Environmental Science I
Fall 2000
Course Introduction

Meeting time: lecture: MWF 10:00 – 10:50 am; lab: T 2:00 – 4:50

Instructor:
Dr. Gail Grabowsky Kaaialii ("Dr. Gail" is fine!)
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Office Hours:
MWF: 9:00 – 10:00 am
T: 10:00 – 12:00
R: 10:00 – 12:00, 2:00 – 4:30

Required Text:

Loban, C. S. and M. Schefter. 1997. Tropical Pacific Island Environments. University of Guam Press, Mangilao, Guam.

Other Readings and Exercises from: (These will be provided to you)

Allen, J.L. editor. 1997. Student Atlas of Environmental Issues. Dushkin/McGraw-Hill, Guilford, CT.
Allen, J.L. editor. 1999. Annual Editions: Environment 99/00. Dushkin/McGraw-Hill, Guilford, CT.
Allen, J.L. editor. 2000. Annual Editions: Environment 00/01. Dushkin/McGraw-Hill, Guilford, CT.
Brown, L. R. et al. Editors. 1998. Vital Signs: The Environmental Trends that are Shaping Our Future. W.W. Norton & Co, New York.
Callicott, J. B. Earth's Insights: A Survey of Ecological Ethics from the Mediterranean Basin to the Australian Outback. University of California Press, Berkeley, CA.
Ehrlich, P.R. & A.H. Ehrlich. 1996. Betrayal of Science and Reason. Island Press, Washington, D.C.
Heinberg, R. 1996. A New Covenant with Nature. The Theosophical Publishing House, Wheaton, IL.
Hunter, J.R. 1997. Simple Things Won't Save the Earth. University of Texas press, Austin, TX.
McConnell, R. L. and D.C. Abel. 1999. Environmental Issues: Measuring, Analyzing, Evaluating. Prentice hall, Upper saddle River, NJ.
Miller, G.T. 2001. Environmental Science. (Eighth Edition). Brooks Cole Thompson Learning, Pacific Grove, CA.
Quine, W.V. & J.S. Ullian. 1970. The Web of Belief. Random House, New York, NY.
Raup, D. M. 1986. The Nemesis Affair: A Story of the Death of Dinosaurs and the Ways of Science. W.W. Norton & Co, New York.
Wilson, E.O. 1992. The Diversity of Life. W. W. Norton and Co., new York.
Wilson, E.O. editor. 1988. Biodiversity. National Academy Press, Washington, DC.

Required Extras:

1. **Lab notebook:** This must be a separate notebook from whatever you use to keep your lecture material from this course in. You will be receiving lots of separate handouts and reading materials for the lab so the notebook should be one that you can easily add materials to. The purpose of the notebook is to provide a place for you to record data, make observations, keep lab protocols, file returned documents, etc. Any scientific notebook should be a place you can return to years and years later and still make sense of! It is a precious record of your work and conclusions AND yours will be

graded! The basis of the notebook grading will be explained in class. (Put that explanation somewhere in your notebook!)

2. **Outdoor "field" clothing:** You'll need to have something to cover your feet that can get wet for two of the labs. If you chose to do service learning with the Nature Conservancy or the research project with Kai Makana you will have to have appropriate shoes and attire: I will announce what these are when the time comes.

Introduction:

Welcome to Environmental Science I. I *really* enjoy teaching/facilitating this class because it comes from the heart (and the mind) as I am a scientist and a citizen concerned for the environment. When I say that I am concerned for the environment, I mean I a concerned for the current and future welfare of all the other species we share the planet with as well as for the future welfare of the people alive today and those who will come after us. I feel this class is not simply a course you take in college, it changes the lives of most who take it, as it addresses real-world issues we confront every day (or every time we take a breath of air...). The syllabus has been layed out, all is planned, yet all need not be adhered to. I inevitably plan too much so I will keep you informed of any changes as the course unfolds.

This course is one of two, the second course being (surprise) Environmental Science II. In this first course we will be examining the *biological* aspects of environmental issues. We will use science: its methods and results, to understand the biological aspects of environmental issues. Science however is not undertaken in a vacuum, it is only a tool, a systematic methodology, for determining what may very well be "reality". Formalized scientific method was invented by a particular culture (although peoples all over the world have been doing, among other things, things that are similar to science in order to learn about their world).

There are, in addition to science, other "ways of knowing. " We will discuss these and see how they are useful as well in this course. What I want all of us to realize through this course is that science is NOT a "sacred cow." It is a very very useful tool, but it is not in itself a solution to all our environmental challenges. Even though I am a scientist and thus I obviously very highly value what science can tell us about the world, I, and (most) other scientists fully realize that science is part of culture, that it is done by people and that it can't tell us everything. To solve or consider any environmental problem we need to consider the people involved, their values and beliefs, their economics, their politics, their history, their needs and desires, etc! The science we do only helps us gather information or determine how to behave in order to change a situation for the better, it does not tell us what is right or wrong, what we should or should not do.

Because of the complexity of environmental issues and the fact that science is only one of the players involved in learning about and solving environmental issues, we will have to (get to) touch on those other factors in this science course. I need to have you understand the context in which the science occurs and be sensitive to the importance of the ethics and values of any environmental issue. Thus this course is about the biological aspects of environmental issues and those important factors "external" to the doing an interpreting of environmental science that nevertheless play a crucial role in determining what science should be done and what should be done with the results of that science.

Course Objectives:

Lecture:

When a student completes this course they should:

- **Know what science is and how science is done**
- **Understand the role of science in enabling us to understand environmental phenomena**
- **Gain an understanding of some of the specific things peoples from other cultures know that allow(s/ed) them to live with nature in their past**
- **Understand the role of ethics in allowing us to define environmental problems and solutions**

- **Know the major global and tropical Pacific island environmental problems**
- **Be familiar with a number of the potential solutions to global and tropical Pacific island environmental problems**
- **Know the basic structure and types of marine, fresh water and terrestrial ecosystems**
- **Understand the basic sorts of interactions between organisms and their environment in an ecosystem**
- **Understand what a sustainable ecosystem is and what sustainability means in general**
- **Understand why human population growth occurred and what its future implications are for ourselves and other species**
- **Understand the effects of ecosystem loss and degradation on human societies and human health**

Lab:

When a student completes this course they should:

- **Understand the scientific method and how to apply it to real environmental issues**
- **Understand what descriptive science is and how it is important in environmental biology**
- **Know the basic units used in making scientific measurements**
- **Know and understand the taxonomic hierarchy, systematic biology methodology and the species concept**
- **Know how to determine species abundances and distributions**
- **Know some of the measures used to determine ecological stress**
- **Know how to read topographic and remote imaging maps**
- **Learn the importance of, and how to access and read, the primary scientific literature**
- **Know how to design a scientific experiment aimed at supporting or disproving a particular hypothesis**
- **Know how to prepare a formal laboratory write-up**

Course Competencies:

Once a student has completed this course they should be able to:

- ☺ Recognize that scientific inquiries into environmental issues are often initiated because of our particular values and that scientific results may, in turn, inform as to what sorts of behaviors are ethical.
- ☺ Clearly communicate the structure, interactions and workings of ecosystems in general.
- ☺ List the major threats to ecosystems in the tropical Pacific posed by man's activities.
- ☺ Explain how threats to ecosystems may effect the quality of human life.
- ☺ Give a scientific explanation for a belief that a particular activity or substance poses a threat to the health of ecosystems and/or ourselves.
- ☺ Explain what is being done or could be done in theory to decrease particular threats to ecosystems and improve human health and quality of life.
- ☺ Integrate their understanding of ecosystems, threats to ecosystems and humans, and potential science-based solutions to environmental challenges in such a way that they are prepared to understand and anticipate future challenges and devise potential solutions -- or avoidance measures -- for those challenges.

Grading:

You will receive a letter grade for both the lecture and the lab portions of this course (if you are enrolled in both). Exams will be as objective as possible although they will contain some essay/short answer questions which tend to be more subjective. For written homework assignments and service learning or service research you will be graded mainly on your *effort* and your *thoughtfulness*. I will explain to all of you how both effort and thoughtfulness should manifest themselves in your work, i.e.

what effort looks like for a particular assignment and what thoughtfulness for assignment "x" is, etc. I will give you these explanations as to the specifics of the grading for each assignment when I describe the assignment to you. All assignments are already in the syllabus with the exception of the service learning and service research assignments. I will be explaining these to you in the first week of class and telling you how they can effect your grade.

Your grades in lecture and lab will be based on the following:

Lecture Grade:

Exam I	25%
Exam II	25%
Final Exam	25%
Sustainability Paper/Service Learning	25%

Lab Grade:

Lab worksheets, Issue Homeworks	50%
Sharing Oral Information (4)	20%
Native Plant Lab (Lab 2)	20%
Attendance	10%

Some Course Specifics:

Service learning Options:

In this course you will have the opportunity to work in the community and/or in the field and do a variety of environmentally-related activities. These activities may involve teaching others about environmental issues, helping out at environmentally-related events, participating in an environmental research project or helping out "in the field" (as we biologists – which you now are -- like to say) as we try to directly help the environment by restoring native ecosystems. These activities are all "Service Learning" opportunities. They are all fun – experience has taught me this, my students always get a lot out of them. They are all educational in a way that pertains to the course. And they all get you out of doing the course sustainability paper or count as extra credit!

Service learning activities occur in conjunction with one of a number of environmental groups or "NGO's": non-governmental organizations. The groups I use for service learning have been carefully chosen by myself because (1) I believe they have a worthy and justifiable environmental mission, (2) they do things that provide opportunities for education for you and (3) they are easy to work with. Some of these groups are: The Nature Conservancy, The Sierra Club, Kai Makana, and The Waikiki Aquarium. You will be hearing from members of some of these organizations. I will explain to you the opportunities that each provides for us that you may want to participate in.

Attendance:

While I dearly hope that you can make every class..., since you are adults now, you are free to miss any class you choose... but know that there may be some consequences should you choose to exercise this option: your grade could suffer. I believe that students who have missed a lot of classes ALWAYS would have done better if they had not missed so many. There simply is no substitute for being in class when it comes to understanding the material. I can give you a fishing pole, but I cannot make you fish. So do yourself a favor and give yourself the opportunity to do the best you can do by coming to class! Paddling analogy pertaining to this: don't bail water into your boat – come to class!

If you miss a lecture exam or lab your absence must be excused if it is not to formally effect your grade. Excused absences occur when you bring in a doctor's note, a funeral announcement for a family member, etc. Excused absences can also occur for: participation in athletic events, extreme personal stress, and on rare occasion, an emergency fill-in at your job ("but Dr. Gail they just couldn't find anyone else to do it!"). Unexcused absences occur when you were working, surfing, sleeping,

cramming for an exam in another class, etc. If you are more than 5 minutes late for class you are marked absent.

Classroom Atmosphere:

Guys, I value a very open, yet courteous class atmosphere. Express your ideas! Ask your questions! (The only dumb question is the one in which you ask yourself if you should ask your question!) Respect the thoughts and ideas and opinions of others – really think about what others say. Let them fully express their thoughts and ideas and then you do the same. **The thing I value most from my college days are all the wonderful, valuable, diverse ways of looking at and understanding the world that I was exposed to. Be an open vessel – take ideas in! You will learn as much from each other as you do from me.**

This syllabus and its introduction are living documents: they are free to change. I try to adhere as closely as possible to the syllabus for your convenience, but there will be times in which we will take longer on a particular topic or add or delete a topic to enhance the course. I like to be able to react to you as the course proceeds and go with the flow a bit in order to make the course experience sort of custom fit to you!

You are responsible for all of the information in this document: losing it or not reading it are not excuses for not knowing what's in it!

Class Schedule

DATE	TOPIC	ACTIVITIES
	Part I **Science, Ethics & Environmental Issues**	
8/28/00	Introductions; Course mechanics; Service learning options; Assessment Pre-test; Discussion of course goals and events	Introduce yourself and your biogeographic range (= where you are from); Fill out course roster, enviro-info form and assessment pre-test
8/29	**Lab 1: Survey of the science in environmental issues**	**Bring in one example of an environmental issue and describe The scientific aspects of it (if there are any). Video**
8/30	What is science; Why do science in general; How is science done	Read: Chapter 1 Lobban & Schefter
9/1	Scientific belief and faith belief	Read: V. Quine & J. Ullian "Belief and change of belief"
9/4	LABOR DAY -- NO CLASSES	
9/5	**Start Lab 2: Design your own experiment aimed at developing successful ways to germinate and grow native Hawaiian plants** **Issue 15: Global warming and the thermal expansion of seawater**	**Form teams, choose plant species** **Take home lab: Issue 15**
9/6	Common ground between scientific knowledge and traditional knowledge	Read: P. Ehrlich & E. Ehrlich "In defence of science"
9/8	The role(s) of science in environmental issues; Do we need science in solving environmental problems?	Video – you find the scientific component of each issue featured in the video or tell why the issue needs some science
9/11	Ecological ethics: understanding the limitations of science and the importance of ethics in environmental problem-solving	Discuss Ehrlich & Ehrlich Read: G. Miller "Environmental worldviews: Clashing values & cultures"
9/12	**Lab 3: Example of indigenous knowledge from your own ethnicity AND your personal connection to nature** **Lab 4: Value Lab**	**Bring in an example of indigenous knowledge from your culture** **Bring in something to have the class determine the value of**
9/13	Is there an environmental crisis? How do we know? How do we go about fixing environmental problems?	Read: M. Vitousek et al.: "Human Domination of Earth's Ecosystems" Read: M. Soule "Mind of the biosphere; Mind in the biosphere"
9/15	Combining science and culture for the environment	**Guest**: Donna Kahakui: Kai Makana

Part II
Pristine Nature: Ecology, Ecosystems and History

9/18	Mans' role in the biosphere prior to the invention of agriculture and industrialization	Read: R. Heinberg "Fateful choices then and now"
9/19	**Alien species presentation** **Continue Lab 2: Plant your seeds, document your methods** **Lab 5: Introduction to units of scientific measure**	**Planting your seeds today!**
9/20	Introduction to Pacific island environments and Pacific peoples	Read: Chapter 2 Loban & Schefter
9/22	A brief history of life	Read: D. Raup "Dinosaurs and the death species"
9/25	Biological classification	
9/26	**Lab 6: Taxonomy and Phylogeny lab**	
9/27	Principles of ecology: Structure of ecosystems	
9/29	Interactions in ecosystems	
10/2	Interactions (cont'd); Cycles	
10/3	**Continue Lab 2: Gather your first data** **Lab 7: Interactions between organisms in the field**	**Record data** **Field trip to St. Louis Heights**
10/4	The flow of energy through ecosystems	Read: T. Hartman "We're made out of sunlight"
10/6	Natural change in ecosystems; Biodiversity	Read: J. Hunter "The role of biodiversity"
10/9	DISCOVERER'S DAY-- NO CLASSES	
10/10	**Lab 8: Identifying species and taxonomic groups in the field**	**Field trip to Makapu'u**
10/11	**EXAM I**	
10/13	Habitats	Read: Chapter 3 Loban & Schefter Homework: Internet habitat diversity project
10/16	Climate	
10/17	**Continue Lab 2: Gather second set of data** **Lab 9: Habitat diversity reports**	**Record data**
10/18	World Habitat types	Videos
10/20	Habitat zonation	

Part III
Island Ecosystems and Challenges

10/23	Terrestrial ecosystems: Intro; Soil	Read: Chapter 4 Loban & Schefter
10/24	**Lab 10: Zonation in the field**	**Field trip to Makapu'u**
10/25	Grasslands & Forests	
10/27	Forest uses	

10/30	Aquatic Pacific island ecosystems: Life in the water and organismal design	Read: Chapter 5 Loban & Shefter
10/31	**Continue Lab 2: Gather third set of data** **Issue 19: Coral reef fishes and marine biodiversity**	**Record data** **Take home lab: Issue 19**
11/1	Freshwater ecosystems	
11/3	Mangrove ecosystems; Wetlands	
11/6	Coral Reefs	Read: Chapter 6 Loban & Schefter
11/7	**Lab 11: Interactions on the reef**	**Fieldtrip to the Waikiki Aquarium** **Pick an organism for biogeo project**
11/8	Risks to the reef; Value of the reef	
11/10	VETERAN'S DAY NO CLASSES (Last day to withdraw from classes)	
11/13	**EXAM II**	
11/14	**Continue Lab 2: Enter data into Excel** **Lab 12: Biogeography reports**	**Bring a disk to hold you team's data**
11/15	Open ocean fisheries	
11/17	Getting to an island; MacArthur and Wilsons' theory of island biogeography	Read: Chapter 7 Loban & Shefter;
11/20	Alien species	Read: Chapter 8 Loban & Schefter
11/21	**Lab 13: Fisheries By-catch lab** **Issue 20: Global fisheries**	**Take home lab: Issue 20**
11/22	Endangered species	
11/24	THANKSGIVING BREAK NO CLASSES	

Part IV
Global Issues on Island Earth

11/27	We are all connected	Read: M. Glantz "The global challenge"
11/28	**Lab 2: Turn in analyses to be checked out** **Lab 14: Global Environmental Issues**	**Bring your analyses from Lab 2** **Bring in an example of a global environmemtal issue. Video**
11/29	Global issues	Read: Chapter 11 Loban & Schefter
12/1	Waste	Read: Chapter 10 Loban & Schefter

Part V
Living Sustainably on Island Earth

12/4	Living sustainably: Human resources	Read: Chapter 9 Loban & Shefter
12/5	**Lab 2: Lab reports due** **Lab 15: Sand Island Waste Treatment Plant**	**Turn in your formal lab write-up for Lab 2. Fieldtrip**
12/6	Wise resource use	Read: L. Brown "Crossing the threshold early signs of an environmental

		awakening"
12/8	Science and ethics in environmental problem solving; Island solutions and island Earth solutions	Read: E.O. Wilson "The environmental ethic" Discussion, brainstorming, synthesizing **Sustainability paper due** (if not doing Service learning)

The Final Exam for this class will be on Thursday, December 14, 2000 from 10:30 – 12:30 in our classroom

F D·OC

PM

Dr. Gail Grabowsky Kaaialii
ENV 201 & 201L: Environmental Science I/Environmental Science I Laboratory
Fall 2000

Environmental Science I & Environmental Science I Laboratory
Syllabus

Is not the sky a father and the earth a mother, and are not all living things with feet or wings or roots their children?

Black Elk

Heaven is my father and earth is my mother and even such a small creature as I finds an intimate place in its midst. That which extends throughout the universe, I regard as my body and that which directs the universe, I regard as my nature. All people are my brothers and sisters and all things are my companions.

Chang Tsai

This living flowing land
Is all there is, forever

We *are it*
It sings through us –

We could live on this Earth
Without clothes or tools!

Gary Snyder

A thing s right if it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong if it tends to do otherwise.

Aldo Leopold

A chain is no stronger than its weakest link, and life is after all a chain.

William James

The nation that destroys its soil destroys itself.

Franklin D. Roosevelt

Civilization is a conspiracy . . . . Modern life is the silent compact of comfortable folk to keep up pretences.

John Buchan

After you have exhausted what there is in business, politics, conviviality, and so on – have found that none of these finally satisfy, or permanently wear – what remains? Nature remains.

Walt Whitman

The scientific community is no private club. In principle, and in its best and broadest sense of the words, scientific inquiry can be undertaken by anyone on almost any subject matter.

W. Quine and J. Ullian