THE RUBENSTEIN SCHOOL
DEGREE REQUIREMENTS
2009 – 2010 UVM CATALOGUE

Students must be matriculated in The Rubenstein School of Environment and Natural Resources and in residence at the University of Vermont during the period in which they earn 30 of the last 45 hours of academic credit applied toward the degree. Students must earn a cumulative grade-point average of 2.0 or above.

Students must complete a program of study that includes:

1. The Rubenstein School's core curriculum, including the University Diversity requirement
2. The Rubenstein School's general educational requirements, including the University Diversity requirement
3. The Rubenstein School's major requirements

THE RUBENSTEIN SCHOOL'S CORE CURRICULUM

The Rubenstein School's core curriculum provides a common experience for all students. The innovative seven-course sequence creates an integrated foundation upon which the individual majors in the School are constructed. Core courses focus on the underlying fundamentals from which natural resources disciplines have evolved and the application of these fundamentals to problems or issues in the natural world and society. The core courses also promote development of thinking, communication, problem solving and analytical skills. Faculty from all of The Rubenstein School's undergraduate programs teach in the core.

The Rubenstein School's core curriculum represents a body of knowledge, skills and values that the faculty believe is central to the study of natural resources and the environment. Eight courses are required:

NR 1, Natural History and Field Ecology	4 cr
NR 6, Race and Culture in Natural Resources	2 cr
NR 2, Nature and Culture	3 cr
NR 103, Ecology, Ecosystems and Environment	3 cr
NR 104, Social Processes and the Environment	3 cr
NR 205, Ecosystem Management: Integrating Science, Society, and Policy	3 cr
NR 206, Environmental Problem Solving and Impact Assessment	4 cr
NR 2XX, Senior Capstone Diversity Experience	1 cr
Total credit hours	23 cr

GENERAL EDUCATION COURSES

The Rubenstein School's general education requirements are designed to enhance a student's ability to assimilate and analyze information, to think and communicate clearly, and to respect multiple perspectives. These requirements are flexible in order to encourage creativity in meeting educational goals. Two sets of courses are stipulated:

Seven courses in required areas –

WRITING
ENGS 1, ENGS 50 or ENGS 53

SPEAKING
SPCH 11, CALS 183, or NR 185: Speaking and Listening

RACE AND CULTURE IN NATURAL RESOURCES
NR 6, 3 credits from the approved list of diversity courses, and a Senior Capstone Diversity Experience (NR 2XX)

MATHEMATICS
MATH 9 or higher (but not MATH 17)*

STATISTICS
NR 140, STAT 111, STAT 141 or STAT 211*

*Requirement varies depending on major choice

Three courses in a self-design sequence --

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 in advance.*

*Before completion of four semesters or 60 credit hours; timeframe may be extended for transfer students.

ENVIRONMENTAL SCIENCES

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 122 credit hours of courses.

4. Completion of the Environmental Sciences minimal basic science/quantitative coursework:
   BCOR 11 and 12, Exploring Biology
   CHEM 31 and 32, Introductory Chemistry
   CHEM 42, Introduction to Organic Chemistry*
   GEOL 55, Environmental Geology -or- PSS 161, Introduction to Soil Science
   MATH 19 and 20, Calculus I and Calculus II**
   NR 140, Natural Resources Biostatistics
   - or - STAT 141, Basic Statistics**

   *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
   ENSC 185, Orientation to the Environmental Sciences*
   ENSC 130, Global Environmental Assessment
   ENSC 160, Pollutant Movement through Air, Land, and Water
   ENSC 201, Recovery and Restoration of Altered Ecosystems
   ENSC 202, Ecological Risk Assessment

   *Internal and External Transfer students to ENSC are exempt from ENSC 185

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

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 122 credit hours of courses.

4. Completion of the Environmental Studies major core courses:

ENVS 1, Introduction to Environmental Studies
ENVS 2, International Environmental Studies
ENVS 151, Intermediate Environmental Studies
ENVS 201, Research Methods
ENVS 202, Senior Project and Thesis (6-12 credits)

5. Completion of individually-designed program:
   Thirty hours of approved environmentally-related courses at the 100- or 200-level, including three hours 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. Courses required are:

ENVS 1, Introduction to Environmental Studies
ENVS 2, International Environmental Studies

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

FORESTRY

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 126 credit hours of courses.

4. Completion of Forestry required courses:

   PBIO 4, Introduction to Botany
   CHEM 23, General Chemistry
   MATH 18, Basic Mathematics*
   NR 25, Natural Resources Measurements and Mapping
   NR 140, Natural Resources Biostatistics*
   WFB 224, Conservation Biology
   PSS 161, Introduction to Soil Science
   A course in Economics or Ecological Economics
   FOR 21, Dendrology
   FOR 73, Small Woodlot Management
   FOR 81, Forestry Seminar**
   FOR 121, Forest Ecology Laboratory
   FOR 122, Forest Ecosystem Analysis***
   FOR 223, Silviculture

(required courses continued on p. 30)

A course in Forest Health—currently fulfilled by: FOR 285, Forest Ecosystem Health
FOR 182, Advanced Forestry Seminar
FOR 272, Forest Management

* 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-approved[1] 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.

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

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

GEOSPATIAL TECHNOLOGIES MINOR

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. The courses for the minor include:

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

(required courses continued on p. 31)

Elective Courses (2):
Select either two courses from Group A or one course each from Group A and Group B.

Group A

GEOG 204, Spatial Analysis (3 credits)
NR 243, GIS Practicum (3 credits)
NR 245, Advanced Spatial Methods (2 credits)
GEOG 281a, Satellite Climatology/Land Surface Applications (3 credits)
GEOG 281b, Advanced GIS Applications (3 credits)

Group B

CS 14, Visual Basic Programming (3 credits)
CS 16, MATLAB Programming (3 credits)
CDAE 101, Computer Aided Drafting and Design (3 credits)

NATURAL RESOURCES

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 122 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
GEOL 1, Introduction to Geology
-or- PSS 161, Introduction to Soil Science
MATH 19, Fundamentals of Calculus I *
NR 140, Natural Resources Biostatistics *
CHEM 23, Outline of General Chemistry - or - CHEM 31 and 32, Introductory Chemistry
CHEM 26, Organic and Biochemistry - or - CHEM 42, Introduction to Organic Chemistry
-or- CHEM 141 and 142, Organic Chemistry
NR 25, Natural Resources Measurements and Mapping
NR 143, Introduction to Geographic Information Systems - or - FOR 146
Remote Sensing of Natural Resources
*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 350. 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

CDAE 2, World Food, Population, and Development – or- ENVS 2, International Environmental Studies

POLS 21, American Political System
- or - POLS 41, Introduction to the Problems of Political Thought

SOC 1, Introduction to Sociology
- or - SOC 11, Social Problems

PHIL 4, Introduction to Philosophy: Ethics
- or - CDAE 156, Law, Ethics, and Responsibility – or – ENVS 178, Environmental Ethics

ANTH 21, Human Cultures
- or - GEOG 50, World Regional Geography

EC 11, Principles of Macroeconomics – or- 12, Principles of Microeconomics
- or – CDAE 61, Principles of Agriculture and Resource Economics

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 350. 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 <u>prior to the end of the add/drop period</u> for the semester in which the student enrolls in the substitute course.

Integrated Natural Resources option:

Option Required courses (minimum of 9 credits):

Students elect at least one course in each of three areas from a list of approved courses available in Aiken 350. The areas are: (1) biology/ecology; (2) natural resources, social sciences and communication; (3) quantitative and analytical methods. These courses are IN ADDITION to those taken to fulfill general education requirements.

Individualized Program of Study (minimum of 39 credits):

The student develops an individualized Program of Study that establishes objectives and defines 39 credits of course selection for the last four semesters. Courses must be consistent with objectives established in the program of study and have an ENVS, ENSC, FOR, NR, RM or WFB prefix. This may include no more than 15 credits outside the School and not more than 6 credits below the 100 level. With careful selection of courses, students have developed such concentrations as Environmental Education, Sustainable Resource Management, Resource Conservation, International Resource Issues, 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 60 credits must have a program of study approved as part of the transfer application. It is expected that these 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 <u>prior to the end of the ADD/DROP period</u> for the semester in which the student enrolls in the substitute course.

RECREATION MANAGEMENT

All students who enroll in the Recreation Management 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 126 credit hours of courses.

4. Completion of Recreation Management foundation courses:

   - One course in humanities (History, Philosophy, Religion, Classics)
   - One course in communications (Art, Music, Theater, Art History, Foreign Language, English Literature)
   - One course in social sciences (Anthropology, Economics, Geography, Political Science, Psychology, Sociology)
   - One 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:

RM 1, Introduction to Recreation Management
RM 138, Park and Recreation Design
RM 153, Recreation Administration and Operation
RM 191, Recreation Management Practicum
RM 235, Outdoor Recreation Planning
RM 240, Park and Wilderness Management
RM 255, Environmental Interpretation

Completion of 3 courses selected from the following list:

RM 50, Tourism Planning
RM 157, Ski Area Management
RM 158, Resort Marketing and Management
RM 230, Ecotourism
RM 258, Entrepreneurship in Recreation and Tourism

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:

RM 1, Introduction to Recreation Management
RM 50, Tourism Planning
RM 157, Ski Area Management
RM 158, Resort Marketing and Management
RM 191, Recreation Management Practicum
RM 230, Ecotourism
RM 258, Entrepreneurship in Recreation and Tourism

(required courses continued on p. 34)

Completion of 3 courses from the following list:

RM 138, Park and Recreation Design
RM 153, Recreation Administration and Operations
RM 235, Outdoor Recreation Planning
RM 240, Park and Wilderness Management
RM 255, Environmental Interpretation

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

Recreation Management MINOR requirements

A minimum of 15 credit hours is required, including:

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

WILDLIFE AND FISHERIES BIOLOGY

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 122 credit hours of courses.

4. Completion of the Wildlife and Fisheries Biology professional core courses:

   MATH 19, Fundamentals of Calculus I – or - 21, Calculus I*
   NR 140, Natural Resources Biostatistics*
   BIOL 1 and 2, Principles of Biology
   CHEM 23, General Chemistry
   CHEM 26, Outline of Organic and Biochemistry – or- 42, Introduction to Organic Chemistry
   NR 25, Measurements and Mapping
   – or – NR 143, Introduction to Geographic Information Systems
   FOR 121, Forest Ecology Laboratory
   - or - FOR 185, Reading the Forested Landscape
   WFB 161, Fisheries Biology
   WFB 174, Principles of Wildlife Management
   WFB 224, Conservation Biology
   *Also fulfills general education requirement.

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

Wildlife Biology option courses:

FOR 21, Dendrology
WFB 130, Ornithology
WFB 131, Field Ornithology**
WFB 150, Wildlife Habitat and Population Measurements**

(required courses continued on p. 35)

PBIO 109, Plant Taxonomy
BIOL 217, Mammalogy
**Field intensive courses offered ONLY DURING THE SUMMER SESSION

Two courses (one must have a lab*) selected from:
WFB 141, Field Herpetology *
WFB 271/272, Wetlands Wildlife, Wetlands Ecology and Management Lab*
WFB 273/274, Terrestrial Wildlife, Terrestrial Wildlife Lab*
WFB 275, Wildlife Behavior
WFB 279, Marine Ecology

Fisheries Biology option courses:

PHYS 11/21, Elementary Physics I/Introductory Lab I
WFB 232, Ichthyology
NR 250, Limnology
NR 260/ WFB 272, Wetlands Ecology and Management
WFB 279, Marine Ecology

Two courses selected from:
NR 256 Ecology of a Large Lake **
NR 270, Toxic and Hazardous Substances in Surface Waters
NR 280, Stream Ecology
BIOL 264, Community Ecology
WFB 271, Wetlands Wildlife
WFB 285: Advanced Special Topics
CE 260, Hydrology or NR 285, Environmental Hydrology
**Field intensive courses offered ONLY DURING THE SUMMER SESSION

Wildlife Biology MINOR requirements

A minimum of 15 credit hours is required.

Required courses:
- WFB 130; WFB 174; WFB 271 -or- 273.

Elective courses:
- WFB 131**, 141, 150**, 176, 177, 185, 187, 224, 271, 272, 273, 274, 275, 279, 285, 287.

**Field intensive courses OFFERED ONLY DURING SUMMER SESSION