Atmospheric and Meteorological Monitoring

Background

The Long-Term Coastal Ecosystem Monitoring Program at Cape Cod National Seashore (CACO) is composed of numerous protocols that are relevant to the major ecosystem types (Estuaries and Salt Marshes, Barrier Islands/Spits/Dunes, Ponds and Freshwater Wetlands, Coastal Uplands). Long-term monitoring of meteorological and atmospheric variables (e.g., precipitation, deposition, wind speed and direction) is fundamental to CACO's monitoring program because the atmosphere drives the water cycle, affects the cycling of elements through all of CACO's ecosystems, and modulates the seasonal and annual cycles of plants and animals. For example, information obtained from meteorological monitoring may be relevant to interpreting both short- and long-term trends in water levels and water chemistry of ponds and freshwater wetlands, or in amphibian productivity.

Long-Term Monitoring

CACO is the recipient of a "pool" of pollutants that form over the industrialized Midwest and heavily populated Northeast corridor. In the late 1990s, CACO ranked 7th of all national parks in daily maximum ozone concentration and the entire Cape is presently classified as a "non-attainment area" of the Environmental Protection Agency's National Ambient Air Quality Standards (NAAQS) for ground-level ozone. A major contributor to acidic deposition in the eastern United States, sulfur dioxide is also a concern at CACO. Although dramatic decreases have been documented by the National Atmospheric Deposition Program in sulfate deposition over the last decade, surface water acidification remains a concern. Another concern for CACO's water resources is the anthropogenic input of nutrients, especially nitrogen. Atmospheric inputs of nitrogen may exceed 65% of the total nitrogen input to Cape Cod water resources, and thereby contribute im-

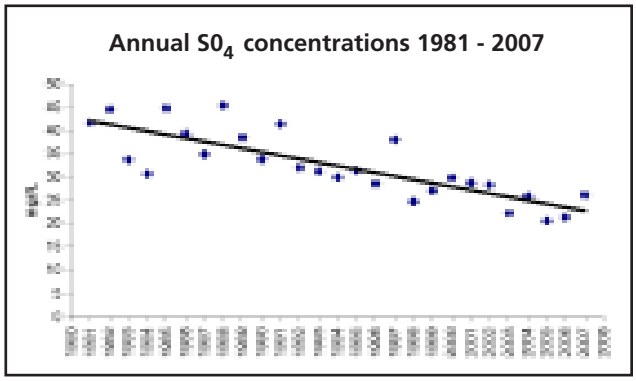

Figure 1: Trend in sulfate (SO_4) from the Cape Cod National Seashore atmospheric deposition monitoring station. Note - figure is for general informational purposes only, not all data points meet quality control criteria established by the National Atmospheric Deposition Program. For more information visit: http://nadp.sws.uiuc.edu/

Additionally, the ability to understand the toxicity, bioaccumulation, chemistry and transport of such ubiquitous contaminants as mercury is necessary. Recent analyses conducted by the Massachusetts Department of Environmental Protection (DEP) in conjunction with ongoing research by USGS and NPS scientists have found mercury levels in fish tissue above the FDA action limit of 1.0mg/kg in at least five of CACO's kettle

Management Applications

Knowledge of trends in precipitation, storm frequency and intensity, deposition chemistry, and atmospheric ozone levels are essential to understanding and interpreting changes in species composition, community structure, water and soil chemistry, or dynamic coastal geologic processes.

Contact

Krista Lee
Physical Scientist
Cape Cod National Seashore
99 Marconi Site Rd
Wellfleet MA 02667

ph: (508) 487-3262
email: Krista_Lee@nps.gov