

Water: Environmental Science

Water — its location, condition, and use — is a critical environmental issue. Central to all ecosystems, water is essential to life as we know it. It shapes our planet on every level, from the chemical properties of the H₂O molecule to the central role of water in global climate. This course will focus on why water is such a critical resource, the impact of human consumption on aquatic and terrestrial ecosystems, and the social, economic, and environmental implications of water management.

Along with a solid grasp of these water-related issues, students should come away grounded in the science that underlies all environmental studies. They will be able to: 1) understand the interrelationships between living things and the ecosystems they inhabit; 2) analyze environmental problems caused by changing natural conditions and by human activity; and 3) evaluate ways to resolve and/or prevent these problems.

Key Science Concepts

- **Water circulates through Earth systems** via underground aquifers; estuaries and bays; rivers and streams; lakes, ponds and reservoirs; wetlands; ocean and coastal shorelines; and the atmosphere.
- **A fragile and complex network of living things** depends upon a very limited supply of freshwater. Growing human populations and demands on this resource are creating a host of **social, economic, environmental and political challenges** on scales that range from local to global.
- Historically, humans have coped with **local scarcity** by drawing upon water resources, including non-renewable groundwater, by building dams, digging wells, and otherwise diverting surface water. When natural flows are altered, humans and other species that depend on the natural system suffer.
- **Rivers, lakes, and wetlands** provide essential and typically irreplaceable **ecosystem services**. These include water purification, habitat support, hydropower, transportation and recreation. A critical link between land and water, wetlands play a key role in filtering pollutants, protecting drinking water and supporting rich biodiversity.
- **Water pollution** from human settlement, industry and agriculture — including the nutrient pollution of **eutrophication** — threatens the health of humans, other living creatures, and the ecosystems themselves.
- **Water allocation** rather than absolute scarcity lies at the heart of many water problems. Responsible water stewardship, especially across international borders, poses an array of social, environmental, economic and political challenges. **Technologies** such as desalination, drip irrigation, and water reuse hold promise.
- Scientists are encouraging **water management plans** that replace a sector-by-sector approach with an **integrated approach** that emphasizes **conservation and reuse**, and which balances the need for development against the vital importance of clean water and healthy ecosystems.

Authoring Scientists:

As Director of the Museum's Center for Biodiversity and Conservation (CBC), **Dr. Eleanor Sterling** oversees strategic planning and project development, leads fundraising efforts, and manages a multidisciplinary staff of over 25. She is also the chair of the Palmyra Atoll Research Consortium and is working to document biodiversity on this remote atoll in the Pacific Ocean. She is especially interested in determining population densities and habitat use by sea turtles on the atoll to better plan for the conservation of turtle habitats and the overall management of the atoll. Eleanor has more than 20 years of field research experience in Africa, Asia, and Latin America, where she conducted surveys and censuses, as well as behavioral, ecological, and genetic studies of primates, whales, and other mammals. She is considered a world authority on the aye-aye, a nocturnal lemur found in Madagascar. Since 1997, Eleanor has been an adjunct professor at Columbia University, where she now serves as the Director of Graduate Studies for the Department of Ecology, Evolution, and Environmental Biology.

Dr. Nora Bynum is Project Director of the Network of Conservation Educators and Practitioners (NCEP) and Associate Director for Capacity Development for the CBC. For the past 15 years, Nora has worked on international capacity building and training in biodiversity conservation and ecology and environmental studies in the Americas, Asia, and Africa. She has conducted fieldwork in tropical forests in Indonesia, Peru, Costa Rica, and Mexico. Her current research interests are in seasonality and phenology of tropical canopy trees, particularly as it relates to global change, and the scholarship of teaching and learning, particularly in undergraduate and experiential contexts. Nora is an Adjunct Professor at Columbia University and at Duke University, where she has taught for the last several years.