ECOLOGICAL PLANT GEOGRAPHY

Objectives:
This is a course in the geography of plant biodiversity and ecology. We will examine the diversity of plant species and ecosystems with emphasis on why they are distributed the way they are. As a consequence of taking this course, you should (1) understand the major factors influencing the geographic distribution of species, (2) be able to understand and interpret the origin and functioning of many of the landscapes you may read about, work in, and pass through, (3) be able to understand the ecological context in which a particular species may have evolved, or a specific ecological process takes place, and (4) better appreciate your natural heritage and how man's activities have and will likely continue to modify it.

Instructor:
Robert K. Peet, I am a Professor in the Department of Biology. My office is 413 Coker Hall. My office phone is 962-6942. My email address is peet@unc.edu. I will almost always be available immediately after class in case you have questions or wish to discuss something with me. If you wish to see me at some other time, just stop by my office, or contact me to arrange an appointment. Although I do not have additional regularly scheduled office hours, I am happy to have you stop by almost any time (except for the two hours immediately prior to lecture).

General information:
Students who take this course come from a broad range of backgrounds. Among you will probably be undergraduates with relatively little background in biology as well as Biology and Ecology graduate students. I will do my best to accommodate all of your varied needs and interests. Please be patient when it is necessary for me to explain elementary background material for the uninitiated, or when I recite a list of scientific names of plants for the more advanced students.

I realize that most of you have not had a course in plant taxonomy such as Biology 272 or 472. However, in many cases I will have no choice but to use scientific names. When I have reason to believe that an important plant name may be unfamiliar to some of you, I will write it on the board or project it on the screen. When we discuss vegetation in the second portion of the course, I will try to provide lists of critical names, and will indicate those that I will expect you to know. You may feel free to use either common or scientific names when referring to species in assignments or on exams.

Although there are no prerequisites for this course, I generally assume that students have had beginning Biology (~Bio 101) and Ecology (~Bio 201) courses in which basic principles of ecology, evolution, and systematics were covered. I also assume that you know basic geography of the sort one generally learns in a good high school. This means that I expect you to know the locations of the states, and the major rivers, mountain ranges and countries or the
world. If at some point you find I am assuming too much (or too little), please let me know so that I can adjust.

I expect this to be a modest-sized class of around 30 students, so it should be possible to ask questions freely and have short discussions. Please feel free to stop me and ask questions at any time. I will similarly feel free to ask you questions.

Textbooks & Readings:
For the first 1/2 of the course I will use as a text *Biogeography (fourth edition)* by Lomolino, Whittaker, Riddle and Brown. Although this text is not specifically oriented toward plants, it does an excellent job of presenting the major processes influencing species distributions. It is also a commonly used textbook so resale should be relatively easy (I hope). For the final 1/2 of the course I will provide suggested readings.

Class Website and supplemental materials:
The class website will be available on blackboard (http://blackboard.unc.edu). The website will be evolving throughout the semester. Check periodically for additions and revisions. This will be my primary mechanism for providing supplementary material.

Evaluation:
Course grades will be based on four equally-weighted parts. These include the three examinations listed on the course outline, and the term project. The final examination will be comprehensive, but the material covered on the earlier examinations will be examined on the final largely in terms of applications of concepts and principles, rather than specific facts. Lecture and reading will both be covered on the exams, but greater emphasis will be placed on lecture material.

I like to combine a variety of types of questions on my exams. Typically these include identification, short answers, map questions, graph or figure interpretation, and essays. Exams from previous iterations of the course will be available on the class website. You might note that it is common for my questions to require you to use in new ways the facts, principles, and approaches I have presented. To do well on my tests, you should not just "learn" the material, but in addition you should take time to think about what it means, why it is significant, and how it might be generalized. You should be able to compare processes or characteristics across different species, regions, or ecosystems.

For your term project you will be required to write a paper describing and explaining the global distribution of a small clade or set of closely related species (typically 2-5), at least one of which grows naturally somewhere in North Carolina. The choice of species group is yours. I will distribute a separate document providing details of this assignment (watch the website) and suggestions for focal species.
# LECTURE OUTLINE

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>(Reading: L= Lomolino et al. 2010)</th>
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<tbody>
<tr>
<td>Jan 9</td>
<td>1. Basic concepts (L1, 2)</td>
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<tr>
<td>Jan 11</td>
<td>2. Climate (L3)</td>
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<td>Jan 13</td>
<td>3. Soils (L3)</td>
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<tr>
<td>Jan 18</td>
<td>4. Biomes &amp; Biogeographic regions (L5)</td>
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## A. A template for understanding biogeography

In this section we will look first at the physical environment experienced by organisms, and how environment influences the distribution of species and ecosystems.

- Jan 9 1. Basic concepts (L1, 2)
- Jan 11 2. Climate (L3)
- Jan 13 3. Soils (L3)
- Jan 18 4. Biomes & Biogeographic regions (L5)

## B. Ecological and evolutionary patterns and processes

Species distributions do not just happen. Rather, they are the consequences of various biological and ecological processes. We will examine major processes responsible for species distributions. You should learn how these factors and processes influence species distributions and how their importance varies geographically.

- Jan 20 5. Migration & dispersal (L6)
- Jan 23 6. Speciation & diversification (L7)
- Jan 25 7. Equilibrium processes; Island biogeography (L13)
- Jan 27 8. Island biogeography (L14)
- Jan 30 9. Diversification & endemism (L10)

## C. Earth history and biogeographic consequences

Current species distributions, as well as many characteristics of regional ecosystems, are the products of past events. In this section we will examine how species distributions and ecosystems have changed through time and what factors have been responsible for those changes.

- Feb 1 10. Mesozoic – Ancient plants & the changing earth (L8) -- Dr. Gensel
- Feb 3 11. Tertiary – Expansion of the angiosperms -- Dr. Gensel
- Feb 6 12. Pleistocene – Impact of the glaciations (L9)
- Feb 8 13. Holocene – History of the temperate deciduous forests
- Feb 10 14. Holocene – Species migrations
- Feb 13 15. Recent – Human impacts
  
  **Examination 1 (Lectures 1-13)**

## D. Biogeographic patterns and processes

In this section we synthesize the information presented in the previous sections as well as other lines of evidence and analytical techniques understand the major patterns of species distributions and how they are generated. You will be expected to learn these major patterns and to know how to go about analyzing the distribution of a group of species.

- Feb 17 16. History of lineages – phylogeography (L11)
- Feb 20 17. Global patterns and vicariance biogeography (L12)
E. Vegetation of the World
In the remaining lectures we examine the vegetation of the major biomes of the world. For each biome you will be expected to learn such things as the world distribution, typical climate & soil characteristics, dominant species, important environmental gradients, the major types of natural disturbance, the major adaptations of the plant species present to the local environment, and important ecological processes characteristic of that biome.

**Temperate forest vegetation**
- Feb 24 19. Temperate deciduous forest – composition & distribution
- Feb 27 20. Temperate deciduous forest – structure & function
- Feb 29 21. Temperate evergreen vegetation – Northern Hemisphere
- Mar 2 22. Temperate evergreen vegetation – Southern Hemisphere

*Species names for term project due!*

**Equatorial vegetation**
- Mar 12 23. Tropical Rain Forest – composition & distribution
- Mar 14 24. Tropical Rain Forest – structure & function

**Seasonal tropical vegetation**
- Mar 16 25. Seasonal forests & savannas – composition & distribution
- Mar 19 26. Seasonal forests & savannas – structure & function

**Hot desert vegetation**
- Mar 21 27. Hot desert – composition & distribution

*Examination 2 (Lectures 14-26)*

**Sclerophyll vegetation**
- Mar 28 29. Sclerophyll woodlands – distribution & composition
- Mar 30 30. Sclerophyll woodlands – structure & function

**Field trip**
- Mar 31 Optional; all day – Croatan National Forest

**Continental temperate vegetation**
- Apr 2 31. Cold woodlands, deserts & semiarid grasslands
- Apr 4 32. Temperate grasslands – distribution & composition
- Apr 9 33. Temperate grasslands – structure & function

**Boreal and montane coniferous forest vegetation**
- Apr 11 34. Boreal forest – distribution & composition
- Apr 13 35. Montane conifer forest – distribution & composition
- Apr 16 36. Boreal forest – structure & function
**Arctic & alpine vegetation**

- Apr 18 37. Arctic & alpine vegetation – distribution & composition
- Apr 20 38. Arctic & alpine vegetation – structure & function

*Term projects due April 20*

**Aquatic, wetland and coastal vegetation**

- Apr 23 39. Terrestrial wetland vegetation
- Apr 25 40. Freshwater & coastal vegetation
- Apr 27 (8am) *Examination 3 (Lectures 28-40, plus cumulative section)*