

ACADEMIC PROGRAM

DEGREE REQUIREMENTS

2013-2014 UVM CATALOGUE

Academic programs in The Rubenstein School include four kinds of requirements: **UNIVERSITY, GENERAL EDUCATION, CORE CURRICULUM, and MAJOR.**

■ UNIVERSITY REQUIREMENTS

There are three University requirements which must be fulfilled by all UVM degree candidates, regardless of school or college affiliation:

1. University Diversity Requirement – Six credits from the list of approved diversity courses
2. Minimum cumulative grade point average of 2.00
3. 30 of the last 45 hours of academic credit applied toward the degree must be earned at UVM

■ GENERAL EDUCATION REQUIREMENTS

The Rubenstein School of Environment and Natural Resources general education requirements are designed to enhance a student's ability to assimilate and analyze information, think and communicate clearly, and respect multiple perspectives. These requirements are flexible in order to encourage creativity in meeting educational goals. Fulfilling general education requirements will account for approximately one-quarter of your total program. This is work that can be spread throughout the four-year sequence, though there are distinct advantages to taking certain classes early on. Also, some majors have specific requirements that should be considered as you make selections; you often can simultaneously fulfill a general education and a major requirement with a single course. Your faculty advisor will help you consider these possibilities as you plan your schedule.

In selecting courses to meet general education requirements, we have two additional pieces of advice: take a variety of courses; take courses that interest you. You will do better and have more fun. The classes you elect to fulfill these requirements are offered by departments all across campus. You will be meeting and interacting with students and faculty with very different interests and backgrounds. This too is an important part of a broad-based education. All students must complete each of the following general education requirements*:

1. **WRITING**
ENGS 1, ENGS 50 or ENGS 53 (3 cr.)
2. **SPEAKING**
SPCH 11, CALS 183, or NR 21 (2 or 3 cr.)
3. **RACE AND CULTURE IN NATURAL RESOURCES****
NR 6, NR 207, and 3 credits from the approved list of D1 or D2 diversity courses (6 cr.)

4. **MATHEMATICS*****

MATH 9 or higher, but **NOT** MATH 17 (3 cr.)

5. **STATISTICS*****

NR 140, STAT 111, STAT 141 or STAT 211 (3 or 4 cr.)

6. **Three courses in a self-design sequence**

Each student defines a learning objective and selects at least 9 credits from departments outside The Rubenstein School to meet that objective. This sequence of courses must be approved by your advisor before the completion of four semesters or 60 credit hours (although the timeframe may be extended for transfer students).

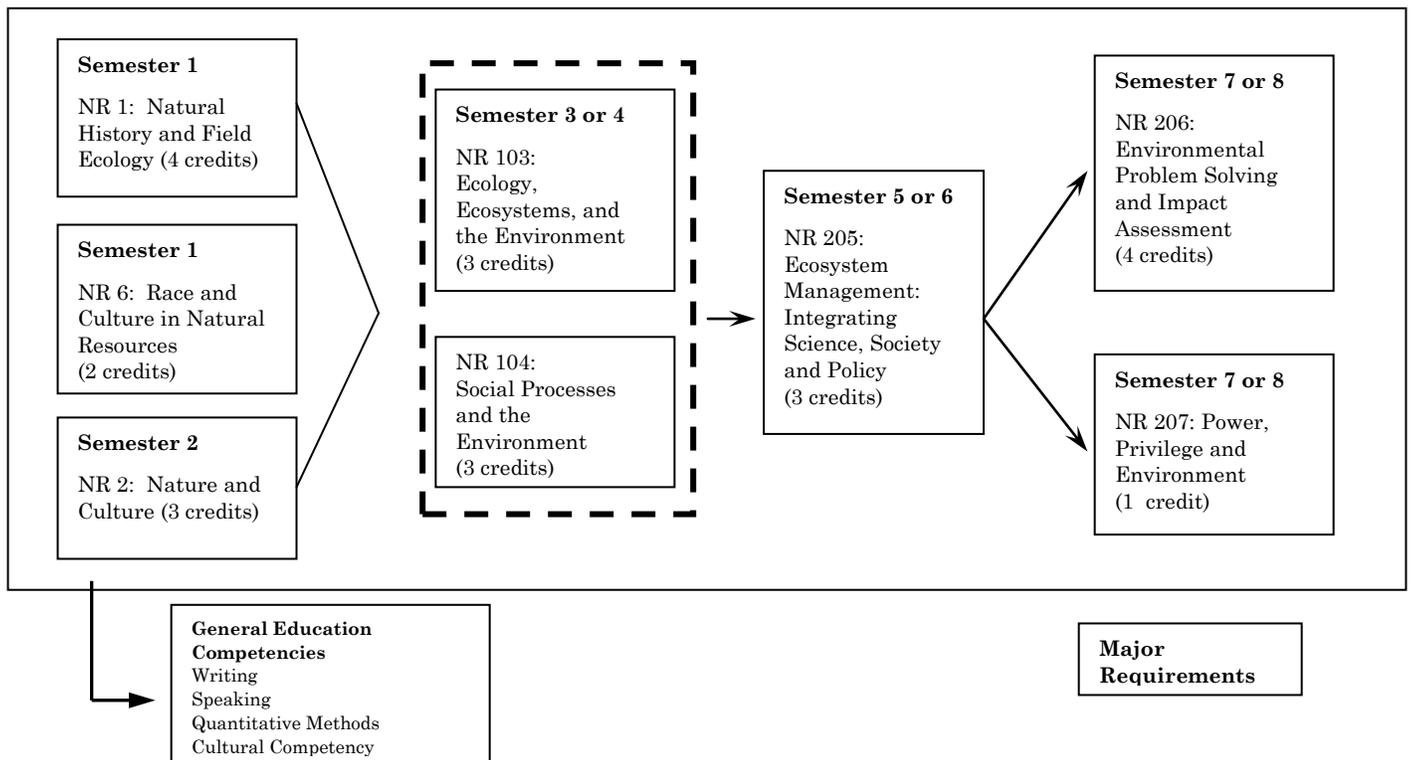
* No single course may be used to satisfy more than one of the above requirements with the exception of the 3 additional Diversity credits.

** Due to space or scheduling limitations, transfer students may be unable to take NR 6 and/or NR 207. In these cases, students may be allowed to take one course from Category D1 and a second course from Category D1 or D2 to fulfill the Race and Culture requirement in the Rubenstein School and the University Diversity Requirement

***Requirement varies depending on major choice.

■ CORE CURRICULUM REQUIREMENTS

The core curriculum of The Rubenstein School represents a body of knowledge, skills, and values that the faculty believe is central to the study of natural resources and the environment. The core curriculum's eight required courses (**23 total credits**) cut across all academic programs within the School, integrating the natural and social sciences in an effort to approach full understanding and resolution of natural resource and environmental issues. The sequence of the core curriculum is shown schematically in the diagram below:



NR 1 and NR 2 provide an introduction to the study of natural resources and the environment from natural and social science standpoints, respectively. At the completion of these courses, students should (1) have a basic understanding of the School's integrated approach to natural resources and the environment, (2) be better prepared to make informed decisions about their academic majors, and (3) be prepared to advance to an intermediate level of study in natural resources. The intermediate courses in the sequence, NR 103 and NR 104, emphasize ecosystems and social systems, respectively. NR 205 and NR 206 focus directly on integrated and holistic management. In NR 205, students integrate natural and social science to understand environmental management principles and policies. In NR 206, the capstone course taken senior year, students are challenged to synthesize and apply the interdisciplinary knowledge, skills, and values they have learned to contemporary natural resources and environmental issues. NR 6 and NR 207 explore how social justice and environmental issues are intertwined, and help students become culturally competent in an increasingly diverse world.

Core Curriculum Course Descriptions

NR 1

Natural History and Field Ecology

Introduction to the dynamics of the natural world. Basic concepts of biological, chemical, physical, and ecological sciences and the application and interpretation of the quantitative measurements are presented within a natural history context. (4 credits)

NR 6

Race and Culture in Natural Resources

Introduces the first-year student to issues of race and culture and their relevance to society, natural resources, and the environment. (2 credits)

NR 2

Nature and Culture

Introduction to natural resources and the environment from a social/cultural perspective. Emphasis on environmental history, values, and ethics with application to natural resource and environmental policy. (3 credits)

NR 103

Ecology, Ecosystems, and Environment

Major ecological concepts and their application. Analysis of form, structure and function of organisms, populations, communities, ecosystems and landscapes. (3 credits)

NR 104

Social Processes and the Environment

Social science theories and their application to environmental issues. Analysis of issues using theories of government, economics, and social movements. Emphasis on integrating frameworks to analyze environmental issues. (3 credits)

NR 205

Ecosystem Management: Integrating Science, Society, and Policy

Integration of natural and social science into ecosystem management and policy. Consideration of ecosystem integrity, ecosystem degradation, human needs and values and the application of management principles within a holistic context. (3 credits)

NR 206

Environmental Problem Solving and Impact Assessment

Group dynamics, impact assessment, risk assessment and decision making. Emphasis on the process of solving complex environmental problems, interdisciplinary team work, and the National Environmental Policy Act. (4 credits)

NR 207

Power, Privilege and Environment

The senior level multicultural experience combines synthesis and personal reflection with a forward-looking perspective about how issues of diversity and equity will influence the lives of students after they graduate. (1 credit)

■ MAJOR REQUIREMENTS

Major requirements are the additional courses that you must take in order to graduate in a specific discipline. The Rubenstein School of Environment and Natural Resources awards degrees in six majors; several of these include distinct options, each of which has somewhat different requirements. The choices are:

Environmental Sciences

Agriculture and the Environment
Conservation Biology and Biodiversity
Ecological Design
Environmental Analysis and Assessment
Environmental Biology
Environmental Chemistry
Environmental Geology
Environmental Resources
Water Resources

Environmental Studies

Forestry

Natural Resources

Integrated Natural Resources
Resource Ecology
Resource Planning

Parks, Recreation, and Tourism

Private Outdoor Recreation and Tourism
Public Outdoor Recreation

Wildlife and Fisheries Biology

Fisheries Biology
Wildlife Biology

MINORS

A minor is a secondary concentration of course work, outside the area of the major. Some UVM academic programs require students to have a minor, but The Rubenstein School of Environment and Natural Resources does not. We do, however, offer minors in:

Environmental Studies

Forestry

Geospatial Technologies

Parks, Recreation, and Tourism

Wildlife Biology

These minors are available to students from any academic unit on campus. Rubenstein School students are also welcome to complete minors in academic departments outside the School.

ENVIRONMENTAL SCIENCES

The demand for environmental scientists has increased dramatically in recent years. State and federal regulations addressing water pollution, solid waste management, air quality and global climate change, and environmental impact assessment have created a substantial demand for personnel with strong basic and applied scientific backgrounds. Large companies are hiring environmental scientists to help them respond to environmental regulations. Consulting firms are growing rapidly, and they are employing scientists with specific skills to work on multi-disciplinary teams. The need for environmental scientists trained to tackle environmental problems will continue to increase.

The Environmental Sciences curriculum offers a science-based education providing both the fundamental knowledge and hands-on experience needed to identify, analyze and solve environmental problems. Prior to the junior year, the student selects a concentration designed to provide greater depth of knowledge in a particular aspect of the field. Concentrations are offered in **Agriculture and the Environment, Conservation Biology and Biodiversity, Ecological Design, Environmental Analysis and Assessment, Environmental Biology, Environmental Chemistry, Environmental Geology, Environmental Resources, and Water Resources.**

Internships: Experiential learning is strongly recommended. Students are encouraged to do a professionally oriented internship under joint supervision of faculty and business, regulatory, or community representatives. An Environmental

Sciences Internship Coordinator oversees the program.

Students may enroll in the Environmental Sciences major through The Rubenstein School of Environment and Natural Resources, the College of Agriculture and Life Sciences, or the College of Arts and Sciences. Majors in the College of Arts and Sciences complete ENSC 1, 130, and 160, while those in the College of Agriculture and Life Sciences and The Rubenstein School complete all five Environmental Sciences Foundation Courses and major requirements. General education and other school-based requirements differ. Those majoring in Environmental Sciences through The Rubenstein School of Environment and Natural Resources complete The Rubenstein School's general education and core requirements.

Program Chair:	Professor Deane Wang	268 Jeffords	656-8885
Program Staff Assistant:	Marcie Newland	304 Aiken	656-2911

DEGREE REQUIREMENTS

All students who enroll in the Environmental Sciences major in The Rubenstein School must fulfill the following requirements for graduation:

1. Completion of The Rubenstein School's core curriculum.
2. Completion of The Rubenstein School's general education requirements.
3. Completion of a minimum of 120 credit hours of courses.
4. Completion of the Environmental Sciences minimal basic science/quantitative coursework:
 - BCOR 11 and 12, Exploring Biology (8 cr.)
 - CHEM 31 and 32, Introductory Chemistry (8 cr.)
 - CHEM 42, Introduction to Organic Chemistry* (4 cr.)
 - GEOL 55, Environmental Geology -or- PSS 161, Introduction to Soil Science (4 cr.)
 - MATH 19 and 20, Calculus I and Calculus II** (6 cr.)
 - NR 140, Applied Environmental Statistics (4 cr.)
 - or - STAT 141, Basic Statistics** (3 cr.)

*Students interested in areas such as environmental analysis and assessment should consider taking more advanced courses such as CHEM 141/142.

** Also fulfills a Rubenstein School general education requirement.

5. Completion of Environmental Sciences foundation courses:
 - ENSC 1, Introduction to Environmental Sciences (3 cr.)
 - ENSC 9, Orientation to Environmental Sciences* (1 cr.)
 - ENSC 130, Global Environmental Assessment (3 cr.)
 - ENSC 160, Pollutant Movement through Air, Land, and Water (4 cr.)
 - ENSC 201, Recovery and Restoration of Altered Ecosystems (3 cr.)
 - ENSC 202, Ecological Risk Assessment (3 cr.)

*Internal and External Transfer students to ENSC are exempt from ENSC 9

6. Completion of focus track requirements (14 credits) in **Agriculture and the Environment, Conservation Biology and Biodiversity, Ecological Design, Environmental Analysis and Assessment, Environmental Biology, Environmental Chemistry, Environmental Geology, Environmental Resources, and Water Resources**. A list of courses approved for each track is available from the Program Director or Dean's Office or from the ENSC website www.uvm.edu/~ensc/. Students may also elect a self-designed track in a particular area of interest.

ENVIRONMENTAL STUDIES

The Environmental Program serves a wide range of environmental interests, with its primary mission being undergraduate education, and its primary focus the individual student. Students in Environmental Studies learn interdisciplinary skills to seek solutions to environmental problems and to enhance the quality of human life and the health of the planet.

Required courses combine the perspectives of the sciences, social studies, and humanities in local, national, and global contexts. Working closely with the faculty, each student plans a personalized program of coursework that combines a broad, comprehensive understanding of the environment with depth in a specific concentration of study. Major concentrations can be in the natural sciences, the humanities, the social sciences, or broadly interdisciplinary around a specific focus. Many students earn credits through internships or projects in the community or beyond; most spend a semester overseas; and all do a nine-credit senior capstone.

Many graduates pursue graduate or professional degrees; others enter employment in public and private sectors as consultants, educators, ecologists, planners, analysts, field or laboratory researchers, writers and activists. Common choices include environmental education, biodiversity and endangered species, natural areas management, environmental policy and law, mediation, landscape restoration, wetlands protection, land conservation and land use planning, sustainable development, women's studies, ecotourism, and environmental communication.

The Environmental Studies major is actually offered through three different schools and colleges at the University. All students in the program complete the same Environmental Studies Core and major requirements, but general education and other school-based requirements differ. Students majoring in Environmental Studies through The Rubenstein School of Environment and Natural Resources complete The Rubenstein School's general education and core requirements.

Program Director:	Professor Stephanie Kaza	Bittersweet	656-4055
Program Secretary:	Susan Bean	Bittersweet	656-4055
Student Services Coordinator:	Ibit Getchell	Bittersweet	656-0176

DEGREE REQUIREMENTS

All students who enroll in the Environmental Studies major in The Rubenstein School must fulfill the following requirements for graduation:

1. Completion of The Rubenstein School's core curriculum.
2. Completion of The Rubenstein School's general education requirements.
3. Completion of a minimum of 120 credit hours of courses.
4. Completion of the Environmental Studies major core courses:
 - ENVS 1, Introduction to Environmental Studies (4 cr.)
 - ENVS 2, International Environmental Studies (4 cr.)
 - ENVS 151, Intermediate Environmental Studies (3 cr.)
 - Senior Capstone (9 cr.)
5. Completion of individually-designed program:

Thirty credits of approved environmentally-related courses at the 100- or 200-level, including three credits at the 200-level, with at least one environmentally-related course in each of these areas: natural sciences, humanities, social sciences, and international studies (may be fulfilled by a Study Abroad experience). These courses are in addition to The Rubenstein School's core and general education requirements.

ENVIRONMENTAL STUDIES MINOR REQUIREMENTS

A minimum of 17 credit hours is required. Students must earn at least a 2.0 cumulative GPA in their Environmental Studies minor courses to earn a minor in Environmental Studies. Courses required are:

ENVS 1, Introduction to Environmental Studies (4 cr.)

ENVS 2, International Environmental Studies (4 cr.)

9 credits of ENVS at the 100-level or above, including 3 credits at the 200-level. Of the 9 credits, one non-ENVS course at the appropriate level may be substituted with the approval of the student's advisor and the Environmental Program.

FORESTRY

The Forestry Program educates students to excel at planning and implementing sustainable forestry, with an emphasis on the complex social and natural landscapes of the northeastern United States. Students develop an ability to coordinate and manage all aspects of sustainable forestry through educational experiences combining a strong foundation in natural and social sciences with field-based classes, internships, research experiences, and forest management projects.

This major is for students who have a sincere interest in, and commitment to, the forests around us. The program of study is designed to prepare students to become actively involved in maintaining and enhancing the long-term viability of forest ecosystems and in meeting society's diverse forest-based needs. The required core of Forestry courses builds directly on The Rubenstein School's core curriculum and provides an interdisciplinary, field-oriented understanding of the fundamental forestry knowledge and skills.

A student-proposed, faculty-approved, **area of concentration** provides curricular flexibility and addresses the individual interests of the Forestry major. This concentration may be an *individually designed area of emphasis* such as forest ecosystem health, forest ecology, consulting forestry, or urban forestry; or a *professionally appropriate University minor* such as wildlife biology, botany, or international development; or a *study abroad experience* that has a clear environmental and natural resources emphasis.

We emphasize experiential learning through extensive field instruction on University-owned forestland near the campus, the Green Mountain National Forest, and other public as well as private forests throughout Vermont. We strongly encourage students to gain valuable career-oriented experience while earning academic credit by assisting with ongoing forestry field or laboratory research, or through internship opportunities with public agencies and private organizations.

Graduates may be employed as resource professionals on public forests, consultants to private forest landowners, or managers of industrial forest lands; or they may choose related employment with organizations such as the Peace Corps, or land conservation groups; or they may pursue certification for secondary school education in biological and natural sciences; or they may decide to continue their education at the master's or doctoral level. To enhance their professional employability, students are strongly encouraged to pursue, and are assisted in finding, forestry internship and summer employment opportunities.

Program Chair:	Professor William Keeton	308B Aiken	656-2518
Program Staff Assistant:	Marcie Newland	304 Aiken	656-2911

DEGREE REQUIREMENTS

All students who enroll in the Forestry curriculum must fulfill the following requirements for graduation:

1. Completion of The Rubenstein School's core curriculum.
2. Completion of The Rubenstein School's general education requirements.
3. Completion of a minimum of 124 credit hours of courses.
4. Completion of Forestry required courses:

PBIO 4, Introduction to Botany (4 cr.)
CHEM 23, General Chemistry (4 cr.)
MATH 18, Basic Mathematics* (3 cr.)
NR 25, Natural Resources Measurements and Mapping (4 cr.)
NR 140, Applied Environmental Statistics * (4 cr.)
WFB 224, Conservation Biology (4 cr.)
PSS 161, Introduction to Soil Science (4 cr.)
A course in Economics or Ecological Economics (3 cr.)
FOR 21, Dendrology (4 cr.)
FOR 73, Small Woodlot Management (3 cr.)
FOR 81, Forestry Seminar** (1 cr.)
FOR 121, Forest Ecology Laboratory (2 cr.)
FOR 122, Forest Ecosystem Analysis*** (4 cr.)
FOR 223, Multi-Resource Silviculture (4 cr.)
FOR 235, Forest Ecosystem Health (4 cr.)
FOR 182, Advanced Forestry Seminar (1 cr.)
FOR 272, Sustainable Management of Forest Ecosystems (4 cr.)

* Also fulfills general education requirement.

**Transfer students with 45 or more credit hours are exempt from FOR 81.

***Field intensive course **OFFERED ONLY DURING THE SUMMER SESSION.**

5. Completion of Forestry area of concentration:
Twelve additional credit hours of student-proposed, faculty-approved¹ course work addressing individual interests of the student. The concentration may be *self-designed*² such as forest ecosystem health, forest ecology, consulting forestry, public forestry administration, or international development; an appropriate University *minor*; or a natural resource oriented *study abroad*

¹ Must be endorsed by the student's advisor and approved by the Forestry faculty prior to the last 3 semesters of study.

² At least 9 credits are to be at the 100-level or higher.

FORESTRY MINOR REQUIREMENTS

A minimum of 16 credit hours is required, with at least 9 at the 100-level or higher. Applications for the minor must be filed no later than June 1 of the year preceding graduation. Students must earn at least a 2.0 cumulative GPA in their Forestry minor courses to earn a minor in Forestry.

Required courses: FOR 1, Forest Conservation* - or - FOR 73, Small Woodlot Management (3 cr.)
FOR 21, Dendrology (4 cr.)
Additional FOR courses to total 16 credit hours.

*Rubenstein School students may not count FOR 1 towards completion of Forestry minor.

GEOSPATIAL TECHNOLOGIES

With the advent of high resolution satellite imagery, desktop software for GIS and remote sensing, and inexpensive GPS receivers, geospatial technologies are currently on the forefront of a revolution which incorporates huge volumes of data from a multitude of sources tied to a location on the Earth and analyzes that data using new and innovative methods which incorporate relationships in time and space. The application of these technologies is no longer limited to the military and federal government; the applications are unlimited and the market for this technology is booming. Geospatial technologies provide new and evolving expertise for addressing the major environmental issues of our time by transforming data into geographically-referenced information.

A minor in Geospatial Technologies provides knowledge of Geographic Information Systems (GIS), remote sensing, Global Positioning Systems (GPS), and spatial analyses. The tools offered by these technologies are essential in the acquisition, integration, and analysis of geographically-referenced data and applicable to a wide array of environmental issues at local to global scales. Complementing their major field of study, an enhanced understanding of geospatial technology will provide students with the expertise necessary to meet the demands of their diverse careers in the global workplace.

Participating Faculty:

RSENR – Leslie A. Morrissey, Austin Troy, Jarlath O’Neil-Dunne, Ernie Buford, and Walter Poleman
GEOGRAPHY –Beverley Wemple, Lesley-Ann Dupigny-Giroux, Shelly Rayback, and Meghan Cope
GEOLOGY – Paul Bierman
CIVIL ENGINEERING - Donna Rizzo
COMPUTER SCIENCE – Alison Pechenick

GEOSPATIAL TECHNOLOGIES MINOR REQUIREMENTS

The courses for the minor include three required courses and at least two elective courses for a minimum of 15 required credits. At least 9 credit hours must be at the 100-level or above. At least half of the courses (8 credits) used to satisfy the minor must be taken at UVM. Students must earn at least a 2.0 cumulative GPA in their Geospatial Technologies minor courses to earn a minor in Geospatial Technologies. The courses for the minor include:

Required Courses (3):

- 1) Introduction to Geospatial Technologies (select one course)
 - CE 10/12, Geomatics/Lab (5 cr.)
 - NR 25, Measurement and Mapping of Natural Resources (4 cr.)
 - GEOG 81, Geotechniques (3 cr.)
 - ENSC 130, Global Environmental Assessment (3 cr.)
 - GEOL 151, Geomorphology (3 cr.) – cross listed as GEOG 144
- 2) Geographic Information Systems (select one course)
 - NR 143, Introduction to Geographic Information Systems (3 cr.)
 - GEOG 184, Geographic Information: Concepts and Applications (3 cr.)
- 3) Remote Sensing (select one course)
 - NR 146, Remote Sensing of Environment (3 cr.)
 - GEOG 185, Remote Sensing (3 cr.)

Elective Courses (2):

Select either two courses from Group A or one course each from Group A and Group B.

Group A

- GEOG 287, Spatial Analysis (3 cr.)
- NR 243, GIS Practicum (3 cr.)
- NR 245, Integrating GIS and Statistics (3 cr.)
- GEOG 281a, Satellite Climatology/Land Surface Applications (3 cr.)

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GEOG 281b, Advanced GIS Applications (3 cr.)

NR 242, Advanced Spatial Techniques (1-3 cr.)

Group B

CS 21, Programming in Python (3 cr.)

CS 42, Dynamic Data on the Web (3 cr.)

CS 148, Database Design for the Web (3 cr.)

CS 189, Computer Science for Geospatial Technologies (3 cr.)

CDAE 101, Computer Aided Drafting and Design (3 cr.)

NATURAL RESOURCES

The Natural Resources curriculum combines coursework from disciplines within and outside The Rubenstein School of Environment and Natural Resources to produce an individualized major focused on an ecological theme or human/environment relationship. Students may choose to concentrate their studies in **Resource Ecology** or **Resource Planning**, or to develop an individualized program of study in **Integrated Natural Resources**.

The **Resource Ecology** option explores the biology and ecology of plants and animals in both aquatic and terrestrial systems and allows students to select courses around specific individual interests. Students can concentrate their studies on areas such as conservation biology, ecosystem analysis, or ecological dimensions of environmental quality.

The **Resource Planning** option explores interactions among individuals, communities, and society with nature, resources and the environment. It allows students to select courses around specific individual interests such as natural resource planning and community, policy and economic dimensions of resource planning, and international dimensions of resource planning.

The **Integrated Natural Resources** (INR) option provides a broad natural resources education, giving students considerable flexibility in selecting courses. It is for students who have strong interests in natural resources and the environment, clear academic direction, and the motivation to develop a well-focused, personally meaningful course of study. Students in INR have developed concentrations in Environmental Education, Sustainable Resource Management, Resource Conservation, International Resource Issues, and Spatial Analysis of Natural Resources.

Program Chair:	Professor Clare Ginger	308F Aiken	656-2698
Program Staff Assistant:	Marcie Newland	304 Aiken	656-2911

DEGREE REQUIREMENTS

All students who enroll in the Natural Resources curriculum must fulfill the following requirements for graduation:

1. Completion of The Rubenstein School's core curriculum.
2. Completion of The Rubenstein School's general education requirements.
3. Completion of a minimum of 120 credit hours of courses.
4. Completion of option requirements for **Resource Ecology**, **Resource Planning**, or **Integrated Natural Resources**.

Resource Ecology option:

Required Basic Science courses (31-34 credits, depending on Chemistry courses taken):

- BIOL 1 and 2, Principles of Biology (8 cr.)
- GEOL 1, Earth System Science (4 cr.)
 - or - PSS 161, Introduction to Soil Science (4 cr.)
- MATH 19, Fundamentals of Calculus I * (3 cr.)
- NR 140, Applied Environmental Statistics * (4 cr.)
- CHEM 23, Outline of General Chemistry (4 cr.)
 - or - CHEM 31 and 32, Introductory Chemistry (8 cr.)
- CHEM 26, Organic and Biochemistry (4 cr.) - or - CHEM 42, Introduction to Organic Chemistry (4 cr.)
 - or - CHEM 141 and 142, Organic Chemistry (8 cr.)
- NR 25, Natural Resources Measurements and Mapping (4 cr.)
- NR 143, Introduction to Geographic Information Systems (3 cr.)
 - or - NR/FOR 146, Remote Sensing of Natural Resources (3 cr.)

*Also fulfills general education requirement.

Option Electives -- ecology or ecology-related courses (27 credits): In consultation with an academic advisor, student chooses 27 additional credits from an approved list of courses available in Aiken 305 and 304 and online at <http://www.uvm.edu/rsenr/undergraduate-natural-resources-major>. In choosing courses, students pursue interests in the biology and ecology of plants and animals in aquatic and terrestrial systems. They may concentrate their studies in areas such as conservation biology, ecosystem analysis, or ecological dimensions of environmental processes and quality.

Any course substitution request should be approved prior to the end of the add/drop period for the semester in which the student enrolls in the substitution course.

Resource Planning option:

Required distribution courses (24 credits):

- PSYC 1, General Psychology - or - PSYC 104, Learning, Cognition, and Behavior,
 - or - PSYC 130, Social Psychology - or - PSYC 161 Developmental Psychology (3 cr.)
- CDAE 2, World Food, Population, & Develop. (3 cr.) - or - ENVS 2, International Environmental Studies (4 cr.)
- POLS 21, American Political System - or - POLS 41, Introduction to Political Theory
 - or - POLS 51, Intro International Relations (3 cr.)
- SOC 1, Introduction to Sociology - or - SOC 11, Social Problems (3 cr.)
- PHIL 10, Introduction to Philosophy: Ethics - or - CDAE 208, Agricultural Policy and Ethics
 - or - ENVS 178, Environmental Ethics (3 cr.)
- ANTH 21, Cultural Anthropology - or - GEOG 50, World Regional Geography (3 cr.)
- EC 11, Principles of Macroeconomics - or - 12, Principles of Microeconomics
 - or - CDAE 61, Principles of Community Development (3 cr.)

Option Electives (27 credits): In consultation with an academic advisor, student chooses a minimum of 27 additional credits from an approved list of courses available in Aiken 305 and 304 and online at <http://www.uvm.edu/rsenr/undergraduate-natural-resources-major>. In choosing these courses, students pursue interests in interactions among individuals, communities, and society with nature, resources, and the environment. They may concentrate their studies in areas such as natural resource planning and community, policy and economic dimensions of resource planning, and international dimensions of resource planning.

Any course substitution request should be approved prior to the end of the add/drop period for the semester in which the student enrolls in the substitute course.

Integrated Natural Resources option:

Option Required courses (minimum of 9 credits):

Students select from a list of approved courses, at least one course in each of three areas: *biology/ecology; NR courses in social sciences and communications; and quantitative and analytical methods*. These courses are IN ADDITION to those taken to fulfill RSENr's general education requirements. List of approved courses is available in Aiken 305 and 304 and online at <http://www.uvm.edu/rsenr/undergraduate-natural-resources-overview>

Individualized Program of Study (minimum of 39 credits):

The student develops an Individualized Program of Study composed primarily of intermediate level RSENr courses (ENVS, ENSC, FOR, NR, PRT or WFB prefix). This must include at least twenty-four credits inside the School and no more than six credits below the 100-level. With careful selection of courses, students develop concentrations such as *Environmental Education, Sustainable Resource Management, Environmental Health, and Spatial Analysis of Natural Resources*.

All programs of study must be endorsed by the advisor, then approved by the faculty. If not approved, the student may not continue in the INR option and must seek another major. **The program of study is to be completed by the end of the sophomore year (60 credits)**. Transfer students with more than sixty credits must have a program of study approved as part of the transfer application. It is expected that transfer students will be active in the Program for at least two years (four semesters) after transferring into the INR option. Any course substitution request should be approved prior to the end of the add/drop period for the semester in which the student plans to enroll in the substitute course.

PARKS, RECREATION, AND TOURISM

The Parks, Recreation, and Tourism program offers students professional preparation in the planning and management of outdoor recreation and tourism resources in combination with a well-rounded liberal education. The program stresses the development of recreation and leisure opportunities integrated with the wise use and protection of natural resources. Emphasis is placed on maintaining the integrity of recreation and tourism resources, balancing public and private interests in land, and creating recreation opportunities as a component of planned land use.

In their advanced work, students have the opportunity to emphasize either Private Outdoor Recreation and Tourism or Public Outdoor Recreation as they prepare for professional careers in a variety of outdoor recreation enterprises and agencies. Past graduates are employed in the management of ski areas, private campgrounds, marinas, four-season resorts, travel businesses, and national, state and community parks. Internships and cooperative education opportunities provide valuable work experiences. These courses assist students with career planning, provide education not offered in campus course work, and often lead to useful professional contacts.

Program Chair:	Professor Walter Kuentzel	308H Aiken	656-0652
Program Staff Assistant:	Marcie Newland	304 Aiken	656-2911

DEGREE REQUIREMENTS

All students who enroll in the Parks, Recreation, and Tourism Program must fulfill the following requirements for graduation:

1. Completion of The Rubenstein School's core curriculum.
2. Completion of The Rubenstein School's general education requirements.

3. Completion of a minimum of 124 credit hours of courses.
4. Completion of Parks, Recreation, and Tourism foundation courses:
 - One 3-credit course in humanities (History, Philosophy, Religion, Classics)
 - One 3-credit course in communications (Art, Music, Theater, Art History, Foreign Language, English Literature, World Literature)
 - One 3-credit course in social sciences (Anthropology, Economics, Geography, Political Science, Psychology, Sociology)
 - One 4-credit laboratory course in natural sciences (Biology, Physics, Chemistry, Plant Biology, Zoology, Geology)
5. Completion of requirements for either the **Public Outdoor Recreation** or **Private Outdoor Recreation and Tourism** option (see below).

Public Outdoor Recreation option requirements:

Completion of Public Outdoor Recreation core courses:

PRT 1, Introduction to Recreation and Tourism (3 cr.)

PRT 138, Park and Recreation Design (4 cr.)

PRT 153, Recreation Administration and Operation (3 cr.)

PRT 191, Parks, Rec, and Tourism Practicum (3-6 cr) – *Internship must be approved in advance with required documentation complete*

PRT 235, Outdoor Recreation Planning (3 cr.)

PRT 240, Park and Wilderness Management (3 cr.)

PRT 255, Environmental Interpretation (3 cr.)

Completion of **3 courses** selected from the following list:

PRT 50, Tourism Planning (3 cr.)

PRT 157, Ski Area Management (4 cr.)

PRT 158, Resort Marketing and Management (3 cr.)

PRT 230, Ecotourism (3 cr.)

PRT 258, Entrepreneurship in Recreation and Tourism (3 cr.)

Completion of **nine credits** of professional electives chosen in consultation with an advisor.

Private Outdoor Recreation and Tourism option requirements:

Completion of Private Outdoor Recreation and Tourism core courses:

PRT 1, Introduction to Recreation and Tourism (3 cr.)

PRT 50, Tourism Planning (3 cr.)

PRT 157, Ski Area Management (4 cr.)

PRT 158, Resort Marketing and Management (3 cr.)

PRT 191, Parks, Rec, and Tourism Practicum (3-6 cr) – *Internship must be approved in advance with required documentation complete*

PRT 230, Ecotourism (3 cr.)

PRT 258, Entrepreneurship in Recreation and Tourism (3 cr.)

Completion of **3 courses** from the following list:

PRT 138, Park and Recreation Design (4 cr.)

PRT 153, Recreation Administration and Operations (3 cr.)

(cont. on p. 31)

- PRT 235, Outdoor Recreation Planning (3 cr.)
- PRT 240, Park and Wilderness Management (3 cr.)
- PRT 255, Environmental Interpretation (3 cr.)

Completion of **nine credits** of professional electives chosen in consultation with an advisor.

PARKS, RECREATION, AND TOURISM MINOR REQUIREMENTS

A minimum of 15 credit hours is required, including:

- at least 9 credits to be selected from PRT 1, 50, 138, 153, 157, 158; and
- at least 6 credits to be selected from PRT 230, 235, 240, 255, 258.

Students must earn at least a 2.0 cumulative GPA in their Parks, Recreation, and Tourism minor courses to earn a minor in Parks, Recreation, and Tourism.

WILDLIFE AND FISHERIES BIOLOGY

The Wildlife and Fisheries Biology program focuses on research and management of wildlife, fish and people in the total environment. The curriculum includes summer field courses in ornithology and habitat and population measurements as well as extensive laboratory and field work during the regular year. Since competition for jobs in this profession is high nationwide, students are encouraged to continue their studies at the graduate level. The four-year curriculum does provide an excellent background for many wildlife and fisheries-related positions. These employment possibilities range from traditional game and fish management careers to administrative, interpretative and research positions in private conservation organizations, state conservation agencies, or federal agencies such as the U.S. Fish and Wildlife Service, National Biological Survey, Bureau of Land Management, National Park Service, Department of Defense, or the Peace Corps. Privately-owned environmental consulting firms and planning agencies also employ wildlife and fisheries biologists to carry out environmental impact assessments. Two program options are available: Fisheries Biology and Wildlife Biology.

Program Chair:	Professor Ellen Marsden	308D Aiken	656-0684
Program Staff Assistant:	Marcie Newland	304 Aiken	656-2911

DEGREE REQUIREMENTS

All students who enroll in the Wildlife and Fisheries Biology curriculum must fulfill the following requirements for graduation:

1. Completion of The Rubenstein School's core curriculum.
2. Completion of The Rubenstein School's general education requirements.
3. Completion of a minimum of 120 credit hours of courses.
4. Completion of the Wildlife and Fisheries Biology professional core courses:
 - MATH 19, Fundamentals of Calculus I (3 cr.) - or - 21, Calculus I* (4 cr.)
 - NR 140, Applied Environmental Statistics * (4 cr.)
 - BIOL 1 and 2, Principles of Biology (8 cr.)
 - CHEM 23, General Chemistry (4 cr.)

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CHEM 26, Outline of Organic and Biochemistry (4 cr.) – or- 42, Introduction to Organic Chemistry (4 cr.)
NR 25, Measurements and Mapping (4 cr.)
– or – NR 143, Introduction to Geographic Information Systems (3 cr.)
FOR 121, Forest Ecology Laboratory (2 cr.)
WFB 161, Fisheries Biology (4 cr.)
WFB 174, Principles of Wildlife Management (3 cr.)
WFB 224, Conservation Biology (4 cr.)

5. Completion of option requirements in **Wildlife Biology** or **Fisheries Biology**.

Wildlife Biology option courses:

FOR 21, Dendrology (4 cr.)
WFB 130, Ornithology (3 cr.)
WFB 131, Field Ornithology** (2 cr.)
WFB 150, Wildlife Habitat and Population Measurements** (1 cr.)
P BIO 109, Plant Taxonomy (4 cr.)
BIOL 217, Mammalogy (4 cr.)

Two courses (one must have a lab^s) selected from:

WFB 185, Herpetology (2 cr.) and WFB 185, Field Herpetology^s (2 cr.)
WFB 285, Wetlands Wildlife and Ecology^s (4 cr.)
WFB 283, Terrestrial Wildlife^s (4 cr.)
WFB 275, Wildlife Behavior (3 cr.)
WFB 279, Marine Ecology (3 cr.)

Fisheries Biology option courses:

WFB 285, Fisheries Management (3 cr.)
WFB 232, Ichthyology (3 cr.)
NR 250, Limnology (4 cr.)
-- or – WFB 280, Stream Ecology (4 cr.)
NR 260, Wetlands Ecology and Management (3 cr.)
-- or – WFB 285, Wetlands Wildlife and Ecology (4 cr.)
WFB 279, Marine Ecology (3 cr.)

Two courses selected from:

NR 270, Toxic and Hazardous Substances in Surface Waters (3 cr.)
NR 280, Stream Ecology (4 cr.)
-- or – NR 250, Limnology (4 cr.)
BIOL 264, Community Ecology
NR 260, Wetlands Ecology and Management (3 cr.)
-- or – WFB 285, Wetlands Wildlife and Ecology (4 cr.)
WFB 285, Advanced Special Topics (1-6 cr.)
CE 260, Hydrology (3 cr.)
-- or -- NR 285, Environmental Hydrology (3 cr.)

WILDLIFE BIOLOGY MINOR REQUIREMENTS

A minimum of 15 credit hours is required. Students must earn at least a 2.0 cumulative GPA in their Wildlife Biology minor courses to earn a minor in Wildlife Biology.

Required courses:

- WFB 130; WFB 174; WFB 285, Wetlands Wildlife and Ecology -or- WFB 283.

Elective courses:

- WFB 131**, 150**, 176, 177, 185, 187, 224, 274, 275, 279, 283, 285, 287.

*Also fulfills general education requirement.

**Field intensive courses OFFERED ONLY DURING SUMMER SESSION

HONORS COLLEGE REQUIREMENTS

If students complete all four years of Honor College requirements (or three years for students accepted as sophomores) in addition to their school or college major requirements, they will graduate as an Honors College Scholar. The following requirements should be discussed with your academic advisor.

First Year and Sophomore Year

The Honors College experience begins with a three-credit seminar in the fall of the first year, **HCOL 85: The Pursuit of Knowledge**, and continues with a three-credit special topics seminar in the spring, **HCOL 86, Ways of Knowing**. Each semester of the second year, students take a three-credit honors seminar (**HCOL 185 and HCOL 186**), choosing from an extensive slate of offerings created for Honors College students by schools and colleges throughout the university. In the junior and senior year, the Honors College requirements are determined within the home school or college to focus more intensively on a field of study related to your major.

Junior Year

- **HCOL 101: Honors College Thesis Preparation Seminar** (0-1 credit, Fall or Spring Semester--recommended) -- *A course designed to assist students in the production and submission of an Honors College Thesis Proposal*
- **NR 199: Honors Seminar** (1 credit, Spring Semester--required) – *A discussion and readings seminar that features guest speakers as part of The Rubenstein School Spring Seminar Series*
- **NR 298: Honors Project Planning *** (2 credits, Spring Semester--required) -- *Process, procedures, and strategies leading to the development of an individual or group Honors Project Proposal*

* Environmental Studies majors or students in other majors with scheduling challenges, such as Study Abroad conflicts, may choose to take **ENVS 201: Research Methods (3 credits)** in place of **NR 298: Honors Project Planning**.

Senior Year

During the final year, students carry out their senior thesis or research project. A total of 6 credits will be earned for this work between fall and spring semester through registration in one of the following discipline areas:

- ENSC 299 Environmental Sciences Honors
- ENVS 202/203 Honors Thesis
- FOR 299 Honors
- NR 299 Honors
- PRT 299 Parks, Rec and Tourism Honors
- WFB 299 Wildlife & Fisheries Honors