

# Fisheries, Wildlife, and Conservation Biology (BS): Fisheries Science Concentration

Fisheries, Wildlife and Conservation Biology (FWCB) major prepares students to manage and conserve populations of fish and wildlife in their natural habitats. This STEM (Science, Technology, Engineering and Mathematics) major gives students the skills they need to observe, research, monitor and assess the impact of environmental change, human behavior and public policy on wild populations of animals. Using a combination of lab work, technology and field study, students develop conservation strategies that ensure the long-term health of fish and wildlife populations.

After sophomore year, students spend six weeks in summer field courses. During "summer camp" experience, students learn hands-on fish and wildlife management techniques in locations across the state. From plant and animal identification and bird mist netting to camera-trapping and radio telemetry, students gain experiences that prepare them for careers after graduation. FWCB students have the option to substitute the summer field course with approved internships or study abroad courses.

The Fisheries concentration meets the qualifications for certification by the American Fisheries Society. The fisheries concentration includes required courses in chemistry, aquatic ecology, and biology of fish that are not required in the other FWCB concentrations.

## Contact

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## Plan Requirements

First Year		Hours
ENV 100	Student Success in Environmental First Year	1
ENV 101	Exploring the Environment	2
MA 131	Calculus for Life and Management Sciences A	3
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
BIO 183	Introductory Biology: Cellular and Molecular Biology	4
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory	4
Acad Writing Research (p. 2) <sup>1</sup>		4
FW 221	Conservation of Natural Resources	3
<b>Hours</b>		<b>25</b>

## Second Year

FOR 172	Forest System Mapping and Mensuration I	2
PY 131	Conceptual Physics	4
COM 110 or COM 112	Public Speaking or Interpersonal Communication	3
CH 201 & CH 202	Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory	4
AEC 360 or PB 360	Ecology or Ecology	4
Select one of the following Organic Chemistry combinations:		4
CH 220 & CH 222	Introductory Organic Chemistry and Organic Chemistry I Lab	
CH 221 & CH 222	Organic Chemistry I and Organic Chemistry I Lab	
Economics Elective (p. )		3
Communication Elective (p. 2)		3
<b>Hours</b>		<b>27</b>

## Summer

Experiential Learning (p. 2)	6
<b>Hours</b>	<b>6</b>

## Third Year

FW 353	Wildlife Management	3
FW 373	Vertebrate Natural History	3
FW 411	Human Dimensions of Wildlife and Fisheries	3
AEC 420	Introduction to Fisheries Science	3
Select one of the following Genetics courses:		3-4
FW 402	Genetics for Wildlife Management	
GN 301	Genetics in Human Affairs	
GN 311	Principles of Genetics	
ST 311	Introduction to Statistics	3
ENG 333	Communication for Science and Research	3
GIS 280	Introduction to GIS	3
ENT 201	Insects and People	3
<b>Hours</b>		<b>27</b>

## Fourth Year

FW 415	Professional Development in Fisheries, Wildlife, and Conservation Biology	1
AEC 441	Biology of Fishes	3
Quantitative Elective (p. 2)		3
Policy Elective (p. 2)		3
Aquatic Elective (p. 2)		3
Physical Science Elective (p. 2)		3
Biology Elective (p. 3)		3
Technical Elective (p. 3)		3
Technical Elective (p. 3)		2
<b>Hours</b>		<b>24</b>
<b>Total Hours</b>		<b>109</b>

<sup>1</sup> A grade of C- or better is required.

Code	Title	Hours
<b>GEP Courses</b>		
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		6
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		2
GEP Elective ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/</a> ) (Verify Requirements)		
GEP Foundations of American Democracy ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-fad/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-fad/</a> ) (verify requirement)		
World Language Proficiency ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/</a> ) (Verify Requirements)		
<b>Total Hours</b>		<b>11</b>

## Acad Writing Research

Code	Title	Hours
<b>Acad Writing Research</b>		
ENG 101	Academic Writing and Research	4
FLE 101	Academic Writing and Research	4
<b>Transfer Sequence</b>		
ENG 202	Disciplinary Perspectives in Writing	3
ENG 1GEP		3

## Communication Electives

Code	Title	Hours
COM 201	Introduction to Persuasion Theory	3
COM 211	Argumentation and Advocacy	3
COM 226	Introduction to Public Relations	3
COM 289	Science Communication and Public Engagement	3
COM 301	Presentational Speaking	3
EMS 350	Teaching Environmental Education	3
ENG 214	Introduction to Editing	3
ENG 216	Technologies for Texts	3
ENG 316	Introduction to News and Article Writing	3
PRT 485	Environmental Education in Practice	3

## Economics Electives

Code	Title	Hours
ARE 201	Introduction to Agricultural & Resource Economics	3
ARE 201A	Introduction to Agricultural & Resource Economics	3
EC 201	Principles of Microeconomics	3
EC 205	Fundamentals of Economics	3
NR 219	Natural Resource Markets	3

## Experiential Learning

Code	Title	Hours
	Summer Camp <sup>2</sup>	
FW 311	Piedmont Wildlife Ecology and Management	3

FW 312	Fisheries Techniques and Management	1
FW 313	Mountain Wildlife Ecology and Management	1
FW 314	Coastal Ecology and Management	1
	Internship <sup>2</sup>	
FW 492	External Learning Experience	3-6
	Study Abroad <sup>2</sup>	
FW 405	Tropical Wildlife Ecology	3
FW 445	Human Dimensions of Conservation Biology in the Bahamas	3

<sup>2</sup> Six credits of experiential learning can be accomplished by completing one of the following four options:

- 1) Summer Camp field courses (FW 311, FW 312, FW 313, FW 314)
- 2) Two FWCB approved internships (FW 492)
- 3) Two study abroad experiences (FW 405, FW 445, or other FWCB-approved wildlife study abroad)
- 4) One FWCB-approved internship and one study abroad experience.

Click here (<https://cnr.ncsu.edu/fer/undergraduate/internships-and-summer-camp/>) and here (<https://cnr.ncsu.edu/fer/undergraduate/study-abroad/>) for more information about FWCB's experiential learning opportunities. Click here (<https://packabroad.ncsu.edu/?FuseAction=Programs.ViewProgramAngular&id=3659>) to view additional opportunities offered through NCSU's Pack Abroad portal.

## Quantitative Electives

Code	Title	Hours
MA 231	Calculus for Life and Management Sciences B	3
MA 241	Calculus II	4
NR 300	Natural Resource Measurements	4
ST 312	Introduction to Statistics II	3
MA 107	Precalculus I (Only for cases when math placement exam results determine that pre-calculus is necessary before enrolling in MA 131.)	3

## Policy Electives

Code	Title	Hours
ARE 309	Environmental Law & Economic Policy	3
NR 460	Renewable Natural Resource Management and Policy	3
PS 320	U.S. Environmental Law and Politics	3
PS 336	Global Environmental Politics	3

## Aquatic Electives

Code	Title	Hours
AEC 380	Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy	3
AEC 419	Freshwater Ecology	4
MEA 200	Introduction to Oceanography	3
MEA 220	Marine Biology	3

## Physical Science Electives

Code	Title	Hours
CH 201	Chemistry - A Quantitative Science	3
CH 202	Quantitative Chemistry Laboratory	1
CH 223	Organic Chemistry II	3

ES 200	Climate Change and Sustainability	3
ES 300	Energy and Environment	3
MEA 100	Earth System Science: Exploring the Connections	4
MEA 130	Introduction to Weather and Climate	3
MEA 200	Introduction to Oceanography	3
MEA 210	Oceanography Lab	1
MEA 220	Marine Biology	3
MEA 250	Introduction to Coastal Environments	3
MEA 323	Geochemistry of Natural Waters	3
PY 212	College Physics II	4

## Biology Electives

Code	Title	Hours
AEC 409	Ecology and Conservation of Freshwater Invertebrates	4
ENT 425	General Entomology	3
ZO 250	Animal Anatomy and Physiology	4
ZO 402	Invertebrate Biology	4
ZO 410	Introduction to Animal Behavior	3

## Technical Electives

Code	Title	Hours
FW 402	Genetics for Wildlife Management	3
FW 404	Wildlife Habitat Management	3
FW 413	Herpetology	4
FW 453	Principles of Wildlife Science	4
AEC 245	Practicing Conservation Ecology	3
AEC 370	Parasite and Disease Ecology	3
AEC 371	Parasite and Disease Ecology Lab	1
AEC 380	Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy	3
AEC 384	Tropical Ecology in a Changing World	3
AEC 390	Community Ecology	3
AEC 400	Applied Ecology	3
AEC 409	Ecology and Conservation of Freshwater Invertebrates	4
AEC 419	Freshwater Ecology	4
AEC 441	Biology of Fishes	3
AEC 460	Field Ecology and Methods	4
AEC 470	Urban Ecology	3
ANS 230	Animal Nutrition	3
CS 230	Introduction to Agroecology	3
CS 415	Integrated Pest Management	3
DSC 201	Introduction to R/Python for Data Science	1
DSC 202	Introduction to Data Visualization	1
DSC 205	Data Communication	1
ENT 207	Insects and Human Disease	3
ENT 212	Basic Entomology	1
ENT 401	Honey Bee Biology and Management	3
ENT 402	Forest Entomology	3
ENT 425	General Entomology	3
ES 113	Earth from Space	3
ES 150	Water and the Environment	3

ES 200	Climate Change and Sustainability	3
ES 300	Energy and Environment	3
FOR 248	Forest History, Technology and Society	3
FOR 252	Introduction to Forest Science	3
FOR 304	Theory of Silviculture	4
FOR 318	Forest Pathology	3
FOR 330	North Carolina Forests	3
FOR 353	GIS and Remote Sensing for Environmental Analysis and Assessment	3
FOR 401	Dendrology	4
FOR 402	Forest Entomology	3
FOR 414	World Forestry	3
FOR 420	Watershed and Wetlands Hydrology	4
FOR 472	Forest Soils	4
MEA 200	Introduction to Oceanography	3
MEA 210	Oceanography Lab	1
MEA 220	Marine Biology	3
MEA 250	Introduction to Coastal Environments	3
MEA 251	Introduction to Coastal Environments Laboratory	1
MEA 409	Watershed Forensics	3
MEA 449	Principles of Biological Oceanography	3
NR 203	Humans and the Environment	3
NR 300	Natural Resource Measurements	4
NR 350	International Sustainable Resource Use	4
NR 400	Natural Resource Management	4
NR 420	Watershed and Wetlands Hydrology	4
NR 421	Wetland Science and Management	3
NR 484	Environmental Impact Assessment	4
PB 200	Plant Life	4
PB 220	Local Flora	3
PB 250	Plant Biology	4
SSC 185	Land and Life	3
SSC 200	Soil Science	3
ZO 233	Human-Animal Interactions	3
ZO 250	Animal Anatomy and Physiology	4
ZO 317	Primate Ecology and Evolution	3
ZO 350	Animal Phylogeny and Diversity	4
ZO 402	Invertebrate Biology	4
MEA 252	Biology of Marine Mammals <sup>!</sup>	3
MEA 350	Marine Conservation Biology <sup>!</sup>	3
AEC 424	Marine Fisheries Ecology <sup>!</sup>	3

<sup>!</sup> Course offered only during Semester at CMAST, a 'study away' program at NC State's Center for Marine Sciences and Technology, in Morehead City. Click here (<https://cmast.ncsu.edu/programs-at-cmast/semester-cmast/>) for more information about this program.

## Semester Sequence

This is a sample.

**Critical Path Courses** – Identify using the code (CP) which courses are considered critical path courses which represent specific major

requirements that are predictive of student success in a given program/plan.

### First Year

Fall Semester		Hours
ENV 100 & ENV 101	Student Success in Environmental First Year and Exploring the Environment	3
MA 131	Calculus for Life and Management Sciences A	3
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
FW 221	Conservation of Natural Resources (CP)	3
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
<b>Hours</b>		<b>14</b>

### Spring Semester

CH 101	Chemistry - A Molecular Science	3
CH 102	General Chemistry Laboratory	1
BIO 183	Introductory Biology: Cellular and Molecular Biology	4
ENG 101	Academic Writing and Research <sup>1</sup>	4
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
<b>Hours</b>		<b>16</b>

### Second Year

#### Fall Semester

FOR 172	Forest System Mapping and Mensuration I	2
Select one of the following:		4
CH 220 & CH 222	Introductory Organic Chemistry and Organic Chemistry I Lab	
CH 221 & CH 222	Organic Chemistry I and Organic Chemistry I Lab	
Communication Elective (p. 1)		3
Economics Elective (p. 1)		3
<b>Hours</b>		<b>12</b>

#### Spring Semester

AEC 360 or PB 360	Ecology (CP) or Ecology	4
CH 201 & CH 202	Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory	4
COM 110 or COM 112	Public Speaking or Interpersonal Communication	3
PY 131	Conceptual Physics	4
<b>Hours</b>		<b>15</b>

### Summer

Experiential Learning (p. 2)		6
<b>Hours</b>		<b>6</b>

### Third Year

#### Fall Semester

GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
ENG 333	Communication for Science and Research (CP)	3
FW 353	Wildlife Management (CP)	3
ST 311	Introduction to Statistics	3
Select one of the following:		3-4
FW 402	Genetics for Wildlife Management	
GN 301	Genetics in Human Affairs	
GN 311	Principles of Genetics	
<b>Hours</b>		<b>15</b>

#### Spring Semester

FW 373	Vertebrate Natural History (CP)	3
FW 411	Human Dimensions of Wildlife and Fisheries	3
AEC 420	Introduction to Fisheries Science (CP)	3
ENT 201	Insects and People (GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> ))	3
GIS 280	Introduction to GIS	3
<b>Hours</b>		<b>15</b>

### Fourth Year

#### Fall Semester

Quantitative Elective (p. 2)		3
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )		2-3
Policy Elective (p. 2)		3
Aquatic Elective (CP) (p. 2)		3
FW 415	Professional Development in Fisheries, Wildlife, and Conservation Biology	1
<b>Hours</b>		<b>12</b>

#### Spring Semester

AEC 441	Biology of Fishes (CP)	3
Biology Elective (p. 3)		3
Physical Science Elective (p. 2)		3
Technical Elective (CP) (p. 3)		3
GEP Elective ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
<b>Hours</b>		<b>15</b>
<b>Total Hours</b>		<b>120</b>

<sup>1</sup> A grade of C- or better is required.

## Career Opportunities

Graduates are prepared for graduate school and entry-level professional positions in state and federal government agencies, non-profit organizations and private industry. Upon graduation, students are qualified to seek certification from The Wildlife Society or the American Fisheries Society.

## Career Titles

- Conservation Scientist
- Environmental Scientist
- Environmental Scientist and Protection Technician
- Fisheries Manager
- Forest and Conservation Technician
- Forester

## Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required)

This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students)

A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

North Carolina Chapter of the Wildlife Society (<https://www.nctws.org/>)

North Carolina Chapter of the American Fisheries Society (<https://nc.fisheries.org/>)