

Ecology: Principles and Applications at the Landscape Level

June 5 - 17, 2023

Instructors

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Classroom: Oakes 207

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Course Format

- Lectures - June 5, 7, 12, and 14 (9am - noon)
- Field Trips - June 6, 8, 13, and 15 (9am - 4pm)
- Final Exam – June 17 (9am – noon)

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 the science behind biodiversity conservation, natural resource management, 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 identify basic features of soils, surficial geology, and bedrock geology; 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;
- be familiar with the scientific method and its applications;
- understand the importance of managing landscapes at the watershed scale;
- recognize the interconnectedness of landscape elements and the complexity of environmental issues; and
- understand the basic principles of ecological planning.

Course Readings – needs updating

Most of the course readings will be available on the course TWEN site.

- Wetland, Woodland, Wildland: The Natural Communities of Vermont, 2nd Edition

To be read by the start of class on:

June 5

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

June 6

- Ecology: Chapter 2
- Wetland, Woodland, Wildland – Parts 1-3
- Species in the Spotlight (Northern Red Oak, Red Spruce, & Eastern White Pine)

June 7

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

June 8

- Ecology: Chapters 6
- Wetland, Woodland, Wildland (pp. 78–94, 129–141, 145-149, 244-249, 257-259, 309-313, 337-338)
- Species in the Spotlight (Sugar Maple, White Ash, & Butternut)

June 12

- Ecology: Chapter 8, 9
- What Did Vermont's Pre-settlement Forest Look Like? (Snyder 2003)
- The Myth of the Unchanging Forest (Lautzenheiser 2011)

June 13

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

June 14

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

June 15

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

Course Schedule

Monday, June 5 (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 6 (9am - 4pm) – Field Trip to Kent's Ledge

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

Wednesday, June 7 (9am – Noon) - Classroom

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

Thursday, June 8 (9am - 4pm) – Field Trip to Randolph

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

Monday, June 12 (9am – Noon) – Classroom

- Landscape Change
- Disturbance regimes
- Succession
- Climate Change

Tuesday, June 13 (9am – 4pm) - Field Trip to Zebedee Wetland in Thetford

- Wetland Ecology
- Land-use History

Wednesday, June 14 (9am-Noon) - Classroom

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

Thursday, June 15 (9am – 4pm) – Field Trip to Marsh-Billings-Rockefeller NHP

- Agricultural and Post-Agricultural Landscapes
- Forest Stewardship

Saturday, June 17 (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 12 (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

Important Notes

- Since our field trips will often be off-trail and in buggy environments, we encourage you to wear long pants and long sleeves.
- Ticks are a particular health concern due to their potential when feeding to transmit serious disease to people. We recommend the use of appropriate personal protective measures (e.g. permethrin treated clothing and/or EPA-approved repellent) and thorough end of day tick checks following field trips to reduce the risk of tick bites.
- Field trips often involve extensive hiking in hilly landscapes.
- Students are expected to attend all classes and abide by the policies outlined in the VLS Student Handbook.