



Paul Smith's College
THE COLLEGE OF THE ADIRONDACKS

School of Forestry and Natural Resources

Fisheries and Wildlife Sciences

Baccalaureate Program Planning Guide

Academic Year 2010-2011

This guide belongs to:

Note: this is a **GUIDE** to planning. Official designation of courses is maintained by the Registrar's office.

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Program Mission

Prepare students for entry-level positions or graduate school programs in fisheries and wildlife conservation or related fields.

Program Philosophy

The Fisheries and Wildlife Science Program holds to the philosophy that a series or web of experiential learning opportunities provides a means and model for ‘deeper’, effective learning of science and of management as a continuous process and as a means for personal growth, reflection, and development while a student attends Paul Smith’s College. Furthermore, the program encourages fisheries and wildlife science students to become proficient at observation, comprehension, and enjoyment of the landscape where our college resides, embracing Aldo Leopold’s views of a liberal education (1942 essay):

“Liberal education in wildlife is not merely a dilute dosage of technical education. It calls for somewhat different teaching materials and sometimes even different teachers. The objective is to teach the student to see the land, to understand what he sees, and enjoy what he understands. I say land rather than wildlife, because wildlife cannot be understood without understanding the landscape as a whole. Such teaching could well be called land ecology rather than wildlife, and could serve very broad educational purposes.”

Aldo Leopold

Program Themes and Goals

Theme 1. Science Foundations and Fisheries and Wildlife Conservation. *This theme emphasizes learning introductory knowledge, skills, and competencies in lower division and advanced knowledge, skills, and competencies in upper division courses.*

Goals:

1. Apply science as a body of knowledge and as a method of inquiry.
2. Apply key concepts of biology to fisheries and wildlife organisms, populations, communities, and their habitats.
3. Apply key concepts of ecology to fisheries and wildlife organism, populations, communities, and their habitats.
4. Apply basic math skills to problem solving in fisheries and wildlife populations and their habitat.
5. Apply key principles of physics and chemistry to fisheries and wildlife adaptations.

Theme 2. Major Issues facing Fisheries and Wildlife Conservation. *The major issues are habitat loss and fragmentation, air and water quality, non-indigenous species, resource exploitation, and climate change. This theme emphasizes learning about their history and effects, and the rationale and application of assessment and monitoring programs.*

Goals:

1. Develop a comprehensive understanding of the relation between trends in *human population growth* and *major issues* (past, present, and future) affecting fish and wildlife populations, communities, and their habitat.
2. Explain how *major issues* affect the dynamics of fish and wildlife populations, communities, and their habitats.
3. Articulate scientifically a rationale and justification for assessing and monitoring the effects of *major issues* on fish and wildlife populations, communities, and their habitat.
4. Apply gained knowledge of assessment and monitoring protocols to evaluate the effects of *major issues* on fish and wildlife populations, communities, and their habitats

Theme 3. Natural Resource Management Approaches in Fisheries and Wildlife Conservation. *This theme emphasizes the human dimensions of natural resource management: the environment, the process, approaches, and skills.*

Goals:

1. Delineate the management environment in ecological, economic, political, and socio-cultural terms.
2. Define the cyclic management process as related to an organization's mission statement, goals, objectives, strategies, assessment plan (problem definition), implementation plan (action plan), and evaluation/monitoring program.
3. Articulate the appropriateness of management approaches used to address the issues and problems affecting fisheries and wildlife, their habitats, and humans.
4. Define the skills needed to effectively work with a variety of stakeholders in an interdisciplinary management setting as an integrated team.

General Education and Areas of Literacy

Your education at Paul Smith's College is designed to provide you with a well-rounded, liberal arts education. Five areas of literacy are listed and show how you meet them through course requirements (box with 'x') and through choices in general education course offerings (open box).

Area of Literacy	Course(s)
<u>Written Communication (WC)</u>	
<input checked="" type="checkbox"/> Foundational	English Composition 1
<input type="checkbox"/> Structural	<i>Select from General Education Course Listings</i>
<u>Quantitative Problem Solving (Q)</u>	
<input checked="" type="checkbox"/> Foundational	College Algebra (or Pre-Calculus)
<input checked="" type="checkbox"/> Structural	Statistics, Chemistry 2, General Ecology
<u>Analytical Reasoning/Scientific Inquiry (AR)</u>	
<input checked="" type="checkbox"/> Foundational	Biology 1, Biology 2, Chemistry 1
<input checked="" type="checkbox"/> Structural	Chemistry I, Chemistry 2, General Ecology, Organic Chemistry I, or Physics
<u>Social-Cultural Engagement (SC)</u>	
<input type="checkbox"/> Foundational	<i>Select from General Education Course Listings</i>
<input type="checkbox"/> Structural	<i>FWS-F, Select from General Education Course Listings</i> <i>FWS-W, Conservation Biology fulfills requirement – check box</i>
<u>Responsible Expression (RE)</u>	
<input checked="" type="checkbox"/> Foundational	First Year Experience Course
<input type="checkbox"/> Structural	<i>Select from General Education Course Listings</i>

Fisheries Biology and Management (FWS 480) provide integration of all areas of literacy for the Fisheries Concentration.

Wildlife Management (FWS 470) provides integration of all areas of literacy for the Wildlife Concentration.

Courses Required by All FWS Students

Program Requirements are courses that **all** students in the Fisheries and Wildlife Sciences program are required to take. Most of the lower division courses should be taken during freshmen and sophomore years.

	Course	Credits
Math		
<input type="checkbox"/>	Algebra (MAT 125) – depending on math placement	3
<input type="checkbox"/>	Pre-calculus (MAT 180)	3
<input type="checkbox"/>	Statistics (MAT 210)	3
Science		
<input type="checkbox"/>	Introduction to Fisheries and Wildlife Management (FWS 101)	3
<input type="checkbox"/>	Biology 141 (BIO 101)	4
<input type="checkbox"/>	Biology 142 (BIO 102)	4
<input type="checkbox"/>	Chemistry I (CHM 141)	4
<input type="checkbox"/>	Chemistry II (CHM 142)	4
<input type="checkbox"/>	Genetics (BIO 225)	3
<input type="checkbox"/>	General Ecology (BIO 210)	3
<input type="checkbox"/>	Landscape Ecology (NRS 432)	3
<input type="checkbox"/>	Natural History of North American Vertebrates (FWS 270)	3
<input type="checkbox"/>	Organic Chemistry (CHM 241)	4
Other		
<input type="checkbox"/>	First Year Seminar (FYS 199)	3
<input type="checkbox"/>	Introduction to Geographic Information Systems (GIS 201)	3
<input type="checkbox"/>	Senior Capstone (several options are available)	4

Fisheries Science Concentration Requirements¹

¹Cluster titles match Subject Areas listed by the American Fisheries in their certification requirements; see page 11. Special topics courses will periodically be offered that may meet a cluster requirement.

Fisheries Concentration Requirements – the following courses are required.

<input type="checkbox"/> Aquatic Invertebrates (BIO 457)	3
<input type="checkbox"/> Ichthyology (BIO 362)	3
<input type="checkbox"/> Fisheries Biology and Management (FWS 480)	3
<input type="checkbox"/> Fisheries Techniques (FWS 331)	3
<input type="checkbox"/> Limnology (ENV 361)	3
<input type="checkbox"/> Forest Soils (FOR 330)	3
<input type="checkbox"/> Physics (PHY 241)	4
<input type="checkbox"/> Stream Ecology and Management (ENV 471)	3
<input type="checkbox"/> Watershed Management (NRS 340)	3

Biological Sciences Cluster - choose 2

<input type="checkbox"/> Aquatic Plants	3
<input type="checkbox"/> Anatomy and Physiology I or II	3
<input type="checkbox"/> Biotechnology	3
<input type="checkbox"/> Conservation Biology	3
<input type="checkbox"/> Evolution	3
<input type="checkbox"/> Forest Ecology	3
<input type="checkbox"/> Mammalogy	4
<input type="checkbox"/> Microbial Ecology	3
<input type="checkbox"/> Ornithology	4
<input type="checkbox"/> Paleoecology	4
<input type="checkbox"/> Wetlands Ecosystems and Management	3
<input type="checkbox"/> Winter Ecology	3

Human Dimensions Cluster – Choose 2

(note: many of these fill General Education Electives)

<input type="checkbox"/> Environmental Impact Assessment	3
<input type="checkbox"/> Environmental Law/Regulatory Process	3
<input type="checkbox"/> Ethics	3
<input type="checkbox"/> Land Use Planning	3
<input type="checkbox"/> Politics of the Environment	3
<input type="checkbox"/> Resource Economics	3
<input type="checkbox"/> Sustainable Development	3

Wildlife Science Concentration Requirements¹

¹Cluster titles are based on Subject Areas listed by the Wildlife Society in their certification requirements; see page 11. Special topics courses will periodically be offered that may meet a cluster requirement.

Concentration Requirements – all required

<input type="checkbox"/> Plant Biology (BIO 204)	3
<input type="checkbox"/> Conservation Biology (ENV 330)	3
<input type="checkbox"/> Techniques in Wildlife Management (FWS 320)	3
<input type="checkbox"/> Wildlife Management (FWS 470)	3

Wildlife Biology Cluster– choose 2

<input type="checkbox"/> Mammalogy (BIO 363)	4
<input type="checkbox"/> Ornithology (BIO 364)	4
<input type="checkbox"/> Herpetology (BIO 365)	4

Biological Sciences Cluster – choose 2

<input type="checkbox"/> Animal Behavior	3
<input type="checkbox"/> Aquatic Invertebrates	3
<input type="checkbox"/> Anatomy and Physiology I or II	3
<input type="checkbox"/> Biotechnology	3
<input type="checkbox"/> Entomology	3
<input type="checkbox"/> Evolution	3
<input type="checkbox"/> Fish Biology and Management	3
<input type="checkbox"/> Fisheries Techniques	3
<input type="checkbox"/> Forest Ecology	3
<input type="checkbox"/> Ichthyology	3
<input type="checkbox"/> Microbial Ecology	3
<input type="checkbox"/> Paleoecology	4
<input type="checkbox"/> Winter Ecology	3

Botany Cluster – choose 1

<input type="checkbox"/> Aquatic Plants	3
<input type="checkbox"/> Dendrology	4
<input type="checkbox"/> Plant Physiology	3
<input type="checkbox"/> Understory and Ground Cover Flora	3

Ecosystem Management Cluster – choose 1

<input type="checkbox"/> Forest Management	4
<input type="checkbox"/> Stream Ecology and Management	3
<input type="checkbox"/> Watershed Management	4
<input type="checkbox"/> Wetlands Ecosystems and Management	3

-Wildlife Science Clusters continued-

Physical Sciences – choose 1

- | | |
|--|---|
| <input type="checkbox"/> Atmospheric Science | 3 |
| <input type="checkbox"/> Geology | 3 |
| <input type="checkbox"/> Physics | 4 |
-

Policy, Administration, and Law Cluster – choose 1 **(note: many of these fill General Education Electives)**

- | | |
|---|---|
| <input type="checkbox"/> Dispute Management | 3 |
| <input type="checkbox"/> Environmental Impact Assessment | 3 |
| <input type="checkbox"/> Environmental Law/Regulatory Process | 3 |
| <input type="checkbox"/> Land Use Planning | 3 |
| <input type="checkbox"/> Politics of the Environment | 3 |
| <input type="checkbox"/> Resource Economics | 3 |
| <input type="checkbox"/> Sustainable Development | 3 |
-

Geographic Information Systems (GIS)

Certificate Option

GIS and related techniques for spatial data collection and analysis are increasingly important tools in forestry, recreation, natural resources, environmental science, and related disciplines. The GIS Certificate Program is designed to allow students currently enrolled in other programs to develop and demonstrate their skills in this important area. It is also possible for a student to enroll solely in this program on either a part-time or full-time basis.

A minimum of 15 credit hours is required to complete this program, but several of the required courses or restricted electives have prerequisites, so students starting with no applicable college-level course credits will typically have to complete a minimum of 22 credit hours.

GIS Requirements – all are required

<input type="checkbox"/> Intro to GIS	3
<input type="checkbox"/> Advanced GIS Techniques	3
<input type="checkbox"/> GIS Applications	3
Plus one of the following three:	
<input type="checkbox"/> Aerial Photo Interpretation	3
<input type="checkbox"/> Photogrammetry	3
<input type="checkbox"/> Remote Sensing	3

Restricted Electives - choose two of the following

<input type="checkbox"/> Aerial Photography Interaction	3
<input type="checkbox"/> Computer-Aided Design	3
<input type="checkbox"/> Environmental Simulation Modeling	3
<input type="checkbox"/> Forest Mapping	3
<input type="checkbox"/> Forest Mensuration or Forest Measurements	3
<input type="checkbox"/> General Geography or Physical & Cultural Geography	3
<input type="checkbox"/> Geology	3
<input type="checkbox"/> Landscape Ecology	3
<input type="checkbox"/> Land Use Planning	3
<input type="checkbox"/> Surveying, or Intro Surveying, or Surveying, or Environmental Tech Lab	3
<input type="checkbox"/> Watershed Management	3

Requirements for Professional Certification

Open electives are built into the program to provide students with the flexibility to pursue a variety of courses and interests. One potential option is to meet professional certification requirements for the American Fisheries Society or the Wildlife Society. Students are responsible for checking on current requirements as posted on society websites.

Fisheries Professional Associate (FP-A Status) – American Fisheries Society education requirements are provided in the table below. A minimum grade of C is required to receive credit.

Subject Area	Minimal Requirements
A. Fisheries and Aquatic Sciences	12 semester hours -Four courses; two must be directly related to fisheries science and one must cover principles of fisheries science and management.
B. Other Biological Sciences	18 semester hours - When added to Fisheries and Aquatic Sciences courses must total 30 semester hours.
C. Physical Sciences	15 semester hours
D. Mathematics and Statistics	6 semester hours- Must include one calculus and one statistics or two statistics courses.
E. Communications	9 semester hours
F. Human Dimensions	6 semester hours

Associate Wildlife Biologist (AWB)—The Wildlife Society education requirements are provided in the table below. A minimum grade of C is required to receive credit.

Subject Area	Minimal Requirements
A. Biological Sciences: 36 semester hours	
a. Wildlife Management	6 semester hours
b. Wildlife Biology	6 semester hours
c. Ecology	3 semester hours
d. Zoology	9 semester hours
e. Botany	9 semester hours
B. Physical Sciences	9 semester hours
C. Quantitative Sciences: 9 semester hours	
a. Basic Statistics	3 semester hours
b. Quantitative Sciences	6 semester hours, must include one calculus
D. Humanities and Social Sciences	9 semester hours
E. Communications	12 semester hours, does not include literature or foreign language
F. Policy, Administration, and Law	6 semester hours

Sample Program Schedules - Fisheries Concentration

(Minimum total credits required = 120)

FRESHMAN

FALL SEMESTER		SPRING SEMESTER	
English Composition 1 (ENG 101)	3	General Education Elective ¹	3
Biology I (BIO101)	4	Biology II (BIO 102)	4
Algebra (MAT 125)	3	Statistics (MAT 210)	3
Introduction to Fisheries and Wildlife Management (FWS 101)	3	General Education Elective ¹	3
First Year Seminar (FYS 199)	3		
Total Credits	16	Total Credits	13

SOPHOMORE

FALL SEMESTER		SPRING SEMESTER	
Natural History of Vertebrates (BIO 270)	3	Introduction to GIS (GIS 210)	3
Chemistry I (CHM 141)	4	General Education Elective ¹	3
General Ecology (BIO 210)	3	Chemistry II (CHM 142)	4
Pre-calculus (MAT 180)	3	Genetics (BIO 225)	3
General Education Elective ¹	3	Open Elective	3
Total Credits	16	Total Credits	16

JUNIOR

FALL SEMESTER		SPRING SEMESTER	
Organic Chemistry I (CHM 241)	4	Capstone Planning Seminar ² (SOC 461)	1 (0)
Aquatic Invertebrates (BIO 457)	3	Ichthyology (BIO 362)	3
Fisheries Techniques (FWS 331)	3	Watershed Management (NRS 340)	3
Forest Soils (FOR 330)	3	Open Elective	3
Physics I (PHY 241)	3	Open Elective	3
Total Credits	16	Total Credits	13 (12)

SENIOR

FALL SEMESTER		SPRING SEMESTER	
Stream Ecology and Management (ENV 471)	3	Landscape Ecology (NRS 432)	3
Limnology (ENV 361)	3	Fisheries Biology and Management (FWS 480)	3
Biological Sciences Cluster Elective	3 (4)	Capstone Project ² (SOC 462) [or group capstone option]	3 (4)
Human Dimensions Cluster Elective	3	Human Dimensions Cluster Elective	3
Open Elective	3	Biological Sciences Cluster Elective	3 (4)
Total Credits	15 (16)	Total Credits	15(17)

¹General Education Electives that need to be fulfilled are one WC-S, one SC-F, one SC-S, and one RE-S.

²Senior capstone credits (4) are spread through the curriculum depending on which option the students selects (either SOC 461/ 462 or a group capstone option 499).

Sample Program Schedule - Wildlife Concentration

(Minimum total credits required = 120)

FRESHMAN

FALL SEMESTER		SPRING SEMESTER	
English Composition 1 (ENG 101)	3	General Education Elective ¹	3
Biology I (BIO101)	4	Biology II (BIO 102)	4
Algebra (MAT 125)	3	Statistics (MAT 210)	3
Introduction to Fisheries and Wildlife Management (FWS 101)	3	General Education Elective ¹	3
First Year Seminar (FYS 199)	3		
Total Credits	16	Total Credits	13

SOPHOMORE

FALL SEMESTER		SPRING SEMESTER	
Chemistry I (CHM 141)	4	Chemistry II (CHM 142)	4
Pre-calculus (MAT 210)	3	Genetics (BIO 225)	3
Natural History of Vertebrates (FWS 270)	3	Introduction to GIS (GIS 201)	3
General Ecology (BIO 210)	3	Plant Biology (BIO 204)	3
General Education Elective ¹	3	Open Elective	3
Total Credits	16	Total Credits	16

JUNIOR

FALL SEMESTER		SPRING SEMESTER	
Organic Chemistry I (CHM 241)	4	Capstone Planning Seminar ² (SOC 461)	1(0)
Techniques in Wildlife Management (FWS 320)	3	Policy/Administration/Law Cluster Elective	3
Ecosystem Management Cluster	3 (4)	Wildlife Biology Cluster Elective	4
Biological Sciences Cluster Elective	3	Conservation Biology (ENV 330)	3
Open Elective	3	Open Elective (Upper Division Course)	3
Total Credits	16 (17)	Total Credits	13 (14)

SENIOR

FALL SEMESTER		SPRING SEMESTER	
Biological Sciences Cluster Elective	3	Landscape Ecology (NRS 432)	3
Physical Science cluster	3 (4)	Wildlife Management (FWS 470)	3
Botany Cluster Elective	3	Capstone Project ² (SOC 462) [or a group capstone option]	3 (4)
Open Elective (Upper Division Course)	3	Wildlife Biology Cluster Elective	4
Open Elective (Upper Division Course)	3		
Total Credits	15 (16)	Total Credits	13 (14)

¹General Electives that need to be fulfilled are one WC-S, one SC-F, and one RE-S.

²Senior capstone credits (4) are spread through the curriculum depending on which option the students selects (either SOC 461/ 462 or NRS 499).

Career Resources

We encourage students to visit the following websites to learn more about the profession, about the kinds of jobs that are available, and the qualifications employers seek in employees.

Internships, Summer, & Permanent Jobs

- The Environmental Careers Organization has great opportunities. See www.eco.org.
- Subscribe to Fish and Wildlife jobs, a FREE job service that emails jobs to you. Go to http://www.fw.msu.edu/employmentresources/er_email.html and sign up for FWJOBS. Alternatively, regularly check their archived jobs at <http://list.msu.edu/archives/fwjobs.html>.

Wildlife

- One of the best places for job announcements is at <http://wfsc.tamu.edu/jobboard/index.htm>. Internships, seasonal and permanent wildlife jobs are listed here.
- Many more bird jobs exist than mammal jobs simply because birds are abundant, diverse, easy to see and can act as indicators. Do NOT be quick to rule out working with birds. You can learn a lot working with birds! Maybe you don't have the experience to get a telemetry job working with jaguars, but if you had some telemetry experience with red-tailed hawks, you could be competitive for the jaguar job. Check out the job postings at the Ornithological Societies of North America job site (<http://www.osnabirds.org/on/ornjobs.htm>). The same jobs can also be found at <http://www.birdingonthe.net/maillinglists/BJOB.html>.
- The Wildlife Society maintains a job board at (<http://www.wildlife.org/jobs/index.cfm?tname=jobsboard>).

Fisheries and Aquatic Sciences

- American Fisheries Society lists jobs at <http://www.fisheries.org>.
- <http://wfsc.tamu.edu/jobboard/index.htm>. for internships, seasonal and permanent wildlife jobs.
- North American Benthological Society lists jobs at <http://www.benthos.org>.
- American Society of Oceanography and Limnology at <http://www.aslo.org>.
- American Water Resources Association at <http://www.awra.org>.
- Society and Water Conservation Society at <http://www.swcs.org>.

Ecology

- Ecological Society of America <http://www.esa.org/opportunities>.
- Society for Ecological Restoration Int'l http://www.ser.org/working_resources.asp.
- Society of Wetland Scientists <http://www.sws.org/jobs>.
- Conservation Society posts jobs at <http://www.conbio.org/Jobs/search.cfm>.

Gov't agencies

- NYDEC jobs are posted at <http://www.dec.state.ny.us/website/career/vacancy.html>
- The federal government is required to post all jobs such as working for the U.S. Fish and Wildlife Service, National Park Service and the U.S. Forest Service. Go to www.usajobs.com, click search jobs, then search all jobs in biology. Refine your search with words like “wildlife.”
- The Department of Defense often has great jobs for natural resource students. See The Center for Environmental Management of Military Lands (<http://www.cemml.colostate.edu/>) and the Oak Ridge Institute for Science and Education (<http://www.ornl.gov/orisemaryland/projects.htm>).
- <http://www.volunteer.gov/gov/results.cfm>

Other job sites

Other jobs sites exist. If you know a species or organization with which you would like to work, check their websites. For instance,

- Ducks Unlimited posts jobs at <http://www.ducks.org/about/jobopportunities.asp>
- Trout Unlimited at <http://www.tu.org>
- National Wild Turkey Federation at <http://www.nwtf.org>

Some sites let you sign up for email notices of new job openings

- Eco employ <http://www.ecoemploy.com/>
- Ornithological newsletter <http://www.birdingonthe.net/maillinglists/BJOB.html>
- Ecology jobs listserve <https://listserv.umd.edu/archives/ecolog-l.html>

For more career information see

http://www.fws.gov/hr/HR/Careers_FWS.htm

Don't forget career services on Paul Smith's Campus

(http://www.paulsmiths.edu/programs/career_services/index.php?type=current)! Employers send notices to us to post and many of those employers are PSC alum looking for PSC students or alum.

Graduate School Resources

In today's world, many Fisheries and Wildlife Biologists are expected to hold a graduate degree. The good news is that graduate school assistantships provide an opportunity for students to receive a master's degree (MS) or doctorate degree (PhD) AND it pays for the student's tuition, health insurance and a small stipend (around \$18,000/year). Details on available graduate assistantships are often posted at as well as other locations.

Wildlife in general

- <http://wfsc.tamu.edu/jobboard/index.htm>
- <http://www.wildlife.org/jobs/index.cfm?tname=jobsboard>

Birds

- <http://www.osnabirds.org/on/ornjobs.htm>

Fisheries and Aquatic Sciences

- <http://www.fisheries.org>
- <http://www.benthos.org>

For more information on taking the Graduate Record Exam (the GRE is the equivalent of the ACT or SAT to get into undergraduate programs) and applying for graduate assistantships, attend seminars by the PSC career services, FWS program and talk to your advisor and other PSC professors.