



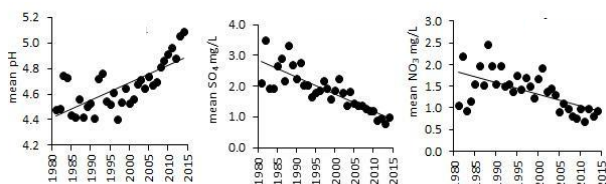
Changes in Air Temperature and Precipitation Chemistry Drive Water Temperature and Acidity Trends in CACO Kettle Ponds

Background

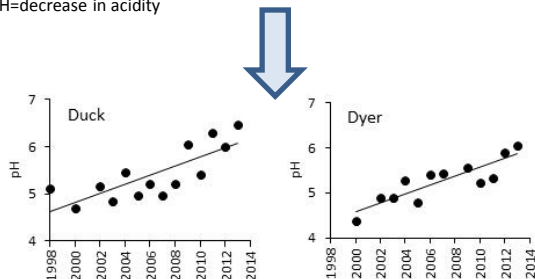
The **Inventory & Monitoring Program** at Cape Cod National Seashore (CACO) is comprised of numerous protocols designed to evaluate the status and trends of the major ecosystem types within the park. Freshwater kettle ponds are one of CACO's important natural resources. The water quality of these ponds, along with local precipitation chemistry has been measured since the 1980s. These datasets, along with air temperature obtained from a local weather station, were analyzed to assess how atmospheric and pond water quality conditions have changed over the last several decades.



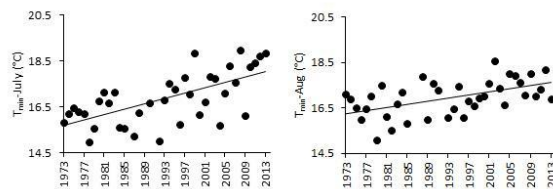
Wellfleet kettle ponds



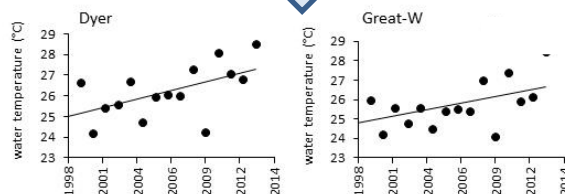
Trends in rainwater acidity (pH) and sulfate (SO_4) + nitrate (NO_3). SO_4 and NO_3 are pollutants from fossil fuel burning that contribute to acid rain. Increase in pH = decrease in acidity



Acidity (pH) of surface waters in Duck and Dyer Ponds (Wellfleet). Increasing pH indicates a ~15-fold lowering of acidity (higher pH = lower acidity)



Minimum daily air temperature trends (Chatham, MA) in July and August since 1973.



Summer water temperature (0.5 m depth) trends in Dyer and Great Ponds (Wellfleet) since 1998.

Conclusions

The information generated by these long-term monitoring programs at CCNS demonstrate how climate change has altered the thermal properties of ponds, while air quality improvements are allowing the ponds to recover from previous acid rain impacts. These changing conditions are likely to alter various chemical and biological processes in the ponds, which will be the subject of future studies at CCNS.



Great Pond (Truro)

Status and trends

Pond surface water temperatures have warmed by an average of 2°C and their acidity has decreased tenfold. These changes are linked to increasing air temperatures and reductions in rainfall acidity due to Clean Air Act of 1970 and its subsequent amendments.

More information

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