SEMESTER AT SEA COURSE SYLLABUS

Voyage: Spring 2013
BIOL 3559: Conservation Biology
Faculty Name: Frank von Hippel
Time: 0925-1040, B Day
Pre-requisites: **Introductory Biology or Environmental Science**

COURSE DESCRIPTION: This upper-division course reviews the drivers of global environmental change (human population growth and consumption of resources), resulting environmental degradation, and tools to slow down or reverse environmental damage. The course begins with analyses of levels of biodiversity and species richness, and then covers concepts in demography, such as source and sink dynamics and population viability analysis. These concepts are then employed to understand major environmental problems, including habitat conversion and modification, climate change, eutrophication, acid rain, stratospheric ozone depletion, endocrine disruption due to contaminants, trade in threatened species, and biological invasions. Connections are explored between biodiversity and human health in a changing global environment. Interactions and synergisms between environmental problems are then illustrated via analysis of the global declines of amphibians, reptiles and primates. The course also explores the conservation biology toolbox, including conservation genetics, island biogeography and the design of nature reserves, restoration ecology, and environmental policy. Special attention is paid to conservation problems along the route of the Semester at Sea voyage.

COURSE OBJECTIVES:

- To teach students how human population growth and consumption of resources drive complex environmental problems. The student will understand the major environmental problems the Earth now faces, such as climate change, eutrophication, acid rain, stratospheric ozone depletion, contaminants and endocrine disruption, habitat modification and conversion, and biological invasions. The student will understand how these and other forces interact to cause global declines of amphibians, reptiles, and primates. The student will understand how many of these problems interact in a synergistic fashion, and therefore the student will improve complex thinking skills.
- To teach students tools for assessing and addressing environmental degradation. Students learn these tools both in class and on field exercises. The student will understand major tools for solving environmental problems, such as legislative tools (e.g., CITES, ESA), tools in conservation genetics, island biogeography and its application to reserve design, restoration ecology, and economic tools (e.g., debt for nature swaps, analysis of lost opportunity costs, perverse subsidies and full cost accounting).
- To teach students to analyze conservation problems in a multidisciplinary manner with consideration of economics, law and policy alongside scientific fields such as conservation genetics, environmental chemistry and population demography.

REQUIRED TEXTBOOK

AUTHOR: Martha J. Groom, Gary K. Meffe, C. Ronald Carroll
TITLE: Principles of Conservation Biology
PUBLISHER: Sinauer Associates, Inc.
ISBN #: ISBN-10: 0878935975, ISBN-13: 978-0878935970
DATE/EDITION: 2005, third edition

TOPICAL OUTLINE OF COURSE
A case study for each country we visit is indicated in *italics*.

Class #	**Date**	**Topic**	**Reading**
1	Jan 12	**Diversity of life 1: species richness, taxonomy & conservation**	Chapter 1
2	Jan 14	**Diversity of life 2: levels of biodiversity and species richness** *Biological invasions and restoration ecology: A Hawaiian case study*	Chapter 2
	Jan 16	*Invasive Species & Restoration Ecology Field Trip, Hilo* 0800-1800	
3	Jan 18	**Environmental problems: drivers & consequences**	Chapter 3
4	Jan 20	**Conservation values & ethics**	Chapter 4
5	Jan 24	**Ecological economics & nature conservation**	Chapter 5
6	Jan 26	**Habitat degradation & loss** *Alternative energies: nuclear energy and Japan*	Chapter 6
7	Feb 2	**Habitat fragmentation** *Controlling population growth in China*	Chapter 7
8	Feb 10	**Overexploitation** *Environmental Justice: Operation Ranch Hand in Vietnam*	Chapter 8
9	Feb 18	**Biological invasions revisited** *Urban ecology in Singapore*	Chapter 9
10	Feb 22	**Climate change**	Chapter 10
11	Feb 24	**Conservation genetics 1** *Conservation under dictatorship: the case of Myanmar*	Chapter 11
12	March 3	**Midterm Exam** *Demographic momentum: Bangladesh, India and Pakistan*	

13	March 12	**Conservation genetics 2**	Chapter 11
14	March 14	**Species & landscape approaches to conservation**	Chapter 12
15	March 17	**Ecosystem approaches to conservation** *Island hotspots of biodiversity*	Chapter 13
16	March 20	**Island biogeography & protected areas 1**	Chapter 14
17	March 23	**Island biogeography & protected areas 2** *Elephant conservation: East Africa vs. southern Africa* *Island biogeography and African game reserves*	Chapter 14
18	March 31	**Restoration ecology revisited**	Chapter 15
19	April 2	**Sustainable development**	Chapter 16
20	April 5	**Conservation science & policy** *Sustainable development and African rainforests*	Chapter 17
21	April 12	**Complex conservation challenges**	Chapter 18
22	April 15	**Biodiversity revisited** *Conservation biology amidst political volatility*	
23	April 23	**Final Exam**	

FIELD WORK

FIELD LAB *(Attendance is mandatory)*

January 16, Hilo

0800	Depart ship
0815	Arrive Keaukaha Military Reservation research site
0815-1230	Invasive species research and service project
1230-1300	sack lunch at field site
1300-1800	Invasive species & native rainforest site visits in Hawaii Volcanoes National Park
1800	Arrive ship

Hawaii has the highest known extinction rate in the world, and the most important driver of

extinctions in Hawaii is invasive species. More generally, invasive species tend to be more important than habitat loss in causing extinctions on islands worldwide, the opposite of the trend for mainland habitats. Hence, there may be no better place than Hawaii to study the impacts of invasive species and how the field of restoration ecology is used to repair environmental damage caused by invasives. We will visit the Keaukaha Military Reservation in Hilo and participate in the Hybrid Ecosystem Project in a low elevation forest. Low elevation forests are rare in Hawaii, and those that remain are highly invaded by non-native plant species. The forest at the Keaukaha Military Reservation has native species in the overstory, but native species are not regenerating well in the understory. Here we will learn about the ecological mechanisms that make invasive species so destructive on islands, and about specific techniques used in restoration ecology of tropical forest ecosystems. The Hybrid Ecosystem Project utilizes a variety of tools, including employing mixtures of native and non-native plant species, each with its own ecological function. Non-native species are selected based on features that should make them non-invasive. Students will learn about this innovative research, and spend the morning in a service project. Prepare to get dirty as we will be clearing, weeding and planting to help the project along. Students will learn about the difference between restoration ecology and intervention ecology, and see the application of intervention ecology first-hand. After lunch, we will visit Hawaii Volcanoes National Park to see more intact, native forest and to learn about invasive species in different forest types.

Note: The weather will be hot, and the field trip will extend from 8:00 am to 6:00 pm. The first half of the day we will be working hard cutting, weeding and planting. The second half of the day we will be walking through rough terrain in intact forest. Wear a thin, long-sleeved shirt and long pants, boots, and a hat. Bring along rain gear and plenty of water.

Assignment: Each student will collect data and record observations during both the morning and afternoon sessions. These will be recorded in field notebooks, along with subsequent integration of observations into the theoretical framework of intervention ecology.

FIELD ASSIGNMENTS

In addition to the field lab described above, each student will complete a field book entry for 6 of the 13 ports/11 countries that we visit after we depart Mexico and before we arrive in Spain (the student chooses the ports/countries to include). Each field book entry will address a question from the course that has relevance to the chosen location. The field book entry will be a descriptive analysis of the question or hypothesis testing, and may include species lists, list of rank-ordered threats, analysis of conservation actions, illustrations, interviews, habitat inventories, data with statistical analysis, and the like. Field book assignments will be due on the second day at sea following the port departure. Field book entries will be evaluated based on clarity, content, quality of writing, depth of analysis, and effectiveness of illustration or data presentation. Feedback will be given for each entry in order for the student to improve future entries.

METHODS OF EVALUATION / GRADING RUBRIC

Field lab participation and assignment = 20%
Field book entry for each port or country = 5% x 6 ports/countries = 30%
Midterm exam = 25%

Final exam = 25%

RESERVE LIBRARY LIST

AUTHOR: Theo Colborn, Dianne Dumanoski and John Peter Meyers
TITLE: Our Stolen Future
PUBLISHER: Plume
ISBN #: ISBN-10: 0452274141, ISBN-13: 978-0452274143
DATE/EDITION: 1997

AUTHOR: Rachel Carson
TITLE: Silent Spring
PUBLISHER: Houghton Mifflin Company
ISBN #: ISBN-10: 0618249060, ISBN-13: 978-0618249060
DATE/EDITION: 2002 (other editions are also fine, originally published in 1962)

AUTHOR: Kathryn Phillips
TITLE: Tracking the Vanishing Frogs
PUBLISHER: Penguin
ISBN #: ISBN-10: 0140246460, ISBN-13: 978-0140246469
DATE/EDITION: 1995

ELECTRONIC COURSE MATERIALS
Supplemental readings and handouts will be provided as pdf's on the ship.

ADDITIONAL RESOURCES
Each student must have a rite-in-the-rain bound notebook for their field entries.
Each student must have a good supply of pencils, a sharpener, and scotch tape.

HONOR CODE
Semester at Sea students enroll in an academic program administered by the University of Virginia, and thus bind themselves to the University's honor code. The code prohibits all acts of lying, cheating, and stealing. Please consult the Voyager's Handbook for further explanation of what constitutes an honor offense.

Each written assignment for this course must be pledged by the student as follows: "On my honor as a student, I pledge that I have neither given nor received aid on this assignment." The pledge must be signed, or, in the case of an electronic file, signed "[signed]."