Twin Cities Campus

Fisheries, Wildlife, and Conservation Biology B.S.

Fisheries, Wildlife, and Conservation Biology

College of Food, Agricultural and Natural Resource Sciences

- Program Type: Baccalaureate
- Requirements for this program are current for Spring 2019
- Required credits to graduate with this degree: 120
- Required credits within the major: 74 to 89
- This program requires summer terms.
- Degree: Bachelor of Science

The fisheries, wildlife, and conservation biology curriculum gives students a broad science background emphasizing biological and environmental sciences and other coursework needed for careers in fisheries, wildlife, conservation biology, and other natural resource and environmental fields. Graduates are prepared to research, plan, and implement the management, protection, and enhancement of fisheries and aquatic resources, wildlife resources, and biological diversity. Graduates find employment as fisheries and wildlife scientists and managers, naturalists, zoo biologists, environmental biologists, environmental educators, and other natural resource professionals. The program also provides students with the fundamental science background needed to enter a wide variety of graduate programs in biological and natural resource sciences, as well as professional programs in veterinary medicine, environmental law, and environmental education.

Students select an area of specialization, usually by the end of the sophomore year. Areas of specialization include conservation biology, fisheries and aquatic sciences, and wildlife.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

For information about University of Minnesota admission requirements, visit the Office of Admissions website.

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the liberal education requirements.Required courses for the major or minor in which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

After completing a core curriculum that includes liberal education, communications, basic science, mathematics, and an orientation to the fields of fisheries, wildlife, and conservation biology, students complete additional credits in one of three areas of specialization: fisheries and aquatic sciences, wildlife, or conservation biology. Some of the core curriculum courses also fulfill diversified core and designated theme requirements. Electives to complete the required 120 credits are chosen in consultation with a program advisor.

Students may also fulfill the minimum requirements for admission to the University's College of Veterinary Medicine and other colleges of veterinary medicine by completing a bachelor's degree in fisheries and wildlife within any of the three areas of specialization.

All major requirements must be taken A-F (unless only offered S-N), and students must earn a grade of at least C- or better.

Mathematical Thinking

Take 1 or more course(s) from the following:

- MATH 1142 - Short Calculus [MATH] (4.0 cr)
- MATH 1271 - Calculus I [MATH] (4.0 cr)

Take 1 or more course(s) from the following:

- FW 4001 - Biometry (4.0 cr)
- ESPM 3012 - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)

Chemical and Biological Sciences

CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
BIOL 1009 - General Biology [BIOL] (4.0 cr)

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BIOL 2012 *{Inactive}*(4.0 cr)
FW 4301 - Conservation Genetics (3.0 cr)
or GCD 3022 - Genetics (3.0 cr)
Take 1 or more course(s) from the following:
•EEB 3807 - Ecology (4.0 cr)
•EEB 3407 - Ecology (3.0 cr)
•EEB 3408W - Ecology [WI] (4.0 cr)

Fisheries, Wildlife, and Conservation Biology Courses
FW 1001 - Orientation in Fisheries, Wildlife, and Conservation Biology (1.0 cr)
FW 2001W - Introduction to Fisheries, Wildlife, and Conservation Biology [ENV, WI] (3.0 cr)
FW 3104 - Skills for Field Techniques in Habitat Assessment, Research, and Conservation (2.0 cr)
FW 3106 - Vegetation Sampling for Habitat Assessments (1.0 cr)
FW 3108 - Field Methods in Research and Conservation of Vertebrate Populations (3.0 cr)

Professional Experience
All students must take either CFAN 3096 or ESPM 4096. Students have three options for fulfilling the professional experience required in these courses: an official internship, a supervised research experience of at least 100 hours (e.g. UROP), or a major capstone research project in a study abroad program. Study abroad option must be discussed and approved by the FWCB major coordinator. Research option must be discussed and approved by a FWCB faculty supervisor.
ESPM 4096 *{Inactive}*(1.0 cr)
or CFAN 3096 - Making the Most of your Professional Experience (1.0 cr)

Interdisciplinary Learning
Take 0 - 1 course(s) from the following:
•FW 2001W - Introduction to Fisheries, Wildlife, and Conservation Biology [ENV, WI] (3.0 cr)

Experiential Learning
Take 0 - 1 course(s) from the following:
•CFAN 3096 - Making the Most of your Professional Experience (1.0 cr)
•ESPM 4096 *{Inactive}*(1.0 cr)

Upper Division Writing Intensive within the Major
Students are required to take one upper division writing intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.
Take 0 - 1 course(s) from the following:
•EEB 3408W - Ecology [WI] (4.0 cr)
•EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
•ESPM 3011W - Ethics in Natural Resources [CIV, WI] (3.0 cr)
•ESPM 3202W - Environmental Conflict Management, Leadership, and Planning [WI] (3.0 cr)
•ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
•ESPM 4061W - Water Quality and Natural Resources [ENV, WI] (3.0 cr)
•FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
•FW 5604W *{Inactive}*[WI] (3.0 cr)
•WRIT 3562W - Technical and Professional Writing [WI] (4.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.

Conservation Biology
The conservation biology specialization is for students interested in careers dealing with a broad range of conservation issues in aquatic or terrestrial habitats. Positions typically focus on protection of endangered species and management for biodiversity. Careers as environmental educators or naturalists are also options.

All required courses in the specialization must be taken A-F and completed with a grade of at least C-.

Communications
Take 1 or more course(s) from the following:
•AECM 2421W - Professional and Oral Communication for Agriculture, Food & the Environment [WI] (3.0 cr)
•COMM 1101 - Introduction to Public Speaking [CIV] (3.0 cr)
•WRIT 3562W - Technical and Professional Writing [WI] (4.0 cr)

Policy, Human Behavior, and Planning
Take exactly 1 course(s) from the following:
•ESPM 3202W - Environmental Conflict Management, Leadership, and Planning [WI] (3.0 cr)

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•ESPM 3245 - Sustainable Land Use Planning and Policy [ENV] (3.0 cr)
•FNRM 3101 - Park and Protected Area Tourism (3.0 cr)
Take exactly 2 course(s) from the following:
•ESPM 3011W - Ethics in Natural Resources [CIV, WI] (3.0 cr)
•ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
•ESPM 3271 - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)
•FW 3925 - Human Dimensions of Fisheries and Wildlife Management (3.0 cr)
•ESPM 3261 - Economics and Natural Resources Management [SOCS, ENV] (4.0 cr)
or APEC 3611W - Environmental and Natural Resource Economics [ENV, WI] (3.0 cr)
•GCC 3031 - The Global Climate Challenge: Creating an Empowered Movement for Change [CIV] (3.0 cr)
or GCC 5031 - The Global Climate Challenge: Creating an Empowered Movement for Change [CIV] (3.0 cr)

Organismal Biology

Take exactly 1 course(s) from the following:
•FW 4101 - Herpetology (4.0 cr)
•FW 2003 - Introduction to Marine Biology (3.0 cr)
•FNRM 1101 - Dendrology: Identifying Forest Trees and Shrubs (3.0 cr)
•FW 4136 - Ichthyology (4.0 cr)
•ENT 5021 - Insect Biodiversity and Evolution (4.0 cr)
•ENT 4361 - Aquatic Insects (3.0 cr)
•PMB 4321 - Minnesota Flora (3.0 cr)
•PMB 4511 - Flowering Plant Diversity (3.0 cr)
•FW 4401 - Fish Physiology and Behavior (3.0 cr)
•EEB 4129 - Mammalogy (4.0 cr)
or EEB 4839 - Field Studies in Mammalogy (4.0 cr)
•EEB 4844 - Field Ornithology (3.0 cr)
or EEB 4134 - Introduction to Ornithology (4.0 cr)

Ecosystem Ecology

Take exactly 1 course(s) from the following:
•FNRM 3204 - Landscape Ecology and Management (3.0 cr)
•EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
•ESPM 3575 - Wetlands (3.0 cr)
•FNRM 3104 - Forest Ecology (4.0 cr)
•FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
•EEB 5601 - Limnology (3.0 cr)
•FNRM 3203 - Forest Fire and Disturbance Ecology (3.0 cr)
•GCC 5008 - Policy and Science of Global Environmental Change [ENV] (3.0 cr)

Conservation Biology

All courses are required.
FNRM 3131 - Geographical Information Systems (GIS) for Natural Resources [TS] (4.0 cr)
FW 4102 - Principles of Conservation Biology [ENV] (3.0 cr)
PMB 2022 - General Botany (3.0 cr)
FW 5051 - Analysis of Populations (4.0 cr)
or FW 5601 *{Inactive}*(3.0 cr)

Management and Restoration

Take exactly 1 course(s) from the following:
•ESPM 3251 - Natural Resources in Sustainable International Development [GP] (3.0 cr)
•ESPM 4601 - Environmental Pollution (3.0 cr)
•ESPM 5071 - Ecological Restoration (4.0 cr)
•FNRM 3411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
•EEB 3603 - Science, Protection, and Management of Aquatic Environments (3.0 cr)
•FW 4103 - Principles of Wildlife Management (3.0 cr)
•FW 5604W *{Inactive}*[WI] (3.0 cr)

Additional Course

Students must select at least one additional course from any of the following course groups: 2. Organismal Biology, 3. Ecosystem Ecology, or 4. Management and Restoration.
Take 1 or more course(s) totaling 3 - 4 credit(s) from the following:
•FW 4101 - Herpetology (4.0 cr)
•FW 2003 - Introduction to Marine Biology (3.0 cr)
•FNRM 1101 - Dendrology: Identifying Forest Trees and Shrubs (3.0 cr)
•FW 4136 - Ichthyology (4.0 cr)
•ENT 5021 - Insect Biodiversity and Evolution (4.0 cr)
•ENT 4361 - Aquatic Insects (3.0 cr)
•PMB 4321 - Minnesota Flora (3.0 cr)
•PMB 4511 - Flowering Plant Diversity (3.0 cr)
•FW 4401 - Fish Physiology and Behavior (3.0 cr)
•FNRM 3204 - Landscape Ecology and Management (3.0 cr)

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•EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
•ESPM 3575 - Wetlands (3.0 cr)
•FNRM 3104 - Forest Ecology (4.0 cr)
•FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
•EEB 5601 - Limnology (3.0 cr)
•FNRM 3203 - Forest Fire and Disturbance Ecology (3.0 cr)
•GCC 5008 - Policy and Science of Global Environmental Change [ENV] (3.0 cr)
•ESPM 3251 - Natural Resources in Sustainable International Development [GP] (3.0 cr)
•ESPM 4601 - Environmental Pollution (3.0 cr)
•ESPM 5071 - Ecological Restoration (4.0 cr)
•FNRM 3411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
•EEB 3603 - Science, Protection, and Management of Aquatic Environments (3.0 cr)
•FW 4103 - Principles of Wildlife Management (3.0 cr)
•FW 5604W *{Inactive}*[WI] (3.0 cr)
•EEB 4129 - Mammalogy (4.0 cr)
or EEB 4839 - Field Studies in Mammalogy (4.0 cr)
•EEB 4134 - Introduction to Ornithology (4.0 cr)
or EEB 4844 - Field Ornithology (3.0 cr)

Fisheries and Aquatic Sciences

The fisheries and aquatic sciences area of specialization is for students who wish to pursue careers in fisheries and aquatic resource science, management, and administration, fish hatchery management, or aquaculture, aquatic education, and aquatic environmental assessment. The curriculum meets the education criteria for the Certified Fisheries Professional designation established by the American Fisheries Society, the major professional organization for fisheries scientists and managers in North America.

All required courses in the specialization must be taken A-F and completed with a grade of at least C-.

Communications
Take 1 or more course(s) from the following:
•AECM 2421W - Professional and Oral Communication for Agriculture, Food & the Environment [WI] (3.0 cr)
•COMM 1101 - Introduction to Public Speaking [CIV] (3.0 cr)
•WRIT 3562W - Technical and Professional Writing [WI] (4.0 cr)

Human Dimensions
Take 2 or more course(s) totaling 6 or more credit(s) from the following:
•FW 3925 - Human Dimensions of Fisheries and Wildlife Management (3.0 cr)
•ESPM 3202W - Environmental Conflict Management, Leadership, and Planning [WI] (3.0 cr)
•ESPM 3245 - Sustainable Land Use Planning and Policy [ENV] (3.0 cr)
•FNRM 4232W - Managing Recreational Lands [WI] (4.0 cr)
•ESPM 3011W - Ethics in Natural Resources [CIV, WI] (3.0 cr)
•ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
•ESPM 3271 - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)

Fisheries and Aquatic Biology
Take 2 or more course(s) from the following:
•FW 4401 - Fish Physiology and Behavior (3.0 cr)
•FW 5459 - Stream and River Ecology (3.0 cr)
•FW 5601 *{Inactive}*(3.0 cr)

Principles
FW 4136 - Ichthyology (4.0 cr)
FW 4107 - Principles of Fisheries Science and Management (3.0 cr)
Take exactly 1 course(s) from the following:
•EEB 3603 - Science, Protection, and Management of Aquatic Environments (3.0 cr)
•EEB 5601 - Limnology (3.0 cr)
•FW 2003 - Introduction to Marine Biology (3.0 cr)

Other Biological Courses
Community and Ecosystem Ecology
Take 1 or more course(s) from the following:
•FW 2003 - Introduction to Marine Biology (3.0 cr)
•FW 4101 - Herpetology (4.0 cr)
•ENT 4361 - Aquatic Insects (3.0 cr)
•HORT 4601 *{Inactive}*(4.0 cr)
•VPM 3102 *{Inactive}*(3.0 cr)
•ESPM 3015 - Invasive Plants and Animals: Ecology and Management (3.0 cr)

Physical Sciences
Depending on your course selection, you will need to take 3 or 4 courses to meet the minimum 11-credit requirement.
Recommended for students interested in a graduate degree or planning a career focused on research.
PHYS

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PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
or PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 cr)
CHEM
CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
•ESPM 3131 - Environmental Physics (3.0 cr)
•BIOC 2011 - Biochemistry for the Agricultural and Health Sciences (3.0 cr)
•BIOC 3021 - Biochemistry (3.0 cr)
•CHEM 3101 - Introductory Analytical Chemistry Lecture (3.0 cr)
CHEM 3111 - Introductory Analytical Chemistry Lab (2.0 cr)
•CHEM 2301 - Organic Chemistry I (3.0 cr)
CHEM 2311 - Organic Lab (4.0 cr)
or Recommended for students planning on a career in professional or managerial fields such as the fisheries aspects of watershed management, applied fisheries management or fisheries within the broader ecosystem. 11-13 cr.
PHYS 1001W - Energy and the Environment [PHYS, ENV, WI] (4.0 cr)
Take 1 or more course(s) from the following:
•BIOC 2011 - Biochemistry for the Agricultural and Health Sciences (3.0 cr)
•CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
Take 1 or more course(s) from the following:
•ESPM 3111 - Hydrology and Water Quality Field Methods (3.0 cr)
•FNRM 3114 - Hydrology and Watershed Management (3.0 cr)

Wildlife

The wildlife specialization is for students who wish to pursue careers in wildlife science, management, and administration, zoo biology, terrestrial ecology, environmental assessment, or education. With proper selection of electives, students can meet the education criteria for the Certified Wildlife Biologist designation established by the Wildlife Society, the major professional organization for wildlife scientists and managers in North America.

All required courses in the specialization must be taken A-F and completed with a grade of at least C-.

Communications
FW 4603 - Preparing Research Proposals for Wildlife Biologists (1.0 cr)
External Communications
Take 2 or more course(s) from the following:
•AECM 2421W - Professional and Oral Communication for Agriculture, Food & the Environment [WI] (3.0 cr)
•COMM 1101 - Introduction to Public Speaking [CIV] (3.0 cr)
•WRIT 3152W - Writing on Issues of Science and Technology [WI] (3.0 cr)
•WRIT 3221W - Communication Modes and Methods [WI] (3.0 cr)
•WRIT 3257 - Technical and Professional Presentations (3.0 cr)
•WRIT 3562W - Technical and Professional Writing [WI] (4.0 cr)
Human Dimensions
Take 2 or more course(s) from the following:
•ESPM 3202W - Environmental Conflict Management, Leadership, and Planning [WI] (3.0 cr)
•ESPM 3245 - Sustainable Land Use Planning and Policy [ENV] (3.0 cr)
•ESPM 3011W - Ethics in Natural Resources [CIV, WI] (3.0 cr)
•ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
•ESPM 3271 - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)
•FW 3925 - Human Dimensions of Fisheries and Wildlife Management (3.0 cr)
Animals and Plants
PMB 2022 - General Botany (3.0 cr)
Take 2 or more course(s) from the following:
•FW 4101 - Herpetology (4.0 cr)
•EEB 4129 - Mammalogy (4.0 cr)
or EEB 4839 - Field Studies in Mammalogy (4.0 cr)
•EEB 4134 - Introduction to Ornithology (4.0 cr)
or EEB 4844 - Field Ornithology (3.0 cr)
Take 1 or more course(s) from the following:
•FNRM 1101 - Dendrology: Identifying Forest Trees and Shrubs (3.0 cr)
•PMB 4321 - Minnesota Flora (3.0 cr)
•PMB 4511 - Flowering Plant Diversity (3.0 cr)
Community and Ecosystem Ecology
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
•FNRM 3104 - Forest Ecology (4.0 cr)
•FNRM 3204 - Landscape Ecology and Management (3.0 cr)

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•EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
•ESPM 3575 - Wetlands (3.0 cr)
•ESPM 3108 - Ecology of Managed Systems [ENV] (3.0 cr)
•ESPM 5071 - Ecological Restoration (4.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)

Wildlife

FW 4103 - Principles of Wildlife Management (3.0 cr)
FNRM 3131 - Geographical Information Systems (GIS) for Natural Resources [TS] (4.0 cr)
FW 5051 - Analysis of Populations (4.0 cr)
FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)

Physical Sciences

Take 1 or more course(s)
PHYS 1001W - Energy and the Environment [PHYS, ENV, WI] (4.0 cr)
or PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
or PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 cr)

Pre-Veterinary Medicine

This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

The doctor of veterinary medicine degree (DVM) is a rigorous four-year professional program preceded by three to four years of pre-professional study. Although a bachelor's degree is not required for admission to the DVM program, approximately 70 percent of the students entering the program each year have completed their bachelor's degree. Fisheries and wildlife is one of the primary college majors at the University of Minnesota that offers a pre-veterinary program.

The following courses are required in addition to the fisheries and wildlife core requirements and courses in one of three areas of specialization. These courses may be substituted for the "suggested courses" in the areas of specialization.

Required Courses

CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
BIOC 3021 - Biochemistry (3.0 cr)
CHEM 2301 - Organic Chemistry I (3.0 cr)
CHEM 2311 - Organic Lab (4.0 cr)
CHEM 2302 - Organic Chemistry II (3.0 cr)
VBS 2032 - General Microbiology With Laboratory (5.0 cr)
or MICB 3301 - Biology of Microorganisms (5.0 cr)
or MICB 3303 - Biology of Microorganisms (without laboratory) (3.0 cr)
PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
PHYS 1102W - Introductory College Physics II [PHYS, WI] (4.0 cr)
or PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 cr)
PHYS 1202W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1301W - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
PHYS 1302W - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)

Other Recommended Courses

The following courses are not required to complete the pre-vet requirements.
Take 0 or more course(s) from the following:
•ANSC 1101 - Introductory Animal Science (4.0 cr)
•FNRM 3131 - Geographical Information Systems (GIS) for Natural Resources [TS] (4.0 cr)
•FW 4103 - Principles of Wildlife Management (3.0 cr)
•ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
•ESPM 3575 - Wetlands (3.0 cr)
•FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
•EEB 4129 - Mammalogy (4.0 cr)
•ESPM 3011W - Ethics in Natural Resources [CIV, WI] (3.0 cr)
•FNRM 1101 - Dendrology: Identifying Forest Trees and Shrubs (3.0 cr)
•FW 5051 - Analysis of Populations (4.0 cr)
•EEB 4134 - Introduction to Ornithology (4.0 cr)

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