings of the 16th Biennial Symposium of the Northern Wild Sheep and Goat Council, Midway, UT.

48. **Shepard, L.S., J.C. McFarland,** R.A. Meyers. 2008. Hindlimb flight posture of Utah shorebirds. Utah Birds 21(1):13-25.

49. **Stone, K**., J.F. Cavitt. 2007. Incubation rhythm and behavior of Long-billed Curlew. American Ornithologists' Union Annual Meeting, Laramie, WY.

50. **Stone, K.,** J.F. Cavitt. 2008. Concentration and effects of selenium and mercury on shorebirds at Great Salt Lake. Annual meeting of the Utah Ornithological Society, Ogden, UT.

51. **Stone, K.,** J.F. Cavitt. 2009. Incubation rhythm and behavior of Long-billed Curlew at Great Salt Lake, Utah. Western Hemisphere Shorebird Group Meeting, Sinaloa, Mexico.

52. **Truong, A.,** J.B. Clark. 2011. Genetic analysis of the *Wolbachia* endosymbiont associated with Great Salt Lake brine flies. Society for Molecular Biology and Evolution Annual Meeting, Kyoto, Japan.

53. **Truong, A.,** M. Sondossi, J.B. Clark. 2010. Characterization of *Wolbachia* in *Cirrula hians* from Great Salt Lake. Sigma Xi Annual Meeting and International Research Conference, Raleigh, NC.

54. **Uchida, A.M., K. Lemmon, J.C. McFarland,** B.G. Cooper, F. Goller, R.A. Meyers. 2007. Structure and function of European Starling syringeal muscles. Journal of Morphology 268(12):1143.

55. **Uchida, A.M., K. Lemmon, J.C. McFarland,** B.G. Cooper, F. Goller, R.A. Meyers. 2007. Structure and function of European Starling syringeal muscles. 8th International Congress of Vertebrate Morphology, Paris, France.

56. **Uchida, A.M., J. Green, S. Ahmad,** F. Goller, R.A. Meyers. 2009. Sexual Dimorphism of Syringeal Muscles in Songbirds. Integrative and Comparative Biology 49(1):e318.

57. **Uchida, A.M., J. Green, S. Ahmad,** F. Goller, R.A. Meyers. 2009. Sexual Dimorphism of Syringeal Muscles in Songbirds. Society for Integrative and Comparative Biology, Boston, MA.

58. **Uchida, A.M.,** R.A. Meyers, B.G. Cooper, F. Goller. 2010. Fibre architecture and song activation rates of syringeal muscles are not lateralized in the European starling. Journal of Experimental Biology 213:1069-1078.

Appendix E

Evidence of "success" after graduation for Zoology majors

Last known occupation of recent graduates from the WSU Department of Zoology

Last Name	First Name	Occupation
Ahmad	Sarah	University of Utah Medical School
Allred	Lisa	Quinnipiac University Pathologist Assistant School
Amaral	Frances	Applying to graduate school
Andersen	Tyler	University of Kentucky Medical School
Anderson	Brandon	Graduate School
Anderson	Lindsay	Zoology-related field
Asper	Kendall	Applying to medical school
Baird	Aaron	Virginia Commonwealth Dental School
Barkdull	Morgan	Working
Barlow	Ryan	Touro University Medical School
Barnes	Tyson	Pharmacy School
Bartosz	Breanna	Dog-sitting business
Black	Jason	Applying to medical school
Blain	Danae	Ross University School of Veterinary Medicine
Bolton	Coltor	Working
Bradshaw	Kami	Working
Bryant	Crystal	coastal marine mammal rescue center
Bunot	Britney	Applying to medical school
Burrows	Jessica	Applying to pharmacy school
Buttars	Paul	A.T. Still Kirksville Medical School
Caldwell	Jeffrey	Med-school
Campbell	Ryan	Graduate School
Christensen	Chester	Applying to medical school
Clegg	Mary	Internship at Hogle Zoo.
Combs	Mike	Midwestern University College of Osteopathic Medicine
Cox	Daniel	Med-school
Cox	David	Dental School
Cox	Haylie	Secondary school science teacher, Davis County, UT
Cranney	Michael	A.T. Still Kirksville Medical School
Creer	Karalee	Research Assistant, Oregon Health Sciences University
Dandoy	Chris	Residency in Pediatrics, Miami Children's Hospital; Residency in Oncology, Cincinnati Children's Hospital
Darger	Kim	Clover Creek Farms Owner/Operator, Layton, UT
Denny	Derek	Medical College of Wisconsin
Deru	Allen	Working toward graduate school in wildlife management.
Diamond	Jordan	University Nevada Las Vegas Dental School
Dichellis	Sharee	Working for ARUP Laboratories
Dickinson	Jannette	Working
Done	Patti	Applying to a Masters in Nursing program
Drysdale	Fredrick	Applying to medical school
Duerden	Brynn	MD from Medical College of Wisconsin
Earley	Austin	Post-graduate program, Japan

Last known occupation of recent graduates from the WSU Department of Zoology

Last Name	First Name	Occupation
Eccles	Christian	Texas Tech University Medical School
Edelmayer	Luke	University of Eastern Virginia Medical School
Eggleston	Darek	Dental School
Ennega	Kate	Residency in emergency medicine, University of Texas, Dallas
Farr	Devin	Optometry School
Farrall	Austin	Internship with Supergen Pharmaceutical Company
Fisher	Andrew	Texas College of Osteopathic Medicine
Ford	John	University of Eastern Virginia Medical School
Francom	Christian	Ohio State Medical School
Frokjer	Valerie	Working
Gilbert	Todd	Virginia Commonwealth University Medical School
Gillins	Mary	DO from Kirksville School of Osteopathic Medicine
Graves	Jon	chiropractic school
Hale	Andrew	Oklahoma State College of Osteopathic Medicine
Hampton	Cliff	Residency in neurology, University of Colorado Medical
Hancock	Joel	Medical College of Wisconsin
Hilton	Daniel	AT Still Kirksville Medical School
Holmes	Nathan	Des Moines University Medical School
Ingraham	Dustin	Applying to medical school
Ishii	Yoko	Working
Jepperson	Jeff	Ohio State University Dental School
Jessen	Brett	Loma Linda University Dental School
Johnson	Skyler	Michigan State Medical School
Johnston	Brett	Commission in the United States Army
Krieger	Holly	Management postion with Petco
Leaptrot	Matt	University of Utah Laboratory
Loader	Bryce	University of West Virginia Medical School
Lott	Jason	Colorado State University Veterinary School
MacFarlane	Leslie	Utah Division of Wildlife Resources
McCoy	Hayley	Applying to optometry school
McFarland	Joshua	Emergeny Medicine PA, Providence Newberg Medical Center
McFarland	Robert	Biology Technician, National Park Service
Mickelson	Connor	Applying to medical school.
Milne	Samantha	Animal Care Staff, Hogle Zoo
Minear	Krystle	Biology Graduate School, University of Utah.
Mock	Brady	Virginia Commonwealth University medical school
Nebeker	Cody	Michigan State Medical School
North	Maria	Applying to medical school
Ogden	Ben	University of Virginia Medical School
Parker	Ed	Zoology-related field
Parsell	Rachelle	Public Health

Last known occupation of recent graduates from the WSU Department of Zoology

Last Name	First Name	Occupation
Porter	Jake	Applying to medical school
Pretti	Roger	Bureau of Land Mgmt
Proctor	AmyJo	Working with education & public outreach
Radmall	Bryce	University of Utah Medical School
Reese	Jeffery	Midwestern University College of Osteopathic Medicine
Richardson	Michael	MD from Tulane University Medical School
Ricks	Katherine	Master's of Education, University of Utah
Romney	Amie	Portland State University PhD student, MS from University of Nevada Las Vegas
Schmalz	Jennifer	Internship with Bureau of Land Mgmt
Schmutz	Daniel	Residency in emergency medicine, Grand Rapids, MI
Schulze	Chris	Utah Division of Wildlife Resources Conservation Officer
Scoresby	Aaron	Applying to graduate school
Shenefelt	Derek	Graduate School
Smith	Christina	Internship, Hogle Zoo
Sorenson	Brad	DD from University of Louisville School of Medicine
Stevens	Rainee	Lab assistant, Department of Zoology, WSU
Syphus	Dallin	Touro University School of Osteopathic Medicine
Taylor	Tessa	Applying to graduate school
Truong	Amanda	Applying to medical school
Uchida	Ami	Howard Hughes Research Fellow, NIH & University of Utah Medical School
Unverrich	Nicole	Applying for work with U.S. Forest Service
Van de Graaf	Joel	Residency hospital medicine, NE
Van Leuven	Dan	Rocky Vista College of Osteopathic Medicine
Vockler	Amanda	Utah State University Veterinary School
Williams	Erica	Working, applying to PA school
Williams	Steven	Military medical school
Woodbury	Kim	Dental School
Yamashita	Tsubomi	Nature Documentary Film Maker in Japan