FISH, WILDLIFE AND CONSERVATION ECOLOGY

Undergraduate Program Information

Through lecture courses, labs, hands-on field experience and internships, the Department of Fish, Wildlife and Conservation Ecology will prepare you for a career in a variety of natural resource fields related to the conservation and management of wild animal populations and the natural systems they perpetuate. Award-winning professors will guide students in the study of how to manage fish and wildlife populations, their habitats, how their populations grow and contract, how different species influence the biotic community in which they live and how natural systems are affected by human activities.

Bachelor of Science in Fish, Wildlife and Conservation Ecology

With the continuous growth of human populations and the ever dwindling of natural resources, natural resource professionals are needed now more than ever. Learn how to sustainably manage fish and wildlife populations and the habitats they utilize to ensure their long-term successful conservation. We offer two options within this degree. The Wildlife Ecology and Management option focuses on the ecology, conservation and management of wildlife (including mammals, birds, amphibians, and reptiles) in their natural habitats. The Aquatic Ecology and Management option focuses on the ecology, conservation and management of aquatic resources and the animals and plants found in them.

The department offers a minor in Wildlife Science for students majoring in other disciplines. The minor includes a minimum of 18 credit hours.

Bachelor of Science in Conservation Ecology

New Mexico State University offers an interdisciplinary, undergraduate program in Conservation Ecology. The goal of this program is to train biologists for the current and future challenges that we face in the conservation and wise use of natural resources. An overriding principle of the program is to provide a solid foundation in basic science coupled with a practical approach towards sustainability and stewardship. The curriculum encompasses several disciplines and includes a wide variety of courses from Fish, Wildlife and Conservation Ecology, Biology, and Geography.

This educational experience will provide students with an overview of global biodiversity and an understanding of the ecological and evolutionary processes that have created and sustained it. Courses in population and community ecology coupled with population viability analysis and risk assessment will give students the necessary background to understand the theory and development of these fields as well as the tools to tackle real-world problems. Courses in basic genetics, evolution, and conservation genetics will expose students to the importance of conserving genetic variation in order to maintain adaptive potential within populations, thereby sustaining the evolutionary process. Students will also receive background on wildlife law and environmental policy, information vital for assisting governing bodies in making decisions regarding the protection and wise use of our natural resources. Skills obtained in the application of geographic information systems, molecular genetics, and professional communication can also be acquired through various electives. If biochemistry is taken as an elective, this curriculum provides the necessary educational background for pre-vet requirements, thus preparing students for veterinary school and future jobs such as wildlife or zoo veterinarian, or conservation medicine practitioner. In sum, we seek to provide undergraduate students with an education that will allow them the opportunity to contribute to the conservation of all life on Earth.

The department offers a minor in Conservation Ecology for students majoring in other disciplines. The minor includes 20 credits.

To graduate from the Department of Fish, Wildlife and Conservation Ecology, an overall grade point average of 2.0 is required in courses taken in the major field and in all courses taken at NMSU.

Graduate Program Information

Master of Science in Fish, Wildlife and Conservation Ecology

The Department of Fish, Wildlife and Conservation Ecology (FWCE) offers graduate work leading to the Master of Science degree with a major in Fish, Wildlife and Conservation Ecology. Faculty members in the department also may advise Ph.D. candidates through the graduate program in the Department of Biology, Department of Animal and Range Sciences, Department of Plant and Environmental Sciences, as well as other Ph.D. granting departments. For additional information please see the graduate catalog entries for the respective departments.

Minimum qualifications for admission to the graduate program include the following:

- 3.0 grade-point average in the last two years of undergraduate work
- Students who are most competitive for admission are those with a combined average GRE score greater than 70th percentile on the verbal and quantitative parts of the GRE.
- Course work in zoology, botany and animal ecology and a basic appreciation of sustainable use of natural resources, with supporting courses in mathematics, chemistry, physics and written and oral communication.

Applicants should submit a written composition of approximately 350 words that indicates the applicant’s reasons for pursuing advanced study, explains personal and educational goals, and any additional experiences (e.g., military or career) or skills that might provide a foundation for graduate study. Applicants should submit three letters of recommendation (it is preferred that at least two letters come from university instructors) along with official GRE scores (use NMSU code 4531). Applicants should also contact a faculty member in the department that they would like to work with as an advisor, and that faculty member needs to agree to serve as the student’s advisor.

Application forms, application fee and transcripts, GRE scores, letters of recommendation and letter of application should be submitted online to the Graduate School. Successful applicants will be selected from those who meet the criteria of grade-point average, GRE scores, and educational background described above and who appear to have professional promise as indicated by personal history and written references.

For the Master of Science degree, a minimum of 30 semester credits of graduate work in the major and related subjects is required, together with a thesis for most students. Of these credits, at least 15 must be in courses numbered 500 or above, and at least 15 must be for courses with the FWCE prefix. Those programs involving a thesis or research project include 4 to 6 credits of research (FWCE 598 Special Research Programs or FWCE 599 Master’s Thesis). Students electing a minor in FWCE are required to take at least 9 credits in the minor field. A nonthesis option is
available to some students, depending on prior training and experience, and subject to approval by the advisor and department head.

All students in the program must complete the following requirements:

- A ST 505 Statistical Inference I or equivalent
- One semester of Graduate Seminar (FWCE 515 Graduate Seminar - may be repeated for credit)
- A minimum of 3 additional credits from the Quantitative Methods category in addition to A ST 505 Statistical Inference I (eligible courses listed below)
- One course each from the Ecological Concepts, Organismal Biology and Ecological Techniques categories (eligible courses listed below)
- 4 to 9 credits from the Independent Study category (eligible courses listed below)

In addition, a student may petition to have up to 3 credits of special topics courses (FWCE 548 Graduate Problems) to apply to one of the three areas. Courses other than those listed may be acceptable, given permission by the student’s supervisory committee.

**Degrees for the Department**

- Conservation Ecology - Bachelor of Science in Conservation Ecology
- Fisheries and Wildlife Science - Bachelor of Science in Fish, Wildlife and Conservation Ecology

**Minors for the Department**

- Conservation Ecology - Undergraduate Minor
- Wildlife Science - Undergraduate Minor

**Professor, Gerald K. Sims, Interim Department Head**

**Professors** Boeing, Caldwell, Cowley, Desmond, Roemer; **Associate Professor** Cain; **Assistant Professor** Gebreselassie; **College Associate Professors** Boykin, Frey


**Fish, Wildlife and Conservation Ecology Courses**

**FWCE 109. Contemporary Issues in Wildlife and Natural Resources Management**

*3 Credits (3)*

Ecological, socioeconomic, and political issues surrounding the management of our natural resources with an emphasis on fish and wildlife resources.

**FWCE 110G. Introduction to Natural Resources Management**

*4 Credits (3+2P)*

This class covers historical and current issues affecting the management of renewable natural resources with an emphasis on water, soil, rangeland, forest, fish, and wildlife resources. An emphasis is placed on the scientific method and critical thinking. In the laboratory students collect and analyze field data on topics covered above and write up each unit as a laboratory report.

**FWCE 255. Principles of Fish and Wildlife Management**

*3 Credits (3)*

Basic principles of fish and wildlife management including history, ecology, economics, and policy. Emphasis on fish and fisheries. Uses an ecosystem approach integrating living and nonliving resources.

**Prerequisite(s):** FWCE 110.

**FWCE 301. Wildlife Ecology**

*3 Credits (3)*

General ecological theory with emphasis on concepts including biogeography, species interactions, population dynamics and disease ecology as they relate to the management and conservation of vertebrates.

**Prerequisite(s):** BIOL 111G or BIOL 190.

**FWCE 330. Natural History of the Vertebrates**

*4 Credits (3+3P)*

Evolution, ecology, and diversity of vertebrates. Topics include comparative anatomy and physiology, biogeography, community ecology, behavior, and conservation. Laboratory emphasizes identification of local taxa. Field trips may be required.

**Prerequisite(s)/Corequisite(s):** BIOL 322 Zoology. Prerequisite(s): BIOL 111G and BIOL 111L.

**FWCE 355. Wildlife Techniques and Analysis**

*4 Credits (3+2P)*

FWCE 355 will provide a broad overview of basic skills and techniques that are commonly used by biologists in performing management, research, and reporting functions in natural resource fields with an emphasis on wildlife techniques, data processing and analysis.

**Prerequisite(s):** FWCE 301, A ST 311.

**FWCE 357. Fisheries Management and Analysis**

*4 Credits (3+2P)*

Lectures and laboratory exercises provide a broad overview of basic skills and techniques used for assessing and managing fish populations.

**Prerequisite(s):** FWCE 301 and A ST 311.

**FWCE 391. Internship**

*1-3 Credits (1-3)*

Professional work experience under the joint supervision of the employer and a faculty member. A written report is required. No more than 3 credits toward a degree. Consent of Instructor required. S/U Grading (S/U, Audit).

**Prerequisite(s):** Consent of instructor.

**FWCE 393. Professional Experience and Communication**

*3 Credits (3)*

Professional work experience under the supervision of employer and/or a faculty member. Written report and presentation is required.

**Prerequisite(s)/Corequisite(s):** FWCE 255.

**FWCE 402. Seminar in Natural Resource Management**

*1 Credit (1)*

Review and discussion of current topics in natural resource management.

**Prerequisite(s):** Senior standing or above.
FWCE 409. Introduction to Population Ecology
3 Credits (3)
Quantitative analysis of vital statistics and mechanisms affecting
dynamics of wild populations. Patterns of growth, age structure, survival,
and natality. Population theories and life tables.
Prerequisite(s): MATH 142G and FWCE 255.
FWCE 430. Avian Field Ecology
4 Credits (3+3P)
Principles of avian ecology and management with an emphasis on
taxonomy, physiology, behavior and field studies. Includes weekly field
trips focusing on identification and behavior of Southwest birds. Pre/
Prerequisite(s)/Corequisite(s): WLSC 330.
FWCE 431. Mammalogy
4 Credits (3+2P)
Classification, identification, anatomy, physiology, life history, and ecology
of mammals. Field trips required.
Prerequisite(s): FWCE 255 and FWCE 330.
FWCE 432. Environmental Biology of Fishes
4 Credits (3+3P)
What makes a fish, a fish? Mechanisms of circulation, gas exchange,
smotic and ionic regulation, swimming, migration, reproduction, and
chemoreception will be covered in this class. Taught with FWCE 532.
Prerequisite(s): CHEM 111G and senior standing.
FWCE 433. Fisheries Management
3 Credits (3)
This course is designed to introduce students to the basic principles
of fisheries management. Students will learn the techniques and tools
used to collect, analyze, and interpret fisheries data needed to undertake
fisheries management decisions. Taught with FWCE 533. Consent of
Instructor required.
Prerequisite(s): FWCE 482 and A ST 311.
FWCE 434. Aquatic Contaminants and Toxicology
4 Credits (3+3P)
Basic principles and methodologies of aquatic toxicity testing; routes of
exposure and modes of action; environmental legislation and ecological
Prerequisite(s): CHEM 111G and senior standing.
FWCE 436. Large Mammal Ecology, Conservation and Management
3 Credits (3)
This course will cover aspects of large mammal ecology, management
and conservation. Will include aspects of foraging ecology, resource
and habitat selection, competition and resource partitioning, predation
and population dynamics. Taught with FWCE 530. Consent of Instructor
required.
FWCE 437. Wildlife Damage Management
3 Credits (3)
Introduction to basic need and appropriate methods for resolving human-
wildlife conflicts and management of animal damage. Socioeconomic,
ecological, and political factors. Field trips required. Taught with
FWCE 537.
Prerequisite(s): BIOL 111G, FWCE 255, FWCE 301, FWCE 409.
FWCE 439. Game Bird Ecology and Management
3 Credits (3)
In this class we will look at the overall history of game bird management
and conservation, how management and conservation of game birds
was and still is the foundation for wildlife conservation in North America,
define the challenges both past and present to managing and conserving
game bird populations, and explore the conceptual and quantitative
models used to manage migratory and non-migratory game birds. Taught
with FWCE 539. Consent of Instructor required. Restricted to: WLSC,FISH
majors.
Prerequisite(s): FWCE 301, FWCE 409, A ST 311 or equivalent.
FWCE 440. Wildlife Habitat Relationships
3 Credits (3)
The study of wildlife-habitat relationships primarily seeks to describe
how the distribution and abundance of resources used for food, cover
and security, and constraints on the use of these resources influence
the distribution of animals. This course will cover aspects of animal
behavior related to how animals select habitat, theoretical models of
habitat selection, the influence of inter-and intra-specific interactions
on habitat selection, habitat quality, study designs for wildlife-habitat
studies, modeling habitat selection and data analyses. Taught with
FWCE 540. Consent of Instructor required.
FWCE 447. Wildlife Law and Policy
3 Credits (3)
Introduction to state and federal laws and policies for wildlife and the
historical context for their development. Taught with FWCE 547.
Prerequisite(s): Junior or Senior level standing.
FWCE 448. Problems
1-3 Credits (1-3)
Individual investigations in fishery or wildlife science. Maximum 3 credits
per semester and a grand total of 6 credits. May be repeated up to 6
credits. Consent of Instructor required.
Prerequisite(s): 18 credits in WLSC.
FWCE 450. Special Topics
1-4 Credits (1-4)
Specific subjects and credits as announced in the Schedule of Classes.
Maximum of 4 credits per semester. May be repeated up to 9 credits.
Consent of Instructor required.
FWCE 457. Ecological Biometry
3 Credits (3)
Use of ecological data to test scientific hypotheses, stochastic and
statistical models for environmental data, data visualization, likelihood-
based and information-based model selection. Emphasis on open-source
software tools.
Prerequisite(s): MATH 142G or 191G, E ST 311, FWCE 301.
FWCE 459. Aquatic Ecology
4 Credits (4)
Ecological functions of plant and animal communities in aquatic
ecosystems with emphasis on chemical and physical properties,
productivity, species interactions, population dynamics, and concepts
for diagnosing problems and restoring aquatic ecosystems. Taught with
FWCE 559.
Prerequisite(s): FWCE 301 or BIOL 301, CHEM 112, MATH 142G.
FWCE 464. Management of Aquatic and Terrestrial Ecosystems
3 Credits (3+2P)
Principles and methods for managing aquatic and terrestrial ecosystems and their fish and wildlife resources. Emphasis on quantitative techniques, data collection and analysis for management of systems at a landscape spatial scale.
Prerequisite(s): (BIOL 301 or FWCE 301) FWCE 330, A ST 311G.

FWCE 467. Herpetology
4 Credits (4)
Systematics, taxonomy, ecology, behavior, and conservation of amphibians and reptiles. Field trips required. Taught with FWCE 567.
Prerequisite(s): FWCE 330.

FWCE 471. GIS for Natural Resource Scientists
4 Credits (4)
Practical GIS class for students with little or no GIS experience. Class focuses on learning to use industry-standard software and applications in natural resource management. Taught with FWCE 571.

FWCE 472. Wildlife Museum Internship
1-4 Credits (1-4)
Substantial directed work experience in various functions of the natural history museum developed by the student in consultation with the faculty curator. Internships may involve aspects of collection development and management, public education programs, or other related museum activities. Internship must be approved by the faculty curator. May be repeated up to 9 credits. Consent of Instructor required.
Prerequisite(s): BIOL 111G and BIOL 111GL.

FWCE 473. Natural History Museum Functions Methods
3 Credits (3)
Principles and methods of natural history museums in research, education, service, and biodiversity conservation. Emphasis on experiential learning. Includes lectures, paper discussions, laboratory activities, specimen preparation, required full-day Friday field trips, and an individual term project.
Prerequisite(s): FWCE 330 or BIOL 322 or BIOL 312 or RGSC 316.

FWCE 482. Ichthyology
4 Credits (3+2P)
Classification, morphology, identification, life history, and ecology of fishes.
Prerequisite(s): FWCE 330 or consent of instructor.

FWCE 509. Population Ecology (s)
3 Credits (2+2P)
Quantitative analysis of vital statistics and mechanisms promoting stability in wild populations. Theory and application of life tables and population models.

FWCE 515. Graduate Seminar
1 Credit (1)
Current topics.

FWCE 530. Large Mammal Ecology, Conservation and Management
3 Credits (3)
This course will cover aspects of large mammal ecology, management and conservation. Will include aspects of foraging ecology, resource and habitat selection, competition and resource partitioning, predation and population dynamics. Taught with FWCE 436.

FWCE 532. Environmental Biology of Fishes
4 Credits (3+3P)
What makes a fish, a fish? Mechanisms of circulation, gas exchange, osmotic and ionic regulation, swimming, reproduction, and chemoreception will be covered in this class. Taught with FWCE 432; however, students are responsible for all requirements in FWCE 432, plus additional assignments.

FWCE 533. Fisheries Management
3 Credits (3)
This course is designed to introduce students to the basic principles of fisheries management. Students will learn the techniques and tools used to collect, analyze, and interpret fisheries data needed to undertake fisheries management decisions. Taught with FWCE 433. Consent of Instructor required.
Prerequisite(s): FWCE 482, A ST 311.

FWCE 534. Aquatic Contaminants and Toxicology
4 Credits (3+3P)
Basic principles and methodologies of aquatic toxicity testing; routes of exposure and modes of action; environmental legislation and ecological risk assessment. Students are responsible for all requirements for FWCE 434 plus additional work.

FWCE 535. Special Topics
1-4 Credits (1-4)
Specific subjects to be announced in the Schedule of Classes. Maximum of 4 credits per semester. No more than 9 credits toward a degree.

FWCE 536. Advanced Avian Ecology
3 Credits (3)
Focuses on current topics and literature in avian ecology including systematics, mating systems, behavior, physiology, movement patterns and conservation. Includes required overnight field trips.
Prerequisite(s): Graduate standing or consent of instructor.

FWCE 537. Wildlife Damage Management
3 Credits (3)
Introduction to basic need and appropriate methods for resolving human-wildlife conflicts and management of animal damage. Socioeconomic, ecological, and political factors. Field trips required. Taught with FWCE 437. Students are responsible for all requirements for FWCE 437 plus additional work. Prerequisite(s): BIOL 111G, FWCE 255, FWCE 301 and FWCE 409.

FWCE 539. Game Bird Ecology and Management
3 Credits (3)
In this class we will look at the overall history of game bird management and conservation, how management and conservation of game birds was and still is the foundation for wildlife conservation in North America, define the challenges both past and present to managing and conserving game bird populations, and explore the conceptual and quantitative models used to manage migratory and non-migratory game birds. Taught with FWCE 439. Restricted to: WLSC, FISH majors.
Prerequisite(s): FWCE 301, FWCE 409, A ST 311 or equivalent.
FWCE 540. Wildlife Habitat Relationships
3 Credits (3)
The study of wildlife-habitat relationships primarily seeks to describe how the distribution and abundance of resources used for food, cover and security, and constraints on the use of these resources influence the distribution of animals. This course will cover aspects of animal behavior related to how animals select habitat, theoretical models of habitat selection, the influence of inter- and intra-specific interactions on habitat selection, habitat quality, study designs for wildlife-habitat studies, modeling habitat selection and data analyses. Taught with FWCE 440.

FWCE 547. Wildlife Law and Policy
3 Credits (3)
Introduction to state and federal laws and policies for wildlife and the historical context for their development. Taught with FWCE 447.

FWCE 548. Graduate Problems
1-3 Credits (1-3)
Individual studies in fishery and wildlife sciences. Maximum of 3 credits per semester. No more than 6 credits of this course and FWCE 598, combined, toward a degree. May be repeated up to 6 credits.

FWCE 558. Nonthesis Project
1-6 Credits (1-6)
Independent study to satisfy nonthesis project requirement. Maximum of 6 credits toward degree. Available only to nonthesis students. May be repeated up to 6 credits.

FWCE 559. Aquatic Ecology
4 Credits (4)
Ecological functions of plant and animal communities in aquatic ecosystems with emphasis on chemical and physical properties, productivity, species interactions, population dynamics, and concepts for diagnosing problems and restoring aquatic ecosystems. Taught with FWCE 459.
Prerequisite(s): FWCE 301 or BIOL 301, CHEM 112, MATH 142G.

FWCE 567. Herpetology
4 Credits (4)
Systematics, taxonomy, ecology, behavior and conservation of amphibians and reptiles. Field trips required. Taught with FWCE 467.

FWCE 571. GIS for Natural Resource Scientists
4 Credits (4)
Practical GIS class for students with little or no GIS experience. Class focuses on learning to use industry-standard software and applications in natural resource management. Taught with FWCE 471.

FWCE 582. Ichthyology
4 Credits (4)
Classification, morphology, identification, life history, and ecology of fishes. Taught with FWCE 482.

FWCE 598. Special Research Programs
1-3 Credits (1-3)
Individual investigations, either analytical or experimental. Maximum of 3 credits per semester. No more than 6 credits of this course and FWCE 548, combined, toward a degree. Not available to students in the nonthesis program. May be repeated up to 6 credits.

FWCE 599. Master's Thesis
1-9 Credits (1-9)