

**ECOLOGY**

**ABIO 320**

**FALL 2011**

**DR. CARACO**

**BI 253A**

**OFFICE HRS: Thursday, 3:30 – 5:30 PM**

**Course Web Page:**

**[www.albany.edu/faculty/caraco/bio320](http://www.albany.edu/faculty/caraco/bio320)**

**Course Syllabus**

**Reading & Writing Assignments**

**ALL Directions, Information on Grading**

**Test Scores**

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## **Texts**

**Gotelli, NJ. *A Primer of Ecology*. 4<sup>th</sup> Edit., 2008 [*Req*]**

**Alstad, D. *Basic Populus Models of Ecology*. 2001 [*Rec*]**

**Link to Download *Populus* on Course Web Page**

**Both books offer problems for solution.**

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## **Prerequisites**

**1. BIO 212Y (Genetics)**

**Background in Evolution, Adaptation**

**2. Calculus Course: MAT 106 (112/114) *OR* PHY 140**

**Link on Web Page, List of Math Sites**

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## **Course Objectives**

**Ecology: Strong Conceptual Framework**

**Core: Set of Mathematical Models**

**Pre-Professional: Graduate Ecology Prep**

**Ecology, Behavior, Diversity/Environmental Science**

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### **1. Acquire Familiarity Ecological Concepts**

**Read Basic Literature in Ecology**

*Learn Independently*

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### **2. Think Quantitatively About Biological Systems**

*“People who wish to understand nature without using mathematics must settle for a reduced understanding.”*

**Richard Feynman**

**General Principles for Understanding**

**Conceptually Unify Interpretation of Specific Cases**

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### **3. Appreciate Role of Deduction in Science**

***Deducing* a prediction, follow by experimental test**

***VS***

**Lengthy observation, then *inducing* a description**

**Which promotes greater understanding of a scientific question?**

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### **4. Evolution: Way Organize Approach to Ecology**

**Understand Ecological Diversity**

**Evolution, Natural Selection, Shapes Growth Rates**

**Ecological Growth Generates Selection Pressures**

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## **Advice**

- 1. Read Text Prior to Lecture, Look at Webpage**
- 2. Do Problem Sets, Problems in Books**
- 3. Quizzes & Tests: MyUAlbany ID, Calculator**
- 4. Class Attendance Not Mandatory**

**In-Class Quizzes Need Not Be Announced**

- 5. Standards of Academic Integrity**

[http://www.albany.edu/undergraduate\\_bulletin/regulations.html](http://www.albany.edu/undergraduate_bulletin/regulations.html)

**Plagiarism, “Cut and paste”**

**Cite all sources**

# **Grades: Quizzes, Tests and Project**

## **Quizzes**

**3, In Class**

**Follow from Book, Problem Sets**

**Pass/Fail**

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## **Tests ( No *Final* Exam )**

**(1) Mid-October**

**(2) Late November**

**Emphasize Quantitative Problems/Concepts**

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# **Project**

**10 Page Report *Plus* Citations**

**Due Wednesday, 7 December 2011**

**Ask Question, Population-Dynamics Model**

**Analytically, Numerically (Commonly, *Populus*)**

**Show Understand Ecological Question through  
Analysis of Model Behavior**

***Populus*: Link on BIO 320 Webpage**

**Lecture: Example**

**Final Grades: Tests 50% Project 30% Quizzes 15%**

**Course Procedures 5%**

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**No Class Meeting: Wed, 14 September**

**Mon, Wed & Fri, 10, 12, 14 October**

**Fri, 4 November**

**Extra Class Meeting: Fri, 16 September**

**Fri, 7 October; Fri, 21 October; Fri, 11 November**

***Extra Class Meeting:***

**11:30 - 12:25 in ES 245 *AND* 12:35 - 1:30 BIO 248A**

## **What is Ecology?**

### **POPULATION BIOLOGY:**

**Ecology ∪ Evolution ∪ Behavior**

**Biological Evolution, Natural Selection, Adaptation**

***Context for Ecology:* Understand Properties of**

**Individuals, Populations & Communities**

**Link Process to Pattern at Larger Scale**

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### **ECOLOGY, General Definition, History**

**1. Study relationships between organisms and their**

**environments ( abiotic & biotic )**

**2. Science with goal of *predicting* community properties**

**Ecological diversity:**

**[ i ] Number/identity of species**

**[ ii ] Species' abundances**

**3. Today: Quantitative science,**

***understanding* dynamics of populations**

**How dynamics increase/decrease biodiversity**

***Predictive.* Informed by deductive theory,**

**mathematical models**

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**Not Natural History, Not Environmentalism**

**Might Inform Environmental Policy:**

**Climate Change**

**Anthropogenic Impact on Biosphere**

**Environmental Justice**

**Ecological Society of America**

**Good Science Informs “Planetary Stewardship”**

# **How Study Ecology, Population Dynamics ?**

## **INDUCTION versus DEDUCTION**

### **INDUCTION**

- 1. Description, Observational data**
- 2. Analyze observations, “preliminary” experiment**
- 3. *Induce* hypothesis from ( statistics ) observations**
- 4. Further experiments**

**Data collection precedes hypothesis**

**Observational, empirical common in biology**

**Usually qualitative**

## **DEDUCTION**

**Hypothesis about natural process ( Assumptions )**

***Deduce* mathematical model from assumptions**

**Generate predictions from model**

**Test predictions**

**Accept / reject model ( = assumptions )**

**Collect data after developing hypothesis**

**Any experiment should test a model prediction**

***Reading.* pp 2 - 23 in Gotelli; 2 - 12 in Alstad**