GEOG 444
Biogeography: Space, Time and Life

Instructor: Dr. Dean Fairbanks, 527 Butte Hall, x5780, dhfairbanks@csuchico.edu

Office hours: M 11-1pm, T 9-11AM, W 12-1pm; or by appointment.

Lecture Time: TR, 11-12 p.m., Butte 101

Lab Activity Time: W 2-4 p.m., Butte 501

Course Description: This course is designed to provide you understanding and interpretation tools to the geographic distribution patterns of plants and animals as they pertain to physical/environmental, biological and ecological concepts that that historically and presently determine these patterns. The focus will be on increasing use of biogeographic and eocological principles as they pertain to biodiversity conservation.

Course Objectives: to critically examine the science of biogeography— its methods, basic principles and current directions. Biogeography is the study of the relationships between living organisms – animals, plants – and their environment, emphasizing the spatial and temporal patterns in their distributions over the face of the Earth. As the impact of humans on the Earth's surface intensifies, we have become aware of the critical role played by living organisms in all aspects of global habitability. Thus, some of the more traditional topics studied under biogeography have come to the forefront of public policy, including such issues as global warming, conservation of biodiversity, sustainability of harvested resources, the spread of pests and diseases, etc. This class will concentrate on the fundamentals of biogeography with a strong emphasis on ecological processes. Course is divided into three sections:

1. Study biological and ecological concepts: species interactions, environmental relations, and community/ecosystem functioning; and the three biogeographic processes: dispersal, speciation, and extinction, and how they all relate to patterns of species over space.
    - Using assignments, to understand the scientific method and how to test hypotheses using inferential statistics and make sense of distribution and abundance patterns.

2. Study how biodiversity changes over time: evolution, over the relatively recent human history, ice ages and longer evolutionary time scales. Study why continents and islands have unique assemblages of species, and the effects of mega-extinctions (past and present) and biotic interchanges between continents.
    - To survey the scientific revolutions of evolution, plate tectonics, and molecular ecology that shaped the path to modern biogeography.

3. Study how biogeography is used in biological conservation by focusing on theory, models and statistical approaches.

    - To understand the processes that affect how biotas respond to a changing climate and land use, and the challenges we face today and in years to come with respect to biodiversity conservation.

Prerequisites: Geog 101, 219 and either Bio 152 or 334; Geog 315 or Math 315 is recommended

Course Requirements: Assignments (30%), field trip attendances (5%), a term paper due at the beginning of Dead Week by 5:00 p.m. (20%) and two midterms (20%), and a final exam (25%).

Course Text(s):

Biogeography. 4th edition. Lomolino, Riddle, Whittaker, and Brown (2011)

The Song of the Dodo: Island Biogeography in an Age of Extinctions. Quammen, D. (1997).

Supplemental notes/papers/book chapters to be placed on WebCT VISTA

Week*	Schedule*	Pages in Text*	Activity *
Jan	Introduction and History of Biogeography	Bio 1&2	1
24-26	*What is biogeography?, History, What is conservation biogeography/biology? Biodiversity threats*	*Dodo* 1&2	
Jan/Feb	Biophysical Environment: Physical Controls on Distribution	Bio 3,5	2
31-2	*Radiation and temperature, climate and microclimate, water relations and soils, biomes*	*Dodo* 3	
Feb	Distribution and Range: Mapping the Patterns of Presence and Abundance	Bio 4, 15	3
7-9	*Diversity Patterns, Sources of information, survey methods, mapping methods, scale issues, vegetation and animal mapping, patterns of distribution, species and habitats, types of species distributions, microhabitats, ecogeographic rules, geography of biotic diversity: latitudinal gradients*	*Dodo* 4	
14-16	Populations and Organism interactions	Handouts	4
	Life history, growth and regulation, dynamics, competition, prediation and herbivory, parasitism, mutualism and commensalism	*Dodo* 5	
21-23	Communities and Ecosystems; Patterns of Diversity	Handouts	No Lab
	nature and change in communities, species diversity, community similarity and species associations, energy flows, production, nutrient cycling, ecosystems	*Dodo* 6	
Feb/Mar	**EXAM I**	Bio 6,10	5
28-1	Dispersal and Immigration; Metapopulations	*Dodo 7*	
	Modes of dispersal, barriers, corridors, distribution and abundance		
Mar			
6-8	Evolution and Ecology: Natural Selection and Speciation	Bio 7	6
	Definition of natural selection, types of selection, gene flow and speciation, types of speciation, rates of speciation	*Dodo* 8	
13-15	Mechanisms/Drivers: Extinction	Bio 7	7
	Contributing factors to extinction: habitat loss, alteration and fragmentation, overexploitation, invasive species, climate change, current rates and trends, historical rates of catastrophism	*Dodo 9*	
19-23	***SPRING BREAK***		
27-29	Continental Drift and Historical Geographies	Bio 8	
	Plate tectonics and paleogeography, plant distribution and continental drift, vertebrate and invertebrate distributions	*Dodo* 10	
April		Bio 9	
3-5	Quaternary Climate Change Events		
	Quaternary climatic changes, Ice Age species distributions in		

	temperate and tropical regions, megafaunal extinctions, Pleistocene effects on Holocene patterns	
10-12	**EXAM II**	Bio 11
	Reconstructing Biogeographic Histories: Molecular and Isotopic biogeography	
	DNA and the molecular clock, Use of radio-isotopes	
17-19	Reconstructing Biogeographic Histories: Principles and Practice	Bio 12
	Phylogeography and cladistics, systematic, vicariance and center-of-origin models, Biogeography of California	
24-26	Island Biogeography: Patterns in species richness	Bio 13
	Equilibrium theory of island biogeography, island patterns and processes	
May		
1-3	Island Biogeography: Assembly and Evolution of insular biotas	Bio 14
8-10	Landscape Ecology and Ecosystem Management; Conservation Biogeography – Real World Conservation?	Bio 16
	Economics and Value of biodiversity, Species approaches to conservation, ecosystem approaches, Reserve and protected area design: conservation planning, restoration ecology	
	FINAL EXAM, Monday 12-2pm	

***Note**: Schedule subject to change without advanced notice given by lecturer.

Field Trips

Date	Destination	Topics
2/18	Mendocino National Forest-West valley and Highway 32 and 70 transects (Plumas/Lassen National Forests)	Biophysical Environment, Species Distributions, Life Zones, Land Management
3/?	Big Chico Creek Nature Preserve Butte Creek Ecological Preserve	Community Ecology, Disturbance, Land Management
4/?	Donald and Sylvia McLaughlin Reserve, located at the junction of Napa, Yolo, and Lake Counties in the North Coast Ranges	Endemics, Serpentine soils, oak woodland and chaparral

Exercises: All exercises will be due at the beginning of class one week after it was assigned. 10% will be deducted each day for any homework turned in late up to one day; no credit will be given for tardiness longer than one day, unless a doctor approved illness is noted.

Term Research Paper: A term paper will also be required on a research topic to be developed by the student, either through questions noted in the lecture, textbook or *Song of the Dodo*. It will be a minimum of 10 pages of text with additional maps, charts or tables, double spaced, 1" margins, and using 12 pt Times Roman font. Complete details for this paper will be provided in the form of a handout to the class later in the semester. Plagiarizing from the Internet or other source material without due acknowledgement is not tolerated. Therefore hardcopy and a digital (MS Word) file will be turned in. The digital file will be uploaded by the student into Turnitin.com for plagiarism checking. Students found to be plagiarizing material will be referred to the Student Judicial Affairs and will receive no credit on their paper.

Attendance policy: Attendance is expected at every class meeting, but especially the lab time where it will be recorded. There is a considerable amount of information presented in lecture and lab that is not covered directly in the texts. I understand, however, that personal things happen during any semester that you feel obligated to attend too therefore everyone is granted one excused absence. After this one, any unexcused absences will affect your final grade. We are all adults here, so let's show respect to your fellow classmates and to the lecturer.

ADDING, DROPPING OR CHANGING THE GRADE OPTION IN THIS COURSE

After the second week of classes and prior to the last three weeks of instruction, ADDING or DROPPING will be permitted only for SERIOUS AND COMPELLING reasons as described in the university catalog. Drops after Friday April 28th and the end of the semester require documentation of serious illness or accident. Students who do not formally withdraw and do not complete minimum course requirements will be given a grade of either "F" or "I" at the instructor's discretion. A grade of "I" will be awarded when, due to unanticipated and extenuating personal circumstances, the student can't complete the class. Otherwise I do not give "I" grades in my classes.