# Environmental Biology

# Student Handbook

Dept. of
Environmental Biology

Autumn 2022

State University of New York College of
Environmental Science and Forestry

# Environmental Biology

# Student Handbook

## *A Guide to Undergraduate Majors*

## *in*

## *Environmental Biology*

## Autumn 2022

# Contents

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# Introduction

If you are, or plan to be, an undergraduate student in one of the six-degree programs (majors) offered by the Department of Environmental Biology (EB) at the SUNY College of Environmental Science and Forestry, this handbook can help you develop an academic experience that best prepares you for the next step in your career. For most students, this step will be employment or graduate school and the preparation for these two paths can be quite different.

Following a list of the EB faculty, with contact numbers, there is a section on general information relating to departmental academic policies. After that is some advice on choosing a major, followed by an explanation of the requirements of each degree program. Remember that the official requirements for the Bachelor of Science degree are those listed in the ESF catalog that pertains to the year in which you first enrolled. Throughout your program you will use Degree Works (available at: https://www.esf.edu/students/) to guide you, but this handbook gives you an overview of all EB programs. The closing pages relate to preparing for life after your BS degree and include examples of job titles held by recent graduates.

Keep this handbook in a safe place and refer to it when you are planning your academic program, especially prior to each advising period. Don't wait to read and think about possible careers and graduate school; it might help you decide on an academic pathway to follow. Remember, while your advisor and other faculty members are anxious to help, the design of a good program is your responsibility. One part of all programs is often underappreciated: the open electives. Use these credits wisely, to expand your knowledge and experience beyond the requirements of the major.

If you have specific career goals, become familiar with any "professional requirements" that go beyond the requirements for graduation. For example, various types of certifications by professional societies or registries (e.g., state, and federal Civil Service registries, the National Registry of Microbiologists, the Ecological Society of America, The Wildlife Society, the American Fisheries Society) require completion of certain sets of courses that may be quite general or very specific. If graduate school is (or may be) in your future, you should closely follow recommendations that pertain to your field, or risk having to catch up after you graduate; such problems are particularly common with regard to mathematics and basic sciences such as physics and organic chemistry.

Finally, potential employers and graduate schools often favor students who have experienced more than the classroom. An internship (EFB 420) is an excellent way to prepare for employment, as well as helping you decide if your chosen field is really right for you. With guidance of the advisor, a student arranges with an outside professional, an agency, or other institution to work while receiving college credit, either during the academic year or over the summer. Faculty and graduate students also frequently employ undergraduate students on hourly wage to help with research projects. If you are inclined toward graduate school yourself, talk to professors in your area of interest about opportunities for undergraduate research (EFB 498); the experience is invaluable - plus, you'll get academic credit.

Kit Sheehan, EB Undergraduate Advisor
Terrance Caviness, EB Undergraduate Advisor
Gregory G. McGee, EB Curriculum Director
Roy A. Norton, EFB Curriculum Director (ret.)

# Faculty

Below are the EB faculty members having general administrative duties that pertain to undergraduate programs, along with a brief description of their duties. Following that is a table listing all faculty members who advise and teach in the EB undergraduate program, their office locations, and contact information. More information about each of our faculty can be found at the EB web page: https://www.esf.edu/efb/directory/.

**Interim Chair:** Dr. Stephen Teale – The leader of faculty, administrative and technical staff, and head of both undergraduate and graduate programs in EB.

**Undergraduate Curriculum Director:** Dr. Gregory McGee - contact regarding general questions about EB undergraduate programs, requirements, degree certification, and petitions.

**Curriculum Coordinators:** - contact for degree requirements and major-related petitions.

*Aquatic and Fisheries Science:* Dr. John Farrell

*Biotechnology:* Dr. Christopher Whipps

*Conservation Biology:* Dr. Donald Leopold

*Environmental Biology:* Dr. Gregory McGee

*Forest Health:* Dr. Stephen Teale

*Wildlife Science:* Dr. Jacqueline Frair

**Undergraduate Advisors:** - advisors for first- and second-year students in the EB department; primary contact for course scheduling, petitions, general academic progress.

*Environmental Biology, Wildlife Science, and Forest Health:* Terrance Caviness

*Aquatic and Fisheries Science, Conservation Biology, and Biotechnology:* Kit Sheehan

**Cranberry Lake Biological Station (CLBS) Director:** Dr. Emily Arsenault

| **Resident Faculty and Advisors** | **Office (Rooms in Illick Hall)** | **Telephone (315-470- )** | **Email Address @esf.edu** |
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# General Information

## I. Keeping Track of Degree Requirements

The ESF College Catalog - The official description of requirements for any of the six-degree programs (majors) offered by the Department of Environmental Biology (EB) can be found in the online ESF Catalog (available online at: https://www.esf.edu/catalog/). From time to time, the requirements of ESF's various majors are changed, so the ESF catalog is updated and published annually (the last time any of our programs changed was 2011). You can find a link for each major's current description at the ESF catalog web page. However, the official description of **YOUR** degree requirements is found in the catalog posted for the year that you entered your degree program. Similarly, if you change majors after matriculating, you must fulfill the degree program of the new major as it is described at the time you entered the new degree program. Also, become familiar with the general section on Academic Policies in that catalog; these relate to all ESF students.

Your Degree Works Audit- Requirements for the majors are summarized on the individualized Degree Works Audit. You are given access to the Degree Works Audit during orientation through the ESF Student Portal, *MyESF* (https://www.esf.edu/students/). The Audit is your most important working document, so become familiar with it. It shows what courses you have taken and what core requirements remain. It indicates your cumulative credit-hour totals and your grade-point average. It also tracks your progress toward meeting your General Education requirements and other elective distribution requirements. The real-time Audit reflects your official record in the Registrar's office, so if you think you have found an error bring it to the attention of your advisor.

This handbook serves as a guide to compliment that Audit and help you project your course work in future semesters. A blank Degree Works Audit for each of the six majors is included in this handbook, so you can easily compare the six EB programs.

*****It is important to remember to work with your own Degree Works Audit. Your friends' requirements may differ, even if in the same major, given different curricular requirements on different dates of matriculation. *****

## II. Transfer Courses

If you are a transfer student planning to enter as a junior, we strongly recommend that lower division (first year, sophomore) deficiencies be satisfied during the summer before you matriculate at ESF to allow for flexibility in taking upper division biology electives and to prevent delay in graduation. The Typical Schedules, provided in the appendix, will help you identify these courses. Four-year students may also transfer credits from another institution. This is accomplished by petition – see your advisor about this process. To help in this process, the Admissions Office provides a list of courses at various Cooperative Transfer Colleges that have been predetermined to fulfill lower division requirements. Find these at: https://www.esf.edu/admissions/transfer/tags/

# III. A Note about Prerequisites

Several EB courses have prerequisite requirements. It is your responsibility to know and complete all prerequisites before enrolling in a course. A list of prerequisites for EB core courses is listed below (this is not an exhaustive list – see the catalog course descriptions for other upper-division elective courses):

| Course | Prerequisite |
|---|---|
| Principles of Evolution (EFB 311) | Genetics (EFB 307/308), General Ecology (EFB 320) |
| Cell Biology (EFB 325) | General Biology, Organic Chemistry, Genetics |
| Population Ecology & Management (EFB 370) | EFB 320 |
| Wildlife Ecology & Management (EFB 390) | EFB 320 |
| Applied Wildlife Science (EFB 491) | EFB 390 |
| Wildlife Habitats & Populations (EFB 493) | EFB 491 |
| Intro. to Conservation Biology (EFB 493) | EFB 320, EFB 307/308 |
| Senior Synthesis Conservation Biology (EFB 414) | EFB 413 |
| Organic Chemistry II (FCH 223/224) | FCH 221/222 (**NOT** Elements of Organic Chemistry FCH 210) |
| Physics II (PHY 102) | PHY 101 (**NOT** Environmental Physics, FOR 296) |
| Senior Project Synthesis in BTC (BTC 499) | Research Design (BTC 497) |

# IV. General Education Requirements

Any undergraduate degree from the State University of New York requires completing a suite of "general education" courses; for ESF students, this means one course from seven of nine "Knowledge and Skill Areas," totaling 27 credit hours. The requirement is designed to give you the academic breadth necessary to become a well-rounded world citizen, in addition to becoming knowledgeable in your special area of study. Details of the requirement for each major are given on the respective Plan Sheet, but in all majors four subject areas are automatically satisfied by core courses:

| | |
|---|---|
| Mathematics (APM105 or APM391) | Natural Sciences (EFB 101) |
| Humanities (EWP 290) | Basic Communication (EWP 190) |

In most of our majors, Social Science is satisfied by EFB 120.

American History, Western Civilization, Other World Civilization, Foreign Language or The Arts need to be satisfied by electives in most majors. Students should feel free to complete their General Education electives in a timeline that reflects their personal interests and flexibility in their schedules. For each General Education area, the relevant elective courses are listed in the online ESF catalog at: https://www.esf.edu/provost/gened.asp

# V. Field Experience

A hallmark of the EB curriculum is its emphasis on field study and training. All majors offered by the Department are intended to be hands-on programs that emphasize laboratory and field experience in addition to classroom studies. To this end, every student in each major except Biotechnology is required to complete **at least six** credit-hours of approved field-based instruction in biology. Three of these six credits are associated with a required core course, EFB 202 (Ecological Monitoring and Biodiversity Assessment), which is offered two to three times each summer at the Cranberry Lake Biological Station (CLBS) in the Adirondacks. ***We recommend students enroll in EFB 202 during the summer between your first year and sophomore years, or as early as possible for transfer students.***

The remaining credit hours of Field Experience are elective and can be obtained in one of the following ways. The following lists identify recent course offerings that satisfy the EB field elective requirement. Be aware that some courses are not offered every year.

- Courses offered at CLBS during summer session:
    - Field Ethnobotany (EFB 337)
    - Fungal Diversity and Ecology (EFB 342)
    - Field Herpetology (EFB 342)
    - Adirondack Fishes (EFB 388)
    - Wildlife Techniques (EFB 496)
    - Ecology of Adirondack Aquatic Ecosystems (EFB 496)
    - Wetland Plants and Communities of the Adirondacks (EFB 496)
    - Ecology of Adirondack Insects (EFB 496)
- Courses offered at the Adirondack Ecological Center and Ranger School
    - Research Methods: Understanding the Adirondack Ecosystem (EFB 411)
    - Mammalian Winter Ecology (EFB 484)
- Courses offered during Maymester at the Syracuse or regional campuses
    - Field Ornithology (EFB 496)
    - Flora of Central New York (EFB 496)
- Other courses offered by ESF faculty
    - Forest Health (EFB 494)
    - Ecosystem Restoration Design (EFB 434, only if taken for 4 cr. With field trip)
- Periodic field trip courses (EFB 500) to locations such as Costa Rica, Ireland, Russia, New Zealand, Australia
    - ADK Forest Ecology and Management (EFB/FOR 513, this course alone does not fulfill the 3 cr. Requirement)
    - Tropical Ecology (EFB 523)
    - Ecological Engineering in the Tropics (ERE 311)
    - Fisheries Science Practicum (EFB 488, 1 cr.; note that this course alone does not fulfill the 3 cr. Requirement)
    - Limnology Practicum (EFB 525, 2 cr.; note that this course alone does not fulfill the 3 cr. Requirement)

- Field courses, **approved by petition**, from another accredited university, including but not limited to the following affiliated programs:
    - SEA Semester (through Boston University). Note: 'Semester at Sea' is different than 'SEA Semester' EB WILL NOT ACCEPT any 'Semester at Sea' courses to fulfill any core or directed elective requirement.
    - The School for Field Studies (through University of Minnesota)
    - Wildlands Studies (through California State University Monterey Bay)
- Acceptable courses will have at least 50% of instruction conducted in the field (out-of-classroom, out-of-laboratory, out-of-clinic, out-of-captivity); and include content focusing on organismal biology, ecology theory, and/or training in field methods for studying populations, ecological communities or ecosystem processes.
- An independent research project (EFB 498) or internship (EFB 420) **that has received <u>prior departmental approval via petition</u>, and that meets the following departmental criteria:**
    - At least 50% of student effort (including contact time with instructor and self-directed study) must be conducted in the field (out-of-classroom, out-of-laboratory, out-of-clinic, out-of-captivity).
    - Student must demonstrate educational growth in organismal biology, ecological theory, and/or application of field methodologies.
    - Students must complete a research or professional product for evaluation.
    - 40 hours of effort will garner 1 academic credit-hour.

# VI. Cranberry Lake Biological Station

The Cranberry Lake Biological Station (CLBS) is home to many field courses. CLBS sits on Cranberry Lake, the third largest body of water in the Adirondacks, and is surrounded by rolling hills, small ponds, bogs, and streams. Since 80 percent of the shoreline is state owned, the lake remains unspoiled by recreational developments. Much of the original forest cover in the region was harvested a century ago and has since reforested with a rich variety of community types. The remaining late-successional forests provide students with many examples of less disturbed ecosystems. From the CLBS, there is easy access to a wide range of additional ecosystems, ranging from wetlands to alpine. This environment is ideally suited for a biology summer program.

The station is designed to support a variety of class types and research. Facilities include four classroom-laboratories, a computer lab, a dozen power boats, dining facilities for 120, faculty cabins, an administration building, 12 student cabins, and a recreation hall among others.

The program extends from late May through mid-August. Thanks to the natural assets of the station, a majority of class time is spent in the field.

Information about the program, including courses and fees, can be found on the CLBS website: https://www.esf.edu/clbs/.

# VII. Internships and Independent Research

An internship is a valuable way to gain experience and to learn if a field of study is right for you. Also, good recommendations from your internship supervisor can be helpful when you seek future employment. Undergraduate students at ESF take advantage of a wide range of internships, generally during the summer or throughout the academic year. Internships are arranged in cooperation with the student's advisor and carry course credits under EFB 420, Internship in Environmental and Forest Biology. **Internships must be completed at an outside institution** (but BTC students, discuss options with your advisor) such as the U.S. Fish and Wildlife Service (USFWS), New York State Department of Environmental Conservation; NYS Parks, Recreation and Historic Preservation; Upstate Freshwater Institute, The Nature Conservancy, the National Park Service and the U.S. Geological Survey. Internships with the local zoo are also common. Several federal agencies (e.g., U.S. Fish & Wildlife Service and U.S. Forest Service) have Cooperative Aid agreements whereby students can receive a salary and preferential employment opportunities after graduation. Field-based internships can, with approval, count toward the field experience elective required by most EB majors. To develop ideas for an internship, speak with your advisor and visit the Career Services website for information: https://www.esf.edu/career/students/internships.htm

EB students may enroll in 1-5 credits of EFB 420 (graded on a Satisfactory/Unsatisfactory basis) for any given experience. Forty hours of effort will yield 1 hour of academic credit. See on-line syllabus at: https://www.esf.edu/catalog/courses/?Prefix=EFB

Faculty and graduate students also frequently employ undergraduate students to help with research projects. Students who are inclined toward graduate school should talk to professors in their area of interest about opportunities for undergraduate research (EFB 498). EB students may enroll in 1-5 credits of EFB 498 for any given experience. Forty hours of effort will yield 1 hour of academic credit. See on-line syllabus at: https://www.esf.edu/catalog/courses/?Prefix=EFB

EB also offers students opportunities to volunteer for credit in faculty labs and on field crews through Research Apprenticeship opportunities (EFB 298). These are low-stakes experiences that permit students to gain basic lab and field skills, and which often develop into independent research projects. EB students may enroll in 1-5 credits of EFB 298 (graded on a Satisfactory/ Unsatisfactory basis) for any given experience. Forty hours of effort will yield 1 hour of academic credit. See on-line syllabus at: https://www.esf.edu/catalog/courses/?Prefix=EFB

******Internship, independent research, and apprenticeship credits completed during the fall or spring semester can be included in the regular full-time tuition. However, students are required to pay additional summer tuition for credits completed during the summer. ******

# VIII. Taking a Minor

You can broaden your education and add to your credentials by electing an undergraduate minor. By definition, these are areas of study – usually involving 15-18 credit hours – that are outside the subject of your major, and can be either complementary to it, or entirely unrelated. Only those formal minors that are described in the ESF college catalog are available. ESF minors may require certain courses at Syracuse University (e.g., the various management minors), but ESF students can formally enroll in only a few SU minors. Students apply for a minor by completing a Minor Enrollment Form obtained at the web page below. Although minors are not formally available during the first semester at ESF this does not preclude electing courses that are required by the minor before you enroll in it. Information regarding descriptions of minors and application procedures can be found online at: https://www.esf.edu/academics/minors.htm

# IX. Taking Syracuse University Courses

Syracuse University offers a rich variety of undergraduate courses and, in general, you have the same access to such courses as does a student enrolled at S.U. However, there are certain restrictions that are closely enforced by the Registrar.

1. Each ESF student is provided an allocation of SU credit hours that will be covered by ESF tuition and fees.
2. ESF students may take SU courses beyond their allocation by paying a tuition supplement.
3. Some additional limitations may apply. See ESF's Accessory Instruction Model with Syracuse University, available online at: https://www.esf.edu/registrar/accessory.htm

### How many SU credits can you earn?

#### SU Credit Hour Limits

| | Maximum SU credits in **1st two full-time semesters** | Maximum SU credits in **1st four full-time semesters** | Maximum SU portion of **total credit hours earned** |
|---|---|---|---|
| Entering First Years: | **8** | **11** | **16** |

**Transfer Students** - based on transferred credit hours applied toward ESF degree at entry:

| | | Maximum SU credits in **1st two full-time semesters** | Maximum SU credits in **1st four full-time semesters** | Maximum SU portion of **total credit hours earned** |
|---|---|---|---|---|
| Number of credits at entry: | 0-7 | **8** | **11** | **16** |
| | 8-14 | **8** | **11** | **15** |
| | 15-22 | **8** | **11** | **14** |
| | 23-29 | **8** | **11** | **13** |
| | 30-37 | **8** | | **12** |
| | 38-44 | **8** | | **11** |
| | 45-52 | **8** | | **10** |
| | 53-59 | **8** | | **9** |
| | 60-67 | | | **8** |
| | 68-74 | | | **7** |
| | 75-82 | | | **6** |
| | 83-89 | | | **5** |
| | 90+ | | | **4** |

# X. Taking Graduate-level courses

As with undergraduate courses (100-400 level), there are different levels of graduate courses at ESF and Syracuse University. As an undergraduate, you need no special approval to register for 500-level courses but be aware that these courses will be more demanding. Registering for 600-level courses requires senior standing, a superior grade-point average (3.0 or higher), written permission from the course instructor and an approved (or at least pending) petition. Undergraduates cannot take courses at the 700, 800 or 900 levels.

# XI. Your Academic Advisor

Each student is assigned an advisor who must approve course selections and who is the first to sign any petition. An advisor's role is to assist you in program development and decision-making, but they are not responsible for any failure to meet your degree requirements. It is your responsibility to know these requirements and to meet them.

The relationship with your advisor(s) is an important one, so learn to nurture it. Also, this relationship is going to change during your time at ESF – in your first year you will most likely be relying on input from your advisor for course selection and registration, and in some instances tips for academic success. As you learn the course registration process and master the skills and discipline of academic work, your relationship with your advisor will mature into one focused on your professional development. You will begin with an undergraduate advisor, listed below, and then transition to a faculty advisor in your last four semesters as your area of focus becomes clear.

ENVIRONMENTAL BIOLOGY UNDERGRADUATE ADVISORS:

Terrance Caviness – 248 Illick Hall – 315-470-4939
*Environmental Biology, Forest Health, & Wildlife Science*

Kit Sheehan – 256 Illick Hall – 315-470-4846
*Aquatic and Fisheries Science, Biotechnology & Conservation Biology*

Whether you are working with Terrance or Kit, you will schedule your appointments through 'Handshake' which requires your ESF log-in credentials.

Before your Junior year you will be assigned to a faculty advisor who works in the same area of interest. If your academic direction is uncertain the advisor assignment will be random, but your advisor can be changed if your plans become more focused. This can be done by making a request to the EB Curriculum Director.

Although EB offers no specific academic program for students aspiring to careers in formal K-12 science education or in the medical/veterinary fields, we do have pathways to assist students in reaching these goals. If you have an interest in these fields, contact the EB Curriculum Director to request that a specialized academic advisor be assigned to you.

# XII. Being a Good Advisee

Once you transition to your faculty advisor in your junior year, you may interact with your advisor in a variety of ways. Each advisor operates differently: some have an open door, some have posted office hours, and others may want you to make appointments. Some like to handle routine questions by email, but others prefer to interact face-to-face. All advisors have a telephone (see directory on page 3) with voice mail, and a mailbox in the department office (Room 241 Illick) - all these can help in establishing contact with your advisor. As with all mentors you can start off on the right foot by establishing a respectful relationship with these tips:

1. Keep your appointments. Your advisor meets with many people; if you can't make the appointment, let them know by phone or email, as far in advance as possible, so they can make schedule adjustments.

2. Be prepared. You are not expected to know everything; however, your advisor will expect that you are familiar with the general requirements of the degree. It might help to review the General Information section of this handbook.

If the meeting is about registration for course:

- Review your course progress in Degree Works before arrival; know what the degree requirements are, and what remains to be completed. Your advisor can help you with any confusing points, but you should make an effort to learn the curriculum.
- Have a preliminary plan; have some options in mind and ask your advisor for recommendations or alternatives; pay attention to course restrictions and prerequisites. Advisors are there to guide you, not to make the schedule for you.
- Check the Registrar's website for course availability and times. The printed schedule from Syracuse University has ESF courses, but it goes to press months before it is used, and many things change in the interim. Don't depend on your advisor to notice such changes.

If the meeting is about a petition:

- Bring the appropriate petition form which can be obtained from the Registrar's office (online or in person) or the Curriculum Director. Fill out the personal information before coming but leave the "request" and "justification" sections blank.
- Have a clear idea of what you are asking for and bring some draft wording. Get approval of the draft text before copying it to the form.
- Bring any necessary information. If the petition is about transferring a course from another institution, be sure to bring the information in Section XII of this handbook, below.

3. Be respectful and take responsibility for your own academic program.

# XIII. Petitions

Petitions are used to request a variance from established College or Faculty policy or procedure; in other words, this is how you ask for permission to do something out of the ordinary. You can obtain a petition form from the Registrar's office in Bray Hall, from the EB Curriculum Director, or on-line at the ESF Registrar's web page. With your advisor's guidance, fill it out and append any supporting documents or letters that pertain to your request.

***Writing a Petition***

- Be clear, concise, and neat – no one will approve an illegible petition.
- You must fill out all information requested on the petition. You will be contacted by email if there are any questions.
- The Request: Write this section as a specific instruction to the Registrar to apply a certain class, class sequence, or experience to a specific curricular requirement on your plan sheet. Remember, you and your advisor may know what you are asking, but this needs to be written so that your intentions are clear to the Curriculum Coordinator, Associate Provost, and Registrar. A couple examples are provided below.
- The Justification: Provide rationale for why you believe the course/experience/program you are proposing should fulfil a particular degree requirement.
    - Attach the course syllabus and catalog description to the petition and highlight the content in the course description that you believe makes it a candidate for fulfilling a requirement.
    - Sometimes the justification can be as simple as indicating that the course has already been determined to fulfill a particular degree requirement through an existing articulation agreement between ESF and one of several Cooperative Transfer Colleges (NYS community colleges and other local institutions). In such cases, no course description needs to be appended. These are usually referred to as TAG-courses (Transfer Articulation Guidelines) and can be found through the Admissions Office webpage: (https://www.esf.edu/admissions/transfer/tags/) If you want to make up a course deficiency over the summer, this webpage is the perfect place to preview which course from a college close to home will match our requirement.
    - If the petition involves a late drop/late add you must obtain the instructor's signature.
- Signatures:
    - Your advisor will sign, date, and add any necessary comments.
    - Obtain the signature of your major Curriculum Coordinator (see p. 3).
    - **Field Study Petitions:** **IF** you are petitioning to replace EFB 202 with an alternative experience **OR IF** you are proposing to apply an Internship (EFB 420) or Independent Research (EFB 498) experience for you Field Study Directed Elective requirement **THEN** you must submit your petition for review by the EB Curriculum Committee. Deliver petition to the EB Curriculum Director (p. 3) for this review.
    - If your petition does not involve field study, then no other departmental signatures are necessary. After receiving the Curriculum Coordinator signature, deliver it to 227 Bray Hall for approval by the Associate Provost for Instruction.
- Final action should be completed within two or three weeks. A copy showing the College's action will be mailed to the address you indicate at the top of the petition form; **keep this**

**copy in a safe place,** perhaps along with this handbook. Degree Works with reflect the outcome of your request after a decision is made. If you wish to appeal a rejected petition, arrange to meet with the Associate Provost for Instruction.

## XIV. Getting Non-Departmental Academic Help

Your advisor, the relevant Curriculum Coordinator and the Curriculum Director can help you with many non-academic problems, but the ESF Offices of Student Life and Experiential Learning provide abundant student services. Become familiar with them at https://www.esf.edu/students/. Check the links to these important units:

- Academic Success Center (9 Moon Library) – Peer tutoring, drop-in math support, TA office hours, ESOL (English Speakers of Other Languages).
- The Writing Resource Center (13 Moon Library)
- Public Speaking Lab (14 Moon Library)
- Digital Storytelling Studio (14 Moon Library)
- Career Services (110 Bray) – Job postings, Career Resources, Internships
- Counseling and Disabilities Services (110 Bray Hall)

# Choosing a Major – What's Best for Me?

A good descriptor of the undergraduate opportunities in the Department of Environmental Biology is that they cover the range from "*Molecules to Ecosystems,"* and this has become the banner-phrase for our offerings. Essentially, this means that you can get training and experience in virtually any major field of biology: all doors are open. The degree program (major) that retains this level of generality through all four years is Environmental Biology (EB). Most educators agree that an undergraduate experience should be broad, to give a foundation that is appropriate for a range of future life-choices.

If you choose, there are many opportunities to specialize within the department. There are five specialized majors to consider, which you can learn about by reading the introductory text for each one in the pages that follow. First, ask yourself how strong and certain that focus is. For example, if you have dreamed of a lifetime career in the study of fishes ever since you first held a fishing pole, you may want to start as a first year in the Aquatic and Fisheries Science major. But for most students such an early commitment is not recommended; there is plenty of time to think about it.

Whether you bring a subject-focus with you when you enroll or develop one after a year or two in the EB major, remember that you have two main choices. One is to use the many elective slots in the EB program to take the specialized courses that are attractive to you, i.e. you do not have to change from the broad EB major; or you can easily change into one of the specialized majors, with little paperwork and few adjustments in most cases. This is because the first year and sophomore years of most EB majors are quite similar, if not identical. By using the 'What-if' tool in Degree Works you can explore

what adjustments, if any would be needed to change from EB to a different major. Courses that are unnecessary in your new major are simply moved to an “open elective”, so nothing is lost.

General or specialized degree: which is better for you? Unfortunately, there is no easy and general answer. Having a specialized degree in some subject areas may increase your employment options in that particular area and may be right for you if your level of commitment is high. If you want the broadest options for a career in biology after graduation, a general degree (EB) is probably better. Any questions or concerns can be answered by the Curriculum Coordinator for the major you are thinking about (see list on page 3).

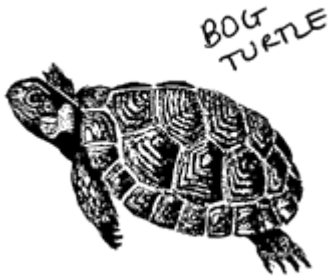
Another possible consideration relates to the number of open electives credits, which ranges among majors from 15-28. If you are entering as a first year, these are the credits that allow you to sample other areas of academic enrichment, or to obtain a minor in another discipline if enough open elective credits are available. If you are entering as a transfer student, the open elective block in your Degree Works Audit is where your miscellaneous courses are slotted, and the number of open elective credits in your program determines how many can be transferred.

While some program changes are simple to make, others can be a little more difficult, especially if you had decided to specialize early and then changed your mind. Most difficulty arises from course selections made (or avoided) during the first year and sophomore years. For example, Biotechnology requires a two-course sequence of organic chemistry, calculus and physics, usually taken during the first year and sophomore years. No other major requires this full set, so moving from (for example) Wildlife Science to Biotechnology is harder than moving in the other direction.

Finally, students who envision a career in the health professions (pre-med, pre-vet, etc.) will be well served by either the Biotechnology or EB majors. Anyone interested in Pre-health studies should read the relevant section toward the end of this handbook.

# Environmental Biology

The curriculum for the Bachelor of Science degree in Environmental Biology (EB) is built around a core of required courses that provides a general education, a background in the principles of biological and physical science, and an orientation to natural resources and other environmental concerns. From this common foundation, the large number of elective credits allows each student to develop a unique plan of study, with the help of an assigned advisor who is expert in the student's general area of interest. In keeping with the hands-on, field orientation of our curriculum, students also must complete six credit hours of field experience.




With appropriate electives, students who complete the degree program will meet requirements for a wide range of federal, state, municipal and private-sector positions that call for training in biological sciences. (Students interested in federal and state positions should review civil service publications and become familiar with specific course requirements early enough to make timely elective choices.) General subject requirements for graduate study in virtually any area of biology also will be met.

Environmental Biology is the broadest of the six biology majors at ESF, and we describe it as covering topics from "molecules to ecosystems." Sufficient elective space exists to allow completion of a minor during the four-year program. In choosing electives, some students sample from the widest spectrum of classes in environmental biology; this is common for those wishing to enter graduate school for further, career-oriented education. Other students focus their electives to some extent, depending on their interests and their educational and career goal

*Refer to the appendix to see a sample of a Typical Student schedule.*

# SUNY College of Environmental Science and Forestry

**Student name**

**Student ID**

**Degree**

**Audit date**

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**Level** Undergraduate **Classification** Freshman **Major** Environmental Biology **College** SUNY ESF

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## Degree in Bachelor of Science INCOMPLETE

Credits required: 126 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

24 of the last 30 credit hours must be taken at ESF.

| | | |
|---|---|---|
| ○ 126 Minimum Total Credits Required | **Still needed:** | You currently have 0 credits including both earned and in-progress courses. To graduate, you need to successfully complete a minimum of 126 additional credits and all graduation requirements. |
| ○ 2.0 GPA Requirement | **Still needed:** | When your first term is graded, your cumulative GPA will be calculated. If your cumulative GPA falls below 2.0 contact your advisor. |
| ○ Major Requirements | **Still needed:** | See **Major in Environmental Biology** section |

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## Major in Environmental Biology INCOMPLETE

Catalog year: 2022-2023 GPA: 0.000

*Students can substitute FOR296 Environmental Physics for PHY101 Major Concepts of Physics.

○ CORE COURSE REQUIREMENTS

| | | |
|---|---|---|
| ○ Writing and the Environment (F) | **Still needed:** | 3 Credits in **EWP** 190 |
| ○ Research Writing and Humanities (S) | **Still needed:** | 3 Credits in **EWP** 290 |
| ○ Survey of Calculus and Its Applications I (F,S) | **Still needed:** | 4 Credits in **APM** 105 or 205 |
| ○ Introduction to Probability and Statistics (F,S) | **Still needed:** | 3 Credits in **APM** 391 or 395 |
| ○ General Biology I: Organismal Biology and Ecology (F) | **Still needed:** | 3 Credits in **EFB** 101 |
| ○ General Biology I Laboratory (F) | **Still needed:** | 1 Credit in **EFB** 102 |
| ○ General Biology II: Cell Biology and Genetics (S) | **Still needed:** | 3 Credits in **EFB** 103 |
| ○ General Biology II Laboratory (S) | **Still needed:** | 1 Credit in **EFB** 104 |

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| | | |
|---|---|---|
| ○ The Global Environment and the Evolution of Human Society (F,S) | **Still needed:** | 3 Credits in **EFB** 120 |
| ○ Orientation Seminar: Environmental and Forest Biology (F) | **Still needed:** | 1 Credit in **EFB** 132 |
| ○ PHYSICS I | **Still needed:** | Choose from 1 of the following: |
| ○ Major Concepts of Physics I (F) | | 4 Credits in **PHY** 101 |
| ○ General Physics I and Laboratory (F,S) | | 4 Credits in **PHY** 211 and 221 |
| ○ Ecological Monitoring and Biodiversity Assessment (CLBS) | **Still needed:** | 3 Credits in **EFB** 202 |
| ○ Diversity of Life I (F) | **Still needed:** | 3 Credits in **EFB** 210 |
| ○ Diversity of Life II (S) | **Still needed:** | 3 Credits in **EFB** 211 |
| ○ Principles of Genetics (S) | **Still needed:** | 3 Credits in **EFB** 307 |
| ○ Principles of Genetics Laboratory (S) | **Still needed:** | 1 Credit in **EFB** 308 |
| ○ Principles of Evolution (S) | **Still needed:** | 3 Credits in **EFB** 311 |
| ○ General Ecology (F) | **Still needed:** | 4 Credits in **EFB** 320 |
| ○ Cell Biology (S) | **Still needed:** | 3 Credits in **EFB** 325 |
| ○ General Chemistry I (F) | **Still needed:** | 3 Credits in **FCH** 150 |
| ○ General Chemistry Laboratory I (F) | **Still needed:** | 1 Credit in **FCH** 151 |
| ○ General Chemistry II (S) | **Still needed:** | 3 Credits in **FCH** 152 |
| ○ General Chemistry Laboratory II (S) | **Still needed:** | 1 Credit in **FCH** 153 |
| ○ ORGANIC CHEMISTRY | **Still needed:** | Choose from 1 of the following: |
| ○ Elements of Organic Chemistry (S) | | 4 Credits in **FCH** 210 |
| ○ Organic Chemistry I with Laboratory (F) | | 4 Credits in **FCH** 221 and 222 |
| ○ ORGANIC CHEMISTRY II, CALCULUS II OR PHYSICS II | **Still needed:** | Choose from 1 of the following: |
| ○ Organic Chemistry II and Laboratory (S) | | 4 Credits in **FCH** 223 and 224 |
| ○ Survey of Calculus and Its Applications II (F,S) | | 4 Credits in **APM** 106 or 206 |
| ○ Major Concepts of Physics II (S) | | 4 Credits in **PHY** 102 |
| ○ General Physics II and Laboratory (F,S) | | 4 Credits in **PHY** 212 and 222 |

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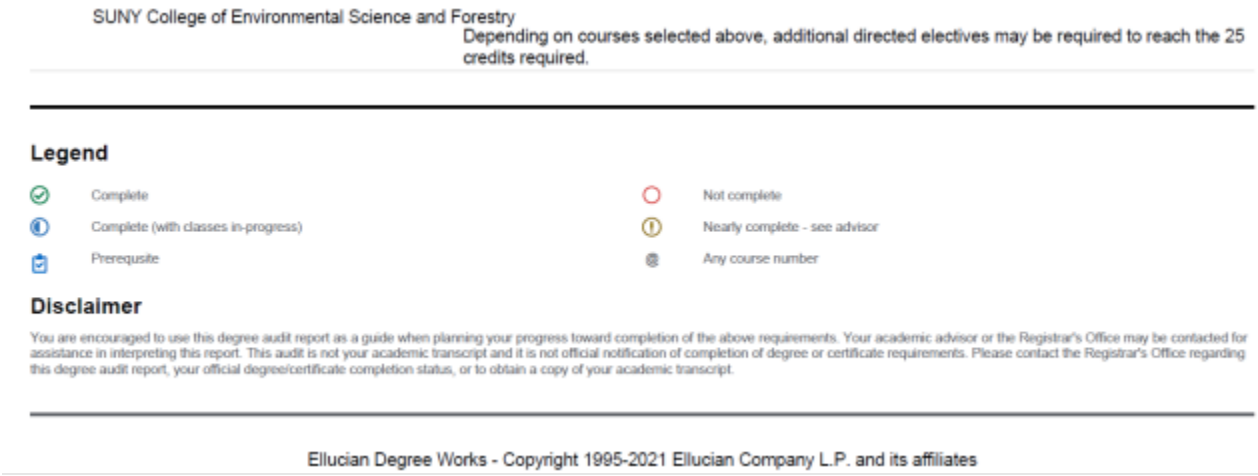
| | | |
|---|---|---|
| ○ Open Electives | **Still needed:** | **27** Credits in @ 100:699 |
| ○ GENERAL EDUCATION | **Still needed:** | Choose from 2 of the following: |
| ○ AMERICAN HISTORY | | **3** Credits in **EST** 201 or 202 or 361 or **FOR** 204 or **HST** 101 or 102 |
| ○ THE ARTS | | **3** Credits in **APH** 261 or **ENG** 215 or 217 or **EWP** 350 or **HOA** 105 or 106 or 201 or 276 or 377 or **HOM** 125 or 165 or 166 or **LSA** 182 or 205 or 206 or **MTC** 125 or **PSE** 201 |
| ○ WESTERN CIVILIZATION | | **3** Credits in **FOR** 203 or **HOA** 105 or 106 or **HST** 111 or 210 or 211 or 212 or **JSP** 114 or 215 or **LIT** 203 or 211 or **LSA** 205 or 206 or 305 or **PSC** 125 or **REL** 114 or 205 or 206 or 215 |
| ○ OTHER WORLD CIVILIZATION | | **3** Credits in **AAS** 241 or **ANT** 121 or 185 or 324 or 326 or **EFB** 217 or 305 or 605 or **EST** 140 or 200 or 204 or **GEO** 272 or **HST** 320 or 321 or **PSE** 201 or **REL** 101 or 185 or 186 or **SAS** 185 or 186 or 324 or **WGS** 324 |
| ○ FOREIGN LANGUAGE | | **3** Credits in **ARB** 100:699 or **ASL** 100:699 or **CHI** 100:699 or **FRE** 100:699 or **GER** 100:699 or **GRE** 100:699 or **HEB** 100:699 or **HIN** 100:699 or **ITA** 100:699 or **JPS** 100:699 or **KOR** 100:699 or **LAT** 100:699 or **LIN** 100:699 or **POL** 100:699 or **POR** 100:699 or **RUS** 100:699 or **SPA** 100:699 or **TRK** 100:699 |
| ○ Directed Electives - 25 Credit Hours | **Still needed:** | See Directed Electives, Environmental Biology section |

## Directed Electives, Environmental Biology

INCOMPLETE

Credits required: 25 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

| | | |
|---|---|---|
| ○ Directed Electives Credits Hours | **Still needed:** | You currently have 0 credit hours including both earned and in-progress courses. To complete your directed electives, you need to successfully complete a minimum of 25 additional credit hours. |
| ○ Field Experience Elective | **Still needed:** | **3** Credits in **EFB** 337 or 342 or 345 or 384 or 388 or 411 or 439 or 484 or 488 or 500 or 523 or 525 or **ERE** 311 or **EFB** 496 Title = Flora of Central New York or 496 Title = Wildlife Techniques or 496 Title = Aquatic Ecosystems:Adirondacks or 496 Title = Wetland Plnts Communties/ADK or 496 Title = Ecology/Adirondack Insects or 496 Title = Field Ornithology or 496 Title = Field Herpetology or 496 Title = Integrating Consrvtn/Agricultr or 496 Title = Ecology of Wetland Communities or 496 Title = Field Entomology or 496 Title = Field Mycology |
| ○ Structure and Function | **Still needed:** | **3** Credits in **BIO** 316 or 335 or 447 or 503 or **EFB** 385 or 427 or 429 or 462 |
| ○ ORGANISMAL DIVERSITY | **Still needed:** | Choose from 2 of the following: |
| ○ Diversity of Microorganisms | | **3** Credits in **EFB** 303 or 340 or 342 or 350 or 428 or 440 |
| ○ Diversity of Plants | | **3** Credits in **EFB** 326 or 336 or 435 or 446 or 496 Title = Flora of Central New York or 496 Title = Wetland Plnts Communties/ADK |
| ○ Diversity of Invertebrate Animals | | **3** Credits in **EFB** 351 or 352 or 355 or 453 or 554 or 566 |
| ○ Diversity of Vertebrate Animals | | **3** Credits in **EFB** 388 or 479 or 482 or 483 or 485 or 486 |
| ○ Additional Electives (as needed to reach 25 Credit Check) | **Still needed:** | **9 to 13** Credits in **BIO** 300:699 or **EFB** 300:699 or **ERE** 311 or **FOR** 513 |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Depending on courses selected above, additional directed electives may be required to reach the 25 credits required.

**Legend**

Complete
Complete (with classes in-progress)
Prerequsite
Not complete
Nearly complete - see advisor
Any course number

**Disclaimer**

You are encouraged to use this degree audit report as a guide when planning your progress toward completion of the above requirements. Your academic advisor or the Registrar's Office may be contacted for assistance in interpreting this report. This audit is not your academic transcript and it is not official notification of completion of degree or certificate requirements. Please contact the Registrar's Office regarding this degree audit report, your official degree/certificate completion status, or to obtain a copy of your academic transcript.



# Directed Electives – Environmental Biology

To ensure that ENB undergraduates obtain both strength and breadth of knowledge, ***25 elective credit*** hours in biology must be obtained through courses designed for juniors or seniors (i.e., courses numbered 300 or higher). Among them must be courses that satisfy requirements A-C (below).

**A. Field Experience Elective**[1] At least 3 elective credits must come from an approved field biology course (in addition to EFB 202). These credits may be obtained through an elective course at Cranberry Lake; an approved field course from another accredited institution; an approved internship (EFB 420) or independent research project (EFB 498); or a field trip course (EFB 500). Some courses at CLBS (underlined) meet **both** requirement A and a diversity requirement.

**B. Structure and Function.** At least 3 credit hours must be in the subject area of organism-level physiology, anatomy, or development. The list of allowable courses below may vary slightly from year to year.

EFB 385 Comparative Vertebrate Anatomy (4 cr.) **S**
EFB 427 Plant Anatomy and Development (3 cr.) **F**
EFB 462 Animal Physiology: Environmental and Ecological (3 cr.) **S**
EFB 429 Plant Physiology (3 cr.) **S**
BIO 316 Anatomy & Physiology for Biology Majors (4 cr.) **F,S BIO 216 is not acceptable**
BIO 355 General Physiology (3 cr.) **F** *BIO 316 is strongly recommended first*
BIO 447 Basic Immunology (3 cr.) **F**
BIO 503 Developmental Biology (3 cr.) **S**

**C. Organismal Diversity (two of the four categories).** To encourage breadth in organism-level biology, students must complete at least one course from two of the four groups listed below (a course from each of the groups is strongly recommended).

**1. Diversity of Microorganisms**

| | |
|---|---|
| EFB 303 | Introductory Environmental Microbiology (4 cr.) **F** |
| EFB 340 | Forest and Shade Tree Pathology (3 cr.) **F** |
| EFB 342 | Fungal Diversity and Ecology (3 cr.) **CLBS** |
| EFB 350 | Microbial Consortia (3 cr.) **S** |
| EFB 428 | Mycorrhizal Ecology (3 cr.) **F even years** |
| EFB 440 | Mycology (3 cr.) **F** |

**2. Diversity of Plants**

| | |
|---|---|
| EFB 326 | Plant Evolution, Diversification and Conservation (3 cr.) **S** |
| EFB 327 | Adirondack Flora (3 cr.) **CLBS** |
| EFB 336 | Dendrology (3 cr.) **F** |
| EFB 435 | Flowering Plants: Diversity, Evolution and Systematics (3 cr.) **F** |
| EFB 446 | Ecology of Mosses (3 cr.) **S** |
| EFB 496 | Flora of Central NY (3 cr.) **Maymester** |
| EFB 496 | Wetland Plants & Communities of Adirondacks (3 cr.) **CLBS** |

**3. Diversity of Invertebrate Animals**

| | |
|---|---|
| EFB 351 | Forest Entomology (3 cr.) **F, odd years** |
| EFB 352 | Entomology (3 cr.) **F, even years** |
| EFB 355 | Invertebrate Zoology (4 cr.) **S** |
| EFB 453 | Parasitology (3 cr.) **F** |
| EFB 554 | Aquatic Entomology (3 cr.) **F** |
| EFB 566 | Systematic Entomology (3 cr.) **S, even years** |

**4. Diversity of Vertebrate Animals**

| | |
|---|---|
| EFB 388 | Ecology of Adirondack Fishes (3 cr.) **CLBS** |
| EFB 479 | Field Ornithology (3 cr.) **Maymester** |
| EFB 482 | Ornithology (4 cr.) **S** |
| EFB 483 | Mammal Diversity (4 cr.) **F** |
| EFB 485 | Herpetology (3 cr.) **F** |
| EFB 486 | Ichthyology (3 cr.) **S** |

# Wildlife Science

Wildlife Science is the application of ecological knowledge in a manner that strikes a balance between the needs of wildlife populations and the needs of people. Research and teaching in wildlife science began at ESF in 1914, one of the first such programs in the United States, and was quickly followed by establishment of the Roosevelt Wild Life Station in 1919. Today, our program is recognized nationally and internationally, and our graduates are employed worldwide. The focus is applied ecology, and students engage the environmental challenges associated with managing wildlife, ranging from endangered species to overabundant populations. The program recognizes and accommodates the fact that wildlife scientists today work with all forms of wildlife, including plants and invertebrates, and the scope is becoming more international.

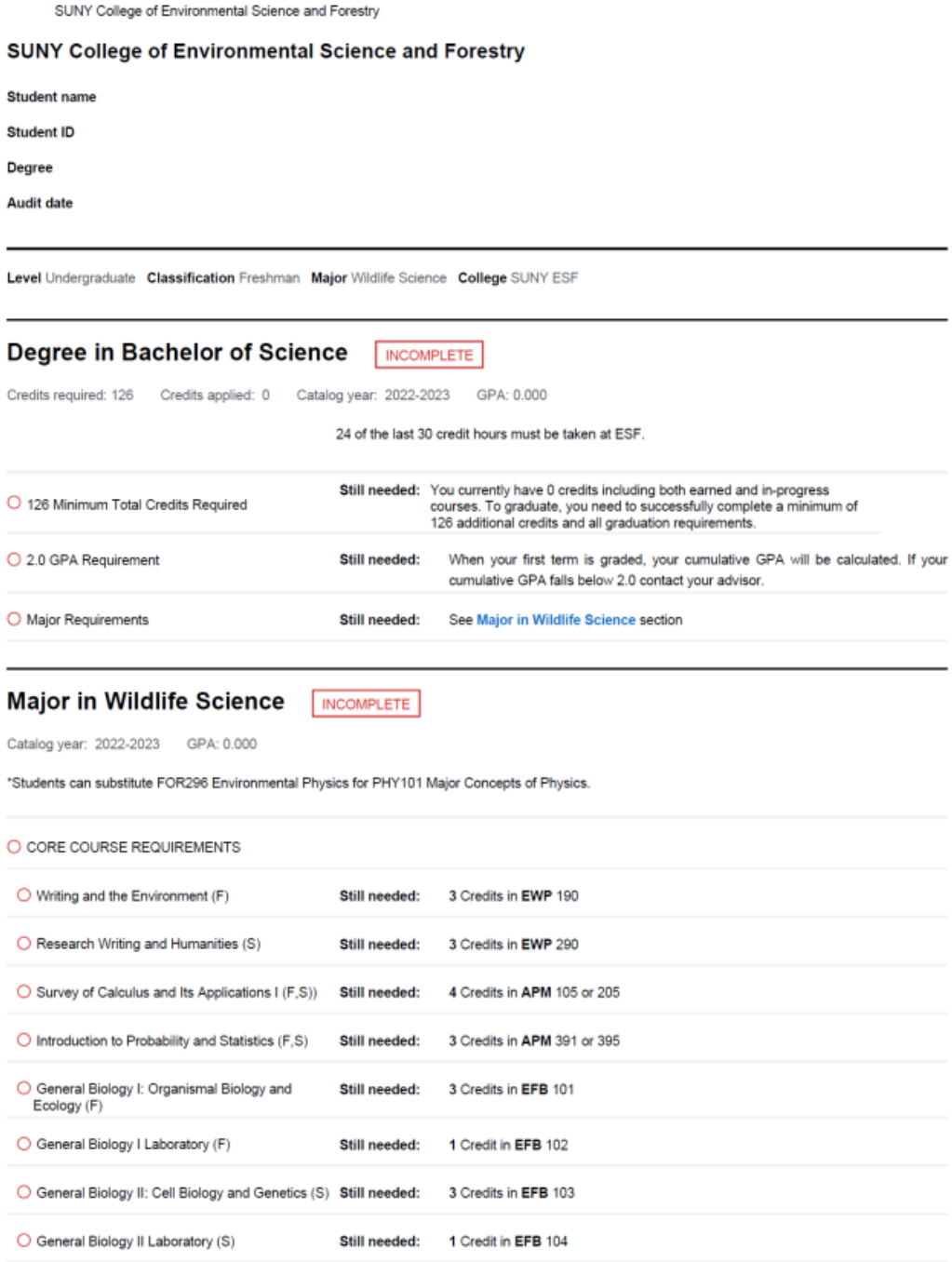
The wildlife science degree prepares students for careers with state and federal agencies as well as an array of domestic and international private organizations. Diverse job functions include management of wildlife on state and federal lands such as federal national wildlife refuges and state wildlife management areas, which includes inventory and assessment of wildlife populations and associated habitats, and interaction with the public to convey the value and rationale of wildlife conservation programs and initiatives. Students who excel academically will also be prepared to continue toward a graduate degree, which can greatly expand employment opportunities and is often necessary for even entry level, career track positions.

Students obtain background in the basic sciences (math, chemistry, physics), and then learn the basic ecological principles and evolutionary forces that affect wildlife and their habitats. Specialized coursework then addresses the assessment and management of wildlife resources as well as the biology and natural history of various taxonomic groups such as plants, birds, mammals, fish, and invertebrates. Students are advised to enhance career opportunities via taxonomic proficiency with one or more plant or animal groups, special skills such as GIS, and practical working experience as an intern, volunteer, or paid employee of a conservation agency. Such opportunities abound during summer as well as other times of the year, and students can receive academic credit for these experiences. Undergraduates also take advantage of ESF's field stations, which provide myriad opportunities. Many courses taken by Wildlife Science undergraduates include field exercises at these facilities, and the properties are also used for undergraduate research and other projects in which undergraduate students can become involved. In addition to coursework outlined in the Curriculum Plan Sheet, highly recommended courses include Microbial Diseases of Fish and Wildlife, and Emerging Diseases of Fish and Wildlife.

*Advising faculty: J. Frair (coord.), J. Cohen, E. Gurarie, M. Schummer, C. Downs, M. Lomolino*

NOTE: The ESF curriculum in wildlife science does not automatically meet the requirements for certification as a wildlife biologist so as not to be overly restrictive in choices of electives by undergraduates. To obtain certification as a wildlife biologist by The Wildlife Society, students must meet further requirements and should consult with their advisor for details (available via the Internet from The Wildlife Society).

*Refer to the appendix to see a sample of a Typical Student schedule.*



SUNY College of Environmental Science and Forestry

**SUNY College of Environmental Science and Forestry**

**Student name**

**Student ID**

**Degree**

**Audit date**

**Level** Undergraduate **Classification** Freshman **Major** Wildlife Science **College** SUNY ESF

**Degree in Bachelor of Science** INCOMPLETE

Credits required: 126 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

24 of the last 30 credit hours must be taken at ESF.

| | | |
|---|---|---|
| ○ 126 Minimum Total Credits Required | **Still needed:** | You currently have 0 credits including both earned and in-progress courses. To graduate, you need to successfully complete a minimum of 126 additional credits and all graduation requirements. |
| ○ 2.0 GPA Requirement | **Still needed:** | When your first term is graded, your cumulative GPA will be calculated. If your cumulative GPA falls below 2.0 contact your advisor. |
| ○ Major Requirements | **Still needed:** | See Major in Wildlife Science section |

**Major in Wildlife Science** INCOMPLETE

Catalog year: 2022-2023 GPA: 0.000

*Students can substitute FOR296 Environmental Physics for PHY101 Major Concepts of Physics.

| | | |
|---|---|---|
| ○ CORE COURSE REQUIREMENTS | | |
| ○ Writing and the Environment (F) | **Still needed:** | 3 Credits in **EWP** 190 |
| ○ Research Writing and Humanities (S) | **Still needed:** | 3 Credits in **EWP** 290 |
| ○ Survey of Calculus and Its Applications I (F,S)) | **Still needed:** | 4 Credits in **APM** 105 or 205 |
| ○ Introduction to Probability and Statistics (F,S) | **Still needed:** | 3 Credits in **APM** 391 or 395 |
| ○ General Biology I: Organismal Biology and Ecology (F) | **Still needed:** | 3 Credits in **EFB** 101 |
| ○ General Biology I Laboratory (F) | **Still needed:** | 1 Credit in **EFB** 102 |
| ○ General Biology II: Cell Biology and Genetics (S) | **Still needed:** | 3 Credits in **EFB** 103 |
| ○ General Biology II Laboratory (S) | **Still needed:** | 1 Credit in **EFB** 104 |

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| | | |
|---|---|---|
| ○ The Global Environment and the Evolution of Human Society (F,S) | **Still needed:** | **3** Credits in **EFB** 120 |
| ○ Orientation Seminar: Environmental and Forest Biology (F) | **Still needed:** | **1** Credit in **EFB** 132 |
| ○ Ecological Monitoring and Biodiversity Assessment (CLBS) | **Still needed:** | **3** Credits in **EFB** 202 |
| ○ Diversity of Life I (F) | **Still needed:** | **3** Credits in **EFB** 210 |
| ○ Diversity of Life II (S) | **Still needed:** | **3** Credits in **EFB** 211 |
| ○ Principles of Genetics (S) | **Still needed:** | **3** Credits in **EFB** 307 |
| ○ Principles of Genetics Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 308 |
| ○ Principles of Evolution (S) | **Still needed:** | **3** Credits in **EFB** 311 |
| ○ General Ecology (F) | **Still needed:** | **4** Credits in **EFB** 320 |
| ○ Wildlife Ecology and Management (F) | **Still needed:** | |
| ○ Wildlife Ecology and Management (F) | | **4** Credits in **EFB** 390 |
| ○ Applied Wildlife Science (S) | **Still needed:** | **3** Credits in **EFB** 491 |
| ○ Wildlife Habitats and Populations (F) | **Still needed:** | **4** Credits in **EFB** 493 |
| ○ General Chemistry I (F) | **Still needed:** | **3** Credits in **FCH** 150 |
| ○ General Chemistry Laboratory I (F) | **Still needed:** | **1** Credit in **FCH** 151 |
| ○ General Chemistry II (S) | **Still needed:** | **1** Class in **FCH** 152 |
| ○ General Chemistry Laboratory II (S) | **Still needed:** | **1** Credit in **FCH** 153 |
| ○ PHYSICS I OR ORGANIC CHEMISTRY I | **Still needed:** | Choose from 1 of the following: |
| ○ Elements of Organic Chemistry (S) | | **4** Credits in **FCH** 210 |
| ○ Organic Chemistry I and Laboratory (F) | | **4** Credits in **FCH** 221 and 222 |
| ○ Major Concepts of Physics I (F) | | **4** Credits in **PHY** 101 |
| ○ General Physics I and Laboratory (F,S) | | **4** Credits in **PHY** 211 and 221 |
| ○ DIRECTED ELECTIVE COURSES | | |
| ○ Field Experience Elective | **Still needed:** | **3** Credits in **EFB** 337 or 342 or 345 or 384 or 388 or 411 or 439 or 484 or 488 or 500 or 523 or 525 or **ERE** 311 or **EFB** 496 Title = Flora of Central New York or 496 Title = Wildlife Techniques or 496 Title = Aquatic Ecosystems:Adirondacks or 496 Title = Wetland Plnts Communties/ADK or 496 Title = Ecology/Adirondack Insects or 496 Title = Field Ornithology or 496 Title = Field Herpetology or 496 Title |

| | | |
|---|---|---|
| SUNY College of Environmental Science and Forestry | | = Integrating Consrvtn/Agricultr or 496 Title = Ecology of Wetland Communities or 496 Title = Field Entomology or 496 Title = Field Mycology |
| ○ Vertebrate Diversity | **Still needed:** | **6** Credits in **EFB** 482 or 483 or 485 or 486 |
| ○ Plant Diversity and Ecology | **Still needed:** | **3** Credits in **EFB** 326 or 336 or 337 or 435 or 445 or 496 Title = Flora of Central New York or 496 Title = Wetland Plnts Communties/ADK |
| ○ Invertebrate Diversity | **Still needed:** | **3** Credits in **EFB** 351 or 352 or 355 or 453 or 554 or 566 |
| ○ Policy | **Still needed:** | **3** Credits in **FOR** 360 or 465 or 487 or 488 or 489 |
| ○ Structure and Function | **Still needed:** | **3** Credits in **EFB** 325 or 370 or 385 or 462 or 480 or 516 or 542 |
| ○ Technical Skills | **Still needed:** | **3** Credits in **BTC** 401 or **ESF** 300 or **ERE** 371 or **SUS** 350 |
| ○ Open Electives | **Still needed:** | **28** Credits in @ 100:699 |
| ○ GENERAL EDUCATION REQUIREMENT | **Still needed:** | Choose from 2 of the following: |
| ○ AMERICAN HISTORY | | **3** Credits in **EST** 201 or 202 or 361 or **FOR** 204 or **HST** 101 or 102 |
| ○ THE ARTS | | **3** Credits in **APH** 261 or **ENG** 215 or 217 or **EWP** 350 or **HOA** 105 or 106 or 201 or 276 or 377 or **HOM** 125 or 165 or 166 or **LSA** 182 or 205 or 206 or **MTC** 125 or **PSE** 201 |
| ○ WESTERN CIVILIZATION | | **3** Credits in **FOR** 203 or **HOA** 105 or 106 or **HST** 111 or 210 or 211 or 212 or **JSP** 114 or 215 or **LIT** 203 or 211 or **LSA** 205 or 206 or 305 or **PSC** 125 or **REL** 114 or 205 or 206 or 215 |
| ○ OTHER WORLD CIVILIZATION | | **3** Credits in **AAS** 241 or **ANT** 121 or 185 or 324 or 326 or **EFB** 217 or 305 or 605 or **EST** 140 or 200 or 204 or **GEO** 272 or **HST** 320 or 321 or **PSE** 201 or **REL** 101 or 185 or 186 or **SAS** 185 or 186 or 324 or **WGS** 324 |
| ○ FOREIGN LANGUAGE | | **3** Credits in **ARB** 100:699 or **ASL** 100:699 or **CHI** 100:699 or **FRE** 100:699 or **GER** 100:699 or **GRE** 100:699 or **HEB** 100:699 or **HIN** 100:699 or **ITA** 100:699 or **JPS** 100:699 or **KOR** 100:699 or **LAT** 100:699 or **LIN** 100:699 or **POL** 100:699 or **POR** 100:699 or **RUS** 100:699 or **SPA** 100:699 or **TRK** 100:699 |

**Legend**

| | |
|---|---|
| ✓ Complete | ○ Not complete |

# Directed Electives – Wildlife Science

To ensure that Wildlife Science undergraduates obtain both strength and breadth of knowledge, and position themselves for professional certification by The Wildlife Society, 24 elective credits must be obtained in the following subject areas (A-G), through specific courses that are designed for juniors or seniors (i.e. courses numbered 300 or higher)

**A. Field Experience Elective (3credits):**

This requirement can be satisfied during any year and is normally done via coursework at Cranberry Lake Biological Station, http://www.esf.edu/clbs/courses.htm, ESF field courses offered during semester break, field courses offered by other institutions or organizations (e.g., School for Field Studies), independent research projects, or job-related internships during the summer session.

**B. Vertebrate Diversity (6 credits):**

| | |
|---|---|
| EFB 482 | Ornithology (4 cr.) **S** |
| EFB 483 | Mammal Diversity (4 cr.) **F** |
| EFB 485 | Herpetology (3 cr.) **F** |
| EFB 486 | Ichthyology (3 cr.) **S** |

Note: Field Ornithology (EFB 496) does NOT fulfill the Vertebrate Diversity elective for the Wildlife Science major.

**C. Plant Diversity and Ecology (3 credits)**

| | |
|---|---|
| EFB 326 | Plant Evolution, Diversification and Conservation (3 cr.) **S** |
| EFB 327 | Adirondack Flora (3 cr.) **CLBS** |
| EFB 336 | Dendrology (3 cr.) **F** |
| EFB 435 | Flowering Plants: Diversity, Evolution, and Systematics (3 cr.) **F** |
| EFB 445 | Plant Ecology and Global Change (3 cr.) **S** |
| EFB 496 | Wetland Plants & Communities of Adirondacks (3 cr.) **CLBS** |
| EFB 496 | Flora of Central NY (3 cr.) **Maymester** |

**D. Invertebrate Diversity (3 credits)**

| | |
|---|---|
| EFB 351 | Forest Entomology (3 cr.) **F, odd years** |
| EFB 352 | Entomology (3 cr.) **F, even years** |
| EFB 355 | Invertebrate Zoology (4 cr.) **S** |
| EFB 453 | Parasitology (3 cr.) **F** |
| EFB 554 | Aquatic Entomology (3 cr.) **F** |
| EFB 566 | Systematic Entomology (3 cr.) **S, even years** |

**E. Policy (3 credits)**

| | |
|---|---|
| FOR360 | Principles of Management (3 cr.) **F** |
| FOR465 | Natural Resources Policy (3 cr.) **F** |

FOR487 Environmental Law and Policy (3 cr.) **F**
FOR488 Natural Resources Agencies and Administration (3 cr.) **S**
FOR489 Natural Resources Policy and Law (3 cr.) **S**

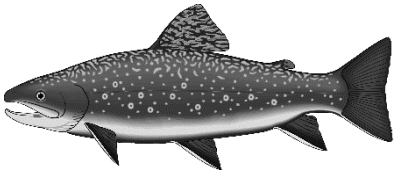
**F. Structure and Function (3 credits)**

EFB 325 Cell Biology (3 cr.) **S**
EFB 370 Population Ecology and Management (3 cr.) **S**
EFB 385 Comparative Vertebrate Anatomy (4 cr.) **S**
EFB 462 Animal Physiology: Environmental and Ecological (3 cr.) **S**
EFB 480 Principles of Animal Behavior (4 cr.) **F**
EFB 542 Freshwater Wetland Ecosystems (3 cr.) **S**

**G. Technical Skills (3 credits)**

BTC 401 Molecular Biology Techniques (3 cr.) F
ESF 300 Introduction to Geospatial Information Technologies (3 cr.) F, S
ERE 371 Surveying for Engineers (4 cr.) F

# Aquatics and Fisheries Science



Aquatic and Fisheries Science seeks to better understand aquatic ecosystems and apply this knowledge toward improved resource management and sustainability. Aquatic systems include wetlands, streams, rivers, lakes, estuaries, and oceans in an interconnected global hydrosystem with complex biological, physical, and chemical properties. Aquatic science professionals conduct research and work to manage natural systems for biodiversity, trophic balance, and environmental quality while providing critical resources of food and drinking water, energy, transportation, recreation, and aesthetics for society. This field of study has a long history; for example, the American Fisheries Society is one of the oldest environmental organizations, founded in 1870 and the American Society of Limnology and Oceanography began in 1948. At ESF, Wilford E. Dence conducted pioneering studies on aquatic systems in New York in the early twentieth century.

The present Aquatic and Fisheries Science program (AFS) at ESF builds on its tradition with a wide array of aquatic courses and diverse opportunities for its students. Our AFS program has regional, national, and international recognition and includes a balance of applied and basic aquatic science. Students in AFS have the opportunity to interact with faculty and graduate students involved with diverse studies on aquatic systems. Undergraduate students considering a career in Aquatic and Fisheries Science need a solid foundation of basic sciences (math, chemistry, physics, statistics) combined with a broad training in organismal biology, ecology and evolution. Upper division courses focus on aquatic systems and fishes, including field experience, methods of assessment and principles for management. Students can broaden themselves with studies on the natural history and diversity of various animals, plants, and other taxa. Other recommended subjects include communications, social and economic principles, policy, hydrology, and ecosystem science. ESF's field stations provide important opportunities for additional field-oriented experiences, both for taking formal courses and for directed independent research. The AFS senior synthesis and internships are an important complement to formal courses and contribute to professional development. Career placement for students with a BS in Aquatic and Fisheries Science are in the areas of fisheries, wetland, limnology, marine biology, and oceanography. Jobs are with federal and state agencies, research institutions, private firms, and nongovernmental organizations, in local to international places and occur in a combination of field, lab, and office settings. Students may continue with graduate studies to develop further in the AFS and broaden career options. To pursue a career in research and teaching in a university, a Ph.D. is generally required.

Advising Faculty: J. Farrell (coordinator), E. Arsenault, H. Green, K. Limburg, R. Razavi, K. Schulz, C. Whipps

*Refer to the appendix to see a sample of a Typical Student schedule.*

## SUNY College of Environmental Science and Forestry

**Student name**

**Student ID**

**Degree**

**Audit date**

---

**Level** Undergraduate **Classification** Freshman **Major** Aquatic and Fisheries Science **College** SUNY ESF

---

## Degree in Bachelor of Science INCOMPLETE

Credits required: 126 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

24 of the last 30 credit hours must be taken at ESF.

| | | |
|---|---|---|
| ○ 126 Minimum Total Credits Required | **Still needed:** | You currently have 0 credits including both earned and in-progress courses. To graduate, you need to successfully complete a minimum of 126 additional credits and all graduation requirements. |
| ○ 2.0 GPA Requirement | **Still needed:** | When your first term is graded, your cumulative GPA will be calculated. If your cumulative GPA falls below 2.0 contact your advisor. |
| ○ Major Requirements | **Still needed:** | See **Major in Aquatic and Fisheries Science** section |

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## Major in Aquatic and Fisheries Science INCOMPLETE

Credits required: 126 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

**Unmet conditions for this set of requirements:** 126 Credits needed

○ CORE COURSE REQUIREMENTS

| | | |
|---|---|---|
| ○ Writing and the Environment (F) | **Still needed:** | **3** Credits in **EWP** 190 |
| ○ Research Writing and Humanities (S) | **Still needed:** | **3** Credits in **EWP** 290 |
| ○ Survey of Calculus and Its Applications I (F,S) | **Still needed:** | **4** Credits in **APM** 105 or 205 |
| ○ Introduction to Probability and Statistics (F,S) | **Still needed:** | **3** Credits in **APM** 391 or 395 |
| ○ General Biology I: Organismal Biology and Ecology (F) | **Still needed:** | **3** Credits in **EFB** 101 |
| ○ General Biology I Laboratory (F) | **Still needed:** | **1** Credit in **EFB** 102 |
| ○ General Biology II: Cell Biology and Genetics (S) | **Still needed:** | **3** Credits in **EFB** 103 |
| ○ General Biology II Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 104 |

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| | | |
|---|---|---|
| ○ The Global Environment and the Evolution of Human Society (F,S) | **Still needed:** | **3** Credits in **EFB** 120 |
| ○ Orientation Seminar: Environmental and Forest Biology (F) | **Still needed:** | **1** Credit in **EFB** 132 |
| ○ Ecological Monitoring and Biodiversity Assessment (CLBS) | **Still needed:** | **3** Credits in **EFB** 202 |
| ○ Diversity of Life I (F) | **Still needed:** | **3** Credits in **EFB** 210 |
| ○ Diversity of Life II (S) | **Still needed:** | **3** Credits in **EFB** 211 |
| ○ Principles of Genetics (S) | **Still needed:** | **3** Credits in **EFB** 307 |
| ○ Principles of Genetics Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 308 |
| ○ Principles of Evolution (S) | **Still needed:** | **3** Credits in **EFB** 311 |
| ○ General Ecology (F) | **Still needed:** | **4** Credits in **EFB** 320 |
| ○ Cell Biology (S) | **Still needed:** | **3** Credits in **EFB** 325 |
| ○ Limnology: Study of Inland Waters (F) | **Still needed:** | **3** Credits in **EFB** 424 |
| ○ Ichthyology (S) | **Still needed:** | **3** Credits in **EFB** 486 |
| ○ Senior Synthesis in Aquatic and Fisheries Science (S) | **Still needed:** | **1** Class in **EFB** 492 |
| ○ General Chemistry I (F) | **Still needed:** | **3** Credits in **FCH** 150 |
| ○ General Chemistry Laboratory I (F) | **Still needed:** | **1** Class in **FCH** 151 |
| ○ General Chemistry II (S) | **Still needed:** | **3** Credits in **FCH** 152 |
| ○ General Chemistry Laboratory II (S) | **Still needed:** | **1** Credit in **FCH** 153 |
| ○ Introduction to Economics (F,S) | **Still needed:** | **3** Credits in **FOR** 207 |
| ○ ORGANIC CHEMISTRY I | **Still needed:** | Choose from 1 of the following: |
| ○ Elements of Organic Chemistry (S) | | **4** Credits in **FCH** 210 |
| ○ Organic Chemistry I and Laboratory (F) | | **4** Credits in **FCH** 221 and 222 |
| ○ PHYSICS I | **Still needed:** | Choose from 1 of the following: |
| ○ Major Concepts of Physics I (F) | | **4** Credits in **PHY** 101 |
| ○ General Physics I and Laboratory (F,S) | | **4** Credits in **PHY** 211 and 221 |
| ○ ORGANIC CHEMISTRY II, CALCULUS II OR PHYSICS II | **Still needed:** | Choose from 1 of the following: |

| | | |
|---|---|---|
| ○ Organic Chemistry II with Laboratory(S) | | **4** Credits in **FCH** 223 and 224 |
| ○ Survey of Calculus and Its Applications II (F,S) | | **4** Credits in **APM** 106 or 206 |
| ○ Major Concepts of Physics II (S) | | **4** Credits in **PHY** 102 |
| ○ General Physics II and Laboratory (F,S) | | **4** Credits in **PHY** 212 and 222 |
| ○ DIRECTED ELECTIVES | | |
| ○ Field Experience Elective | **Still needed:** | **3** Credits in **EFB** 337 or 342 or 345 or 384 or 388 or 411 or 434 or 439 or 484 or 488 or 500 or 513 or 523 or 525 or **FOR** 513 or **ERE** 311 or **EFB** 496 Title = Flora of Central New York or 496 Title = Wildlife Techniques or 496 Title = Aquatic Ecosystems:Adirondacks or 496 Title = Wetland Plnts Communties/ADK or 496 Title = Ecology/Adirondack Insects or 496 Title = Field Ornithology or 496 Title = Field Herpetology or 496 Title = Integrating Consrvtn/Agricultr or 496 Title = Ecology of Wetland Communities or 496 Title = Field Entomology or 496 Title = Field Mycology |
| ○ Structure and Function | **Still needed:** | **3** Credits in **BIO** 447 or 503 or **EFB** 385 or 427 or 429 or 462 or 530 or 570 |
| ○ Organismal Diversity: Plants and Microbes | **Still needed:** | **3** Credits in **EFB** 303 or 326 or 336 or 337 or 340 or 428 or 435 or 440 or 446 or 496 Title = Flora of Central New York or 496 Title = Wetland Plnts Communties/ ADK or 496 Title = Microbial Consortia |
| ○ Organismal Diversity: Invertebrate and Vertebrate Animals | **Still needed:** | **3** Credits in **EFB** 351 or 352 or 355 or 388 or 453 or 482 or 483 or 485 or 554 or 566 |
| ○ Physical and Chemical Environment | **Still needed:** | **3** Credits in **EAR** 101 or 105 or **EFB** 415 or **EST** 231 or **FCH** 510 or 515 or **FOR** 338 or 340 or 345 |
| ○ Environmental Systems Science | **Still needed:** | **3** Credits in **EFB** 423 or 516 or 518 or 523 or 542 or **ERE** 275 |
| ○ Management | **Still needed:** | **3** Credits in **EFB** 390 or 487 or **FOR** 360 or 372 or 442 or **EFB** 496 Title = Ecol And Mgt Of Waterfowl |
| ○ Analytical Tools | **Still needed:** | **3** Credits in **BTC** 401 or **EFB** 488 or 519 or 525 or **ERE** 445 or **ESF** 300 |
| ○ Communications | **Still needed:** | **3** Credits in **EST** 370 or **EWP** 220 or 407 |
| ○ Free Electives | **Still needed:** | **15** Credits in @ 100:699 |
| ○ GENERAL EDUCATION REQUIREMENT | **Still needed:** | Choose from 2 of the following: |
| ○ AMERICAN HISTORY | | **3** Credits in **EST** 201 or 202 or 361 or **FOR** 204 or **HST** 101 or 102 |
| ○ THE ARTS | | **3** Credits in **APH** 261 or **ENG** 215 or 217 or **EWP** 350 or **HOA** 105 or 106 or 201 or 276 or 377 or **HOM** 125 or 165 or 166 or **MTC** 125 or **LSA** 182 or 205 or 206 or **PSE** 201 |
| ○ WESTERN CIVILIZATION | | **3** Credits in **FOR** 203 or **HOA** 105 or 106 or **HST** 111 or 210 or 211 or 212 or **JSP** 114 or 215 or **LIT** 203 or 211 or **LSA** 205 or 206 or 305 or **PSC** 125 or **REL** 114 or 205 or 206 or 215 |
| ○ OTHER WORLD CIVILIZATION | | **3** Credits in **AAS** 241 or **ANT** 121 or 185 or 324 or 326 or **EFB** 217 or 305 or 605 or **EST** 140 or 200 or 204 or **GEO** 272 or **HST** 320 or 321 or **PSE** 201 or **REL** 101 or 185 or 186 or **SAS** 185 or 186 or 324 or **WGS** 324 |

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| | |
|---|---|
| ○ FOREIGN LANGUAGE | 3 Credits in **ARB** 100:699 or **ASL** 100:699 or **CHI** 100:699 or **FRE** 100:699 or **GER** 100:699 or **GRE** 100:699 or **HEB** 100:699 or **HIN** 100:699 or **ITA** 100:699 or **JPS** 100:699 or **KOR** 100:699 or **LAT** 100:699 or **LIN** 100:699 or **POL** 100:699 or **POR** 100:699 or **RUS** 100:699 or **SPA** 100:699 or **TRK** 100:699 |

**Legend**

| | | | |
|---|---|---|---|
| ✓ | Complete | ○ | Not complete |
| ◐ | Complete (with classes in-progress) | ! | Nearly complete - see advisor |
| 📋 | Prerequsite | @ | Any course number |

**Disclaimer**

You are encouraged to use this degree audit report as a guide when planning your progress toward completion of the above requirements. Your academic advisor or the Registrar's Office may be contacted for assistance in interpreting this report. This audit is not your academic transcript and it is not official notification of completion of degree or certificate requirements. Please contact the Registrar's Office regarding this degree audit report, your official degree/certificate completion status, or to obtain a copy of your academic transcript.



# Directed Electives – Aquatic & Fisheries Science

To ensure both strength and breadth of knowledge, 27 elective credit hours must be obtained through courses in the following subject areas.

## A. Field Experience Elective

At least three elective credits must come from an approved field course in biology (this is in addition to the core field course, EFB 202). These credits may be obtained through an elective course at our Cranberry Lake Biological Station, an approved internship (EFB 420) or field trip course (EFB 500). Winter Mammalian Ecology (EFB 484) and Tropical Ecology (EFB 523) meet this requirement, as can approved field courses from other institutions.

## B. Structure and Function

At least 3 credit hours must be in the subject area of organism-level physiology, anatomy, or development. The list of allowable courses below may vary slightly from year to year.

| | |
|---|---|
| EFB 385 | Comparative Vertebrate Anatomy (4 cr.) **S** |
| EFB 427 | Plant Anatomy and Development (3 cr.) **F** |
| EFB 462 | Animal Physiology: Environmental and Ecological (3 cr.) **S** |
| EFB 429 | Plant Physiology (3 cr.) **S** |
| BIO 447 | Immunology (3 cr.) **S** |
| BIO 503 | Developmental Biology (3 cr.) **S** |

## C. Organismal Diversity

To encourage breadth in organism-level biology, students must complete (in addition to the core requirement of EFB 486 or EFB 388) at least 3 credit hours in each of the following two categories:

### 1. Plants and Microbes

| | |
|---|---|
| EFB 303 | Introductory Environmental Microbiology (4 cr.) **F** |
| EFB 326 | Plant Evolution, Diversification and Conservation (3 cr.) **S** |
| EFB 327 | Adirondack Flora (3 cr.) **CLBS** |
| EFB 336 | Dendrology (3 cr.) **F** |
| EFB 340 | Forest and Shade Tree Pathology (3 cr.) **S** |
| EFB 350 | Microbial Consortium (3 cr.) **S** |
| EFB 428 | Mycorrhizal Ecology (3 cr.) **F even years** |
| EFB 435 | Flowering Plants: Diversity, Evolution, and Systematics (3 cr.) **F** |
| EFB 440 | Mycology (3 cr.) **F** |
| EFB 446 | Ecology of Mosses (3 cr.) **S** |
| EFB 496 | Wetland Plants & Communities of Adirondacks (3 cr.) **CLBS** |
| EFB 496 | Flora of Central NY (3 cr.) **Maymester** |

### 2. Invertebrate and Vertebrate Animals

| | |
|---|---|
| EFB 351 | Forest Entomology (3 cr.) **F, odd years** |
| EFB 352 | Entomology (3 cr.) **F, even years** |
| EFB 355 | Invertebrate Zoology (4 cr.) **S** |
| EFB 388 | Ecology of Adirondack Fishes (3 cr.) **CLBS** |
| EFB 453 | Parasitology (3 cr.) **F** |
| EFB 482 | Ornithology (4 cr.) **S** |
| EFB 483 | Mammal Diversity (4 cr.) **F** |
| EFB 485 | Herpetology (3 cr.) **F** |
| EFB 554 | Aquatic Entomology (3 cr.) **F** |
| EFB 566 | Systematic Entomology (3 cr.) **S, even years** |

## D. Physical/Chemical Environment

To encourage understanding and familiarity with the aquatic habit, students must complete at least 3 credit hours from one of the following courses:

| | |
|---|---|
| EST 231 | Environmental Geology (3 cr.) **S** |
| FCH 510 | Environmental Chemistry I (3 cr.) **S** |
| FCH 515 | Methods of Environmental Chemical Analysis (3 cr.) **F** |
| FOR 338 | Meteorology (3 cr.) **S** |
| FOR 340 | Watershed Hydrology (3 cr.) **S** |
| FOR 345 | Introduction to Soils (3 cr.) **F** |
| EAR 101 | Dynamic Earth (3 cr.) **F** |
| EAR 105 | Earth Science (3 cr.) **S** |

## E. Environmental Systems Science

To further promote understanding of the systems approach to aquatic ecosystems and an integration of environmental and biological factors, students must complete at least 3 credit hours from one of the following courses.

| | |
|---|---|
| EFB 423 | Marine Ecology (4 cr.) **S, even years** |
| EFB 523 | Tropical Ecology (3 cr.) **S with 1-week field trip** |
| EFB 542 | Freshwater Wetland Ecosystems (3 cr.) **S** |
| ERE 275 | Ecological Engineering I (3 cr.) **S** |

## F. Management

At least 3 credit hours in resource or ecosystem management must be obtained through a course in the following list.

| | |
|---|---|
| EFB 370 | Population Biology & Management (3 cr.) **S** |
| EFB 390 | Wildlife Ecology and Management (4 cr.) **F** |
| EFB 438 | Ecology & Management of Waterfowl (3 cr.) **F** |
| EFB 487 | Fisheries Science and Management (3 cr.) **F** |
| FOR 360 | Principles of Management (3 cr.) **F** |
| FOR 372 | Fundamentals of Outdoor Rec. (3 cr.) **F, S** |
| FOR 442 | Watershed Ecology & Management (3 cr.) **F** |

## G. Analytical Tools

To increase the breadth of practical skills and knowledge students must complete at least 3 credit hours, obtained through one of the following courses:

| | |
|---|---|
| BTC 401 | Molecular Biology Techniques (3 cr.) **F** |
| EFB 488 | Fisheries Science Practicum (1 cr.) **F** |
| EFB 519 | Geographic Modeling (3 cr.) **S** |
| EFB 525 | Limnology Practicum (2 cr.) **F** |
| ERE 445 | Hydrological Modeling (3 cr.) **F** |
| ESF 300 | Introduction to Geospatial Information Technologies (3 cr.) **F, S** |

## H. Communications

Students must complete at least 3 credit hours from one of the following communication or interpretation courses.

| | |
|---|---|
| EFB 312 | Introduction to Personal Environmental Interpretation Methods (3 cr.) **F** |
| EFB 417 | Non-Personal Environmental Interpretive Methods (3 cr.) **S** |
| EWP 220 | Public Presentation Skills for Environmental Professionals (3 cr.) **F, S** |
| EWP 407 | Writing for Environmental and Science Professionals (3 cr.) **F** |

# Conservation Biology

Conservation Biology is the application of science to conserve the earth's imperiled species and ecosystems. The field is a relatively young one that is growing rapidly in response to the biodiversity crisis, perhaps the most critical environmental issue of our time. Conservation biologists view all of nature's diversity as important and having inherent value. This diversity spans the biological hierarchy and includes variation at the level of genes, populations, communities, ecosystems, and biomes.

A focus on biological diversity and an intrinsic valuation of nature is what distinguishes conservation biology from wildlife management (with its somewhat more utilitarian perspective and a focus on populations of birds and large mammals) and from general environmental biology (with a broad focus on environmental issues). Conservation biologists seek ways to integrate biological perspectives with social, economic, legislative, and political ones to achieve conservation goals.

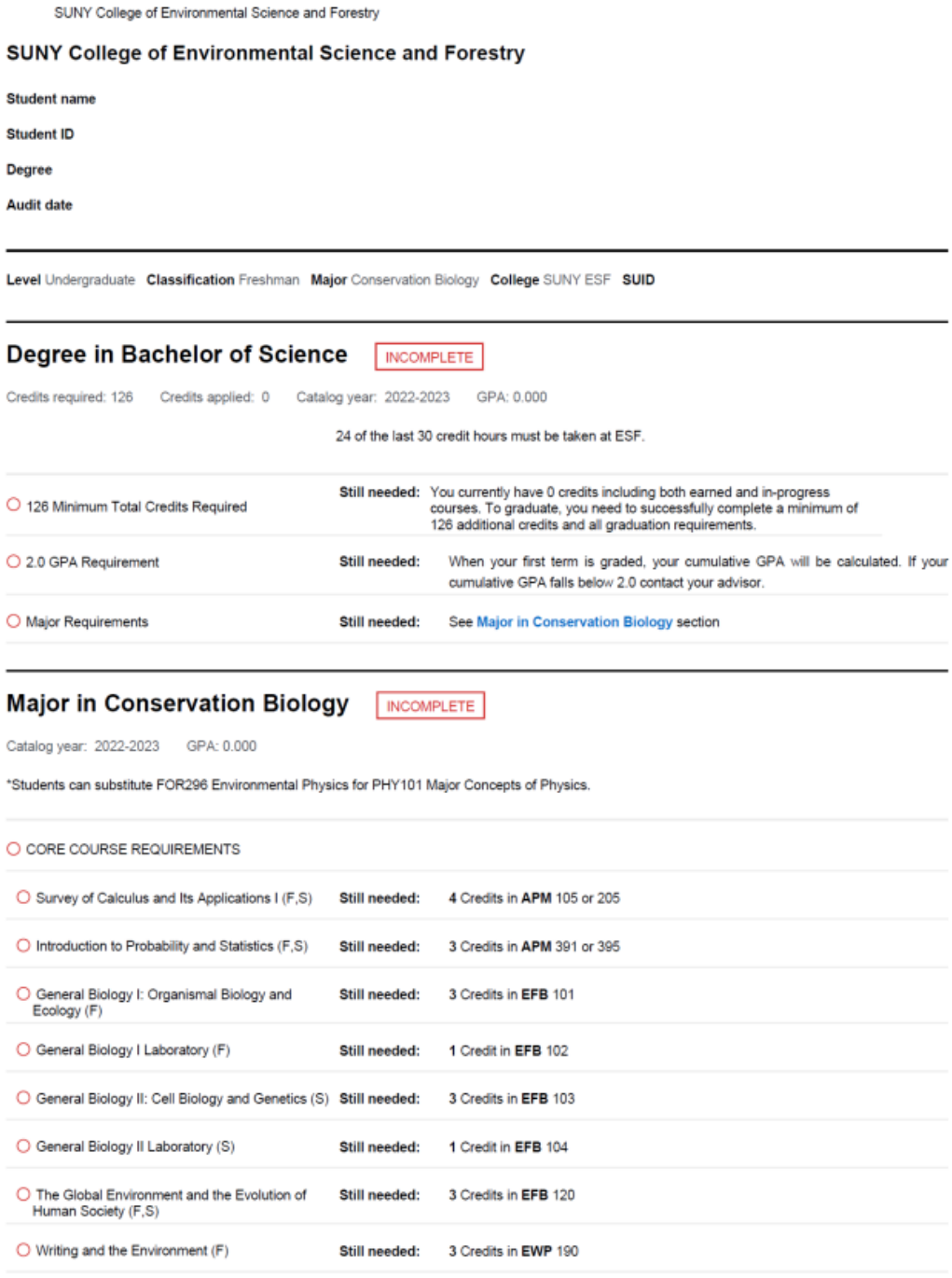
The courses associated with this major are indicative of the interdisciplinary and holistic nature of conservation biology. After obtaining a foundation in basic science communication, and general education subjects, students learn the evolutionary and ecological forces that have generated the patterns of biodiversity around us, through courses in organismal biology, evolutionary and systematic biology, population biology, ecology, and ecosystem science.

An introductory course in Conservation Biology and one in Problem Solving in Conservation Biology familiarize students with the dimensions of the current biodiversity crisis and the management tools available to mitigate for it. These, in combination with a selection of advanced courses in conservation biology, a Senior Synthesis and an Internship or Research Experience in Conservation Biology, cover the breadth of biological, social, political, and economic aspects of the biodiversity crisis.

The program prepares students for employment in a variety of government agencies, at the municipal level (for example, as land use planner), state level (such as with the New York Department of Environmental Conservation; NYS Parks, Recreation, and Historic Preservation; or Natural Heritage Program), federal level (such as with the U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Forest Service, or National Park Service), and occasionally at the international level (such as with the United Nations' Environmental Program). Many private conservation agencies such as The Nature Conservancy preferentially hire broadly trained conservation biologists. Ecological consulting firms are an increasingly important source of employment for conservation biologists. Training in conservation biology also provides a strong basis for postgraduate education and rewarding careers in research, teaching and environmental education.

*Advising Faculty: D. Leopold (coordinator), J. Gibbs, S. Diemont, M. Dovciak, J. Drew, M. Fierke, T. Horton, R. Kimmerer, M. Lomolino, G. McGee, D. Parry, R. Rundell, K. Schulz, A. Weir*

*Refer to the appendix to see a sample of a Typical Student schedule.*



SUNY College of Environmental Science and Forestry

**SUNY College of Environmental Science and Forestry**

**Student name**

**Student ID**

**Degree**

**Audit date**

**Level** Undergraduate **Classification** Freshman **Major** Conservation Biology **College** SUNY ESF **SUID**

**Degree in Bachelor of Science** INCOMPLETE

Credits required: 126 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

24 of the last 30 credit hours must be taken at ESF.

| | | |
|---|---|---|
| ○ 126 Minimum Total Credits Required | **Still needed:** | You currently have 0 credits including both earned and in-progress courses. To graduate, you need to successfully complete a minimum of 126 additional credits and all graduation requirements. |
| ○ 2.0 GPA Requirement | **Still needed:** | When your first term is graded, your cumulative GPA will be calculated. If your cumulative GPA falls below 2.0 contact your advisor. |
| ○ Major Requirements | **Still needed:** | See Major in Conservation Biology section |

**Major in Conservation Biology** INCOMPLETE

Catalog year: 2022-2023 GPA: 0.000

*Students can substitute FOR296 Environmental Physics for PHY101 Major Concepts of Physics.

○ CORE COURSE REQUIREMENTS

| | | |
|---|---|---|
| ○ Survey of Calculus and Its Applications I (F,S) | **Still needed:** | **4** Credits in **APM** 105 or 205 |
| ○ Introduction to Probability and Statistics (F,S) | **Still needed:** | **3** Credits in **APM** 391 or 395 |
| ○ General Biology I: Organismal Biology and Ecology (F) | **Still needed:** | **3** Credits in **EFB** 101 |
| ○ General Biology I Laboratory (F) | **Still needed:** | **1** Credit in **EFB** 102 |
| ○ General Biology II: Cell Biology and Genetics (S) | **Still needed:** | **3** Credits in **EFB** 103 |
| ○ General Biology II Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 104 |
| ○ The Global Environment and the Evolution of Human Society (F,S) | **Still needed:** | **3** Credits in **EFB** 120 |
| ○ Writing and the Environment (F) | **Still needed:** | **3** Credits in **EWP** 190 |

SUNY College of Environmental Science and Forestry

| | | |
|---|---|---|
| ○ Research Writing and Humanities (S) | **Still needed:** | **3** Credits in **EWP** 290 |
| ○ General Chemistry I (F) | **Still needed:** | **3** Credits in **FCH** 150 |
| ○ General Chemistry Laboratory I (F) | **Still needed:** | **1** Credit in **FCH** 151 |
| ○ General Chemistry II (S) | **Still needed:** | **3** Credits in **FCH** 152 |
| ○ General Chemistry Laboratory II (S) | **Still needed:** | **1** Credit in **FCH** 153 |
| ○ Orientation Seminar: Environmental and Forest Biology (F) | **Still needed:** | **1** Credit in **EFB** 132 |
| ○ PHYSICS I | **Still needed:** | Choose from 1 of the following: |
| ○ Major Concepts of Physics I (F) | | **4** Credits in **PHY** 101 |
| ○ General Physics I and Laboratory (F,S) | | **4** Credits in **PHY** 211 and 221 |
| ○ Ecological Monitoring and Biodiversity Assessment (CLBS) | **Still needed:** | **3** Credits in **EFB** 202 |
| ○ Diversity of Life I (F) | **Still needed:** | **3** Credits in **EFB** 210 |
| ○ Diversity of Life II (S) | **Still needed:** | **3** Credits in **EFB** 211 |
| ○ Principles of Genetics (S) | **Still needed:** | **3** Credits in **EFB** 307 |
| ○ Principles of Genetics Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 308 |
| ○ Principles of Evolution (S) | **Still needed:** | **3** Credits in **EFB** 311 |
| ○ General Ecology (F) | **Still needed:** | **4** Credits in **EFB** 320 |
| ○ Population Ecology Management (S) | **Still needed:** | **3** Credits in **EFB** 370 |
| ○ Introduction to Conservation Biology (F) | **Still needed:** | **3** Credits in **EFB** 413 |
| ○ Senior Synthesis in Conservation Biology (F) | **Still needed:** | **3** Credits in **EFB** 414 |
| ○ Internship in Environmental and Forest Biology or Research Problems in Environmental and Forest Biology (F,S) | **Still needed:** | **3** Credits in **EFB** 420 or 498 |
| ○ Open Electives | **Still needed:** | **21** Credits in **@** 100:699 |
| ○ GENERAL EDUCATION ELECTIVE | **Still needed:** | Choose from 2 of the following: |
| ○ AMERICAN HISTORY | | **3** Credits in **EST** 201 or 202 or 361 or **FOR** 204 or **HST** 101 or 102 |
| ○ THE ARTS | | **3** Credits in **APH** 261 or **ENG** 215 or 217 or **EWP** 350 or **HOA** 105 or 106 or 201 or 276 or 377 or **HOM** 125 or 165 or 166 or **LSA** 182 or 205 or 206 or **MTC** 125 or **PSE** 201 |

| | | |
|---|---|---|
| ○ WESTERN CIVILIZATION | | **3** Credits in **FOR** 203 or **HOA** 105 or 106 or **HST** 111 or 210 or 211 or 212 or **JSP** 114 or 215 or **LIT** 203 or 211 or **LSA** 205 or 206 or 305 or **PSC** 125 or **REL** 114 or 205 or 206 or 215 |
| ○ OTHER WORLD CIVILIZATION | | **3** Credits in **AAS** 241 or **ANT** 121 or 185 or 324 or 326 or **EFB** 217 or 305 or 605 or **EST** 140 or 200 or 204 or **GEO** 272 or **HST** 320 or 321 or **PSE** 201 or **REL** 101 or 185 or 186 or **SAS** 185 or 186 or 324 or **WGS** 324 |
| ○ FOREIGN LANGUAGE | | **3** Credits in **ARB** 100:699 or **ASL** 100:699 or **CHI** 100:699 or **FRE** 100:699 or **GER** 100:699 or **HEB** 100:699 or **HIN** 100:699 or **ITA** 100:699 or **JPS** 100:699 or **KOR** 100:699 or **LAT** 100:699 or **LIN** 100:699 or **POL** 100:699 or **POR** 100:699 or **RUS** 100:699 or **SPA** 100:699 or **TRK** 100:699 |
| ○ Directed Electives - 30 Credits | **Still needed:** | See **Directed Electives, Conservation Biology** section |

## Directed Electives, Conservation Biology

INCOMPLETE

Credits required: 30 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

| | | |
|---|---|---|
| ○ Directed Electives Credits Hours | **Still needed:** | You currently have 0 credit hours including both earned and in-progress courses. To complete your directed electives, you need to successfully complete a minimum of 30 additional credit hours. |
| ○ Field Experience Elective | **Still needed:** | **3** Credits in **EFB** 337 or 342 or 345 or 384 or 388 or 411 or 434 or 439 or 484 or 488 or 500 or 513 or 523 or 525 or **FOR** 513 or **ERE** 311 or **EFB** 496 Title = Flora of Central New York or 496 Title = Wildlife Techniques or 496 Title = Aquatic Ecosystems:Adirondacks or 496 Title = Wetland Plnts Communties/ADK or 496 Title = Ecology/Adirondack Insects or 496 Title = Field Ornithology or 496 Title = Field Herpetology or 496 Title = Integrating Consrvtn/Agricultr or 496 Title = Ecology of Wetland Communities or 496 Title = Field Entomology or 496 Title = Field Mycology |
| ○ Biodiversity Specialization | **Still needed:** | **9** Credits in **EFB** 303 or 326 or 336 or 340 or 342 or 350 or 351 or 352 or 355 or 388 or 428 or 435 or 440 or 441 or 446 or 453 or 479 or 482 or 483 or 485 or 486 or 554 or 566 or 693 or 496 Title = Flora of Central New York or 496 Title = Field Ornithology or 496 Title = Wetland Plnts Communties/ADK |
| ○ Applied Conservation Biology | **Still needed:** | **6** Credits in **EFB** 305 or 390 or 423 or 424 or 444 or 445 or 480 or 487 or 493 or 502 or 522 or 542 or 496 Title = Ecol And Mgt Of Waterfowl or 496 Title = Integrating Consrvtn/Agricultr or 496 Title = Bio,Eco&Cnsrvtn of Coral Reefs or **FOR** 321 or 332 or 442 |
| ○ Human Dimensions | **Still needed:** | **3** Credits in **EST** 471 or 312 or 353 or 366 or 390 or 460 or **EWP** 390 or **FOR** 312 or 360 or 465 or 487 or 489 |
| ○ Communications and Interpretation | **Still needed:** | **3** Credits in **EST** 370 or 471 or **EWP** 220 or 407 or **EFB** 496 Title = Adv Interpretation Certificatn |
| ○ Technical Skills | **Still needed:** | **3** Credits in **BTC** 401 or 425 or 426 or **EFB** 518 or **ERE** 445 or 563 or **ESF** 300 or **MCR** 484 or 485 or 585 or **SUS** 350 |
| ✓ Additional Electives (as needed to reach 30 Credit Check) | **Still needed:** | **1** Class in **BTC** 401 or 425 or 426 or **EFB** 303 or 305 or 326 or 336 or 337 or 340 or 342 or 345 or 350 or 351 or 352 or 355 or 384 or 388 or 390 or 404 or 411 or 417 or 423 or 424 or 428 or 434 or 435 or 439 or 440 or 441 or 444 or 446 or 453 or 479 or 480 or 482 or 483 or 484 or 485 or 486 or 487 or 488 or 493 or 500 or 502 or 513 or 518 or 522 or 523 or 525 or 542 or 554 or 566 or 693 or 496 Title = Flora of Central New York or 496 Title = Wildlife Techniques or 496 Title = Aquatic Ecosystems:Adirondacks or 496 Title = Wetland Plnts Communties/ADK or 496 Title = Ecology/Adirondack Insects or 496 Title = Field Ornithology or 496 Title |

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= Field Herpetology or 496 Title = Integrating Consrvtn/Agricultr or 496 Title = Field Entomology or 496 Title = Ecol And Mgt Of Waterfowl or 496 Title = Field Mycology or **ERE** 311 or 445 or 563 or **ESF** 300 or **EST** 312 or 353 or 366 or 370 or 390 or 460 or 471 or 472 or **EWP** 220 or 390 or 407 or **FOR** 321 or 332 or 442 or 360 or 370 or 471 or 465 or 487 or 489 or 513 or **MCR** 484 or 485 or 585 or **SUS** 350

Depending on courses selected above, additional directed electives may be needed to reach the 30 credits required.

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**Legend**

| | |
|---|---|
| Complete | Not complete |
| Complete (with classes in-progress) | Nearly complete - see advisor |
| Prerequsite | @ Any course number |

**Disclaimer**

You are encouraged to use this degree audit report as a guide when planning your progress toward completion of the above requirements. Your academic advisor or the Registrar's Office may be contacted for assistance in interpreting this report. This audit is not your academic transcript and it is not official notification of completion of degree or certificate requirements. Please contact the Registrar's Office regarding this degree audit report, your official degree/certificate completion status, or to obtain a copy of your academic transcript.

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# Directed Electives – Conservation Biology

To ensure that Conservation Biology undergraduates obtain both strength and breadth of knowledge, **30 elective credit hours** must be distributed in a way that satisfies six requirements (A-F, below).

**A. Field Experience Elective**

At least three elective credits from an approved field course in biology (in addition to the core field course, EFB 202). These credits are typically obtained through an elective course at our Cranberry Lake Biological Station, an approved internship (EFB 420) or field trip course (EFB 500). Approved field courses from other institutions can also fulfill this requirement.

**B. Biodiversity Specialization (at least three courses from the following list)**

*The availability of courses that satisfy this requirement varies.* The suggestions below are pre-approved courses that are typically taken - consult with your advisor or the curriculum coordinator about other possibilities. Many other courses can potentially substitute (by petition) for those listed.

| | |
|---|---|
| EFB 303 | Introductory Environmental Microbiology (4 cr.) **F** |
| EFB 326 | Plant Evolution, Diversification and Conservation (3 cr.) **S** |
| EFB 327 | Adirondack Flora (3 cr.) **CLBS** |
| EFB 336 | Dendrology (3 cr.) **F** |
| EFB 340 | Forest and Shade Tree Pathology (3 cr.) **F** |
| EFB 342 | Fungal Diversity and Ecology (3 cr.) **CLBS** |

EFB 350 Microbial Consortia (3 cr.) **S**
EFB 351 Forest Entomology (3 cr.) **F, odd years**
EFB 352 Entomology (3 cr.) **F, even years**
EFB 355 Invertebrate Zoology (4 cr.) **S**
EFB 388 Ecology of Adirondack Fisheries (3 cr.) **CLBS**
EFB 428 Mycorrhizal Ecology (3 cr.) **F, even years**
EFB 435 Flowering Plants: Diversity, Evolution, and Systematics (3 cr.) **F**
EFB 440 Mycology (3 cr.) **F**
EFB 446 Ecology of Mosses (3 cr.) **S**
EFB 453 Parasitology (3 cr.) **F**
EFB 479 Field Ornithology (3 cr.) **CLBS**
EFB 482 Ornithology (4 cr.) **S**
EFB 483 Mammal Diversity (4 cr.) **F**
EFB 485 Herpetology (3 cr.) **F**
EFB 486 Ichthyology (3 cr.) **S**
EFB 496 Wetland Plants & Communities of Adirondacks (3 cr.) **CLBS**
EFB 496 Flora of Central NY (3 cr.) **Maymester**
EFB 554 Aquatic Entomology (3 cr.) **F**
EFB 566 Systematic Entomology (3 cr.) **S, even years**

**C. Applied Conservation Biology (at least 6 credits)**

EFB 305 Indigenous Issues in the Environment (3 cr.) **S**
EFB 390 Wildlife Ecology and Management (4 cr.) **F**
EFB 423 Marine Ecology (4 cr.) **S, even years**
EFB 424 Limnology (3 cr.) **F**
EFB 438 Ecology and Management of Waterfowl (3 cr.) **F**
EFB 444 Biodiversity and Geography of Nature (3 cr.) **F even years**
EFB 480 Animal Behavior (4 cr.) **F**
EFB 487 Fisheries Science & Management (3 cr.) **F**
EFB 493 Management of Wildlife Habitats & Populations (3 cr.) **F**
EFB 502 Ecology and Management of Invasive Species (3 cr.) **S**
EFB 504 Plant-Herbivore Interactions (3 cr.) **F, odd years**
EFB 522 Ecology, Resources and Development (2 cr.) **S**
EFB 542 Freshwater Wetland Ecosystems (3 cr.) **S**
FOR 332 Forest Ecology (3 cr.) **F**
FOR 442 Watershed Ecology & Management (3 cr.) **F**

**D. Human Dimensions (at least 3 credits)**

EFB 404 Nat Hist Museums of Modern Sci (3 cr.) **Maymester**
EST 353 Environ Psychology (3 cr.) **F, odd years**
EST 366 Attitudes, Values, & Env. (3 cr.) **S**
EST 390 Social Processes and Environment (3 cr.) **S**

EST 460 Land Use Law (3 cr.) **S**
EWP 390 Intro to Literature of Nature (3 cr.) **F**
FOR 312 Sociology/Natural Resources (3 cr.) **S**
FOR 360 Principles of Management (3 cr.) **F**
FOR 465 Natural Resources Policy (3 cr.) **F**
FOR 487 Environmental Law and Policy (3 cr.) **F**
FOR 489 Natural Resources Law and Policy (3 cr.) **S**

**E. Communications and Interpretation (at least 3 credits)**

EFB 312 Introduction to Personal Environmental Interpretation Methods (3 cr.) **F**
EFB 417 Non-Personal Environmental Interpretive Methods (3 cr.) **S**
EWP 220 Public Presentation Skills (3 cr.) **F,S**
EWP 407 Writing for Environmental and Science Professionals (3 cr.) **F**
EST 496 Advanced Interpretation & Certification (3 cr.) **S, even years**

**F. Technical Skills (at least 3 credits)**

BTC 401 Molecular Biol. Techniques (3 cr.) **F**
BTC 425 Plant Biotechnology (3 cr.) **S**
BTC 426 Plant Tissue Culture Methods (3 cr.) **F**
ERE 445 Hydrological Modeling (3 cr.) **F**
ESF 300 Introduction to Geospatial Information Technologies (3 cr.) **F,S**
ERE 563 Photogrammetry (3 cr.) **S**
MCR 484 Scanning Electron Microscopy (3 cr.) **F**
MCR 485 Transmission Electron Microscopy (3 cr.) **S**
MCR 585 Light Microscopy for Research Applications (3 cr.) **S**

# Forest Health

Forest Health is a multidisciplinary and collaborative field of study that involves the understanding, monitoring, and protection of the world's forest resources. A solid foundation in Forest Health requires expertise in many disciplines including, but not limited to, plant pathology, entomology, ecology, dendrology, mycology, silviculture, and forest management. At ESF, we have provided expertise in these areas for decades, but they had not been merged into an academic major until recently.

The Forest Health major prepares biology-oriented students for employment in positions that deal with maintaining the health of forest resources. The major is distinct from those in Sustainable Resource Management such as Forest Ecosystem Science, which provides skills and preparation in forest management. Employers today have expressed a need for a deeper understanding of the science behind the trees. Positions requiring a Forest Health background are found in federal and state agencies, nonprofit organizations, and the private sector. The Forest Health major prepares students for graduate study to pursue higher-level positions, such as forest pathologist, entomologist, or mycologist.

The curriculum provides a solid foundation in mathematics and the physical sciences followed by courses focusing on forest trees and their requirements, the basic ecological principles that shape forest ecosystems, and the management of those ecosystems. Other required courses introduce students to the identification and impact of biological agents of disease and physical damage and to the methods by which these are monitored. The flexibility of the major will permit students to pursue more intensive training in integral forest health specialties, such as forest pathology and forest entomology, or to obtain even broader knowledge in related fields such as forestry, microbiology, mycology, and ecology. Field experience is an important element of the program and is integral to several required courses and many of the directed electives. Two of the requirements are field courses at our Cranberry Lake Biological Station.

*Advising Faculty: S. Teale (coordinator), S. Lynch, W. Powell*

*Refer to the appendix to see a sample of a Typical Student schedule.*

**NOTE: Forest Health Majors,** several courses in this major have been renumber/renamed but these changes do not yet appear on your audit form. Please reference the suggested schedule (in appendix) and consult with your advisor to update this working copy of your audit form.

## SUNY College of Environmental Science and Forestry

**Student name**

**Student ID**

**Degree**

**Audit date**

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**Level** Undergraduate **Classification** Freshman **Major** Forest Health **College** SUNY ESF

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## Degree in Bachelor of Science

INCOMPLETE

Credits required: 126 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

24 of the last 30 credit hours must be taken at ESF.

| | | |
|---|---|---|
| ○ 126 Minimum Total Credits Required | **Still needed:** | You currently have 0 credits including both earned and in-progress courses. To graduate, you need to successfully complete a minimum of 126 additional credits and all graduation requirements. |
| ○ 2.0 GPA Requirement | **Still needed:** | When your first term is graded, your cumulative GPA will be calculated. If your cumulative GPA falls below 2.0 contact your advisor. |
| ○ Major Requirements | **Still needed:** | See **Major in Forest Health** section |

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## Major in Forest Health

INCOMPLETE

Catalog year: 2022-2023 GPA: 0.000

*Students can substitute FOR296 Environmental Physics for PHY101 Major Concepts of Physics.

○ CORE COURSE REQUIREMENTS

| | | |
|---|---|---|
| ○ Writing and the Environment (F) | **Still needed:** | **3** Credits in **EWP** 190 |
| ○ Research Writing and Humanities (S) | **Still needed:** | **3** Credits in **EWP** 290 |
| ○ Introduction to Probability and Statistics (F,S) | **Still needed:** | **3** Credits in **APM** 391 or 395 |
| ○ General Biology I: Organismal Biology and Ecology (F) | **Still needed:** | **3** Credits in **EFB** 101 |
| ○ General Biology I Laboratory (F) | **Still needed:** | **1** Credit in **EFB** 102 |
| ○ General Biology II: Cell Biology and Genetics (S) | **Still needed:** | **3** Credits in **EFB** 103 |
| ○ General Biology II Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 104 |
| ○ General Chemistry I (F) | **Still needed:** | **3** Credits in **FCH** 150 |
| ○ General Chemistry Laboratory I (F) | **Still needed:** | **1** Credit in **FCH** 151 |

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| | | |
|---|---|---|
| ○ General Chemistry II (S) | **Still needed:** | **3** Credits in **FCH** 152 |
| ○ General Chemistry Laboratory II (S) | **Still needed:** | **1** Credit in **FCH** 153 |
| ○ The Global Environment and the Evolution of Human Society (F,S) | **Still needed:** | **3** Credits in **EFB** 120 |
| ○ Orientation Seminar: Environmental and Forest Biology (F) | **Still needed:** | **1** Credit in **EFB** 132 |
| ○ PHYSICS I | **Still needed:** | Choose from 1 of the following: |
| ○ Major Concepts of Physics I (F) | | **4** Credits in **PHY** 101 |
| ○ General Physics I and Laboratory (F,S) | | **4** Credits in **PHY** 211 and 221 |
| ○ Ecological Monitoring and Biodiversity Assessment (CLBS) | **Still needed:** | **3** Credits in **EFB** 202 |
| ○ Diversity of Life I (F) | **Still needed:** | **3** Credits in **EFB** 210 |
| ○ Diversity of Life II (S) | **Still needed:** | **3** Credits in **EFB** 211 |
| ○ Introductory Environmental Microbiology (F) | **Still needed:** | **3** Credits in **EFB** 303 |
| ○ Principles of Genetics (S) | **Still needed:** | **3** Credits in **EFB** 307 |
| ○ Principles of Genetics Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 308 |
| ○ Principles of Evolution (S) | **Still needed:** | **3** Credits in **EFB** 311 |
| ○ General Ecology (F) | **Still needed:** | **4** Credits in **EFB** 320 |
| ○ Dendrology (F) | **Still needed:** | **3** Credits in **EFB** 336 |
| ○ Forest and Shade Tree Pathology (S) | **Still needed:** | **3** Credits in **EFB** 340 |
| ○ Forest Health Senior Synthesis (F) | **Still needed:** | **3** Credits in **EFB** 425 |
| ○ Forest Entomology or Entomology (F) | **Still needed:** | **3** Credits in **EFB** 351 or 352 |
| ○ Internship in Environmental and Forest Biology or Research Problems in Environmental and Forest Biology (F,S) | **Still needed:** | **3** Credits in **EFB** 420 or 498 |
| ○ Forest Health Monitoring (May) | **Still needed:** | **3** Credits in **EFB** 439 |
| ○ Forest Health Capstone (F,S) | **Still needed:** | **1** Credit in **EFB** 494 |
| ○ ORGANIC CHEMISTRY | **Still needed:** | Choose from 1 of the following: |
| ○ Elements of Organic Chemistry (S) | | **4** Credits in **FCH** 210 |
| ○ Organic Chemistry I and Laboratory (F) | | **4** Credits in **FCH** 221 and 222 |

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| | | |
|---|---|---|
| ○ Forest Ecology and Silviculture (F) | **Still needed:** | **3** Credits in **FOR** 321 |
| ○ Introduction to Soils (F) | **Still needed:** | **3** Credits in **FOR** 345 |
| ○ DIRECTED ELECTIVES | **Still needed:** | Choose from 5 of the following: |
| ○ Forest Protection and Conservation Biology | | **3** Credits in **EFB** 390 or 413 or 502 |
| ○ Forestry and Wood Products | | **3** Credits in **CME** 376 or **FOR** 322 or 334 or 360 or 455 or 465 or 480 or 481 |
| ○ Technology | | **3** Credits in **BTC** 296 or 401 or 425 or 426 or **ESF** 300 or **FOR** 324 |
| ○ Ecology and Environmental Science | | **3** Credits in **EFB** 415 or 428 or 445 or 505 or 516 or 518 or **EST** 370 or **FOR** 338 |
| ○ Biodiversity | | **3** Credits in **EFB** 326 or 342 or 350 or 351 or 352 or 355 or 428 or 435 or 440 or 453 or 566 or 496 Title = Microbial Consortia |
| ○ Mathematics and Physical Science | | **3** Credits in **APM** 105 or 106 or 205 or 206 or 510 or **FOR** 323 or **PHY** 102 |
| ○ Anatomy and Physiology | | **3** Credits in **EFB** 325 or 427 or 429 or 462 or 570 |
| ○ Open Electives | **Still needed:** | **19** Credits in **@** 100:699 |
| ○ GENERAL EDUCATION REQUIREMENTS | **Still needed:** | Choose from 2 of the following: |
| ○ AMERICAN HISTORY | | **3** Credits in **EST** 201 or 202 or 361 or **FOR** 204 or **HST** 101 or 102 |
| ○ THE ARTS | | **3** Credits in **APH** 261 or **ENG** 215 or 217 or **EWP** 350 or **HOA** 105 or 106 or 201 or 276 or 377 or **HOM** 125 or 165 or 166 or **LSA** 182 or 205 or 206 or **MTC** 125 or **PSE** 201 |
| ○ WESTERN CIVILIZATION | | **3** Credits in **FOR** 203 or **HOA** 105 or 106 or **HST** 111 or 210 or 211 or 212 or **JSP** 114 or 215 or **LIT** 203 or 211 or **LSA** 205 or 206 or 305 or **PSC** 125 or **REL** 114 or 205 or 206 or 215 |
| ○ OTHER WORLD CIVILIZATION | | **3** Credits in **AAS** 241 or **ANT** 121 or 185 or 324 or 326 or **EFB** 217 or 305 or 605 or **EST** 140 or 200 or 204 or **GEO** 272 or **HST** 320 or 321 or **PSE** 201 or **REL** 101 or 185 or 186 or **SAS** 185 or 186 or 324 or **WGS** 324 |
| ○ FOREIGN LANGUAGE | | **3** Credits in **ARB** 100:699 or **ASL** 100:699 or **CHI** 100:699 or **FRE** 100:699 or **GER** 100:699 or **GRE** 100:699 or **HEB** 100:699 or **HIN** 100:699 or **ITA** 100:699 or **JPS** 100:699 or **KOR** 100:699 or **LAT** 100:699 or **LIN** 100:699 or **POL** 100:699 or **POR** 100:699 or **RUS** 100:699 or **SPA** 100:699 or **TRK** 100:699 |

## Legend

| | | | |
|---|---|---|---|
| ✓ | Complete | ○ | Not complete |
| ◐ | Complete (with classes in-progress) | ! | Nearly complete - see advisor |
| 📋 | Prerequsite | @ | Any course number |

## Disclaimer

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# Directed Electives – Forest Health

To ensure that Forest Health majors obtain both strength and breadth of knowledge, 15 elective credit hours must be selected from the following list, including at least one course from ***five*** of the seven categories.

**A. Forest Protection and Conservation Biology**

| | |
|---|---|
| EFB 390 | Wildlife Ecology & Management (4 cr.) **F** |
| EFB 413 | Intro Conservation Biology (3 cr.) **S** |
| EFB 502 | Ecology and Management of Invasive Species (3 cr.) **S** |

**B. Forestry/Wood Products**

| | |
|---|---|
| CME 376 | Decay of Wood Products (3 cr.) **S** |
| FOR 322 | Forest Mensuration (3 cr.) **F** |
| FOR 360 | Principles of Management (3 cr.) **F, S** |
| FOR 480 | Urban Forestry (3 cr.) **S** |
| FOR 465 | Natural Resources and Policy (3 cr.) **S** |
| FOR 455 | Forest Genetics and Tree Improvement (3 cr.) **S** |
| FOR 481 | Arboriculture (3 cr.) **S** |

**C. Technology**

| | |
|---|---|
| BTC 296 | Topics in Biotechnology (3 cr.) **F,S** |
| BTC 401 | Molecular Biology Techniques (3 cr.) **F** |
| BTC 425 | Plant Biotechnology (3 cr.) **S** |
| BTC 426 | Plant Tissue Culture Methods (3 cr.) **F** |
| ESF 300 | Introduction to Geospatial Information Technologies (3 cr.) **F, S** |
| FOR 324 | Natural Resources Information Systems (3 cr.) **S** |

**D. Ecology and Environmental Science**

| | |
|---|---|
| EFB 428 | Mycorrhizal Ecology (3 cr.) **F** |
| EFB 445 | Plant Ecology and Global Change (3 cr.) **S** |
| EFB 505 | Microbial Ecology (3 cr.) **S** |
| FOR 332 | Forest Ecology (4 cr.) **F** |
| FOR 338 | Meteorology (3 cr.) **F** |

**E. Biodiversity**

| | |
|---|---|
| EFB 326 | Plant Evolution, Diversification and Conservation (3 cr.) **S** |
| EFB 342 | Fungal Ecology and Diversity (3 cr.) **CLBS** |
| EFB 351 | Forest Entomology (3 cr.) **F, odd years** |
| EFB 352 | Entomology (3 cr.) **F, even years** |
| EFB 355 | Invertebrate Zoology (4 cr.) **S** |
| EFB 428 | Mycorrhizal Ecology (3 cr.) **F, even years** |

EFB 435 Flowering Plants: Diversity, Evolution, and Systematics (3 cr.) **F**
EFB 440 Mycology (A) (3 cr.) **F**
EFB 453 Parasitology (3 cr.) **F**
EFB 566 Systematic Entomology (3 cr.) **S, even years**

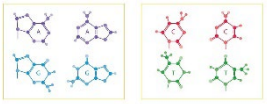
**F. Mathematics and Physical Science**

APM 105 Survey of Calculus and Application I (4 cr.) **F,S**
APM 106 Calculus and its Applications II (A) (4 cr.) **F,S**
APM 510 Statistical Analysis (3 cr.) **F**
FOR 323 Forest Biometrics (3 cr.) **S**
PHY 102 General Physics II (A) (4 cr.) **S**

**G. Anatomy and Physiology**

EFB 325 Cell Biology (3 cr.) **S**
EFB 427 Plant Anatomy and Development (3 cr.) **F**
EFB 462 Animal Physiology: Environmental & Ecological (3 cr.) **S**
EFB 429 Plant Physiology (3 cr.) **S**
EFB 570 Insect Physiology (3 cr.) **S**

# Biotechnology



Biotechnology is an interdisciplinary major administered through the Department of Environmental & Forest Biology, but which involves faculty and courses in several other programs at ESF (see the Biotechnology home page is at https://www.esf.edu/biotech/).

Biotechnology is the application of biological organisms, cells, or molecules to produce a product or service for the betterment of humankind. This area of study includes aspects of molecular biology, cell biology, biochemistry, and genetic engineering, among other related biological disciplines. This is a growing field of study that offers diverse career opportunities involving the application of biotechnology in solving environmental and natural resource problems. The Biotechnology major provides focus to students with a strong interest in subjects relating to biotechnology in natural systems. It also provides a route for students interested in the health professions, while at the same time encouraging elective breadth in the social sciences, humanities, and environmental studies. The curriculum has an emphasis on the basic sciences with a strong foundation in biology, chemistry, calculus, and physics that will prepare the student for upper level biology and chemistry courses, including entry level graduate biochemistry courses. This degree program will prepare students to use molecular and biochemical approaches to tackle environmental, natural resource, agricultural, or medical questions, as well as provide sufficient breadth for a student to enter a clinical medical career. Students who complete this major will be qualified to enter the growing biotechnology job market or continue their studies in graduate or professional school.

The Biotechnology curriculum requires a minimum of 126 total credits. The core requirements are listed below in a sample schedule. There are also 12 credits of directed electives that can be chosen from a list of approved courses (see below) and 20 open electives that can be selected with help from your faculty advisor. There are also many courses offered at Syracuse University or the SUNY Upstate Medical University that could be used to fill these electives. Because these are open electives, you might choose to take an international field trip, a language course, an art course, or whatever interests you.

*Advising Faculty, C. Whipps (coord.), D. Fernando, H. Green, B. Leydet, W. Powell.*

*Refer to the appendix to see a sample of a Typical Student schedule.*

## SUNY College of Environmental Science and Forestry

**Student name**

**Student ID**

**Degree**

**Audit date**

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**Level** Undergraduate **Classification** Freshman **Major** Biotechnology **College** SUNY ESF

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## Degree in Bachelor of Science INCOMPLETE

Credits required: 126 Credits applied: 0 Catalog year: 2022-2023 GPA: 0.000

24 of the last 30 credit hours must be taken at ESF.

| | | |
|---|---|---|
| ○ 126 Minimum Total Credits Required | **Still needed:** | You currently have 0 credits including both earned and in-progress courses. To graduate, you need to successfully complete a minimum of 126 additional credits and all graduation requirements. |
| ○ 2.0 GPA Requirement | **Still needed:** | When your first term is graded, your cumulative GPA will be calculated. If your cumulative GPA falls below 2.0 contact your advisor. |
| ○ Major Requirements | **Still needed:** | See **Major in Biotechnology** section |

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## Major in Biotechnology INCOMPLETE

Catalog year: 2022-2023 GPA: 0.000

○ CORE COURSE REQUIREMENTS

| | | |
|---|---|---|
| ○ Writing and the Environment (F) | **Still needed:** | **3** Credits in **EWP** 190 |
| ○ Research Writing and Humanities (S) | **Still needed:** | **3** Credits in **EWP** 290 |
| ○ Survey of Calculus and Its Applications I (F,S) | **Still needed:** | **4** Credits in **APM** 105 or 205 |
| ○ Survey of Calculus and Its Applications II (F,S) | **Still needed:** | **4** Credits in **APM** 106 or 206 |
| ○ Introduction to Probability and Statistics (F,S) | **Still needed:** | **3** Credits in **APM** 391 or 395 |
| ○ Orientation Seminar (F) | **Still needed:** | **1** Credit in **BTC** 132 |
| ○ Molecular Biology Techniques (F) | **Still needed:** | **4** Credits in **BTC** 401 |
| ○ Internship in Biotechnology or Research Problems in Biotechnology (F,S) | **Still needed:** | **5** Credits in **BTC** 420 or 498 |
| ○ Research Design and Professional Development (S) | **Still needed:** | **1** Credit in **BTC** 497 |

| | | |
|---|---|---|
| ○ Senior Project Synthesis (S) | **Still needed:** | **1** Credit in **BTC** 499 |
| ○ General Biology I: Organismal Biology and Ecology (F) | **Still needed:** | **3** Credits in **EFB** 101 |
| ○ General Biology I Laboratory (F) | **Still needed:** | **1** Credit in **EFB** 102 |
| ○ General Biology II: Cell Biology and Genetics (S) | **Still needed:** | **3** Credits in **EFB** 103 |
| ○ General Biology II Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 104 |
| ○ Diversity of Life I or II | **Still needed:** | **3** Credits in **EFB** 210 or 211 |
| ○ Introductory Environmental Microbiology (F) | **Still needed:** | **4** Credits in **EFB** 303 |
| ○ Principles of Genetics (S) | **Still needed:** | **3** Credits in **EFB** 307 |
| ○ Principles of Genetics Laboratory (S) | **Still needed:** | **1** Credit in **EFB** 308 |
| ○ General Ecology (F) | **Still needed:** | **4** Credits in **EFB** 320 |
| ○ Cell Biology (S) | **Still needed:** | **3** Credits in **EFB** 325 |
| ○ General Chemistry I (F) | **Still needed:** | **3** Credits in **FCH** 150 |
| ○ General Chemistry Laboratory I (F) | **Still needed:** | **1** Credit in **FCH** 151 |
| ○ General Chemistry II (S) | **Still needed:** | **3** Credits in **FCH** 152 |
| ○ General Chemistry Laboratory II (S) | **Still needed:** | **1** Credit in **FCH** 153 |
| ○ Organic Chemistry I (F) | **Still needed:** | **3** Credits in **FCH** 221 |
| ○ Organic Chemistry Laboratory I (F) | **Still needed:** | **1** Credit in **FCH** 222 |
| ○ Organic Chemistry II (S) | **Still needed:** | **3** Credits in **FCH** 223 |
| ○ Organic Chemistry Laboratory II (S) | **Still needed:** | **1** Credit in **FCH** 224 |
| ○ Biochemistry I (F) | **Still needed:** | **3** Credits in **FCH** 430 or 530 |
| ○ Biochemistry II (S) | **Still needed:** | **3** Credits in **FCH** 432 or 532 |
| ○ PHYSICS I | **Still needed:** | Choose from 1 of the following: |
| ○ Major Concepts of Physics I (F) | | **4** Credits in **PHY** 101 |
| ○ General Physics I and Laboratory (F,S) | | **4** Credits in **PHY** 211 and 221 |
| ○ PHYSICS II | **Still needed:** | Choose from 1 of the following: |
| ○ Major Concepts of Physics II (S) | | **4** Credits in **PHY** 102 |

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| | | |
|---|---|---|
| ○ General Physics II and Laboratory (F,S) | | **4** Credits in **PHY** 212 and 222 |
| ○ Directed Electives | **Still needed:** | **12** Credits in **BIO** 211 or 216 or 217 or 316 or 317 or 355 or 396 or 422 or 441 or 442 or 443 or 447 or 448 or 450 or 463 or 464 or 501 or 503 or **BCM** 477 or 484 or **BEN** 364 or 421 or 433 or 462 or 468 or 473 or 481 or 541 or 561 or 621 or 633 or 662 or 664 or 668 or 673 or **BPE** 300 or 310 or 420 or 438 or 510 or 536 or 620 or 638 or 658 or **BTC** 425 or 426 or **EFB** 311 or 340 or 360 or 385 or 400 or 427 or 428 or 440 or 453 or 462 or 505 or 429 or 629 or 496 Title = Phytoremediation or 496 Title = Cell Biology Recitation or 496 Title = Ecotoxicology or 496 Title = Ecoimmunological Concepts or 496 Title = Microbial Consortia or **EHS** 320 or **FCH** 380 or 381 or 390 or 510 or 531 or 630 or **MCR** 480 or 484 or 485 or **PSE** 200 or 202 or 223 or 361 or 350 or 370 or 371 or 438 or 450 or 465 or 550 or 570 or 638 or 650 or 665 |
| ○ Open Electives | **Still needed:** | **20** Credits in **@** 100:699 |
| ○ GENERAL EDUCATION | **Still needed:** | Choose from 3 of the following: |
| ○ AMERICAN HISTORY | | **3** Credits in **EST** 201 or 202 or 361 or **FOR** 204 or **HST** 101 or 102 |
| ○ THE ARTS | | **3** Credits in **APH** 261 or **ENG** 215 or 217 or **EWP** 350 or **HOA** 105 or 106 or 201 or 276 or 377 or **HOM** 125 or 165 or 166 or **LSA** 182 or 205 or 206 or **MTC** 125 or **PSE** 201 |
| ○ WESTERN CIVILIZATION | | **3** Credits in **FOR** 203 or **HOA** 105 or 106 or **HST** 111 or 210 or 211 or 212 or **JSP** 114 or 215 or **LIT** 203 or 211 or **LSA** 205 or 206 or 305 or **PSC** 125 or **REL** 114 or 205 or 206 or 215 |
| ○ OTHER WORLD CIVILIZATION | | **3** Credits in **AAS** 241 or **ANT** 121 or 185 or 324 or 326 or **EFB** 217 or 305 or 605 or **EST** 140 or 200 or 204 or **GEO** 272 or **HST** 320 or 321 or **PSE** 201 or **REL** 101 or 185 or 186 or **SAS** 185 or 186 or 324 or **WGS** 324 |
| ○ FOREIGN LANGUAGE | | **3** Credits in **ARB** 100:699 or **ASL** 100:699 or **CHI** 100:699 or **FRE** 100:699 or **GER** 100:699 or **GRE** 100:699 or **HEB** 100:699 or **HIN** 100:699 or **ITA** 100:699 or **JPS** 100:699 or **KOR** 100:699 or **LAT** 100:699 or **LIN** 100:699 or **POL** 100:699 or **POR** 100:699 or **RUS** 100:699 or **SPA** 100:699 or **TRK** 100:699 |
| ○ SOCIAL SCIENCE | | **3** Credits in **EFB** 120 or **EST** 203 or 204 or 221 or 366 or 390 or **FOR** 202 or 207 or **GEO** 103 or **MAX** 132 or **PAF** 101 or **PSC** 123 or 124 or 125 or **PSY** 205 or **SOC** 248 or 281 |

## Legend

| | | | |
|---|---|---|---|
| ✓ | Complete | ○ | Not complete |
| ◐ | Complete (with classes in-progress) | ! | Nearly complete - see advisor |
| 📋 | Prerequsite | @ | Any course number |

## Disclaimer

You are encouraged to use this degree audit report as a guide when planning your progress toward completion of the above requirements. Your academic advisor or the Registrar's Office may be contacted for assistance in interpreting this report. This audit is not your academic transcript and it is not official notification of completion of degree or certificate requirements. Please contact the Registrar's Office regarding this degree audit report, your official degree/certificate completion status, or to obtain a copy of your academic transcript.

# Directed Electives – Biotechnology

A minimum of 12 credits of directed elective courses required. New biotechnology related courses not currently on the list may also fulfill this requirement with permission of your advisor.

Although any combination of courses below may satisfy the minimum 12 credits required, the following list has been categorized into 4 of the most common subject areas of interest to BTC students, as well as those courses that would be suitable for multiple subject areas of interest. These groupings of elective courses are guidelines and is best to consult your advisor when selecting courses since students have unique career goals and interests.

**Courses that fit multiple areas of interest**

EFB 311 Principles of Evolution (3 cr.) S
FCH 380 Analytical Chemistry I (3 cr.) F
FCH 381 Analytical Chemistry II (3 cr.) S
FCH 510 Environmental Chemistry (3 cr.) S
FCH 531 Biochemistry lab (3 cr.) F
MCR 480 Fundamentals of Microscopy (3 cr.) F
MCR 484 Scanning Electron Microscopy (3 cr.) F
MCR 485 Transmission Electron Microscopy (3 cr.) S
BIO 422 Bioinformatics for Life Scientists (3 cr.) – SU course
BIO 442 Seminar in Model Organism Genetics (3 cr.) – SU course
BIO 443 Seminar in Epigenetics (3 cr.) – SU course
BIO 450 Seminar in Evolutionary Genetics (3 cr.) – SU course
BIO 463 Molecular Biotechnology (4 cr.) – SU course
BIO 464 Applied Biotechnology (4 cr.) – SU course
BCM 477 Proteins and Nucleic Acids Lab (3 cr.) - SU course
BCM 484 Biomolecular Modeling (3 cr.) – SU course
BEN 541 Principles of Tissue Engineering (3 cr.) – SU course

**Pre-health (Pre-Veterinary, Pre-Medical, etc.)**

EFB 360 Epidemiology (3 cr.) F
EFB 385 Comparative Vertebrate Anatomy (4 cr.) S
EFB 400 Toxic Health Hazards (3 cr.) F
EFB 453 Parasitology (3 cr.) F
EFB 462 Animal Physiology: Environmental & Ecological (3 cr.) F
EHS 320 Disease Prevention (3 cr.) S
FCH 390 Drugs from the Wild (3 cr.) F
BIO 211 Introduction to Neuroscience (3 cr.) S – SU course
BIO 316 Anatomy & Physiology I for Biology Majors (4 cr.) – SU course
BIO 317 Anatomy & Physiology II for Biology Majors (4 cr.) – SU course

BIO 355 General Physiology (3 cr.) S – SU course *[caution: should take BIO 316 & 317 first]*
BIO 396 Stem Cells and Society (3 cr.) – SU course
BIO 441 Seminar in Infectious Diseases (3 cr.) S – SU course
BIO 447 Basic Immunology (3 cr.) – SU course
BIO 448 Evolutionary Medicine (3 cr.) – SU course
BIO 501 Biology of Cancer (3 cr.) – SU course
BIO 503 Developmental Biology (3 cr.) – SU course

**Plant Biotechnology**

BTC 425 Plant Biotechnology (3 cr.) S
BTC 426 Intro. Plant Tissue Culture (3 cr.) F
EFB 427 Plant Anatomy and Development (3 cr.) F
EFB 429 Plant Physiology (3 cr.) S
FCH 630 Plant Biochemistry (3 cr.) S

**Microbial Biotechnology**

EFB 340 Forest & Shade tree Pathology (3 cr.) S
EFB 428 Mycorrhizal Ecology (3 cr.) F
EFB 440 Mycology (3 cr.) F
EFB 505 Microbial Ecology (2 cr.) S

**Bioprocess Engineering**

PSE 200 Introduction to Papermaking (3 cr.)*
PSE 202 Pulp and Paper Laboratory Skills (1 cr.)*
PSE 223 Introduction to Lignocellulosics (4 cr.)*
PSE 361 Engineering Thermodynamics (3 cr.)*
PSE 370/570 Principles of Mass and Energy Balance (3 cr.)**
PSE 371 Fluid Mechanics (3 cr.)*
BPE 300 Introduction to Industrial Bioprocessing (3 cr.)*
PSE 350/550 Fiber Processing (3 cr.)**
PSE 450/650 Pulping and Bleaching Processes (3 cr.)**
PSE 465/665 Fiber and Paper Properties (3 cr.)**
PSE 438/638 Biorenewable Fibrous and Nonfibrous products (3 cr.)**
BPE 310 Colloid and Interface Science (3 cr.)*
BPE 420/620 Bioseparations (3 cr.)**
BPE 438/638 Introduction to Biorefinery Processes (3 cr.)**
BPE 510 Introduction to Polymer Coatings (3 cr.)
BPE 536 Radiation Curing of Polymer Technologies (3 cr.)
BPE 658 Advanced Biocatalysis (3 cr.)
BEN 364/664 Quantitative Physiology (4 cr.) – SU course**
BEN 421/621 Biochemical Engineering (3 cr.) – SU course**

BEN 433/633 Drug Delivery (3 cr.) – SU course**
BEN 462/662 Biofuels, Bioproducts, and Biorefining (3 cr.) – SU course**
BEN 468/668 Biomaterials & Medical Devices (3 cr.) – SU course**
BEN 473/673 Biomanufacturing (3 cr.) – SU course**
BEN 481 Bioinstrumentation (3 cr.) – SU course
BEN 561 Polymer Science & Engineering (3 cr.) – SU course

*Useful background and prerequisite courses if you are planning on entering the MPS program in Paper and Bioprocess Engineering.

**The graduate level course may be applicable to the MPS program in Paper and Bioprocess Engineering.

# Pre-Health Track

Many students enroll in an EB degree program with the ultimate goal of a career in medicine, veterinary science, or other health profession. Since ESF has no formal undergraduate program in pre-health studies, students with these professional interests must take a more active role in planning their course selections. With the following guidelines, and the help of a specialized faculty advisor, this is simple to do.

Either the Environmental Biology or Biotechnology majors will prepare students for admission to a variety of professional schools in health-related areas, including human and veterinary medicine. A rigorous foundation in the basic biological sciences, calculus, physics and organic chemistry is provided by the core requirements of these majors. Potential electives include certain benchmark courses that admissions committees of professional schools frequently look for, such as comparative vertebrate anatomy and animal physiology. Pre-veterinary students will find strong supporting courses and faculty interest in vertebrate biology, and pre-medical students can pursue such relevant elective subjects as microbiology and environmental toxicology. In addition, our students take advantage of Syracuse University's broad array of relevant courses. Students can earn credit for a variety of internships, such as paid or volunteer work in clinics and other professional settings. You can find additional information on ESF's pre-health website: https://www.esf.edu/prehealth/

*Faculty Advisors: C. Whipps (Coordinator), B. Leydet.*

Course suggestions: Students pursuing pre-health studies via the Environmental Biology major should enroll in two semesters organic chemistry, calculus, and physics. With the help of an advisor, students should carefully consider their elective choices, ensuring they are tailored to their post-graduation needs.

# What's Next? Life After ESF

(Some words of wisdom from a past Curriculum Director, the late Dr. Larry VanDruff)

## Employment

Students with the BS degree may find employment in governmental agencies, initially performing technical services. To qualify for Civil Service registry, an examination is mandatory; and specific course work is required. In addition, some of the more practical-oriented career paths may lead to positions with commercial institutions or in self-employment. Here are some steps to take.

1. Begin by visiting 105 Bray Hall - Career Services. Seek help in preparing your resume, a letter of inquiry, and narrowing your search. Look through posted notices, newsletters and other job listings as well as employment directories. The "Environmental Opportunities" and "Job Scan" periodicals are especially useful. Ask to be placed on Career Service's email list when you leave ESF, to keep in touch with current listings in the office. They can show you the following helpful documents:
    - ESF Career Services (https://www.esf.edu/career/)
    - Annual Placement Surveys (tells you what past grads are doing)
2. Review this Handbook again. The introductions to the degree programs and options give employment suggestions. Discuss your availability and job aspirations with faculty associated with your concentration - occasionally employers call us with immediate needs.
3. Read newsletters from the professional societies in your career area. For example, the eWildlifer is the newsletter from The Wildlife Society that includes job notices, as well as announcements of graduate (research) assistantships. Web sites of professional societies usually have a jobs listing.
4. Consult both state and federal Civil Service announcements (e.g., federal Life Sciences Announcement No. 421) which list the educational requirements, including specific subject matter, for numerous job titles. The New York State Employment Office is CNY Works (www.cnyworks.com). Federal job listings can be found at https://www.usajobs.gov/and New York State jobs can be found at https://statejobs.ny.gov/
5. Don't overlook contacts with anyone you know in agencies, consulting firms, and private business. Call or visit ESF alumni who usually are sympathetic and able to help you.
6. Be patient and PERSISTENT. It will take time and work to get established in a career as it did to get the B.S. degree.

# Graduate School

Graduate degrees (M.S., Ph.D.) are often required for positions in research, consulting, management, and teaching. Generally, the degree of responsibility achievable is commensurate with the highest post-graduate degree obtained. Preparation for graduate study demands dedication and high academic proficiency. The sooner you identify this goal, the more time you will have to develop an appropriate course background. Do this with the help of your advisor, but also in consultation with other faculty members who work in your desired field. Seek advice on potential graduate programs and faculty advisors at other institutions, and on opportunities for financial support.

Most students are unfamiliar with the correct way to select - and gain entrance into - a graduate program appropriate to their needs and interests. Begin by studying guides available from room 110 Bray Hall. Here are some additional guidelines.

1. Register for and take the GRE (Graduate Record Exam) (www.gre.org) and/or LSAT, MCAT, GMAT, etc. I recommend taking the GRE general (Verbal, Quantitative, Analytical) in November and the advanced (Biology) in December. Many colleges look carefully at GRE scores to decide on admissions, assistantships, and even awards during your graduate program. Some institutions also require a specialty examination (e.g., Biology).

2. Use EB faculty from your concentration area, graduate school websites, and graduate school guides to identify a school, researcher, or topic of interest for graduate study. The stronger your interest is in a particular university, certain researcher, given taxon, biological concept or process, or geographic area, the better your chances of conveying that interest and focus to the application review committee.

3. Write specific professors inquiring about their current research and anticipated assistantships for the semester or summer when you would like to matriculate. A departmental representative or a selection committee chairperson may answer you instead. Follow this correspondence with a request to visit the department, preferably a potential faculty advisor ("major professor"), at the 2-4 programs in which you are most interested. Above all, do not submit a single generic application to one department and expect it to gain you acceptance and support at a graduate school, unless your credentials are truly outstanding.

4. Financial support for graduate-level work and study are of three types: fellowships (the graduate version of scholarships), teaching assistantships, and research assistantships. If you want to do research, you'll need a stipend (living allowance) and possibly money for equipment, supplies, travel, and publication. Awards may or may not include full tuition costs. You should know what funds will be available to you and compare offers from graduate schools accordingly.

# Examples of EB Graduates

Below are some examples of job titles held by EB graduates (B.S., M.S., or Ph.D.)

Animal Ecologist

Animal Scientist

Aquatic Biologist

Aquatic Ecologist

Animal Physiologist

Electronic Microscope

Biometrician

Botanist

Coastal Zone Resources Specialist

Conservation Biologist

Conservation Exhibit Specialist

Cooperative Extension Agent

Cytologist

Ecological Modeler

Entomologist

Enviro. Assessment Specialist

Enviro. Conservation Officer

Enviro. Education Specialist

Environmental Impact Analyst

Extension Wildlife Specialist

Fish Farmer

Fish Pathologist

Foreign Fisherman Observer

Game Biologist

Greenhouse Manager

Ichthyologist

Invertebrate Ecologist

Laboratory Animal Supervisor

Mammologist

Marine Resources Specialist

Medical Technologist

Mycologist

Naturalist

Nursery Operations Manager

Ornamental Horticulturist

Ornithologist

Park Ranger

Pest Control Supervisor

Pesticide Investigator

Plant Ecologist

Plant Propagator

Preserve Manager

Public Health Specialist

Research Biologist

Research Geneticist

Research Plant Pathologist

Sanctuary Manager

Sea Lion Trainer

Seed Orchard Researcher

Soil Conservationist

Technical Writer

Toxicologist

Vegetation Specialist

Veterinary Assistant

Water Quality Planner

Weed Control Supervisor

Wildlife Conservation Specialist

Wildlife Researcher

Zoologist

# Appendix – Typical Schedule

Following the schedule would allow a ***four-year student*** to complete all degree requirements in a timely manner. Variations should be discussed with your advisor. Schedules of ***transfer students*** may vary from this significantly.

## Environmental Biology

### First Year

#### Fall

| | |
|---|---|
| EFB 101 General Bio I: Organismal Bio & Ecology | 3 |
| EFB 102 General Biology I Laboratory | 1 |
| FCH 150 General Chemistry Lec. I | 3 |
| FCH 151 General Chemistry Lab I | 1 |
| APM 105 Survey of Calculus I | 4 |
| EWP 190 Writing and the Environment | 3 |
| EFB 132 Orientation Seminar: EB | 1 |
| Total Credits | **16** |

#### Spring

| | |
|---|---|
| EFB 103 General Bio II: Cell Biology & Genetics | 3 |
| EFB 104 General Biology II Laboratory | 1 |
| FCH 152 General Chemistry Lec. II | 3 |
| FCH 153 General Chemistry Lab II | 1 |
| Electives[2] | 6 |
| Total Credits | **14** |

#### Summer

| | |
|---|---|
| EFB 202 Ecological Monitoring & Bio Assessment | 3 |
| Field Experience Elective | 3 |
| Total Credits | **6** |

### Sophomore Year

#### Fall

| | |
|---|---|
| EFB 120 Global Environment | 3 |
| APM 391 Introduction to Probability and Statistics | 3 |
| EFB 210 Diversity of Life I | 3 |
| EFB 320 General Ecology | 4 |
| Electives[1] | 1 |

| | |
|---|---|
| Total Credits | **16** |

**Spring**

| | |
|---|---|
| EWP 290 Writing, Humanities & Environment | 3 |
| EFB 307 Principles of Genetics | 3 |
| EFB 307 Principles of Genetics Laboratory | 1 |
| EFB 211 Diversity of Life II | 3 |
| FCH 210 Elements of Organic Chemistry | 4 |
| Electives[1] | 3 |
| Total Credits | **16** |

**Junior Year**

**Fall**

| | |
|---|---|
| FOR 296 Environmental Physics (or PHY101) | 3 |
| Electives | 12 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| EFB 311 Principles of Evolution | 3 |
| EFB 325 Cell Biology | 3 |
| Electives | 3 |
| Total Credits | **15** |

**Senior Year**

**Fall**

| | |
|---|---|
| Electives | 15 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| Electives | 15 |
| Total Credits | **15** |

[1]Recall that a second semester of calculus, physics or organic chemistry is needed (see Degree Works)

# Wildlife Science

## First Year

### Fall

| | |
|---|---|
| EFB 101 General Bio I: Organismal Bio & Ecology | 3 |
| EFB 102 General Biology I Laboratory | 1 |
| FCH 150 General Chemistry I | 3 |
| FCH 151 General Chemistry Lab I | 1 |
| APM 105 Survey of Calculus I | 4 |
| EWP 190 Writing and the Environment | 3 |
| EFB 132 Orientation Seminar: EB | 1 |
| Total Credits | **16** |

### Spring

| | |
|---|---|
| EFB 103 General Bio II: Cell Biology & Genetics | 3 |
| EFB 104 General Biology II Laboratory | 1 |
| FCH 152 General Chemistry Lec. II | 3 |
| FCH 153 General Chemistry Lab II | 1 |
| Electives | 6 |
| Total Credits | **14** |

### Summer

| | |
|---|---|
| EFB 202 Ecological Monitoring & Bio Assessment | 3 |
| Field Experience Elective | 3 |
| Total Credits | **6** |

## Sophomore Year

### Fall

| | |
|---|---|
| EFB 120 Global Environment | 3 |
| FTC 298 Environmental Physics (or PHY101) or Elective | 3 |
| EFB 210 Diversity of Life I | 3 |
| EFB 320 General Ecology | 4 |
| Electives | 4 |
| Total Credits | **17** |

### Spring

| | |
|---|---|
| EWP 290 Writing, Humanities & Environment | 3 |
| EFB 211 Diversity of Life II | 3 |
| FCH 210 Elements of Organic Chemistry | 4 |
| Electives | 4 |

| | |
|---|---|
| Total Credits | **14** |

**Junior Year**

**Fall**

| | |
|---|---|
| EFB 390 Wildlife Ecology and Management | 4 |
| APM 391 Introduction to Probability & Statistics | 3 |
| Electives | 8 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| EFB 307 Principles of Genetics | 3 |
| EFB 308 Principles of Genetics Laboratory | 1 |
| EFB 311 Principles of Evolution | 3 |
| EFB 491 Applied Wildlife Science | 3 |
| Electives | 5 |
| Total Credits | **16** |

**Senior Year**

**Fall**

| | |
|---|---|
| EFB 493 Wildlife Habitats and Population | 4 |
| Electives | 12 |
| Total Credits | **16** |

**Spring**

| | |
|---|---|
| Electives | 14 |
| Total Credits | **14** |

# Aquatic & Fisheries Science

## First Year

### Fall

| | |
|---|---|
| EFB 101 General Bio I: Organismal Bio & Ecology | 3 |
| EFB 102 General Biology I Laboratory | 1 |
| FCH 150 General Chemistry I | 3 |
| FCH 151 General Chemistry Lab I | 1 |
| APM 105 Survey of Calculus I | 4 |
| EWP 190 Writing and the Environment | 3 |
| EFB 132 Orientation Seminar: EB | 1 |
| Total Credits | **16** |

### Spring

| | |
|---|---|
| EFB 103 General Bio II: Cell Biology & Genetics | 3 |
| EFB 104 General Biology II Laboratory | 1 |
| FCH 152 General Chemistry Lec. II | 3 |
| FCH 153 General Chemistry Lab II | 1 |
| EFB 120 Global Environment | 3 |
| Electives[2] | 3 |
| Total Credits | **14** |

### Summer

| | |
|---|---|
| EFB 202 Ecological Monitoring & Bio Assessment | 3 |
| Field Elective | 3 |
| Total Credits | **6** |

## Sophomore Year

### Fall

| | |
|---|---|
| PHY 101 Major Concepts of Physics I | 4 |
| FOR 207 Introduction to Economics | 3 |
| EFB 210 Diversity of Life I | 3 |
| EFB 320 General Ecology | 4 |
| Total Credits | **14** |

### Spring

| | |
|---|---|
| EWP 290 Writing, Humanities & Environment | 3 |
| EFB 307 Principles of Genetics | 3 |
| EFB 308 Principles of Genetics Laboratory | 1 |
| EFB 211 Diversity of Life II | 3 |

| | |
|---|---|
| FCH 210 Elements of Organic Chemistry | 4 |
| Electives[1] | 3 |
| Total Credits | **16** |

**Junior Year**

**Fall**

| | |
|---|---|
| Electives | 15 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| APM 391 Introduction to Probability & Statistics | 3 |
| EFB 311 Principles of Evolution | 3 |
| EFB 486 Ichthyology | 3 |
| Electives | 6 |
| Total Credits | **15** |

**Senior Year**

**Fall**

| | |
|---|---|
| EFB 424 Limnology | 3 |
| Electives | 12 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| EFB 492 Senior Synthesis in Aquatic & Fisheries | 1 |
| EFB 325 Cell Biology | 3 |
| Electives | 11 |
| Total Credits | **15** |

[1]Recall that a second semester of calculus, physics or organic chemistry is needed (see Degree Works)

# Conservation Biology

## First Year

### Fall

| | |
|---|---|
| EFB 101 General Bio I: Organismal Bio & Ecology | 3 |
| EFB 102 General Biology I Laboratory | 1 |
| FCH 150 General Chemistry I | 3 |
| FCH 151 General Chemistry Lab I | 1 |
| APM 105 Survey of Calculus I | 4 |
| EWP 190 Writing and the Environment | 3 |
| EFB 132 Orientation Seminar: EB | 1 |
| Total Credits | **16** |

### Spring

| | |
|---|---|
| EFB 103 General Bio II: Cell Biology & Genetics | 3 |
| EFB 104 General Biology II Laboratory | 1 |
| FCH 152 General Chemistry Lec. II | 3 |
| FCH 153 General Chemistry Lab II | 1 |
| EFB 120 Global Environment | 3 |
| Electives | 3 |
| Total Credits | **14** |

### Summer

| | |
|---|---|
| EFB 202 Ecological Monitoring & Bio Assessment | 3 |
| Field Experience Elective | 3 |
| Total Credits | **6** |

## Sophomore Year

### Fall

| | |
|---|---|
| FOR 296 Environmental Physics (or PHY101) | 3 |
| EFB 210 Diversity of Life I | 3 |
| EFB 320 General Ecology | 4 |
| Electives | 5 |
| Total Credits | **15** |

### Spring

| | |
|---|---|
| EFB 307 Principles of Genetics | 3 |
| EFB 308 Principles of Genetics Laboratory | 1 |
| EFB 211 Diversity of Life II | 3 |
| FCH 210 Elements of Organic Chemistry | 3 |

| | |
|---|---|
| APM 391 Introduction to Probability & Statistics | 3 |
| EWP 290 Writing, Humanities & Environment | 3 |
| Total Credits | **16** |

**Junior Year**

**Fall**

| | |
|---|---|
| EFB 413 Introduction to Conservation Biology[1] | 3 |
| Electives | 12 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| EFB 370 Population Ecology & Management[1] | 3 |
| Electives | 12 |
| Total Credits | **15** |

**Senior Year**

**Fall**

| | |
|---|---|
| EFB 414 Senior Synthesis in Conservation Bio[1] | 3 |
| Electives | 12 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| Electives | 16 |
| Total Credits | **15** |

[1]Note the fall-spring-fall Conservation Biology sequence in the junior-senior years. Each course in this sequence is a pre-requisite for the next. Also note that Genetics and Ecology are both prerequisites for EFB 413. Variations should be discussed with your advisor.

# Forest Health

## First Year

### Fall

| | |
|---|---|
| EFB 101 General Bio I: Organismal Bio & Ecology | 3 |
| EFB 102 General Biology I Laboratory | 1 |
| FCH 150 General Chemistry I | 3 |
| FCH 151 General Chemistry Lab I | 1 |
| EWP 190 Writing and the Environment | 3 |
| EFB 132 Orientation Seminar: EB | 1 |
| Elective | 3 |
| Total Credits | **15** |

### Spring

| | |
|---|---|
| EFB 103 General Bio II: Cell Biology & Genetics | 3 |
| EFB 104 General Biology II Laboratory | 1 |
| FCH 152 General Chemistry Lec. II | 3 |
| FCH 153 General Chemistry Lab II | 1 |
| *EFB 245 Forest Health Colloquium (odd years) | 1 |
| Electives | 6 |
| Total Credits | **15** |

### Summer

| | |
|---|---|
| EFB 202 Ecological Monitoring & Bio Assessment | 3 |
| Total Credits | **3** |

## Sophomore Year

### Fall

| | |
|---|---|
| FOR 296 Environmental Physics (or PHY101) | 3 |
| EFB 210 Diversity of Life I | 3 |
| EFB 320 General Ecology | 4 |
| EFB 303 Intro Environmental Microbiology | 4 |
| Total Credits | **14** |

### Spring

| | |
|---|---|
| EFB 120 Global Environment | 3 |
| EFB 211 Diversity of Life II | 3 |
| EWP 290 Writing, Humanities & Environment | 3 |
| APM 391 Introduction to Probability & Statistics | 3 |

| | |
|---|---|
| FCH 210 Elements of Organic Chemistry | 4 |
| Total Credits | **16** |

**Junior Year**

**Fall**

| | |
|---|---|
| EFB 336 Dendrology | 3 |
| EFB 340 Forest & Shade Tree Pathology | 3 |
| EFB 351 or 352 (Forest) Entomology | 3 |
| *Note scheduling conflict with FOR334, another core course | |
| #EFB 344 Forest Health Seminar (odd years) | 1 |
| Electives | 6 |
| Total Credits | **16** |

**Spring**

| | |
|---|---|
| EFB 307 Principles of Genetics | 3 |
| EFB 308 Principles of Genetics Laboratory | 1 |
| EFB 311 Principles of Evolution | 3 |
| Electives | 9 |
| Total Credits | **16** |

**Senior Year**

**Fall**

| | |
|---|---|
| ##EFB 425 Forest Health Senior Synthesis (odd years) | 3 |
| FOR 345 Introductory Soils | 3 |
| FOR 344 Silviculture | 3 |
| *Note scheduling conflict with EFB 351/352 | |
| EFB 420 Internship in Env & Forest Biology | 3 |
| Electives | 4 |
| Total Credits | **16** |

**Spring**

| | |
|---|---|
| EFB 494 Forest Health Capstone | 1 |
| Electives | 14 |
| Total Credits | **15** |

#Forest Health majors will enroll either in EFB 245 as freshmen/sophomores, or in EFB 344 as juniors/seniors.

##Forest Health Senior Synthesis is offered only during odd years and may be taken in either the junior or senior year.

# Biotechnology

## First Year

### Fall

| | |
|---|---|
| EFB 101 General Bio I: Organismal Bio & Ecology | 3 |
| EFB 102 General Biology I Laboratory | 1 |
| FCH 150 General Chemistry I | 3 |
| FCH 151 General Chemistry Lab I | 1 |
| APM 101 Survey of Calculus I | 4 |
| EWP 190 Writing and the Environment | 3 |
| BTC 132 Orientation Seminar in Biotechnology | 1 |
| Total Credits | **16** |

### Spring

| | |
|---|---|
| EFB 103 General Bio II: Cell Biology & Genetics | 3 |
| EFB 104 General Biology II Laboratory | 1 |
| FCH 152 General Chemistry Lec. II | 3 |
| FCH 153 General Chemistry Lab II | 1 |
| APM 106 Survey of Calculus II | 4 |
| EWP 290 Writing and the Environment | 3 |
| Total Credits | **15** |

## Sophomore Year

### Fall

| | |
|---|---|
| FCH 221 Organic Chemistry I | 3 |
| FCH 221 Organic Chemistry Lab I | 1 |
| EFB 320 General Ecology | 4 |
| PHY 101 Major Concepts of Physics I [1] | 4 |
| EFB 210 Diversity of Life I or Elective | 3 |
| Total Credits | **15** |

### Spring

| | |
|---|---|
| BTC 497 Research, Design & Professional Development | 1 |
| EFB 307 Principles of Genetics | 3 |
| EFB 308 Principles of Genetics Laboratory | 1 |
| EFB 223 Organic Chemistry II | 3 |
| EFB 223 Organic Chemistry Lab II | 1 |
| PHY 102 Major Concepts of Physics II [1] | 4 |
| EFB 211 Diversity of Life II or Elective | 3 |

| | |
|---|---|
| Total Credits | **16** |

**Junior Year**

**Fall**

| | |
|---|---|
| EFB 303 Intro to Environmental Microbiology | 3 |
| BTC 401 Molecular Biology Techniques | 4 |
| Electives | 7 |
| Total Credits | **15** |

**Spring**

| | |
|---|---|
| APM 391 Intro/Probability & Stats | 3 |
| BTC 498 or 420 Research Problems in Biotech or Internship | 2 |
| EFB 325 Cell Biology | 3 |
| Electives | 6 |
| Total Credits | **15** |

**Summer**

| | |
|---|---|
| BTC 498 or 420 Research Problems in Biotech or Internship | 3 |
| Total Credits | **3** |

**Senior Year**

**Fall**

| | |
|---|---|
| FCH 430 Biochemistry I | 3 |
| Electives | 13 |
| Total Credits | **16** |

**Spring**

| | |
|---|---|
| BTC 499 Senior Project Synthesis | 1 |
| FCH 432 Biochemistry II | 3 |
| Electives | 11 |
| Total Credits | **15** |