INTRODUCTION

| Jan.  | 17 | Historical aims of plant community ecology |
|      | 19 | Ecological and evolutionary processes structuring communities |
|      | 24 | Local and regional competition |
|      | 26 | Fugitive species, metapopulation dynamics, lottery models |
|      | 31 | Predation and mutualism |
| Feb.  | 2  | Apparent competition, multi-trophic level interactions |

ADAPTIVE STRATEGIES and PHYSIOGNOMY

|    | 7  | Plant strategies: the Grime perspective |
|    | 9  | Plant strategies: the Tilman and Westoby perspectives |
|    | 14 | Economics of gas exchange, support, and biotic interactions |
|    | 16 | Tundra and treelines – constraints on plant height and growth form |
|    | 21 | Boreal forests and bogs: significance of evergreenness |
|    | 23 | Boreal forests and bogs: *Sphagnum*, ombrotrophy, and landscape dynamics |
|    | 28 | Temperate deciduous forests: phenological adaptations and constraints in understory herbs |
| Mar. | 2  | Temperate deciduous forests: determinants of shade tolerance, successional trends |
|    | 7  | Tropical forests: evolution of anti-herbivore defenses |

COMMUNITY COMPOSITION

|    | 9  | Debate over the community concept: Clements and Gleason, Curtis and Whittaker |
|    | 21 | Gradient analysis: spatial trends in community composition and structure |
|    | 23 | Community classification and ordination |
|    |    | Ordination via PC-ORD – lab hours to be arranged |

COMMUNITY DYNAMICS

| Apr. | 28 | Succession and climax |
|      | 30 | Gap-phase dynamics: the importance of temporal and spatial scale |
|      | 4  | Landscape dynamics |
|      | 6  | Fire ecology |
| 8-15 |     | FIELD TRIP: Clifty Falls State Park (IN), Great Smoky Mountains National Park (TN), Cedars of Lebanon State Park (TN) |
| Apr. | 18 | Positive and negative feedbacks and the generation of pattern |
April 20  Nutrient dynamics and ecosystem function
21  LAB: Noe Woods succession

SPECIES DIVERSITY

25  Trends in diversity along environmental gradients: tropical rain forests, temperate forests, Mediterranean scrub
27  Determinants of species richness: speciation, resource partitioning

May 2  Determinants of species richness: local immigration-extinction dynamics, natural enemies
4  Ecological effects of species richness

Course objectives: Understanding the conceptual bases and empirical approaches used to study trends in the composition, structure, dynamics, and diversity of plant communities. We will read and discuss some of the most important papers in plant community ecology, both classical and the very latest in the modern literature. The course includes a week-long field trip to the Great Smoky Mountains in mid-April, which should provide an opportunity for collaborative research on some current ideas, as well as provide familiarity with one of the most diverse landscapes in eastern North America. Each student will develop a detailed research report on class data collected in the Great Smokies on at Noe Woods, or on a simulation of landscape pattern development in the Florida Everglades (see below). In addition, there will be a lab on ordination (led by Stephanie) and a whole-day field lab on successional dynamics, completing 50 years of data on forest dynamics at Noe Woods.

Botany 801 complements several other courses which bear on aspects of plant community ecology:

- Forestry 550 (Forest Ecology) - which provides, among other things, an excellent background for understanding patterns in community productivity and nutrient cycling;
- Zoology/Forestry/Botany 665 and 879 (Landscape Ecology and Advanced Landscape Ecology) - which treat the ecological dynamics of spatially structured areas;
- Botany 802 (Physiological Ecology) - which focuses on the physiological mechanisms that help plants survive and compete successfully in different environments; and
- Botany 828 (Plant Evolutionary Ecology) - which analyzes other features of plant adaptation (e.g., life-history, reproductive allocation) and genetic variation that influence ecological performance.

As the syllabus indicates, Botany 801 focuses on (i) the kaleidoscopic range of ecological interactions within communities; (ii) the context-specific advantages of key traits that help generate trends in community structure and composition; (iii) the study of gradients of community composition, structure, dynamics, and diversity; (iv) selective basis for community trends; and (v) the role of community dynamics in maintaining diversity at the community and landscape level.

Readings from the primary research literature will be photocopied and made available for purchase. These papers provide background for the lectures and form the core of the course. We will discuss selected papers during class. Everyone should be ready to discuss the assigned readings – which means reading and thinking about each paper before class, and participating actively in the class discussion. We strongly recommend buying McCune, B., J. B. Grace, and D. L. Urban. 2002. Analysis of ecological communities. MjM Software Design, Gleneden Beach, Oregon. This book is available on the web and from a variety of sources; we will NOT be xeroxing the required chapters (see below) for our coverage of direct and indirect gradient analysis.

The field trip to Great Smoky Mountains National Park will be held from April 8-15. We will observe a wide range of plant communities, discuss potential reasons for the patterns observed, and collaborate on one or more research projects. Each of us will be responsible for food and housing costs, and for providing suitable camping gear; the University will provide transportation. We will hold a special meeting (probably in the hour before class) a month before leaving to discuss plans and research topics, finalize logistics, and prepare for a singularly enjoyable (and educational!) time. We will also conduct a one-day resurvey of the mapped plots at Noe Woods on April 21.

Examinations: A take-home midterm will be issued on Tuesday, March 21, and will be due in class on Tuesday,
March 28. The exam will consist of a series of short essay questions. If people’s schedules permit, the final exam will involve an innovative and collaborative approach, tentatively scheduled for the afternoon and evening of May 10. If this approach does not work with everyone’s schedules, a take-home final will be issued on Thursday, May 4 and will be due by 4 pm on Thursday, May 11.

**Research report.** Three options are available:

a. You may, individually or in collaboration, analyze data collected by the class in the Great Smoky Mountains and write a report explaining the scientific issues addressed, why they are significant, how they were examined, your results, and the specific and broader conclusions drawn from the study. Reports may focus on any one of the collaborative projects undertaken. Placing the investigation and findings in the context of the current scientific literature is essential.

b. Similarly, you may write a report on our joint resampling of Noe Woods.

c. You may also, individually or in collaboration with others, write a report based on spatially structured simulations of the factors putatively generating patterned landscapes in the Florida Everglades. If you are interested in this option, please contact Professor Givnish asap, get the PowerPoint presentation on the Everglades, and read Couwenberg 2005 (see below).

**Research reports** are due, without fail, by May 10.

**Grades** are based on class participation (20%), midterm exam (20%), final exam (20%), class project (30%), and project evaluation (10%).

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### Reading List

**Week 1:**


**Week 2:**


**Week 3:**


**Week 4:**


**Week 5:**


**Week 6:**


Week 7:  
Feb 28 – Mar 2


Week 8:  
Mar 7 – 9


Week 9:  
Mar 21 – 23


Week 11:  
Mar 28 – 30


Week 12:  
Apr 4 – 6


Week 13: 

Apr 8 – 15 (Great Smoky Mountains field trip)


Week 14: 

Apr 18 – 20


Week 15: 

Apr 25 – 27


**Week 16:**


