

Ecology: Principles and Applications at the Landscape Level

June 18 - 30, 2018

Instructors

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Classroom: Oakes 107

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Course Format

Lectures - M, W (9am - noon)

Field Trips - T, Th (9am - 4pm)

Course Description

Ecology is the study of organisms and their environments — and the interrelationships between the two. During this two-week, field-based course we'll study ecological principles and applications through an intensive, integrative investigation of the White River and Ottauquechee River watersheds. Rather than relying primarily on textbook examples of ecological concepts, we'll venture into the local landscape to explore the diversity of life and illustrate these concepts.

We'll spend two-thirds of the class time visiting a variety of field sites and learning an ecological approach to landscape assessment that stresses not only inventorying the biotic and physical components (pieces), but also examining how these pieces are distributed in the landscape (patterns) and what forces drive these patterns (processes). A strong emphasis will be placed on interpreting the history of how the landscapes we see today have unfolded through time — from their geological origins to the impacts of European settlement and 20th century land-use. We'll look to the future of the landscape by exploring strategies for maintaining and restoring the ecosystems and organisms native to the region.

The science of ecology will play a critical role in guiding our society as we face the increasing complex challenges of the 21st century. As Oswald Schmitz states in the introduction to our companion text, ecology helps us “appreciate the intricate ways that humans are connected to their environment and how their interaction can alter the sustainability of the very ecosystems on which they are a part and from which they derive vital services.” This course will provide aspiring environmental professionals with a solid introduction to science behind biodiversity conservation, phosphorus runoff, and other landscape-level issues in the context of increasing climate instability.

Learning Objectives

By the end of the course, it is our hope that the students will:

- understand the influence of the physical environment on the biological components of the landscape,
- be able to interpret a soil pit, key out plants, and recognize common natural community types
- be able to begin to decipher the imprint of human history and natural disturbance on the local landscape,
- recognize and apply essential ecological concepts, including natural selection, succession, biogeochemical cycling, energy flow, landscape connectivity, and biological diversity,
- understand the phosphorus cycle and the connections between phosphorus, surface runoff, sediment transport, and aquatic ecosystems.
- understand the scientific method and its applications.

Course Readings

Most of the course readings will be available through Westlaw.

Required Text (available at the bookstore):

Ecology and Ecosystem Conservation (Schmitz 2007). 166 pages.

On Reserve:

- State of the Lake 2105 – Lake Champlain Basin Program
- Conserving Vermont's Natural Heritage (Austin 2004)
- Reading the Forested Landscape: A Natural History of New England (Wessels 1997)
- Hands on the Land (Albers 2000)
- Wetland, Woodland, Wildland: The Natural Communities of Vermont (Thompson and Sorenson 2000)

To be read by the start of class on:

June 18

- Ecology: Preface and Chap 1
- The Round River, by Aldo Leopold

June 19

- Ecology: Chapter 2
- Wetland, Woodland, Wildland – Parts 1-3
<http://www.vtfishandwildlife.com/books.cfm?libbase=Wetland,Woodland,Wildland>
- Species in the Spotlight (Northern Red Oak, Red Spruce, & Eastern White Pine)
- [Vermont's Revised Standards for Managing Polluted Runoff from Farms](#)

June 20

- Ecology: Chapter 3, 4
- Ready Or Not, Garlic Mustard Is Moving In (Rodgers, Stinson, and Finzi 2008)

June 21

- Ecology: Chapters 6
- Wetland, Woodland, Wildland (pp. 78-94, 129-141, 145-149, 244-249, 257-259, 309-313, 337-338)
<http://www.vtfishandwildlife.com/books.cfm?libbase=Wetland,Woodland,Wildland>
- Species in the Spotlight (Sugar Maple, White Ash, & Butternut)

June 25

- Ecology: Chapter 8, 9
- What Did Vermont's Pre-settlement Forest Look Like? (Snyder 2003)
- The Myth of the Unchanging Forest (Lautzenheiser 2011)
<http://www.massaudubon.org/sanctuary/features.php?id=81>

June 26

- Reading the Forested Landscape (Chapter 2)
- Species in the Spotlight (Eastern Hemlock, Red Maple, & Yellow Birch)

June 27

- Vermont Conservation Design: Maintaining and Enhancing an Ecologically Functional Landscape
- Ecosystems and Their Services – Millennium Ecosystem Assessment

June 28

- Ecology: Chapter 10
- Mount Tom Forest Management
- Species in the Spotlight (Basswood, Trembling Aspen, & American Beech)

Course Schedule

Note: Field trips often involve extensive hiking in hilly landscapes.

Monday, June 18 (9am – Noon) - Classroom

- Course Introduction
- Overview of Southern Vermont Piedmont Biophysical Region
- Landscape Analysis Frameworks
- Bedrock and Surficial Geology
- The Natural Community Concept
- Ecology and Natural History

Tuesday, June 19 (9am - 4pm) – Field Trip to Kent’s Ledge

- Landforms
- Pattern Observation/Scientific Method
- Quantifying Pattern
- Introduction to Pieces (Trees)
- Soils

Wednesday, June 20 (9am – Noon) - Classroom

- Ecosystem Dynamics and Community Ecology
- Speciation and Natural Selection
- Wetland Ecology
- Phosphorus Cycle and Nutrient Loading

Thursday, June 21 (9am - 4pm) – Field Trip to Randolph

- Invasive Species
- Water Quality
- River and Floodplain Forest Analysis

Monday, June 25 (9am – Noon) – Classroom

- Landscape Change
- Disturbance regimes
- Succession
- Climate Change

Tuesday, June 26 (9am – 4pm) - Field Trip to Zebedee Wetland in Thetford

- Wetland Ecology

- Land-use History

Wednesday, June 27 (9am-Noon) - Classroom

- Principles of Landscape Ecology, Conservation Biology, and Ecological Planning

Thursday, June 28 (9am – 4pm) – Field Trip to Marsh-Billings-Rockefeller National Historical Park

- Agricultural and Post-Agricultural Landscapes
- Forest Stewardship

Saturday, June 30 (9am – Noon) – Final Exam

Assessment & Grading

- Final Exam (90%) – please note that this exam will have indoor and outdoor components
- Midterm Assignment (10%) – due June 25 (9 AM) – details will be provided in class.

Required field gear

- rain gear
 - waterproof hiking boots
 - clipboard
 - field notebook
 - writing utensil (mechanical pencils are best)
 - knapsack with extra clothes, water, and snacks
 - lunch!!
- optional items:
- hand lens
 - bug repellent
 - binoculars
 - field guides
 - camera

Please note:

- Since our field trips will often be off-trail and in buggy environments, we encourage you to wear long pants and long sleeves.
- Students are expected to attend all classes and abide by the policies outlined in the VLS Student Handbook.