

ANIMAL ECOLOGY

Administered by the Department of Natural Resource Ecology and Management

The Animal Ecology curriculum provides its majors with an understanding of ecological principles and processes and their applications to natural resource management. This major is oriented toward students desiring a general and flexible program in environmental biology and for those planning graduate study. Graduates find employment as aquaculturists, aquatic ecologists, wildlife biologists, fisheries biologists, resource managers, and ecologists for industry, environmental consulting firms, natural resource and environmental agencies and organizations, zoos, and as educators. Graduates are able to communicate and work effectively in the multidisciplinary arena of ecology and natural resource management. Additionally, they recognize the importance of ethics in their field of study and are sensitive to cultural diversity and broad environmental concerns.

Students majoring in Animal Ecology may select from one or more of four options: Fisheries and Aquatic Sciences, Interpretation of Natural Resources, Preveterinary and Wildlife Care, or Wildlife. Each option has specific outcomes expectations that include (1) the scope of the specialization and its relationships to broader aspects of animal ecology, biotic resource management, and other allied scientific disciplines and professions, (2) career opportunities and requirements, and (3) knowledge and skills appropriate for employment at technical and practitioner levels in each discipline.

All options require three months (400 hours) of relevant work experience or study at a biological station prior to graduation. The latter may be accomplished at the university's affiliate field stations: Rod and Connie French Conservation Camp in Montana, Iowa Lakeside Laboratory at West Lake Okoboji, and Gulf Coast Research Laboratory at Ocean Springs, Mississippi. Information on these laboratories is available from the Department of Natural Resource Ecology and Management Student Services Center.

Preveterinary medicine preparation may be achieved while satisfying degree requirements in animal ecology.

Additional education and training can lead to other opportunities in such areas as research and management, natural resources planning and administration, teaching, and environmental consulting, among others. Graduate training is necessary for many specialized positions within the fields of animal ecology. Students preparing for graduate study should consult with their academic advisor concerning appropriate coursework.

Students wishing to be certified by the American Fisheries Society or The Wildlife Society need to consult with their advisors in selecting required courses in their respective programs. The formal application then needs

to be completed and submitted for review by their professional societies. Certification in either society has many professional benefits and may be required or recommended for employment by federal and state agencies and private industry.

Students seeking certification to teach biology in secondary schools must meet requirements of the College of Human Sciences as well as those of the Animal Ecology curriculum. In addition, they must apply formally for admission to the teacher education program (see Teacher Education Program (<http://catalog.iastate.edu/previouscatalogs/2022-2023/collegeofhumansciences/schoolofeducation/#teachereducationtext>)). Students with an interest in careers in outdoor writing are encouraged to obtain a minor or a second major in journalism (see Journalism and Communication, Courses and Programs (http://catalog.iastate.edu/previouscatalogs/2022-2023/collegeofliberalartsandsciences/journalism_and_mass_communication/)). Students who wish to pursue a job as a conservation officer may wish to minor in criminal justice (see Criminal Justice (<http://catalog.iastate.edu/previouscatalogs/2022-2023/collegeofliberalartsandsciences/criminaljustice/>)).

Student Learning Outcomes

Upon graduation, students should be able to:

1. Identify, explain and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics.

For any given situation, graduates identify, critically evaluate, and state their own beliefs and values as they relate to professional and societal ethical standards, for any given situation. They elaborate on how those values and beliefs impact their actions, and they explain which specific canons or principles of a professional code of ethics are applicable to a particular situation.

2. Anticipate, analyze and evaluate natural resource issues and opportunities, explaining the ecological, economic, and social consequences of natural resource actions at various scales and over time.

In the case of existing natural resource issues, graduates explain the ecological, economic, and social consequences that reasonably could be expected to occur as the result of actions taken to address the issue. The explanation includes considerations of the geographic area influenced by the issue as well as the time frame over which the consequences can be expected to occur. In the case of evolving circumstances, graduates predict natural resource issues that may arise as a result of the circumstances and explain the ecological, economic and social consequences of those issues.

3. Actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.

Graduates identify the comprehensive list of individuals or groups who may be impacted by particular natural resource problems and issues. They are well versed in techniques for seeking and incorporating input and perspectives from those people, and they incorporate those inputs and perspectives into the decision-making process.

4. Assess, analyze, synthesize, and evaluate information fairly and objectively.

Not all information is equally sound or applicable in a particular situation. Graduates evaluate the validity and importance of information obtained from any source. Once evaluated, they use the information appropriately in the solution of natural resource problems.

5. Work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem-solving approaches.

Effective solution of natural resource problems often involves input from diverse constituencies with diverse value scales. When working individually, graduates incorporate those values into the solution of problems. Graduates work effectively with diverse individuals and groups to reach consensus on problem solutions.

6. Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.

The natural resource base with which we deal is capable of providing numerous goods and services to numerous publics. Graduates formulate multiple alternatives, as well as action plans, to achieve stakeholder objectives. They evaluate each of the feasible alternatives in terms of biological possibility, economic feasibility and social acceptability. They recommend best alternatives based on the stakeholders' objectives, and they justify their recommendations on the basis of sound science.

7. Communicate clearly and effectively with all audiences using appropriate oral, visual, electronic, and written techniques.

Graduates utilize the best form, or forms, of communication for effectively conveying information to, or seeking input from, a particular audience. They are proficient in all forms of communication, and adjust their style or technique of communication to suit different audiences.

8. Recognize and interpret resource problems and opportunities across spatial scales from local to global.

Graduates recognize where resource problems and opportunities can or could exist, and they evaluate and interpret these for others. They evaluate and interpret for individual landowners at a very local scale

as well as for problems that span multiple ownerships, regions and ecosystems.

9. Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.

Different cultures, population densities, and income classes value and use natural resources in very different ways. Because natural resources often are used simultaneously by different groups, it is important for graduates to be able to account for those differing uses and valuations when making management decisions about natural resources.

10. Exercise leadership skills as professionals and engaged citizens

Graduates organize, facilitate, and participate effectively in groups, teams, or organizations. They define problems or opportunities, implement action planning processes, work toward goals and justify actions taken.

11. Demonstrate creativity and innovation in identifying and pursuing opportunities that produce environmental, social, or economic value.

Graduates display creativity in a variety of situations, and identify opportunities to promote understanding of natural resource issues. They demonstrate persistence when working with individuals who have diverse interests in order to build consensus and facilitate accomplishing stated objectives.

12. Exercise life-long learning skills developed before graduation.

Graduates articulate why life-long learning is important. Graduates find answers to their questions as they arise throughout life. They are capable of determining what they need to know to effectively deal with an issue or situation, and they know how to obtain the necessary knowledge. They have learned how to learn in the absence of teachers.

CURRICULUM IN ANIMAL ECOLOGY

Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

International Perspective: 3 cr.

U.S. Diversity: 3 cr.

Communications Proficiency (with grade of C or better):

6 cr. of English composition

3 cr. of speech fundamentals

Communication/Library 16 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
SP CM 212	Fundamentals of Public Speaking	3
LIB 160	Introduction to College Level Research	1

Plus 6 credits from the following: 6

ENGL 207	Introduction to Creative Writing	
ENGL 275	Analysis of Popular Culture Texts	
ENGL 302	Business Communication	
ENGL 303	Free-Lance Writing for Popular Magazines	
ENGL 304	Creative Writing: Fiction	
ENGL 305	Creative Writing: Nonfiction	
ENGL 306	Creative Writing: Poetry	
ENGL 309	Proposal and Report Writing	
ENGL 310	Rhetorical Analysis	
ENGL 312	Communicating Science and Public Engagement	
ENGL 314	Technical Communication	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
P R 305	Publicity Methods	
NREM 330	Principles of Interpretation	
SP CM 312	Business and Professional Speaking	
SP CM 313	Communication in Classrooms and Workshops	

Humanities and Social Sciences: 6 cr.

Humanities course list: <https://www.cals.iastate.edu/student-services/humanities> (<https://www.cals.iastate.edu/student-services/humanities/>)

Social Science course list: <https://www.cals.iastate.edu/student-services/social-sciences> (<https://www.cals.iastate.edu/student-services/social-sciences/>)

Approved humanities course	3
Approved social science course	3

Total Credits 6

Ethics: 3 cr.

3 cr. from approved ethics list: <https://www.cals.iastate.edu/student-services/ethics> (<https://www.cals.iastate.edu/student-services/ethics/>)

Mathematical Sciences: 6 cr.

MATH 140	College Algebra	3
STAT 101	Principles of Statistics	3-4
or STAT 104	Introduction to Statistics	

Total Credits 6-7

Physical Sciences: 14 cr.

CHEM 163	College Chemistry	5
& 163L	and Laboratory in College Chemistry	
or CHEM 177	General Chemistry I	
& 177L	and Laboratory in General Chemistry I	
CHEM 231	Elementary Organic Chemistry	4
& 231L	and Laboratory in Elementary Organic Chemistry	

or CHEM 331	Organic Chemistry I	
& 331L	and Laboratory in Organic Chemistry I	

PHYS 115	Physics for the Life Sciences	5
& 115L	and Laboratory in Physics for the Life Sciences	

or PHYS 131	General Physics I	
& 131L	and General Physics I Laboratory	

Total Credits 14

Biological Sciences: 24 cr.

NREM 110	Orientation in Natural Resource Ecology and Management	1
----------	--	---

NREM 120	Introduction to Renewable Resources	3
----------	-------------------------------------	---

NREM 211	Careers in Natural Resources	1
----------	------------------------------	---

A ECL 231	Principles of Wildlife & Fisheries Conservation	3
-----------	---	---

A ECL 312	Ecology	4
-----------	---------	---

A ECL 365	Vertebrate Biology	4
-----------	--------------------	---

BIOL 211	Principles of Biology I	3
----------	-------------------------	---

BIOL 211L	Principles of Biology Laboratory I	1
-----------	------------------------------------	---

BIOL 212	Principles of Biology II	3
----------	--------------------------	---

BIOL 212L	Principles of Biology Laboratory II	1
-----------	-------------------------------------	---

Total Credits 24

Practical Experience:

FISHERIES AND AQUATIC SCIENCES OPTION

A ECL 321	Fish Biology	3
-----------	--------------	---

A ECL 486	Aquatic Ecology	3
-----------	-----------------	---

A ECL 486L	Aquatic Ecology Laboratory	1
------------	----------------------------	---

Choose one of two Mathematics sequences: 7-8

Sequence 1 (Calculus)

MATH 143	Preparation for Calculus	
----------	--------------------------	--

One of the following:

MATH 160	Survey of Calculus	
----------	--------------------	--

MATH 165	Calculus I	
----------	------------	--

Sequence 2 (Statistics)

NREM 240	Quantitative Problem Solving in Natural Resources	
----------	---	--

or MATH 143 Preparation for Calculus

STAT 301	Intermediate Statistical Concepts and Methods	
----------	---	--

Plus 20 credits from approved list 20

Total Credits 34-35

INTERPRETATION OF NATURAL RESOURCES OPTION

A ECL 366	Natural History of Iowa Vertebrates	3
-----------	-------------------------------------	---

BIOL 366	Plant Systematics	4
----------	-------------------	---

ENT 370	Insect Biology	3
---------	----------------	---

NREM 303	Internship	1-3
----------	------------	-----

NREM 330	Principles of Interpretation	3
BIOL 474	Plant Ecology	3
or FOR 356	Dendrology	
One of the following:		3
AGRON 182	Introduction to Soil Science	
AGRON 206	Introduction to Weather and Climate	
ASTRO 120	The Sky and the Solar System	
GEOL 100	How the Earth Works	
GEOL 101	Environmental Geology: Earth in Crisis	
GEOL 108	Introduction to Oceanography	
Plus additional credits from approved list to total 33 credit hours.		10-13
Total credits = 33		

PREVETERINARY & WILDLIFE CARE OPTION

AN S 214	Domestic Animal Physiology	3
or B M S 329	Anatomy and Physiology of Domestic Animals	
One of the following:		3
A ECL 551	Behavioral Ecology	
AN S 336	Domestic Animal Behavior and Well-Being	
ANTHR 317	Primate Behavior, Ecology, and Evolution	
BIOL 354	Animal Behavior	
Three credits from the following:		3
A ECL 321	Fish Biology	
A ECL 366	Natural History of Iowa Vertebrates	
A ECL 457	Herpetology	
A ECL 457L	Herpetology Laboratory	
A ECL 458	Ornithology	
A ECL 458L	Ornithology Laboratory	
A ECL 459	Mammalogy	
A ECL 459L	Mammalogy Laboratory	
One of the following:		3-5
AN S 214	Domestic Animal Physiology	
B M S 329	Anatomy and Physiology of Domestic Animals	
BIOL 335	Principles of Human and Other Animal Physiology	
BIOL 351	Comparative Chordate Anatomy	
BIOL 352	Vertebrate Histology	
BIOL 434	Endocrinology	
One of the following:		3
AN S 331	Domestic Animal Reproduction	
BIOL 313	Principles of Genetics	
BIOL 423	Developmental Biology	
GEN 320	Genetics, Agriculture and Biotechnology	
NREM 315	Genetics for Natural Resource Managers.	

At least three credits from the following list:		3-4
A ECL 401	Intro to Aquatic Animal Medicine	
A ECL 442	Aquaculture	
A ECL 454	Principles of Wildlife Disease	
AN S 319	Animal Nutrition	
AN S 493	Workshop in Animal Science	
BIOL 353	Introductory Parasitology	
MICRO 201	Introduction to Microbiology	
MICRO 201L	Introductory Microbiology Laboratory	
3 cr from course level 300-500 from A ECL or NREM		3
Plus additional credits from approved list to total 33 credit hours.		9-12
Total credits = 33		

WILDLIFE OPTION

A ECL 371	Ecological Methods	3
A ECL 451	Wildlife Ecology and Management	3
BIOL 313	Principles of Genetics	3
or GEN 320	Genetics, Agriculture and Biotechnology	
or NREM 315	Genetics for Natural Resource Managers.	
BIOL 366	Plant Systematics	4
Choose one of two Mathematics sequences		7-8
Sequence 1 (Calculus)		
MATH 143	Preparation for Calculus	
One of the following:		
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Sequence 2 (Statistics)		
NREM 240	Quantitative Problem Solving in Natural Resources	
or MATH 143:Preparation for Calculus		
STAT 301	Intermediate Statistical Concepts and Methods	
Six credits from the following list:		6
A ECL 457	Herpetology	
A ECL 457L	Herpetology Laboratory	
A ECL 458	Ornithology	
A ECL 458L	Ornithology Laboratory	
A ECL 459	Mammalogy	
A ECL 459L	Mammalogy Laboratory	
Six credits from the following list:		6
A ECL 455	International Wildlife Issues	
ENV S 293	Environmental Planning	
ENV S 383	Environmental Politics and Policies	
NREM 270	Foundations in Natural Resource Policy and History	

NREM 385	Natural Resource Policy	
NREM 452	Ecosystem Management	
NREM 460	Controversies in Natural Resource Management	
AM IN 313	Native Land, Water, and Resources	
At least three credits from the following list:		3-4
A ECL 415	Ecology of Freshwater Invertebrates, Plants, and Algae	
A ECL 454	Principles of Wildlife Disease	
A ECL 516	Avian Ecology	
A ECL 551	Behavioral Ecology	
ANTHR 317	Primate Behavior, Ecology, and Evolution	
BIOL 315	Biological Evolution	
BIOL 336	Ecological and Evolutionary Animal Physiology	
BIOL 354	Animal Behavior	
BIOL 354L	Laboratory in Animal Behavior	
BIOL 471	Introductory Conservation Biology	
EEOB 507	Advanced Animal Behavior	
ENT 370	Insect Biology	
At least five credits from the following list:		5
A ECL 415	Ecology of Freshwater Invertebrates, Plants, and Algae	
AGRON 317	Principles of Weed Science	
BIOL 355	Plants and People	
BIOL 454	Plant Anatomy	
BIOL 456	Principles of Mycology	
BIOL 474	Plant Ecology	
EEOB 564	Wetland Ecology	
FOR 356	Dendrology	
FOR 358	Forest Herbaceous Layer: Ecology and Identification.	
NREM 357	Midwestern Prairie Plants	
Plus additional credits from approved list to total 45 credit hours.		0-5
Total credits = 45		

Animal Ecology, B.S. - fisheries and aquatic sciences

Freshman

Fall	Credits	Spring	Credits
BIOL 211	3	BIOL 212	3
BIOL 211L	1	BIOL 212L	1
NREM 110	1	NREM 120	3
MATH 140	3	ENGL 150	3
CHEM 163	4	LIB 160	1
CHEM 163L	1	STAT 101 or 104	3-4

Required Elective	3	
	16	14-15

Sophomore

Fall	Credits	Spring	Credits
A ECL 365	4	A ECL 231	3
NREM 211	1	CHEM 231	3
A ECL 312	4	CHEM 231L	1
MATH Calculus Elective	4	SP CM 212	3
ENGL 250	3	Free Elective / Restricted Elective	3
		Required Elective	3
	16		16

Junior

Fall	Credits	Spring	Credits
PHYS 115	4	A ECL 321	3
PHYS 115L	1	Communications Elective	3
A ECL 486	3	Restricted Elective	3
A ECL 486L	1	Required Elective	3
Restricted Elective	6	Free Elective	3
Required Elective	3		
	18		15

Senior

Fall	Credits	Spring	Credits
Required Elective	3	Restricted Electives	7
Restricted Elective	6	Communications Elective	3
Free Electives	8	Free Electives	6
	17		16

* To complete degree program in 4 years students must maintain an average of 16 credits per semester.

** Initial math course is determined on the basis of high school math and placement test scores. A non-credit course (Math 10) maybe be required at additional costs.

*** In scheduling coursework, students should pay particular attention to courses with limited offerings (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course).

Animal Ecology, B.S. - interpretation of natural resources option

Freshman

Fall	Credits	Spring	Credits
BIOL 211	3	BIOL 212	3
BIOL 211L	1	BIOL 212L	1

NREM 110	1 NREM 120	3
Required Elective	3 ENGL 150	3
MATH 140**	3 STAT 101 or 104	3-4
CHEM 163	4 LIB 160	1
CHEM 163L	1	
16		14-15
Sophomore		
Fall	Credits Spring	Credits
A ECL 365	4 CHEM 231	3
NREM 211	1 CHEM 231L	1
A ECL 312	4 SP CM 212	3
Earth Science Elective	3 Free Elective/ Restricted Elective	3
ENGL 250	3 Required Elective	3
	A ECL 231	3
15		16
Junior		
Fall	Credits Spring	Credits
PHYS 115	4 NREM 330	3
PHYS 115L	1 Communications Elective	3
Botany or Restricted Elective	3-4 A ECL 366	3
ENT 370	3 Required Elective	3
Required Elective	3 BIOL 366	4
Free Elective	3	
17-18		16
Senior		
Fall	Credits Spring	Credits
Restricted Elective	6-7 Botany or Restricted Elective	3
Required Elective	3 Restricted Elective	3
Free Electives	7 Communications Elective	3
	NREM 303	1-3
	Free Electives (if needed)	8
16-17		18-20

* To complete degree program in 4 years students must maintain an average of 16 credits per semester.

** Initial math course is determined on the basis of high school math and placement test scores. A non-credit course (Math 10) maybe be required at additional costs.

*** In scheduling coursework, students should pay particular attention to courses with limited offerings (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course).

Animal Ecology, B.S. - Pre-vet & wildlife care option

Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
NREM 110	1 NREM 120	3
Required Elective	3 ENGL 150	3
MATH 140	3 STAT 101 or 104	3-4
CHEM 163 [#]	4 LIB 160	1
CHEM 163L [#]	1	
16		14-15

Sophomore

Fall	Credits Spring	Credits
A ECL 365	4 CHEM 231 [#]	3
NREM 211	1 CHEM 231L [#]	1
A ECL 312	4 SP CM 212	3
Restricted Elective	3 Free Elective/ Restricted Elective	3
ENGL 250	3 Required Elective	3
	A ECL 231	3
15		16

Junior

Fall	Credits Spring	Credits
PHYS 115	4 NREM 330	3
PHYS 115L	1 AN S 214 or B M S 329	3
Restricted Elective	3 Natural History Elective	3
Required Elective	3 Required Elective	3
Free Elective	6 Free Elective	6
17		18

Senior

Fall	Credits Spring	Credits
Restricted Elective	6 Restricted Elective	3
Genetics/Development Elective	3 Communications Elective	3
Required Elective	3 Free Elective	9
Communications Elective	3	
Free Elective	2	
17		15

* To complete degree program in 4 years students must maintain an average of 16 credits per semester.

- ** In scheduling coursework, students should pay attention to courses with limited offerings, (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course).
- # Admission to the ISU College of Veterinary Medicine requires a different set of Chemistry and Physics courses. Students should plan to enroll in Chemistry 177, 177L, 178, 331, 331L and 332. The Physics requirement is PHYS 131 and 131L.

Free Electives	6	
	18	15

- * To complete degree program in four years students must maintain an average of 16 credits per semester.
- ** Initial math course is determined on the basis of high school math and placement test scores. A non-credit course (Math 10) maybe be required at additional costs.
- *** In scheduling coursework, students should pay attention to courses with limited offerings, (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course). It is critical that students take A ECL 371 fall semester of the junior year and A ECL 451 fall semester of the senior year.

Animal Ecology, B.S. - wildlife option

Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
NREM 110	1 NREM 120	3
MATH 140	3 ENGL 150	3
CHEM 163	4 LIB 160	1
CHEM 163L	1 STAT 101 or 104	3-4
Required Elective	3	
	16	14-15

Sophomore

Fall	Credits Spring	Credits
A ECL 365	4 CHEM 231	3
NREM 211	1 CHEM 231L	1
A ECL 312	4 SP CM 212	3
MATH Calculus Elective	4 Free Elective / Restricted Elective	3
ENGL 250	3 Required Elective	3
	A ECL 231	3
	16	16

Junior

Fall	Credits Spring	Credits
PHYS 115	4 BIOL 366	4
PHYS 115L	1 Communications Elective	3
A ECL 371	3 Restricted Electives	6
Restricted Electives	6 Required Elective	3
Required Elective	3	
	17	16

Senior

Fall	Credits Spring	Credits
A ECL 451	3 Restricted Electives	9
Restricted Electives	6 Communications Elective	3
Required Elective	3 Free Elective	3

Minor - Animal Ecology

The department offers a minor in animal ecology that may be earned by taking 15 credits in the department including:

A ECL 312	Ecology	4
A ECL 365	Vertebrate Biology	4
NREM 120	Introduction to Renewable Resources	3

Plus four additional credits of Animal Ecology or NREM courses at the 300 level or above.

The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.