PRINCIPLES OF ECOLOGY
BIOL 271, Spring 2012

Meetings
Lecture Tue & Thu 9:45-11:15, Schaibel Auditorium
Labs:  F01 - Wed 9:15-12:15, 402 Bunnell (CRN 35129)
       F02 - Wed 2:15-5:15, 402 Bunnell (CRN 34130)
       F03 – Thu 2:00-5:00, 402 Bunnell (CRN 35131)

Instructor
Prof. Diane Wagner
diane.wagner@alaska.edu
Telephone for course-related issues 474-5622
Office hours Tues 12 – 1 or by appointment in 403 Bunnell

TAs
Andrew Baltensperger, abaltens@alaska.edu, 347-0175
Jonathon Newman, jnewman11@alaska.edu
Michaela Swanson, m.swanson@alaska.edu, 474-6052

TA contact information, office hours, and locations will be posted on Blackboard

Catalog
Basic principles in physiological, ecosystem, population, and community ecology.

Description
The course covers environmental variation and how organisms cope with that variation; the structure, growth and regulation of populations; and ecosystem structure and function.

Required Text
The text is available in loose leaf or casebound form in the UAF Bookstore. You can order the ebook from the Sinauer website or the Coursesmart website. A copy of the text will also be available on reserve in Rasmuson library.

Website
The course website is administered through Blackboard at classes.uaf.edu. Please log on to Blackboard and confirm that you are can access course materials during the first week of class.

Your textbook provides an companion website at www.sites.sinauer.com/ecology2e. On this website you will find learning aids and practice quizzes. You will need to register to access quizzes. To register, click “Online Quizzes” in the list of resources on the left-hand side, click “Create New Account”, enter the instructors’s email address (diane.wagner@alaska.edu), and click “Submit”. Then follow the instructions to create an account.

Instructional Methods
Instructional methods include lectures, discussion, and laboratory work.
Students should read the assigned portion of the textbook before lecture.
During most lectures, we will break for a short period to engage in problem-solving activities in smaller groups.
Prerequisites
Biology 115X or 106X; BIOL 116X or 105X; LS F100X or LS F101X or successful completion of library skills competency test; or permission of instructor

Prior knowledge expected
The course material will build on concepts skills you should have learned in previous courses; particularly the following:
- Basic chemical concepts (atomic and molecular structure, stoichiometry, oxidation-reduction reactions, acid-base reactions)
- Elemental composition, basic structure, and function of proteins, carbohydrates, lipids and nucleic acids
- Osmosis and diffusion
- Cell structure and function
- Mechanisms of photosynthesis and cellular respiration
- Mendelian genetics and mutation
- Biological classification system (domain, kingdom, phylum, etc.)
- Phylogenetic trees
- Sexual and asexual reproduction
- Plant and animal structure and function, including homeostasis
- Basic mathematics (percents, averages, unit conversions, probability, logarithms, algebra)
- The structure of a scientific paper / lab report
- Basic understanding of how to find journal articles and books using the library’s online resources

Course Goals
The goals of BIOL 271 are to provide students with (a) an understanding of the basic patterns, mechanisms and concepts central to the science of ecology and (b) the ability to design, implement, interpret, and communicate simple ecological experiments using the scientific method.

Learning Outcomes
More specifically, students completing the course should able to explain the following concepts and draw on them to solve problems:
- Mechanisms that produce variation in Earth’s climate at global and regional scales, and effects of climate on soils, vegetation, and communities
- Major environmental challenges faced by organisms on land and in water, and physiological and behavioral mechanisms by which animals and plants deal with those challenges
- The role of environment, population size, and genetic diversity in evolutionary change
- Patterns of variation in the life history traits of plants and animals, and tradeoffs among those traits
- How populations grow under ideal conditions and what factors limit population growth under real conditions
- The structure of natural communities and changes in community composition and ecosystems over time
- Pathways and transformations of energy and matter
- Human influences on ecosystems, in particular on the carbon and nitrogen cycles, and implications for global change

Student who complete the course should also be able to apply the following skills:
- Measure the abundance, density, and dispersion of plant and animal populations
- Apply exponential, geometric, and logistic mathematical models of population growth
- Design, interpret, and communicate a simple ecological experiment

**Assessment**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Midterm 1</td>
<td>15%</td>
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<tr>
<td>Midterm 2</td>
<td>15%</td>
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<tr>
<td>Final exam</td>
<td>20%</td>
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<tr>
<td>Essay</td>
<td>6%</td>
</tr>
<tr>
<td>Homework (3 assignments)</td>
<td>9%</td>
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<tr>
<td>Lab assignments</td>
<td>30%</td>
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<tr>
<td>Participation</td>
<td>5%</td>
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</tbody>
</table>

**Grading**

Grades will be assigned based on the percentage of points you earn in class. Grades will not be assigned on a curve. **No extra credit assignments are available.**

<table>
<thead>
<tr>
<th>Grade</th>
<th>% of Total Points</th>
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<tbody>
<tr>
<td>A</td>
<td>90 - 100</td>
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<tr>
<td>B</td>
<td>80 – 89</td>
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<td>C</td>
<td>70 - 79</td>
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<tr>
<td>D</td>
<td>60 - 69</td>
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<tr>
<td>F</td>
<td>0 - 59</td>
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**Exams**

Exams emphasize reasoning, problem-solving, and clarity of expression. The format will include short-answer, essay, and math problems. The final exam will emphasize material presented since the last midterm, but will also incorporate earlier material. You may not use your own calculator on exams. Departmental calculators will be distributed when needed. You will have a chance to familiarize yourself with the departmental calculators prior to the exam, if you wish.

**Missing exams** - If you need to miss an exam for a scheduled activity (e.g. sports event), you must schedule a makeup at least one week before the exam. **If you are ill on the day of the exam, you must a) contact the instructor by email or phone before the exam begins, b) take a makeup exam within 48 hours, and c) bring to the makeup exam a note from a medical professional explaining your absence.**

**Lectures**

Lectures will cover the concepts and facts you will need to know in order to do well in the course. PowerPoint presentations will accompany most lectures, and the slides will be posted to Blackboard later that day. PowerPoint slides are intended to illustrate lecture topics and may be useful study aids. However, viewing the slides is not a substitute for attending lecture. Plan to attend class and take notes. Some lectures, notably those which introduce population growth models and associated calculations, will be delivered using the overhead projector, so there will be no electronic summary to fall back on if you miss lecture. If you cannot attend lecture, you should obtain the notes from a classmate. During many lectures, we will break for problem solving activities. While lecture attendance is not mandatory, participation in these problem solving activities during lecture will contribute to your overall participation score (see below).
Labs

Labs will illustrate concepts from lecture and allow you the opportunity to pursue your own questions about ecology by designing and implementing experiments. Lab attendance is required.

There are graded assignments associated with each full lab exercise. Lab reports, written in the format of a scientific paper, are required for 3 of the labs. Detailed instructions about how to write an effective lab report will be given in a separate handout. Less demanding worksheets are required for the remainder of the lab exercises. Due dates are listed on the schedule. Quizzes (see below) will take place at the beginning of most labs, so it is important to be on time.

**Missing labs** - If you need to miss a lab, you should arrange to attend another lab that week. Contact both your own TA and the TA of the lab section you wish to attend. Only rarely can make-up labs be arranged. If you miss a lab entirely, you may receive zero points for any associated assignments or papers. Please keep in mind that many of the lab exercises will be carried out in teams. If you do not attend lab, you will place your team members at a disadvantage.

Late assignments

Late assignments will be marked down by 5% per day, with a maximum penalty of 50%.

Homework

There will be 3 homework assignments. Each is due the week before an exam (see schedule). Homework assignments will be posted on Blackboard on Monday and are due Thursday at 5pm of the same week. Homework assignments will cover some of the material that will be covered on the next exam and are intended to help you study effectively.

Essay

Students are expected to write a single short essay (500-1000 words). For this assignment, you will choose a single species found in interior Alaska and write about how its physiology, morphology, and/or behavior allow it to survive the winter at high latitude. You must include at least 3 references from journal articles. A more detailed description of this assignment will be provided in class.

Participation

You are expected to be an active participant at all class meetings, both lecture and lab. Lectures will frequently incorporate short problem-solving activities, and effective participation in these activities is tracked. Your participation in lab is crucial. Many of our experiments are conducted in teams; if you are absent, your team members will have to do your share of the work. Please note that some experiments will require maintenance and data collection outside class hours. Your willingness to contribute to the success of your team’s experiments counts toward your participation grade. At the end of the course, the instructor will work with TAs to evaluate your participation in the course.

Academic dishonesty

Acts of academic dishonesty include cheating on exams, helping others to cheat, plagiarizing (see the next paragraph), feigning illness to obtain an extension, turning in work that was written for another class without permission, and receiving credit for a group project to which you did not contribute. Please read the UAF Student Code of Conduct in the UAF Catalog. Students who behave dishonestly will
receive an F for the class and the case will be presented to the University
Disciplinary and Honor Code Committee for review.

Plagiarism means presenting someone else’s ideas or text – published or
unpublished – as if they were your own. Instances of plagiarism include failing to
cite your sources properly and copying someone else’s work. Please note that
making small alterations to someone else’s text to obscure the resemblance still
constitutes plagiarism. Students are welcome to work in groups to discuss lab
assignments and homework and are encouraged to review each other’s work, but
unless otherwise specified, each student must prepare his or her own assignments.

**Student Support Services**

**Writing Center** - Students are encouraged to take advantage of the Writing
Center on campus in 801 Gruening, 474-5314.

**Student Support Services Program** – Tutors, laptops, and calculator checkout
services are available to eligible low-income and first-generation students, as well as
those with disabilities. [http://www.uaf.edu/sssp](http://www.uaf.edu/sssp), 512 Gruening, 474-6884,
fysssp@uaf.edu.

**Academic Advising Center** – The Academic Advising Center offers free workshops
on how to succeed in college. [http://www.uaf.edu/advising/student](http://www.uaf.edu/advising/student), 509 Gruening,
474-6396, advising@uaf.edu.

**Disabilities**

The Office of Disability Services implements the Americans with Disabilities Act and
insures that UAF students have equal access to the campus and course materials.
The instructor will work with the Office of Disabilities Services (208 Whitaker Bldg,
474-5655, fydso@uaf.edu) to provide accommodation to students with disabilities.
If you have a physical or learning disability, please inform the instructor during the
first 2 weeks of class.
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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Section(s)</th>
<th>Text: Chapter, Section*</th>
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<tbody>
<tr>
<td>1</td>
<td>Jan 19</td>
<td>Introduction</td>
<td>Ch 1</td>
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<tr>
<td>2</td>
<td>Jan 24</td>
<td>Variation in the Physical Environment I</td>
<td>Ch 2.1-2.3 &amp; 24.1-24.2</td>
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<tr>
<td></td>
<td>Jan 26</td>
<td>Variation in the Physical Environment II</td>
<td>Ch 2.4-end</td>
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<td></td>
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<td>LAB: Allelopathy Experiment – Begin; plus Lab Report Expectations</td>
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<td>DUE IN LAB: nothing</td>
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<tr>
<td>3</td>
<td>Jan 31</td>
<td>Intro to Soils, The Biosphere I</td>
<td>Ch 21.1-21.2 &amp; Ch 3.1</td>
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<td></td>
<td>Feb  2</td>
<td>The Biosphere II</td>
<td>Ch 3.2-end</td>
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<td>LAB: Data Analysis &amp; Ecological Literature</td>
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<td>DUE IN LAB: Worksheets</td>
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<td><em>(Fri, Feb 3 is the deadline to drop a course without it appearing on the transcript)</em></td>
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<td>4</td>
<td>Feb  7</td>
<td>Coping with Environmental Variation: Temperature</td>
<td>Ch 4.1-4.2</td>
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<td>Feb  9</td>
<td>Coping with Environmental Variation: Water</td>
<td>Ch 4.3-end</td>
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<td>LAB: Allelopathy Experiment – End</td>
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<td>DUE IN LAB: Allelopathy Data to TA</td>
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<td>5</td>
<td>Feb 14</td>
<td>Coping with Environmental Variation: Energy</td>
<td>Ch 5</td>
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<td>Feb 16</td>
<td>Evolution &amp; Life History</td>
<td>Ch 6.1 – 6.3 &amp; Ch 7</td>
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<td>LAB: Interactions in Ecology: Planning Greenhouse Experiment (meet in the usual lab Room, 402 BUNN)</td>
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<td>DUE IN LAB: Your team’s experimental design</td>
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<td>DUE ON BLACKBOARD: Homework assignment 1, due Friday 17 Feb 5pm</td>
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<td>6</td>
<td>Feb 21</td>
<td>Exam 1</td>
<td>handouts</td>
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<td>Feb 23</td>
<td>Behavioral Ecology</td>
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<td>LAB: Interactions in Ecology: Greenhouse Experiment - Begin (meet in Institute of Arctic Biology Greenhouse on West Ridge room: 402 BUNN)</td>
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<td>DUE IN LAB: nothing</td>
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<tr>
<td>7</td>
<td>Feb 28</td>
<td>Population Distribution, Abundance, Life Tables</td>
<td>Ch 8 &amp; 9.1</td>
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<td></td>
<td>Mar  1</td>
<td>Population Growth</td>
<td>Ch 9.2 - 9.3</td>
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<td></td>
<td>LAB: Measuring Population Abundance &amp; Dispersion</td>
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<td>DUE IN LAB: Allelopathy lab report</td>
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* Unless particular sections are specified, read the whole chapter.
<table>
<thead>
<tr>
<th>Week 8</th>
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<tbody>
<tr>
<td>T Mar 6</td>
<td>Population Growth &amp; Regulation</td>
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<tr>
<td>R Mar 8</td>
<td>Population Dynamics &amp; Metapopulations</td>
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</tbody>
</table>

**LAB:** Life Tables and Human Demography  
**DUE IN LAB:** Population Abundance and Dispersion Worksheet  
**DUE IN LECT:** Essay on traits of a species adapted to the Fairbanks area  

**Week 9**  
12-16 March, *Spring break, no classes*  

**Week 10**  
| T Mar 20 | Competition | Ch 11 |
| R Mar 22 | Predation | Ch 12 |

**LAB:** Population Growth  
**DUE IN LAB:** Life Tables Worksheet  

*(Fri, Mar 23 is the deadline for student- and faculty-initiated withdrawals; “W” on transcript)*  

**Week 11**  
| T Mar 27 | Herbivory | Ch 12 |
| R Mar 29 | Mutualism | Ch 14 |

**LAB:** Temperature Acclimation in Fish  
**DUE IN LAB:** Fish data  
**DUE ON BLACKBOARD:** Homework assignment 2, due Friday 30 Mar, 5pm  

**Week 12**  
| T Apr 3 | Exam 2 | Ch 15 & 16 |
| R Apr 5 | Community Structure and Succession | Ch 15 & 16 |

**LAB:** Interactions in Ecology: Greenhouse Experiment - End (meet in Institute of Arctic Biology Greenhouse on West Ridge)  
**DUE IN LAB:** Fish Acclimation Worksheet  

**Week 13**  
| T Apr 10 | Biogeography | Ch 17 |
| R Apr 12 | Species Diversity | Ch 18 |

**LAB:** Interactions in Ecology: Greenhouse Experiment – Analysis and Interpretation  
**DUE IN LAB:** Graph(s) and major conclusions  

**Week 14**  
| T Apr 17 | Production | Ch 19 |
| R Apr 19 | Energy Flow and Food Webs | Ch 20 |

**LAB:** Forest Ecology  
**DUE IN LAB:** Interactions in Ecology: Greenhouse Experiment Lab Report  

**Week 15**  
| T Apr 24 | Nutrient Cycling I | Ch 21 |
| R Apr 26 | Nutrient Cycling II | Ch 21 & review 24.1 |

**LAB:** Forest Ecology continuation, and Aquatic Ecology  
**DUE IN LAB:** Forest Ecology Worksheet
<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Topic</th>
<th>Ch</th>
<th>Handouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>May 1</td>
<td>Landscape Ecology &amp; Ecosystem Management</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>May 3</td>
<td>Human Influences on Ecosystems</td>
<td></td>
<td>handouts</td>
</tr>
</tbody>
</table>

LAB: Permafrost tunnel field trip
DUE IN LAB: nothing
DUE ON BLACKBOARD: Homework assignment 3, due Friday 4 May, 5pm

**Final exam – Tues. 8 May, 3:15-5:15, Schaibel Auditorium**