

SYLLABUS

COMMUNITY ECOLOGY OF THE NEW ENGLAND LANDSCAPE

FALL 2006 ESF550 3 CREDITS

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COURSE CONTENT

This course examines the ecological dynamics of central New England's plant communities. A diverse array of communities will be visited and within each, we will study the impact of topography, substrate, and disturbance history on plant community development and composition. Content will include the glacial and cultural history of New England, an introduction to soils, ecological theory including dominance, diversity, coevolution, niche structuring, and succession. Students will develop skills to interpret community composition and structure both qualitatively through "reading the landscape" and quantitatively through plant community sampling and inventory techniques. Students will also develop skills in plant identification, the use of ecoindicator species, and soil interpretation.

COURSE OBJECTIVES

To become familiar with the region's glacial and cultural history.

To become familiar with New England's successional patterns and evidence of various forms of disturbance.

To understand the ecological characteristics of the diverse array of plant communities found in Central New England.

To learn how topography and substrate affects plant community development and specific site conditions for central New England's ecoindicators.

To learn the process of reading the landscape.

For students to learn basic plant community sampling techniques and how to refine and interpret quantitative data.

To learn basic woody plant identification and the use of taxonomic keys.

EVALUATION CRITERIA

CLASS ATTENDANCE: Since so much of the course instruction takes place in the field at a variety of sites, it is not possible for a student to master the material if they miss class. Missing three classes will make a student liable for receiving a no-credit for the course. **For a missed class students should make arrangements to have a classmate tour them through the sites missed and then submit a summary paper of the communities visited including dynamics specific to each community within two weeks of the missed class.**

OBSERVATION PAPERS: to develop interpretive skills, student will make field observations on changes in contiguous plant community composition and/or structure, and explain the reasons for these changes with respect to topography, substrate, or disturbance history in a paper approximately two to four pages double spaced. There will be a total of four observation papers with each paper based on a different site. The first paper will be conducted in pairs. The other three papers will be done by individuals.

PLANT SPECIES LIST: A forested site of the student's choice will be the focus of a woody plant inventory. Using taxonomic keys, students will identify all the woody plants within their chosen site. A list of species organized by families and denoting ecoindicators from this study site will be due the week of Oct. 4, 6 (see class folder for format). Herbaceous plants can also be added to the list and we encourage students to do so. The use of Newcomb's Wildflower Guide will greatly aid students who wish to add herbaceous plants to their list.

COMPARATIVE PLOT SAMPLING PROJECT: in groups, students will quantitatively sample two contiguous plant communities that differ due to changes in just one of the following: topography, substrate, or disturbance history. Data will be collected outside of scheduled class time. The data will be interpreted in a scientific paper having an introduction, methods, results, and discussion sections (see class folder for format). Each group will submit one paper that will be collaboratively written and due the week of Nov. 15, 17.

PLANT COMMUNITIES POINT INVENTORY PROJECT: in groups students will inventory a parcel of land that is a minimum of 10 acres in size and has at least three distinct plant communities. Data will be collected outside of scheduled class time. Students will map the communities and present their findings through a class presentation not to exceed 30 minutes on Dec. 20, 22. The focus of the presentation will be to explain why the communities occur where they do. (see class folder for data collection protocols)

TEXTS

Petrides, George. 1958. *A Field Guide to Trees and Shrubs*. Houghton Mifflin Co. Boston. Also a required text for NE Flora

Thompson, Elizabeth and Eric Sorenson. 2000. *Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont*. University Press of New England. Hanover, NH. Also a required text for Natural Resource Inventory – Vegetation and Soils.

Wessels, Tom. 1997. *Reading the Forested Landscape: A Natural History of New England*. The Countryman Press. Woodstock, VT.

RESERVE READINGS

Abrams, M. D. 2001. Eastern white pine versatility in the presettlement forest. *Bioscience* 51:967-979. OHIO LINK

Boose, E. R., K. E. Chamberlin, and D. R. Foster. 2001. Landscape and regional impacts of hurricanes in New England. *Ecological Monographs* 71:27-48. PRINT RESERVE

Cogbill, C. V., J. Burk, and G. Motzkin. 2002. The forests of presettlement New England, USA: spatial and compositional patterns based on town proprietor surveys. *Journal of Biogeography* 29:1279-1304.

Foster, D. R. 1988. Disturbance history, community organization and vegetation dynamics of the old-growth Pisgah forest, south-western New Hampshire, U.S.A. *Journal of Ecology* 76:105-134. JSTOR

Henry, J. D., and J. M. A. Swan. 1974. Reconstructing forest history from live and dead plant material: an approach to the study of forest succession in southwest New Hampshire. *Ecology* 55:772-783. JSTOR

Motzkin in Foster D. and J Aber. 2004. Forests in time: environmental consequences of 1,000 years of change in New England. Yale University Press. New haven.

Schwarz, P. A., T. J. Fahey, C. W. Martin, T. G. Siccama, and A. Bailey. 2001. Structure and composition of three northern hardwood-conifer forests with differing disturbance histories. *Forest Ecology and Management* 144:201-212. OHIO LINK

Tyrrell, L. E., and T. R. Crow. 1994. Structural characteristics of old-growth hemlock-hardwood forests in relation to age. *Ecology* 75:370-386. JSTOR

Wessels, Tom. 2001. Chapter 3. *The Granite Landscape: A Natural History of America's Mountain Domes from Acadia to Yosemite*. The Countryman Press. Woodstock, VT.

Whitney, G. G., and D. R. Foster. 1988. Overstorey composition and age as determinants of the understorey flora of woods of central New England. *Journal of Ecology* 76:867-876. JSTOR

OPTIONAL TEXTS

Newcomb, Lawrence. 1977. *Newcomb's Wildflower Guide*. Little, Brown and Co. Boston. Also at required text for NE Flora.

Jorgensen, Neil. 1978. *A Sierra Club Naturalist's Guide to Southern New England*. Sierra Club Books. San Francisco. (a wonderful guide for people living in CT, RI, and eastern MA)

Marchand, Peter. 1987. *North Woods*. Appalachian Mountain Club Press. Boston. (a wonderful guide for people living in northern VT, NH, and ME or mountainous regions of the Northeast). Also a required text for Forest Ecosystem Analysis.

TREE IDENTIFICATION AND ECOLOGY WEBSITES

Burns, Russell M., and Barbara H. Honkala. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S.D.A. Forest Service, Wash., DC. vol.2, 877 p.
http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm. August 19, 2006. *Government web page that provides ecological descriptions of woody tree species.*

Forest Biology and Dendrology Educational Site at Virginia Tech. <http://www.cnr.vt.edu/dendro>. August 19, 2006. *Virginia Tech web page for plant identification courses. Excellent pictures and information.*

Roberts, Steve. New England Flora.
<http://www.inter-lakes.k12.nh.us/ilmt/Faculty/sroberts/neflora/neflora.htm>. August 19, 2006.
Web page created by former Antioch flora student. Pictures of the woody plants.

The USDA Plants database: <http://plants.usda.gov/> August 19, 2006.
An excellent site for general information about a wide range of species. This is a good site for the latest information on taxonomy and wetlands classification.

PLANT COMMUNITY REFERENCES

New Hampshire

Sperduto, D. and W. Nichols. 2004. Natural Communities of New Hampshire. New Hampshire natural Heritage Bureau and the Nature Conservancy. \$230 order form on line
<http://ceinfo.unh.edu/Forestry/Docs/NCform.pdf>. August 19, 2006.

New York State

http://www.dec.state.ny.us/website/dfwmr/heritage/Draft_ECNY2002.htm. August 19, 2006.

Massachusetts

<http://www.state.ma.us/dfwele/dfw/nhsp/nhpubrare.htm#rarepubs>. August 19, 2006

FIRST CLASS

The First Class course folder will be used to post project instructions, formats and data template and any other materials for course use, messages, and whatever use students find productive.

Please submit hard copy of papers when due to facilitate timely return of comments. Do not submit papers via email unless you get specific permission from the instructor.

SCHEDULE

- Sept 6, 8 Course overview, introduction to the Pleistocene glaciations of New England and the substrates and topographic features left by the Laurentide Ice Sheet, introduction to soils.
- Sept. 13, 15 Introduction to community ecology including dominance, diversity, coevolution, and niche structuring. Introduction to plant ID and taxonomic keys
- Readings:** Petrides pp. xvi-xxxiii, Thompson and Sorenson pp. 1-19, 58-103, 171-173
 Motzkin in Forest in Time (RESERVE CLASS FOLDER)
- Sept. 20, 22 Plant community sampling and inventory techniques, use of Bitterlich prisms in the field at the Horatio Colony Preserve.
- Assignments due:** Observation paper 1
- Readings:** Thompson and Sorenson PP. 142-149, Cogbill et. al 2002 (RESERVE:
 CLASS FOLDER)
- Sept. 27, 29 Comparative plot sampling protocol
- Assignments due:** Diagram of how the Inventory Protocol will be set up
- Readings:** Abrams 2001 (RESERVE: OHIO LINK), Whitney and Foster 1988
 (RESERVE: JSTOR)

- Oct. 4, 6 *Field excursion to examine glacial erosional and depositional features, and interpreting soils in Putney
- Assignments due:** Plant species list
Readings: Thompson and Sorenson pp. 237-259
- Oct. 11, 13 *Field excursion to calcium rich alluvial and upland communities in Putney with special attention to rich-sited ecoindicators.
- Readings:** Thompson and Sorenson pp. 129-141, 150-151, 169-176
Assignments due: Observation paper 2
- Oct. 18, 20 Introduction to ecological succession including primary succession of hydrachs and xerarchs
- Readings:** Thompson and Sorenson pp. 309-320, Wessels 2001, Chapter 3 Succession (RESERVE: CLASS FOLDER)
- Oct. 25-27 Field excursion to examine plant communities on outwash sands at the airport with special attention to acidic-sited ecoindicators
- Nov. 1, 3 Reading the forested landscape at Goose Pond.
- Assignments due:** Observation paper 3
Readings: Boose et. al 2001 (RESERVE: PRINT), Schwarz et. al. 2001 (RESERVE: OHIO LINK)
- Nov. 8, 10 *Field excursion to Vernon's Black Gum Swamp with Wessels and Gunn, or Dummerston Black Mountain with Palmiotto.
- Readings:** Thompson and Sorenson 1152-159, 218-219, 265-268, 277-279
- Nov. 15, 17 *Field excursion to Dummerston's Black Mountain with Wessels and Gunn, or to Vernon's Black Gum Swamp with Palmiotto.
- Assignments due:** Comparative sampling project
- Nov. 22, 24 Thanksgiving Break
- Nov. 29, Dec. 1 *Field excursion to Gap Mountain with Wessels and Gunn, or Pisgah State Park with Palmiotto
- Assignments due:** Observation paper 4
Readings: Foster 1988 (RESERVE: JSTOR), Tyrrell and Crow 1994 (RESERVE: JSTOR), Henry and Swan 1974 (RESERVE: JSTOR)

- Dec. 6, 8 *Field excursion to Pisgah State Park with Wessels and Gunn, or Gap Mountain with Palmiotto
- Dec. 13, 15 *Class time to prepare for group presentation on the Plant community inventory project.
- Dec. 20-22 Presentation of group inventory projects, course wrap-up.

Assignments due: Plant communities inventory presentation

DIRECTIONS TO FIELD EXCURSIONS

For any field excursions that have an * the class will not meet at Antioch but at the site. Directions for each of these sites is given below and students are encouraged to carpool to these sites. For field excursions to Horatio Colony, Goose Pond, Yale Forest, and the airport we will meet at Antioch and then carpool from there.

PUTNEY (40 MINUTES FROM ANTIOCH): The class will meet at the Putney Central School outdoor pool. To get to the school take interstate 91 to exit 4 and follow route 5 into the center of Putney. Turn left off of route 5 between the Putney General Store and the Tavern. Drive about a mile and the Central School will be on the right. Turn right down the dirt driveway just before the school building to the outdoor pool.

VERNON'S BLACK GUM SWAMP (25 MINUTES FROM ANTIOCH): We will meet at the Hannaford shopping plaza in north Brattleboro and then car pool from there. To get to the shopping plaza take route 9 west and when you cross the CT river turn left at the round-about and the plaza is two lights down on the right. Park in the lot close to the road.

DUMMERSTON'S BLACK MOUNTAIN (25 MINUTES FROM ANTIOCH): We will meet at the Hannaford shopping plaza in north Brattleboro and then car pool from there. To get to the shopping plaza take route 9 west and when you cross the CT river turn left at the round-about and the plaza is two lights down on the right. Park in the lot close to the road.

PISGAH (25 MINUTES FROM ANTIOCH): We will meet at the Kilburn Pond Trailhead. To get there take route 9 west to route 63. Turn left on route 63 and drive about 5 miles south. The trailhead parking is on the left.

GAP MOUNTAIN (20 MINUTES FROM ANTIOCH): To get to the Gap Mountain trailhead take route 12 south through Troy. About a mile south of Troy look for the Gap Mountain Road on the left. At the first fork in the road go right. At the next fork go left staying on paved road. The trailhead is on the left.

WANTASTIQUET MOUNTAIN (25 MINUTES FROM ANTIOCH): To get to Wantastiquet head into downtown Brattleboro and cross the Connecticut River on route 119 to Hinsdale. You will go over two bridges as you cross the river. Directly after the second bridge turn left on a dirt road before WalMart. The trailhead parking area is at the roads end on the right.

PITCHER MOUNTAIN (30 MINUTES FROM ANTIOCH): To get to the Pitcher Mountain trailhead take route 10 north through Gilsum. A few miles north turn right onto route 123. the trailhead parking is on the left at the top of the long hill climb.

PLANT COMMUNITIES BIBLIOGRAPHY

- Baldwin, I. and J. Schultz. 1983. Rapid changes in tree leaf chemistry induced by damage: evidence of communication between plants. *Science*. 221:277-279.
- Barbour, M. and W. Billings. 1988. *North American Terrestrial Vegetation*. Cambridge University Press. Cambridge.
- Bonham, C. 1989. *Measurements for Terrestrial Vegetation*. John Wiley & Sons. New York.
- Bormann, F. and M. Buell. 1964. Old growth stand of Hemlock-Northern Hardwood forest in central Vermont. *Bulletin of the Torrey Botanical Club*. 91:451-465.
- Bormann, F. and Likens. 1979. *Pattern and Process in a Forested Ecosystem*. Springer-Verlag. New York.
- Braun, E. 1950. *Deciduous Forests of Eastern North America*. Blakiston. Philadelphia.
- Davis, M. 1976. Pleistocene biogeography of the temperate deciduous forest. *Geoscience and Man*, vol. XIII.
- Day, G. 1953. The Indian as an ecological factor in the northeastern forest. *Ecology*. 34:329-346.
- Drury, W. and I. Nisbet. 1973. Succession. *Journal of the Arnold Arboretum*. 54:331-368.
- Eyre, F. 1980. *Forest Cover Types of the United States and Canada*. Society of American Foresters.
- Forcier, L. 1975. Reproductive strategies and the co-occurrence of climax tree species. *Science*. 189:808-810.
- Foster, D. 1992. Land-use history (1730-1990) and vegetation dynamics in central New England. *Journal of Ecology*. 80:753-772.
- Foster, D. and E. Boose. 1992. Patterns of forest damage resulting from catastrophic wind in central New England. *Journal of Ecology*. 80:79-98
- Fowells, H. 1965. *Silvics of Forest Trees of the United States*. Agricultural Handbook no. 271. Washington, D.C. U.S. Department of Agriculture Forest Service.
- Gordon, Whitney. 1994. *From Coastal Wilderness to Fruited Plain: A History of Environmental Change in Temperate North America 1500-Present*. Cambridge. Cambridge University Press.
- Horn, H. 1975. Forest Succession. *Scientific American*. 232(5):90-98.
- Larcher, W. 1983. *Physiological Plant Ecology*. Springer-Verlag. New York.
- Oliver, C. and E. Stephens. 1977. Reconstruction of a mixed-species forest in central New England. *Ecology*. 58:562-572.

- Rogers, R. 1978. Forests Dominated by Hemlock (*Tsuga canadensis*): distribution as related to site and post settlement history. *Canadian Journal of Botany*. 56:843-854.
- Russell, E. 1983. Indian-set fires in the forests of the northeastern United States. *Ecology*. 64:78-88.
- Thompson, D. and R. Smith. 1970. The forest primeval in the Northeast-A great myth? *Tall Timbers Ecol. Conf. no. 10*. pp. 255-265. Tall Timbers Research Station. Tallahassee, FL.
- Watts, M. 1964. *Reading the Landscape*. The MacMillan Co. New York.
- West, D. et. al. 1981. *Forest Succession Concepts and Applications*. Springer-Verlag. New York.
- Westveld, M. 1956. Natural forest vegetation zones of New England. *Journal of Forestry*. 54:332-338.
- Woods, K. 1984. Patterns of tree replacement: canopy effects on understory pattern in hemlock-northern hardwood forests. *Vegetatio*. 56:87-107.