



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
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## Introduction

We live in a world in which humankind's footprint on the environment, and thereby on the diversity of life, is ever increasing in both its degree and spatial scale. It is becoming impossible to talk about humans' relationship with Nature without referring to ecological impacts. And so, understanding ecological science is becoming increasingly foundational to any endeavor to understand the basis of and to solve environmental problems. This seminar was designed to provide such insight to New Haven Public School teachers in order that they may increase their students' awareness and understanding of the role society plays in shaping its surrounding environment. One of the seminar participants stated that he and his students often thought that the "environment" was something that belonged exclusively to the natural surroundings of the urban realm. Through seminar discussions, he and the other participants came to learn that the "environment" is everywhere. It is merely the complexion and the species composition of the environment that changed with setting. This underscored the point that the environment becomes what we humans literally choose to make of it. The crux of good conservation, then, is to make choices that are informed by rigorous scientific insights about the relationship between humans and the diversity of life.

This seminar thus presented founding principles of ecological science as they related to the latest ideas and insights about the conservation of the rich diversity of life biodiversity on earth. It covered topics ranging from fundamental definitions of ecology and evolution, the viability of threatened species, the impacts of global climate change and habitat fragmentation and destruction, to the economics of resource exploitation and the environmental services that biodiversity provides to human health and well-being, and finally modern measures to conserve and protect biodiversity. The under-girding theme of the seminar was the ethical point that humans should recognize that they are part of ecosystems and that they are connected to other species through myriad lines of dependency. Disrupting those lines may jeopardize human existence. So any economic development aimed at improving human health and well-being must be undertaken with careful thought about the environmental impacts that may ensue. The effects of development (such as global climate change arising from greenhouse gas emissions) can manifest themselves over large spatial scales and take decades to play themselves out. Thinking about environmental impacts means thinking about the legacy current society will leave its grandchildren.

The seminar was comprised of teachers working at all levels of public school education. The challenge was to help teachers create units that make environmental issues understandable and relevant to students ranging from first grade to advanced placement high school environmental science. The seminar participants rose to the challenge and developed a rich and creative set of units. The common theme, however, was to develop units in which students would hone their powers of scientific observation, description and communication (both oral and written) and thereby inculcate a comfort with ecological vocabulary and ideas. Ultimately, the

hope is that these units will [re]kindle an abiding, life-long interest in Nature.

Christine Elmore developed her unit around a semi biographical examination of the life and work of the famous primatologist and conservationist Jane Goodall. Her unit will, through the use of video recordings, teach young elementary school children to make behavioral observations of wild chimpanzees using the same techniques used by Dr. Goodall in her pioneering work. The students will learn to record their observations using the journal writing style developed by Dr. Goodall and thereby gain a deep appreciation for the ecology and behavior of chimpanzees. Kristen Borsari embedded ecology into a year-long social studies curriculum that examines the geographical regions of the continental United States. Her unit will encourage young elementary students to compare the species that exist within each geographic region and develop an appreciation of their role in the regional food chains. Her unit will also give students an awareness of the way habitat fragmentation alters a species' livelihood by creating barriers to movement. She will teach students to empathize with non-human species through structured games. Students on a playground will be increasingly prevented from accessing favored apparatus such as swings or slides by erecting barriers that prevent access to that apparatus. Julianne Kaphar's unit aims to teach middle elementary students to control waste and pollution. She will teach students how ecological systems cycle materials such as organic debris and water and how humans can emulate this through waste recycling. Her unit involves demonstration experiments on the water cycle. She will also build composters (miniature landfills) and conduct experiments that teach students the fate of organic debris (kitchen scraps) vs. inorganic debris (bottles and cans) after they have been disposed. The aim is to get students to think more deliberately about the kind of waste they produce and its fate whenever they buy different goods. Pedro Mendia-Landa is a passionate gardener and will use urban gardening as metaphor to teach young elementary students the seasonal cycles of life of both plants and animals. He will also create experimental butterfly gardens in which he will alter the diversity of plant species. He will then relate this to the diversity of butterfly species that visit the different garden types.

Anthony Pellegrino primarily teaches history to high school students, in particular the saga of colonial expansion of the European west. His unit will compare Native American and European use of land and natural resources. The unit will explore how religious, ethical and moral differences between societies led to particular patterns of land alteration and abundance of natural resources. The unit will teach students how peoples' beliefs and attitudes create the sometimes irreversible legacies of exploitation and land alteration that modern society 10 generations since that era is now forced to deal with. Continuing on this theme, Matthew Cacopardo's unit explores how decades of industrial pollution in the Quinnipiac River and the New Haven harbor can alter patterns of diversity in bottom-dwelling marine creatures including mussels and oysters. His unit will teach students how to undertake quantitative, systematic chemical analysis of water quality along a gradient of pollution levels and relate those measures of water quality to quantitative measures of the diversity of sea life along the gradient. Abie Benítez's unit aims to teach students that urban ecosystems are rich in diversity of plant and animal life. Through comparisons of New Haven residential and commercial neighborhoods she will explore how the degree and nature of urban development influences the kinds of species that reside in those areas. Students will develop facility with natural history through species identification and descriptions of species' forms, habits and habitats. Tim Coleman, who teaches an AP environmental science class, will teach students basic principles of plant and animal taxonomy and apply those skills to species identification within the urban New Haven setting. Students will also learn the major structures of plants and animals and understand their life cycles. Through comparisons of those structures, students will begin to appreciate how body form contributes toward defining the diversity of life. Finally students will learn to associate different plant and animal species through detailed field observations in order to appreciate the lines of dependency among species in urban food chains. Steve Broker, who also teaches AP environmental science, focuses his unit on understanding patterns of vertebrate diversity within Connecticut.

He aims to teach students the meaning and value of biodiversity through field examinations of vertebrate species within different habitats in Connecticut. Students will also learn how environmental factors such as resource availability and predation (or lack thereof) influences the dynamics and abundance of species. Through systematic examinations, students will also learn how environmental factors such as climate and habitat determine the extent and nature of biodiversity on local, regional, national, and global scales. Finally, his unit will explore how humans can have profound impacts on biodiversity through habitat degradation and destruction, introduction of exotic, invasive species and global warming.

Collectively, the units provide as rich an array of ideas and teaching methodology as the diversity of life they will explore. Moreover, all the units reveal that one may teach important scientific principles in ways that are meaningful and relevant to the day-to-day lives of the students. These units thus represent a fresh new way of introducing the principles and relevance of science to all levels of education.

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