

A photograph of a soil profile. A red and white measuring rod is placed vertically in the soil. At the top of the rod is a white sign with the number '507' written on it. The soil is dark brown and appears to be a loam or silt loam. There are some green plants and roots visible in the soil. The background is a mix of brown soil and green vegetation.

507

**Assessment of repeated soil sampling as a monitoring tool for investigating the effects of changes in soil chemistry**

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Soil profile at an ARNEWS site

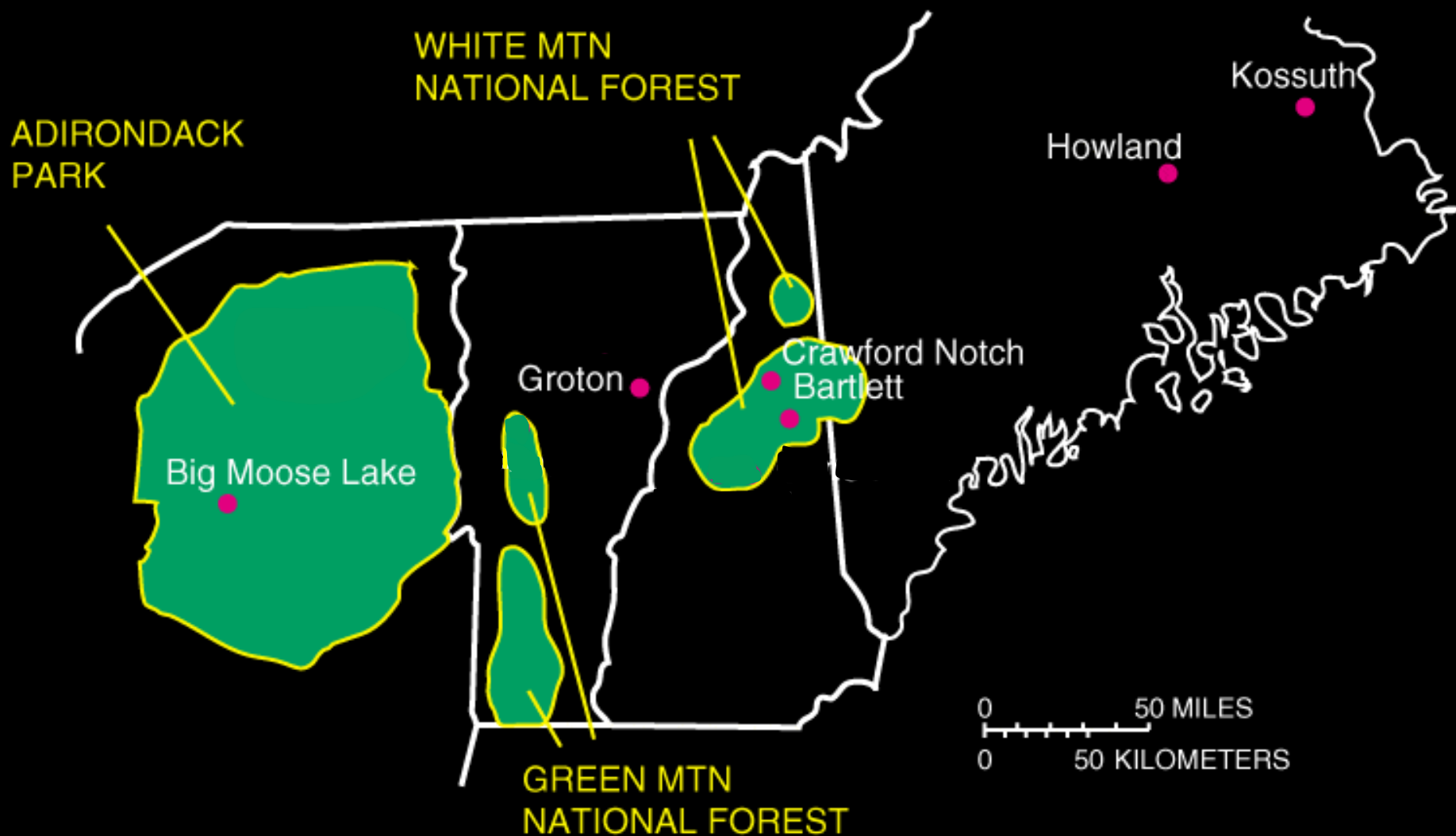
# Background

- Acidic deposition has been linked to depletion of calcium and other effects on soils.
- A handful of studies have shown direct evidence of lowered calcium availability in soils, but there is insufficient data to assess soil recovery.
- Opportunities for soil resampling to measure changes have resulted from numerous soil studies conducted in the 1980s and 1990s to relate soil conditions to surface waters and forests.
- Interest in soil resampling has grown, but questions remain regarding the length of time required to detect changes, and the most effective methods for collection and analysis of soil in resampling studies.

# Soil Resampling Sites



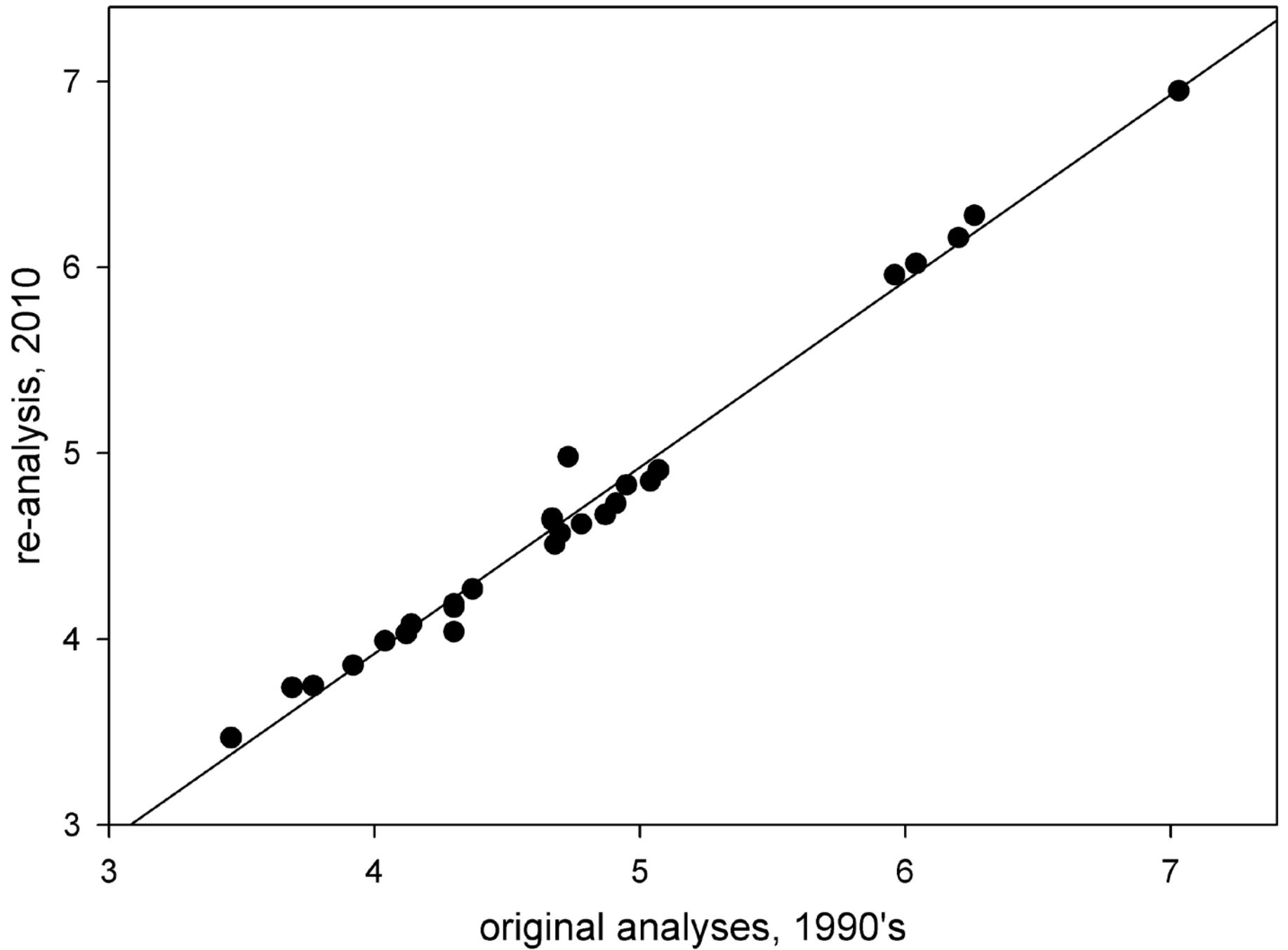
# Spruce Stands Sampled in 1992-93 and 2002-03



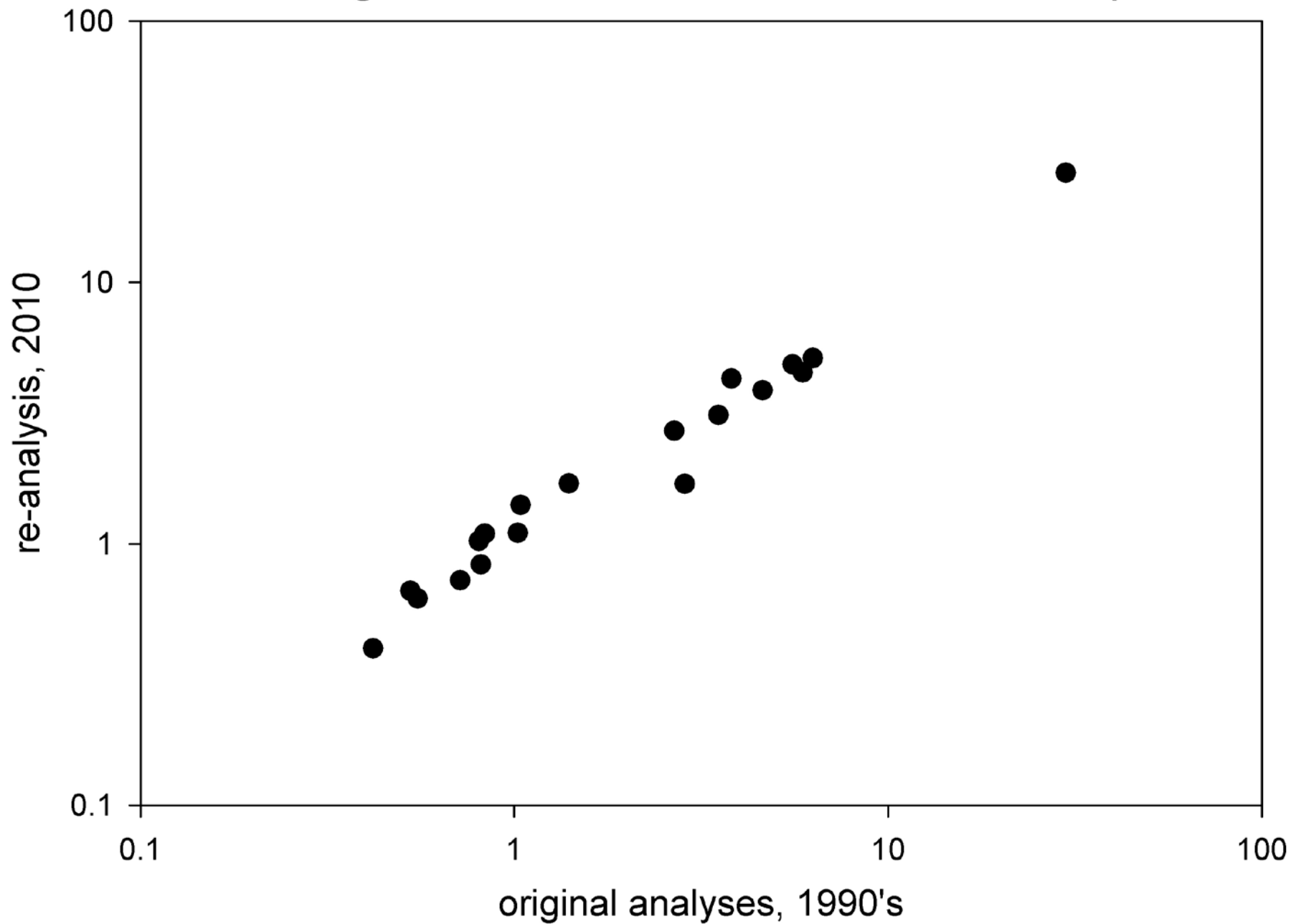
# Methods

- Resampling at 16 sites in Ontario, Quebec, NY, VT, NH.
- Locations of original sampling were identified by field markers, GPS and detailed field notes.
- All resampling overseen by original investigators.
- Resampling was replicated by 2 to 5 pits per plot except at Buck Creek, where sampling was repeated at 27 locations within a single 27-ha watershed.
- Samples collected and archived in the original sampling were available for all sites.
- Data obtained in the original analysis were compared to data obtained in reanalysis of archived samples to evaluate possible storage effects and analytical bias.

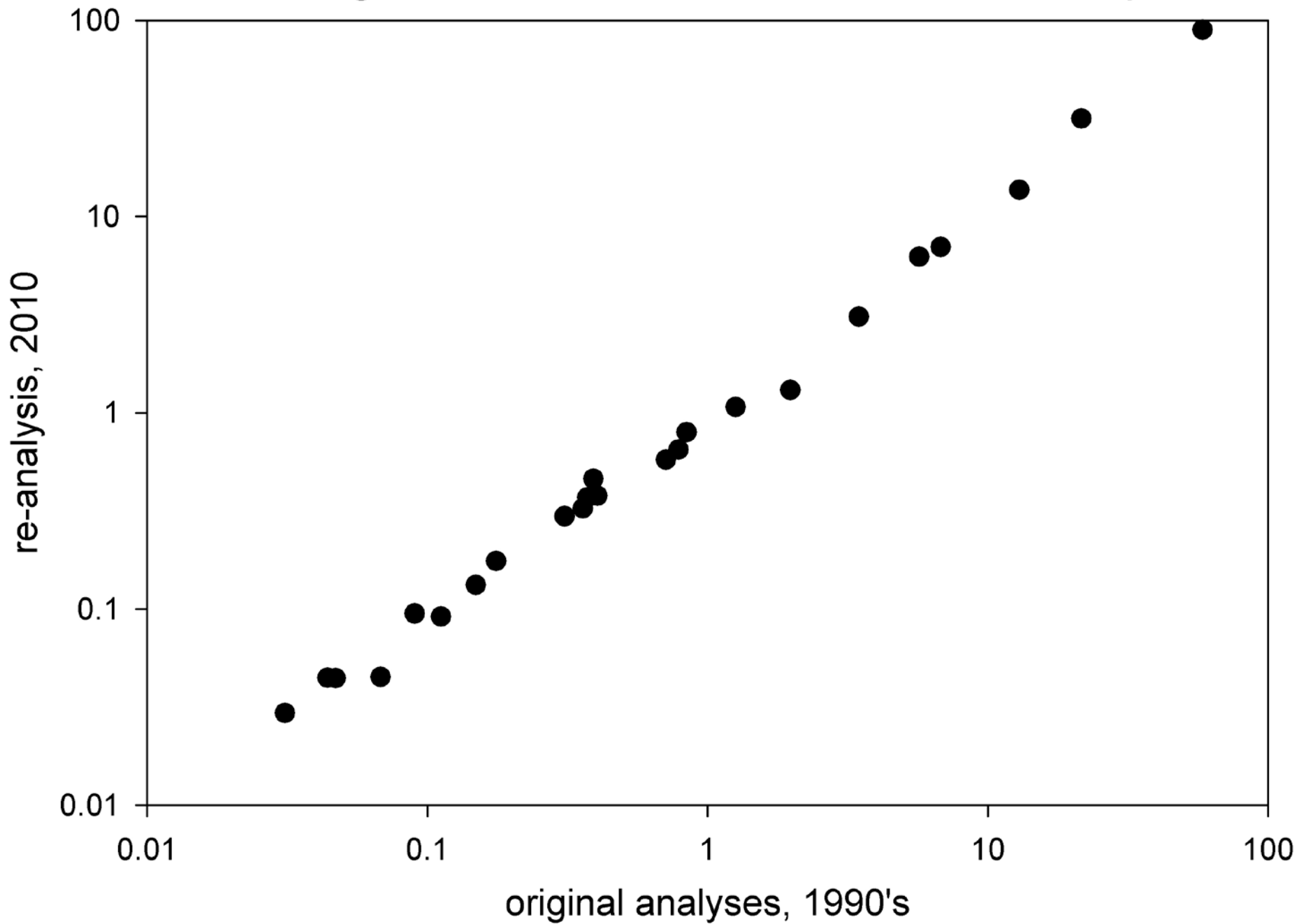
# pH in fresh versus archived samples



# Exchangeable Al in fresh versus archived samples

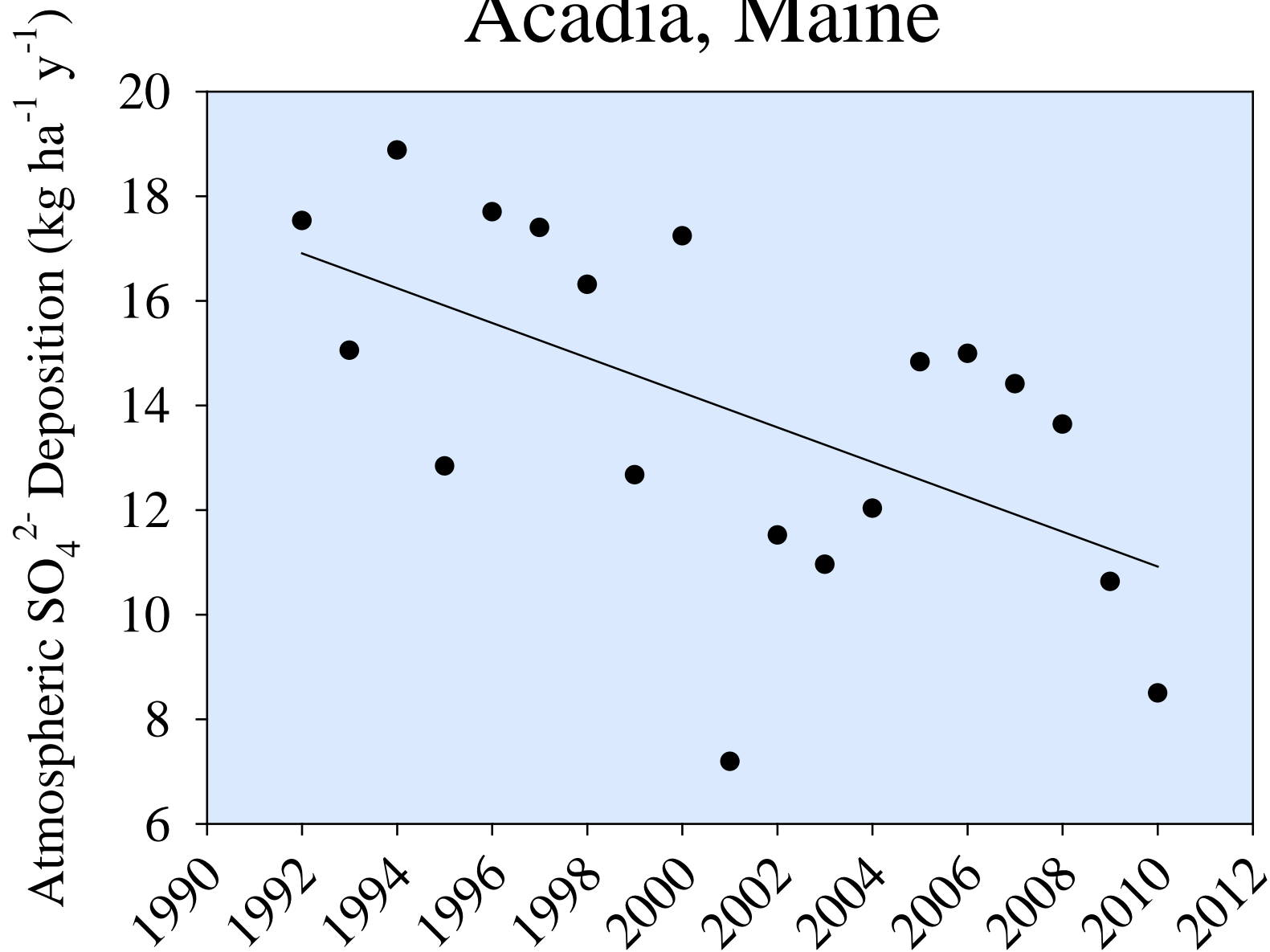


# Exchangeable Ca in fresh versus archived samples

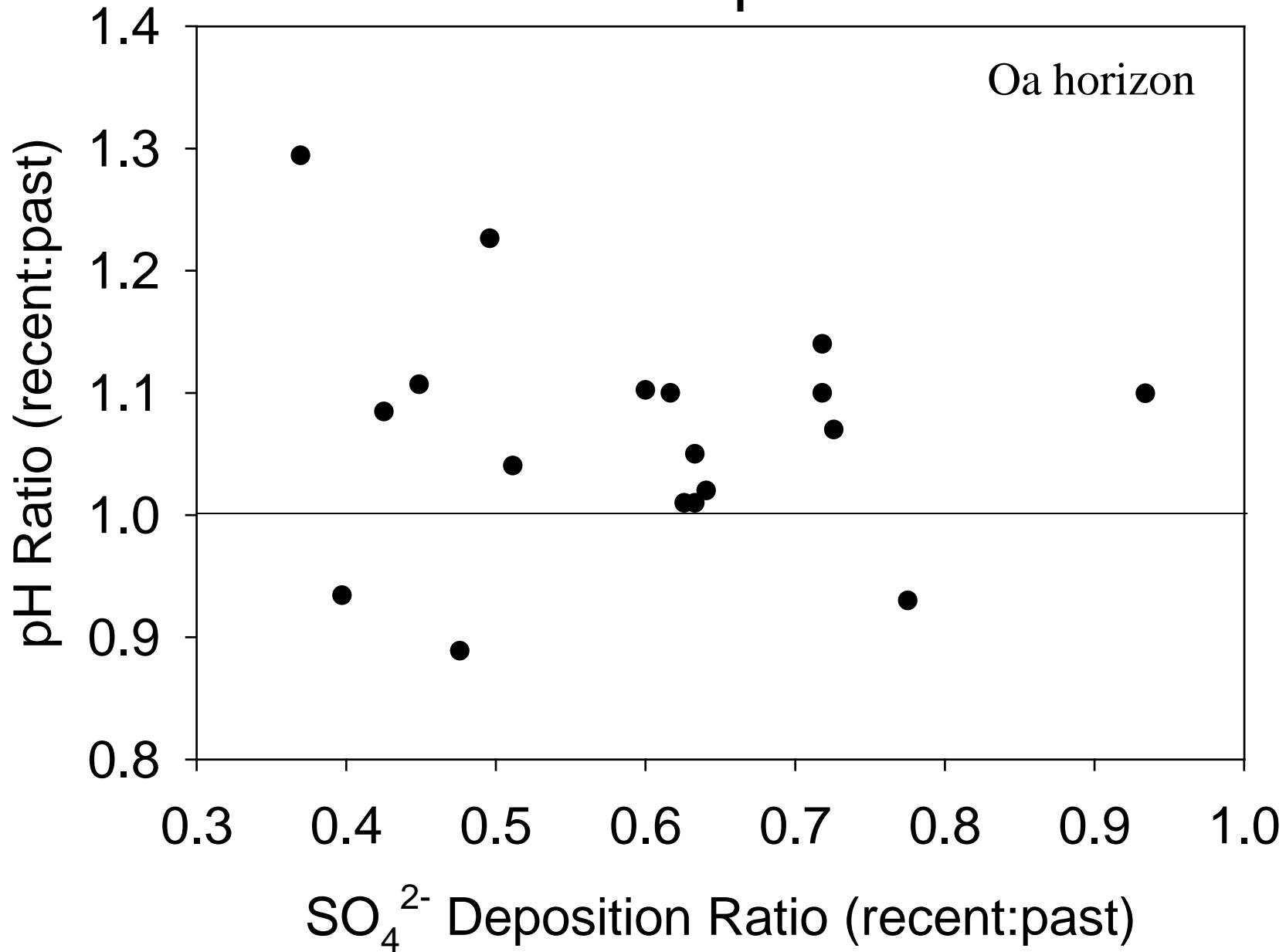




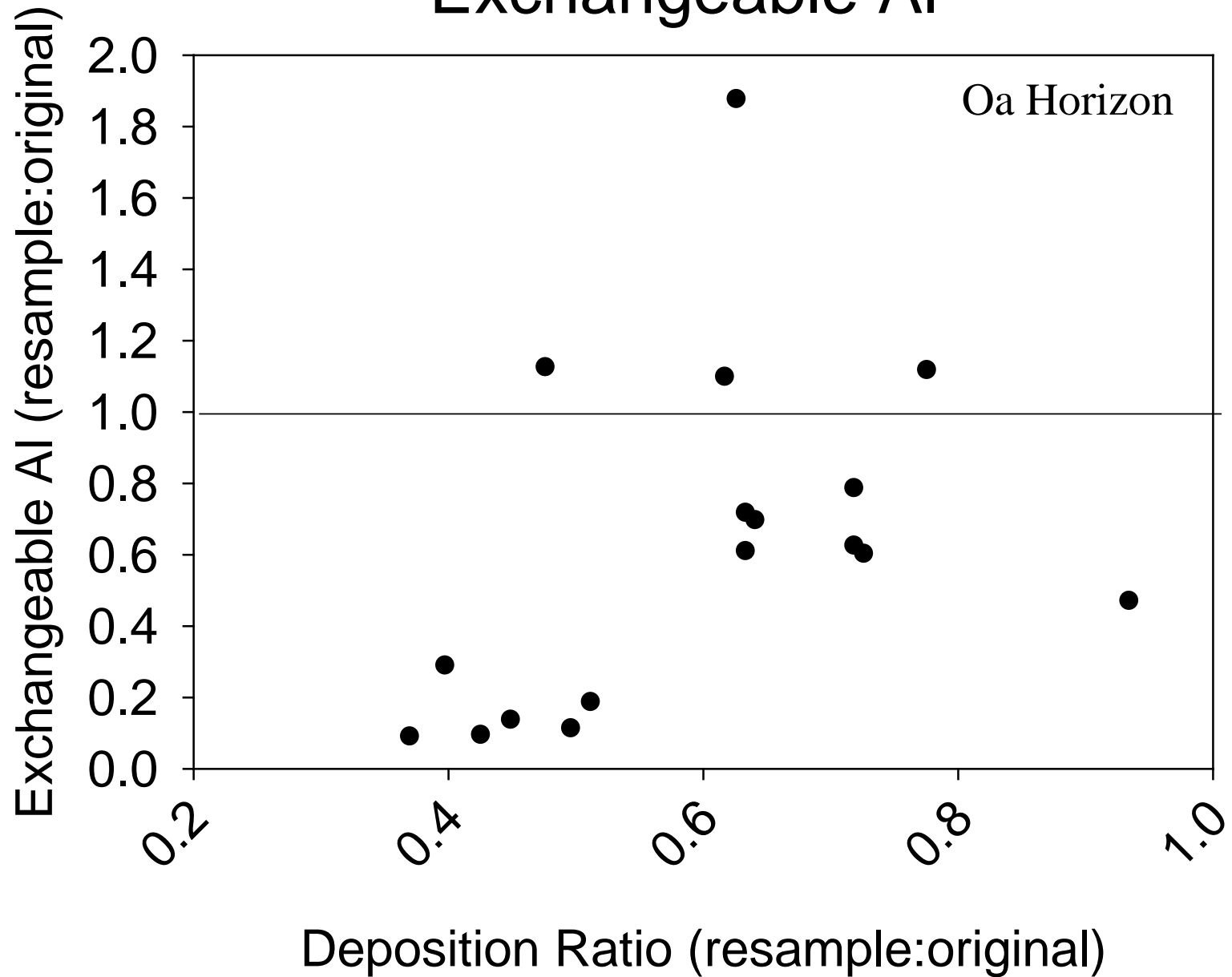
# Acadia, Maine



# Soil pH

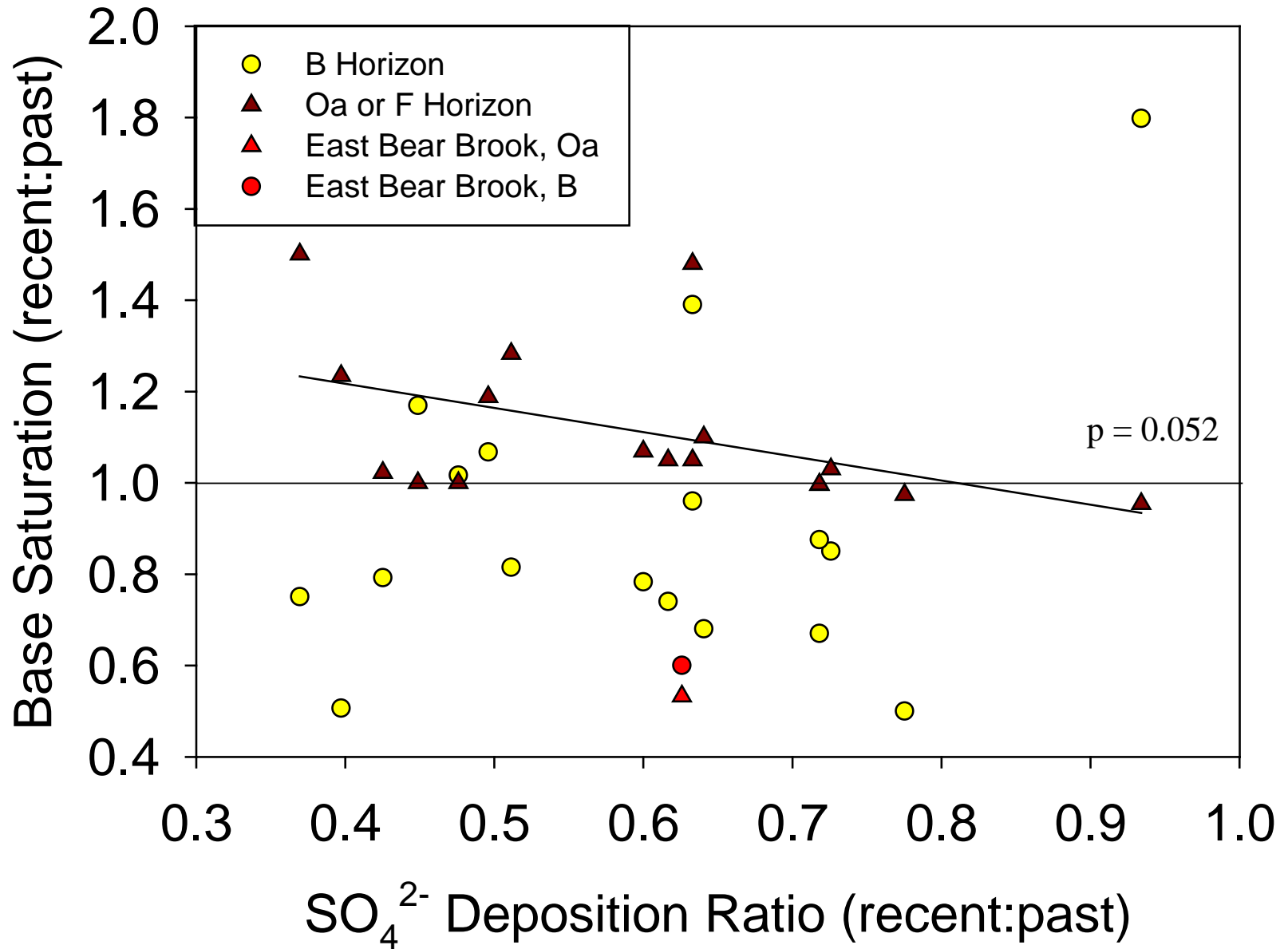


# Exchangeable Al





# Base Saturation



# Implications and Future Directions

- Forests with low-calcium soils are common throughout the NERC region.
- The importance of the forest floor in providing nutrient base cations has grown in these soils, making nutrient cycling more dependent on organic carbon dynamics.
- The effects of substantial decreases in acidic deposition on forest floor carbon is not well understood, and effects of climate change even less so.
- Further research is also needed to determine the capacity of the mineral soil and deeper substrates to supply nutrient base cations to the rooting zone.

# Implications and applications in the Northern Forest region



- Decreasing trends of acidic deposition were generally related to decreased acidity in organic soil horizons across the region.
- However, general increases in acidity not related to acidic deposition trends were found in the B horizon of most sites.
- Decreased acidity in organic horizons was likely tied to more effective uptake and recycling of nutrient base cations by vegetation under lowered deposition levels.
- Decreased base saturation of the B horizon suggests that base cation leaching rates continued to exceed inputs from weathering under the deposition rates that occurred between samplings.