Forests Through Time and Space
Course Description, Fall 2004

The goals of this all-level program were to give students a solid background in forest ecology, evolutionary biology, and the socio-political forces that have shaped forest ecosystems. Central questions we explored were: What is a forest? How do we describe forests? How do forests change over time and space? What forces in current time and throughout history have shaped the forest ecosystems and the organisms within them? How have these forces acted on landscapes, forests, communities, species, populations and individuals?

This program examined how various forces operate on many different levels of scale—from landscape to organism. These included abiotic factors such as the underlying geology and climatic influences, as well as biotic factors such as competition, succession and resource availability. Beginning with the question, "What is science?", we covered evolutionary forces that shape plants and animals, and attempted to explain current observations in terms of evolution and adaptation. A wide range of forest ecosystems—from tropical to boreal—were used as examples to explore various processes.

These topics were covered through lectures, workshops, study questions, labs, and field trips. The workshops and study questions required students to think critically about the material presented in lectures and in their texts and integrate the various topics. Students completed the study questions on their own and then discussed them during a weekly workshop, and frequently included opportunities to practice quantitative skills.

Topics covered include, but were not limited to, the following: the scientific process; origin of species and species concepts; mechanisms of microevolution; geologic history of the PNW; soil ecology; amphibian biology; terrestrial nutrient cycles; the role of salmon and marine-derived nutrients in PNW forests; succession; competition; influences of climate and topography on forests; biogeography; tropical rainforest ecology; global diversity gradients; the role of disturbance in forests; sustainable forestry; threats to tropical forests; ecology, land-use and conservation in Madagascar; terrestrial carbon cycle, carbon sequestration and global warming; terrestrial water cycle; decomposition; and environmental policy.

Field trips were a significant part of the program. We took six field trips during fall quarter, including two three-day field trips, and four during winter quarter. The emphasis of the field trips during the fall was to see a variety of forest ecosystems and to learn a number of ecological field techniques. Students learned standard procedures to measure forests, including how to: use variable plots to estimate the relative dominance of over story trees (basal area); measure tree height and DBH; estimate canopy cover; establish fixed plots to estimate the relative abundance/dominance of sapling, shrub, herbaceous, and moss layers; and use point intercept and quadrats to measure plant communities. Students also learned to identify many of the most common trees, shrubs, and herbaceous plants in PNW forests. Additional field trips focused on salmon mating behavior, stream-dwelling amphibian survey techniques, and mushroom identification. Field trips during the winter quarter focused on human interactions with forests and included trips to a Weyerhaueser tree farm, a small private tree farm, a sawmill and pulp mill, and an amphibian survey.

During winter quarter, we also completed two multi-week lab exercises which introduced students to techniques for isolating soil fungi and bacteria, and for extracting microarthropods from soil. Students gained experienced using microscopes (dissecting and compound) to observe these organisms and learned basic taxonomic differences between major groups of soil microorganisms.

During winter quarter, students completed a six-credit independent research project that focused on some aspect of forested ecosystems and/or their inhabitants. Each student posed and refined a specific question which they then researched. Each student produced at least two drafts of their research paper which included a minimum of ten peer-reviewed references. Each student also prepared and presented a ten-minute Powerpoint presentation for the entire class.

Students' progress and degree of understanding were assessed in a variety of ways, including their performance on weekly take-home quizzes; work with their peers in small groups; engagement with the material during lectures and workshops; participation in field trips; oral presentations; and writing assignments. Writing assignments included two short papers in Fall quarter; and in Winter, all aspects of their research paper, including an annotated bibliography, outline, an early draft, and the final paper.

Readings in this program included textbooks and primary scientific articles. Texts used were: *An Introduction to Tropical Rainforests,* by Whitmore, *The Diversity of Life.* by Wilson, *The World of Northern Evergreens* by E.C. Pielou, *Principles of Terrestrial Ecosystem Ecology* by Chapin III, Matson, and Mooney, *Isle of Fire: The political ecology of landscape burning in Madagascar* by Kull., *A Field Guide to the Cascades and Olympics* by Whitney, *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska* by Pojar and MacKinnon, and *Cascade-Olympic Natural History* by Raven.