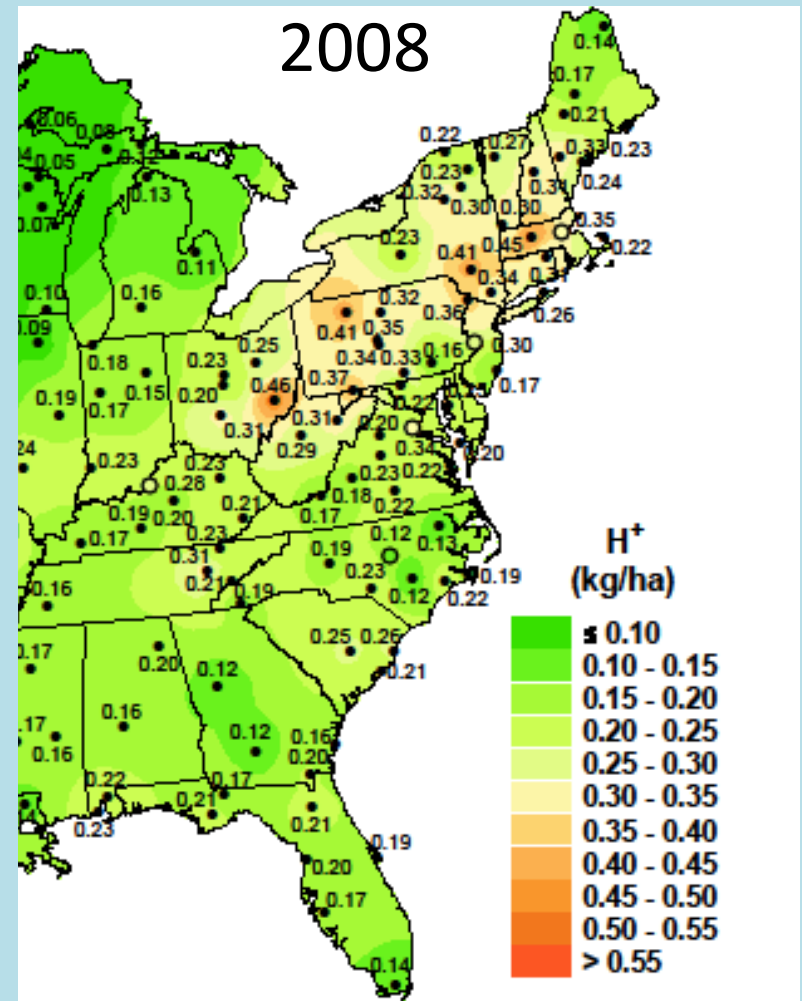
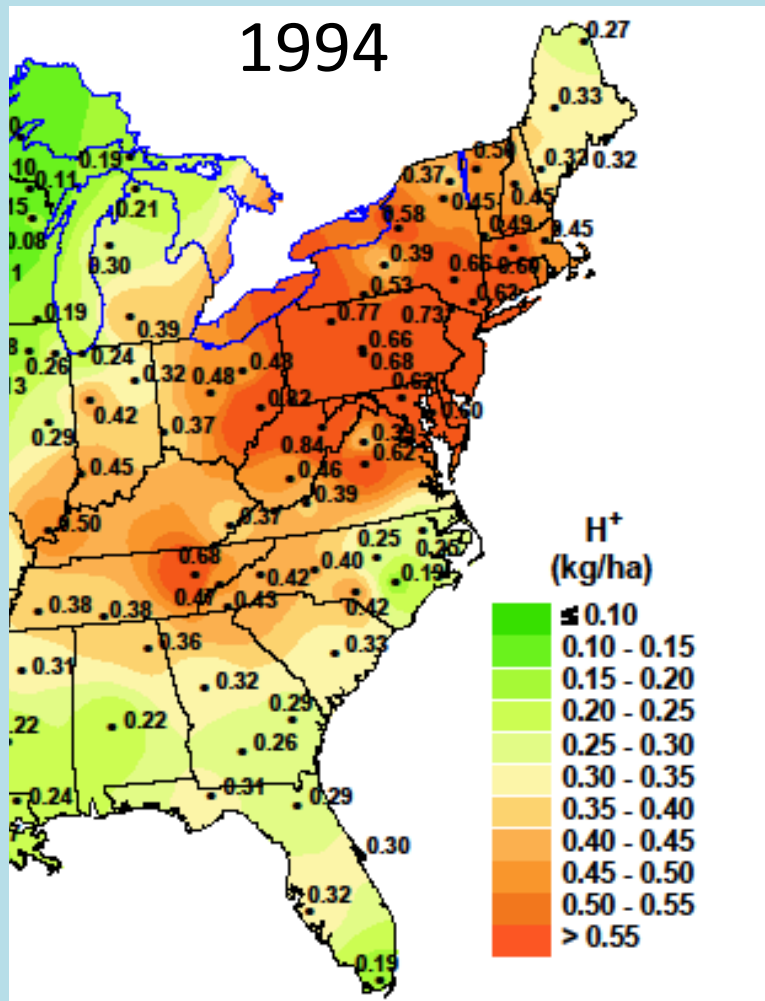


# Monitoring and Modeling the Acidification and Recovery of Catskills Waters and Soils

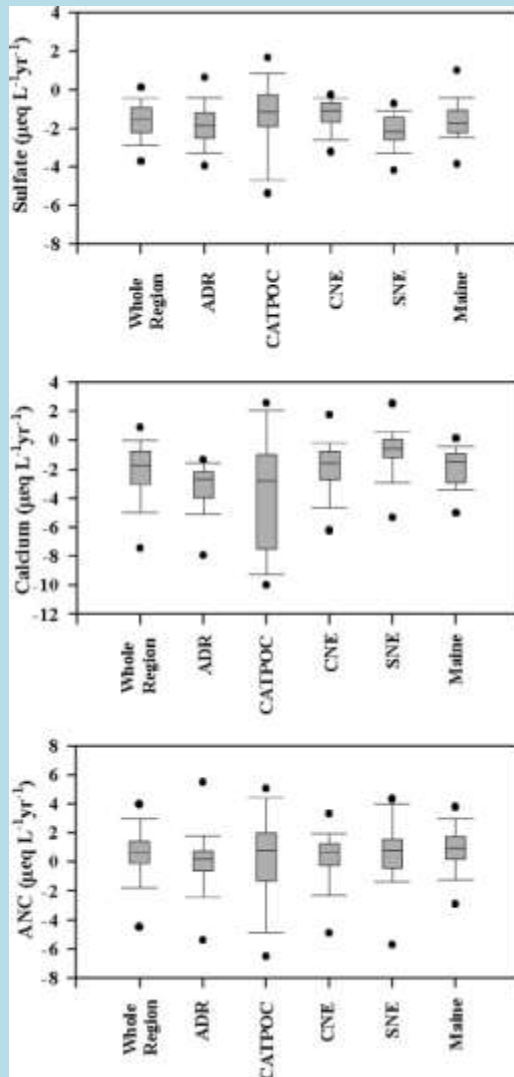
Chris E. Johnson & Charles T. Driscoll  
Dept. of Civil & Environmental Engineering  
Syracuse University

# Acid Deposition: 1994-2008

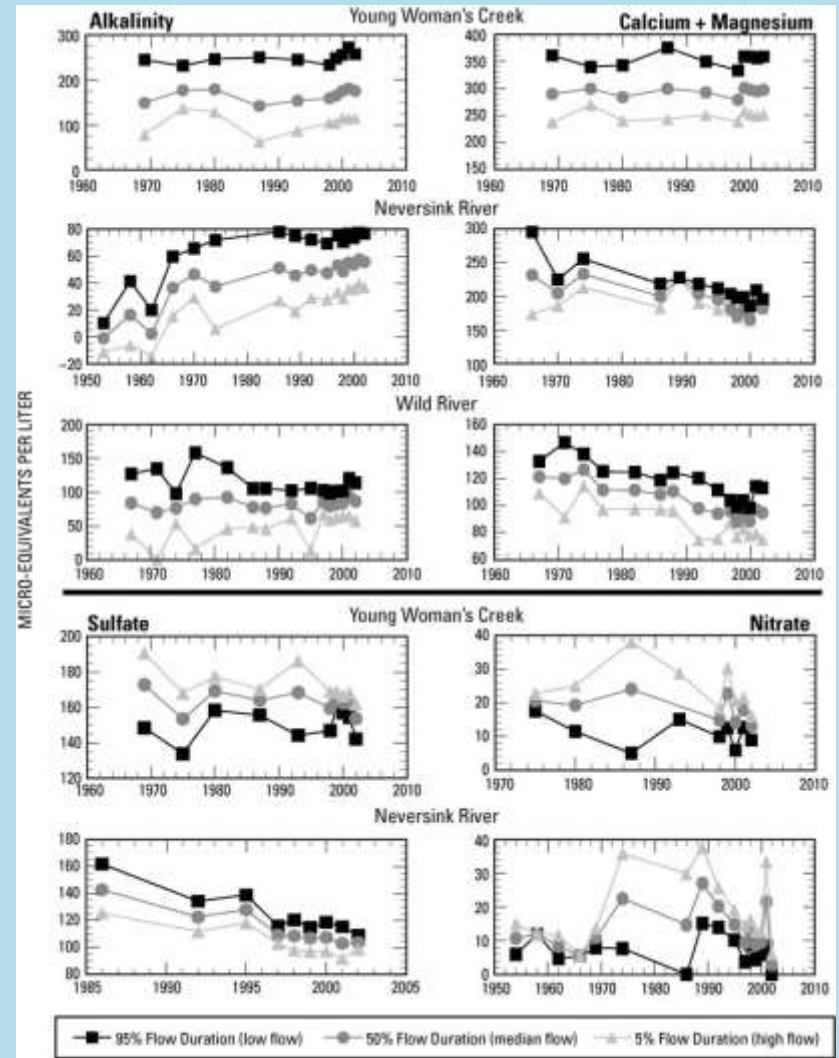


# Long-Term Changes in Surface-Water Chemistry

Annual Rate of Change, 1984-2001



Source: Warby et al., 2005, *Env. Science & Technology*



Source: Murdoch and Shanley, 2006, *Env. Monitoring & Assessment*

# Response of Acidified Soils and Associated Surface Waters to Reduced Atmospheric Acid Inputs and Calcium Mitigation Strategies

- New Project – April 2010
  - How is soil chemical change linked to stream and lake responses to acidic deposition?
  - Are existing soil chemical data sufficient to adequately track future soil change?
  - Have applications of Ca to soils been effective in increasing the long-term base status of forest soils and drainage waters?
  - Which Ca mitigation strategies hold the most promise for accelerating the chemical recovery of soils and surface waters in the Adirondacks?





**Climatic data**

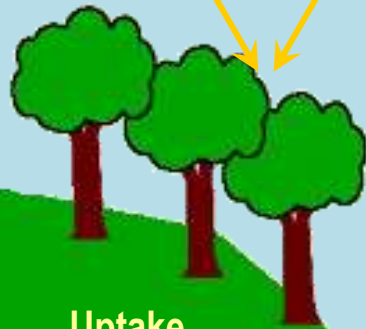
- Solar radiation
- Precipitation
- Temperature

Wet  
Deposition

Dry  
Deposition

# PnET

Water balance  
Photosynthesis  
Living biomass  
Litterfall



Net Mineralization

Uptake

Shallow water flow

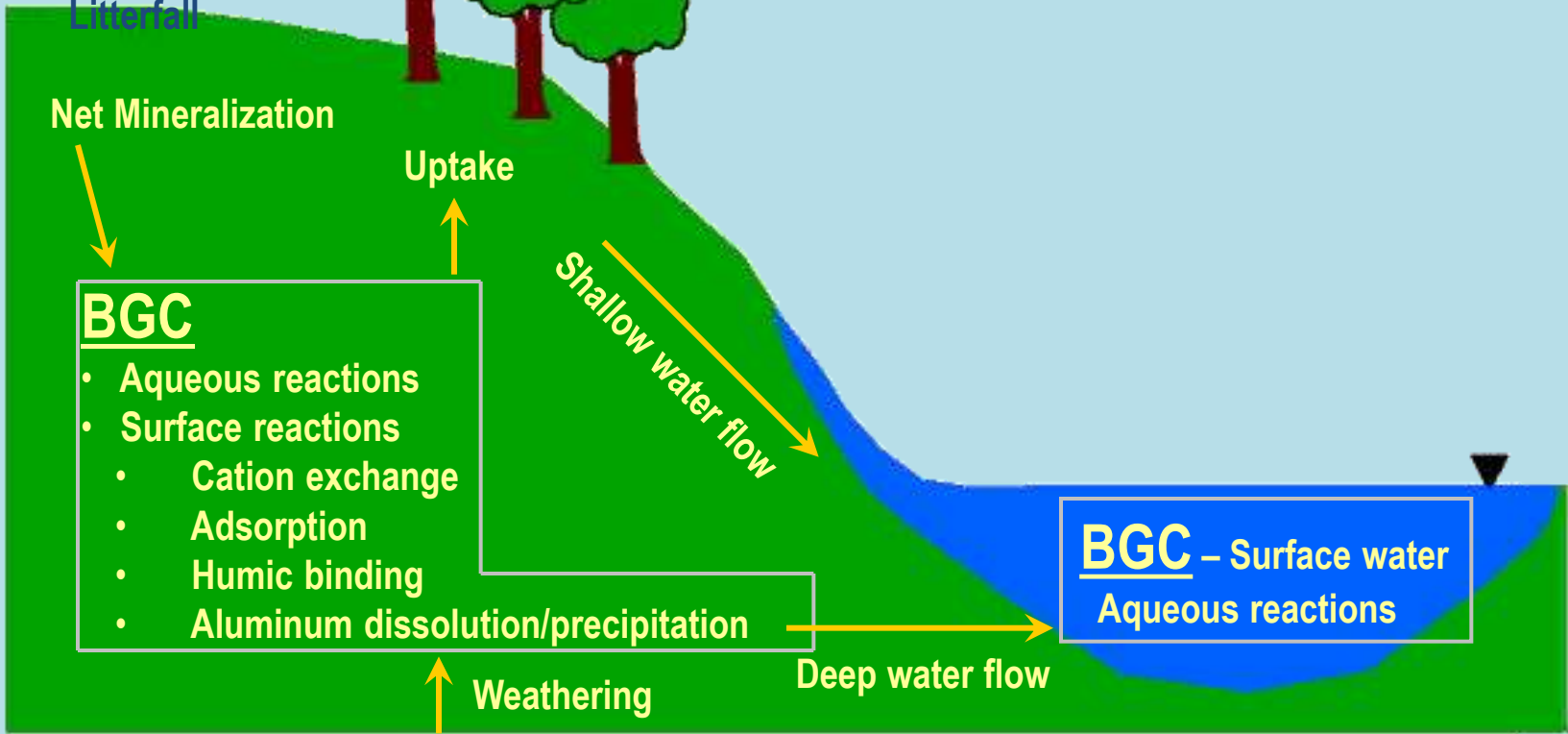
**BGC**

- Aqueous reactions
- Surface reactions
  - Cation exchange
  - Adsorption
  - Humic binding
  - Aluminum dissolution/precipitation

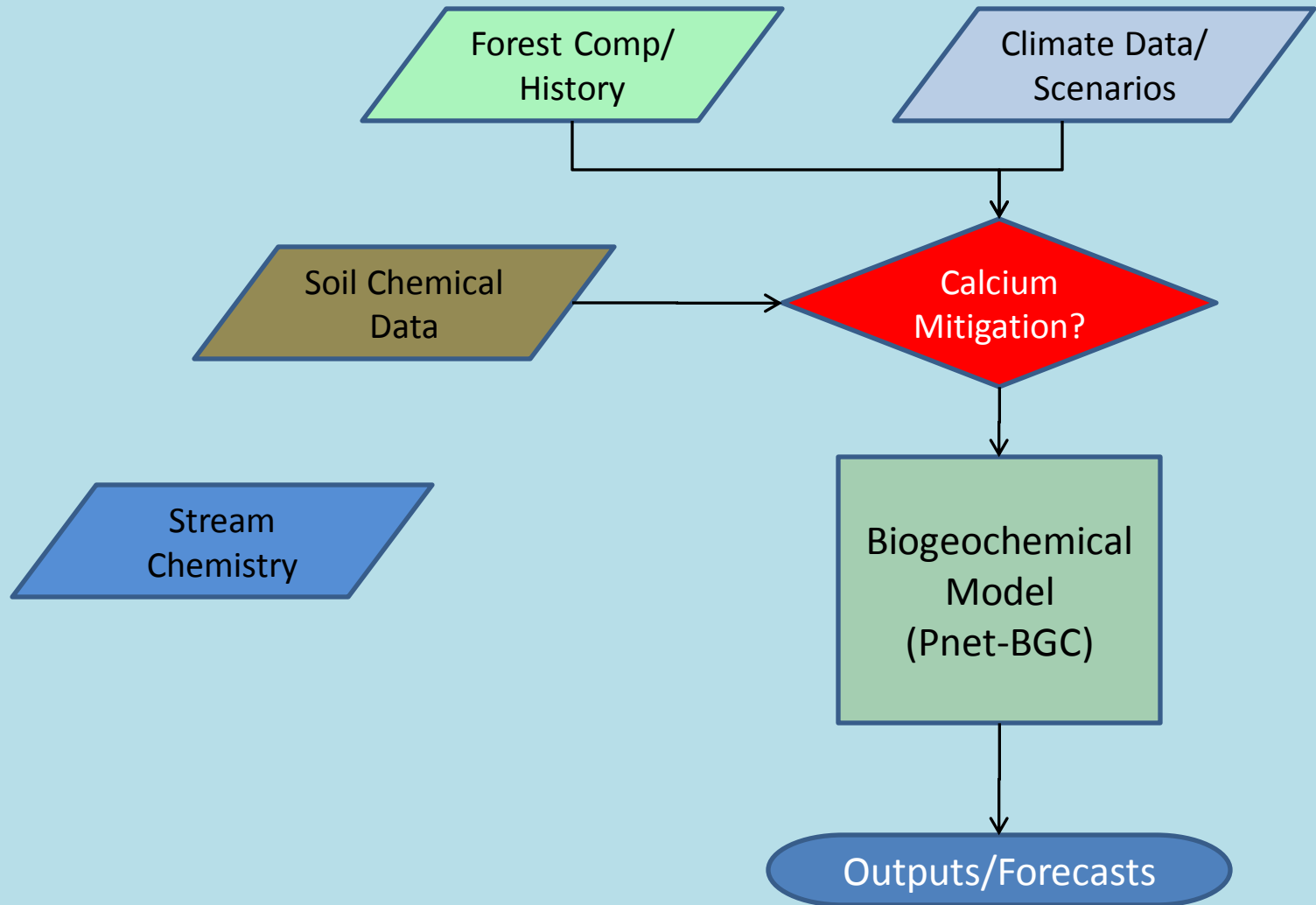
**BGC** – Surface water  
Aqueous reactions

Weathering

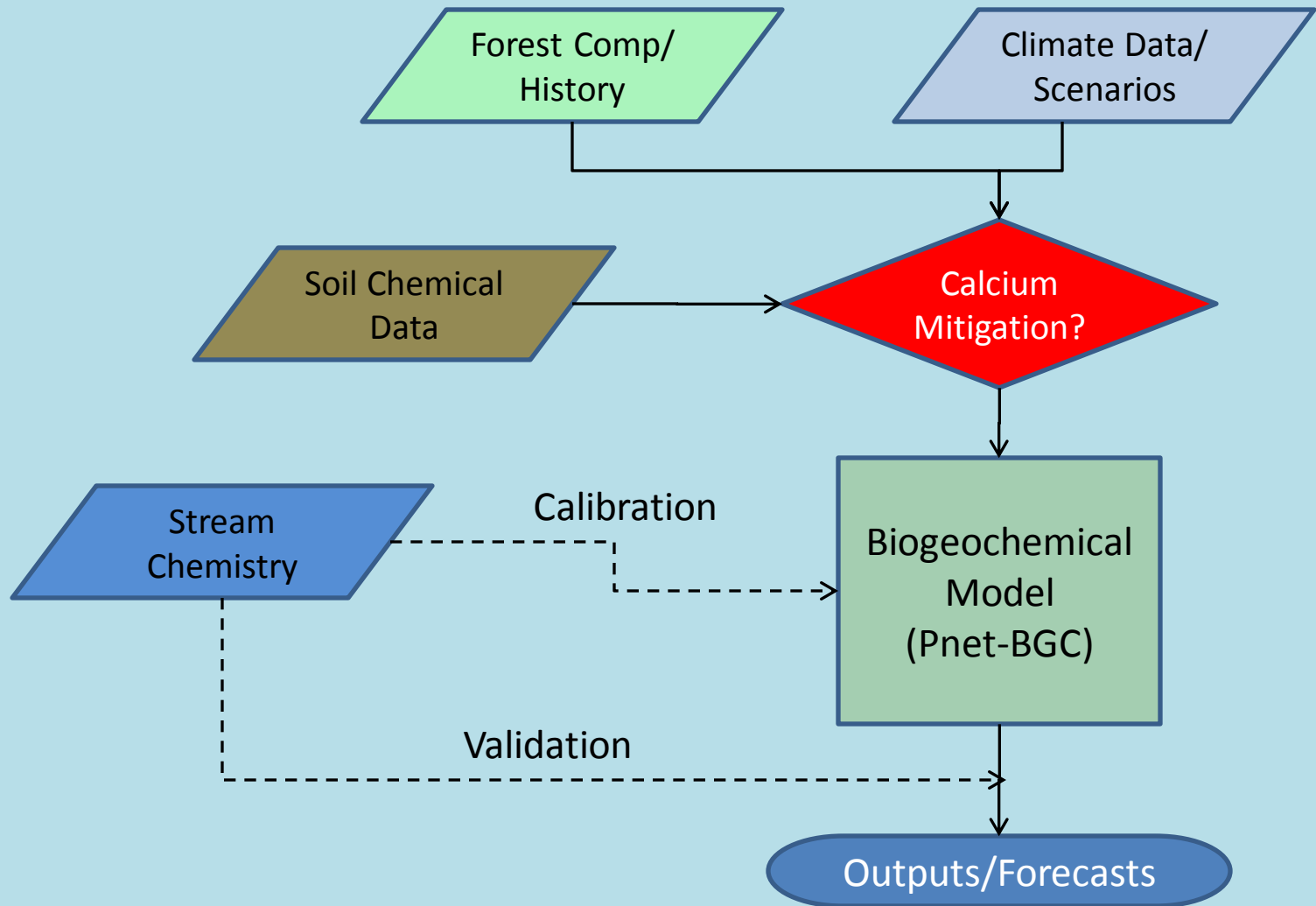
Deep water flow



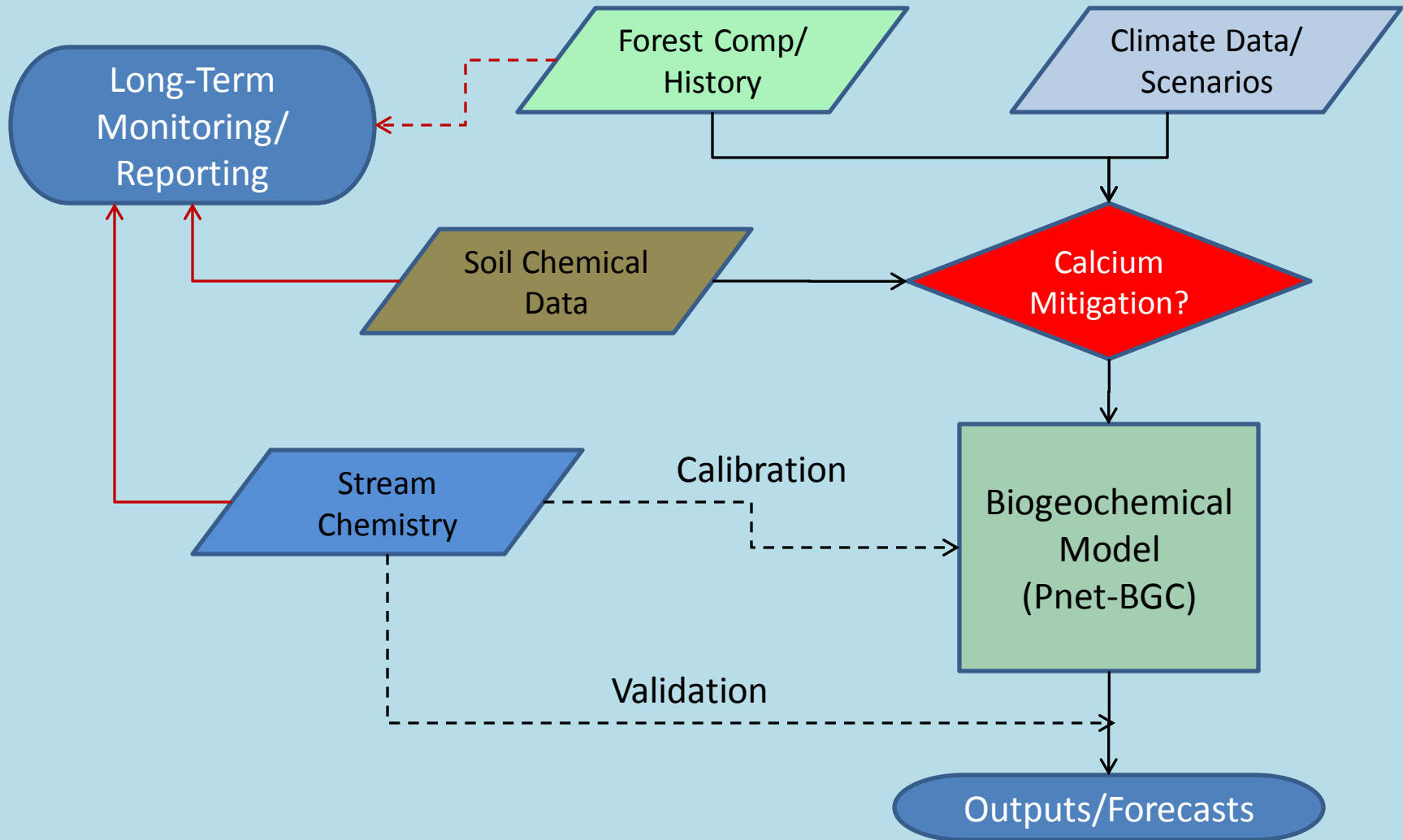
# Response of Acidified Soils and Associated Surface Waters to Reduced Atmospheric Acid Inputs and Calcium Mitigation Strategies



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- Proposed Field and Laboratory Work

- Chemical analysis of mineral soil samples collected at 130 sites in NE USA in 2001-02, comparison with 1984 data.
- Monthly sampling and analysis of 12 (or more) Catskills stream sites selected from sites in Lovett et al. (2000) study.
- Bi-monthly sampling and analysis of inlet streams to five Adirondack lakes.
- Soil sampling and analysis from experimentally manipulated sites in the Adirondacks.
- Soil sampling and analysis from 25 Catskills watersheds to establish a soil monitoring baseline for future studies

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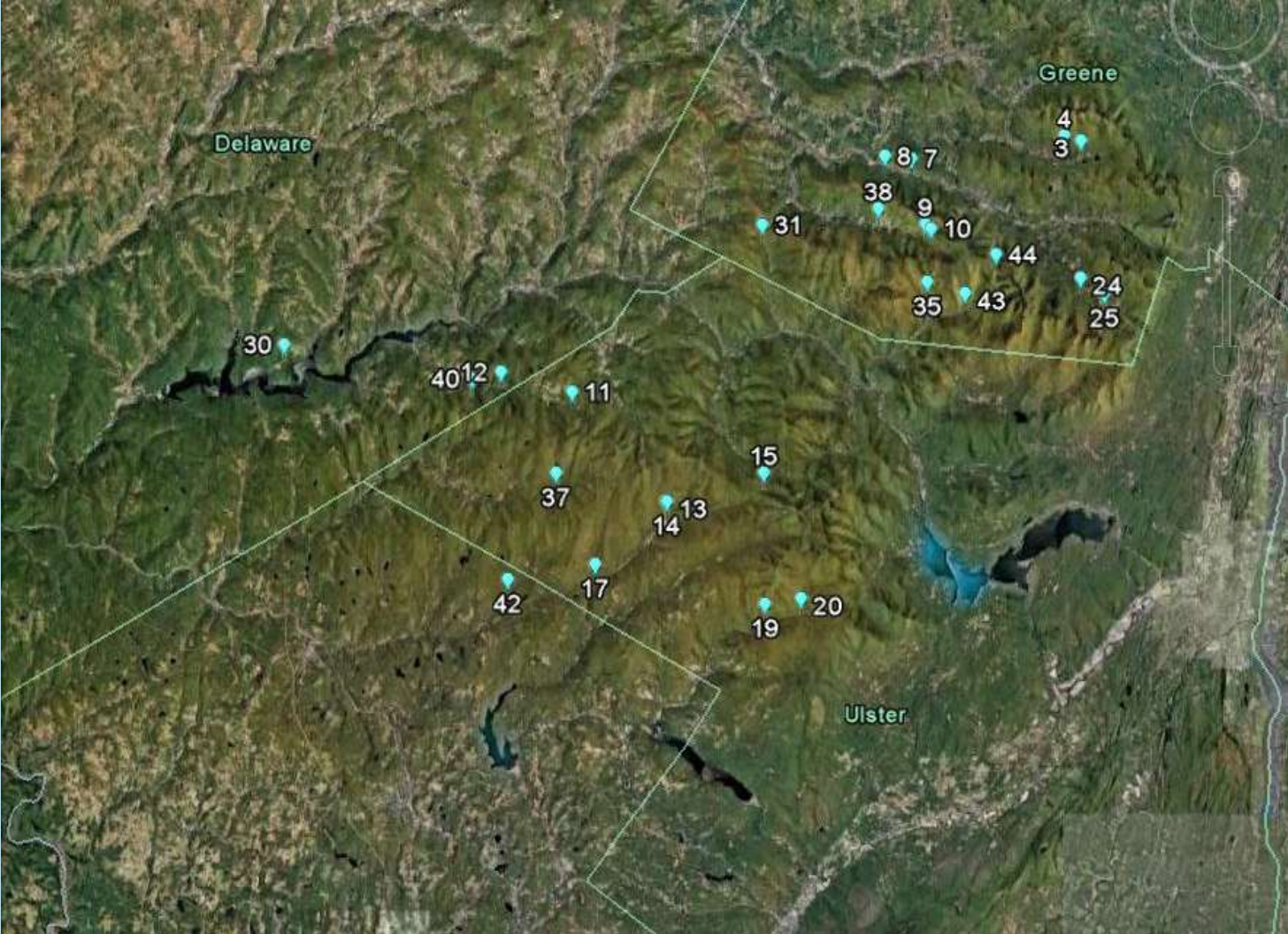
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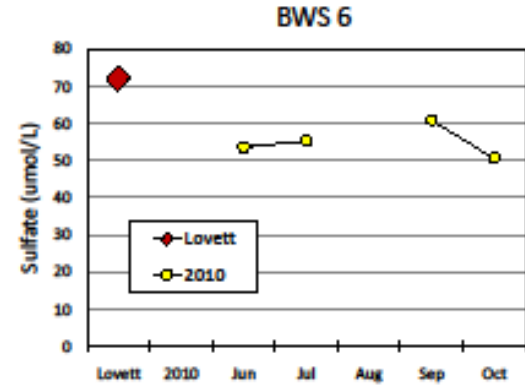
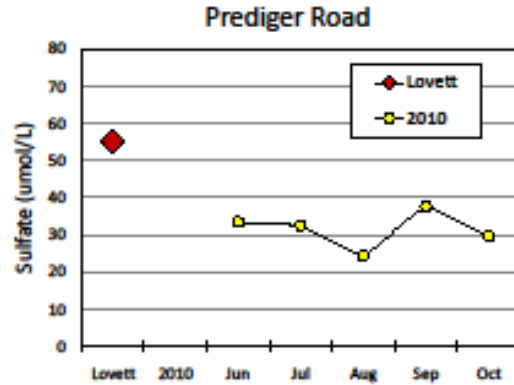
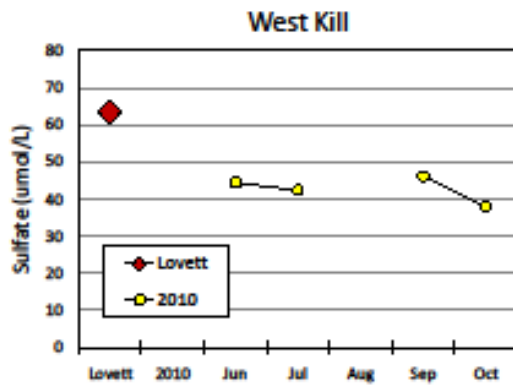
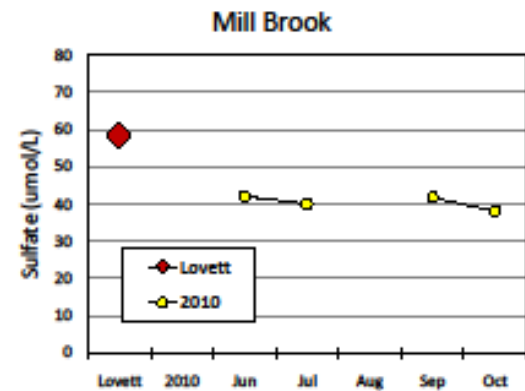
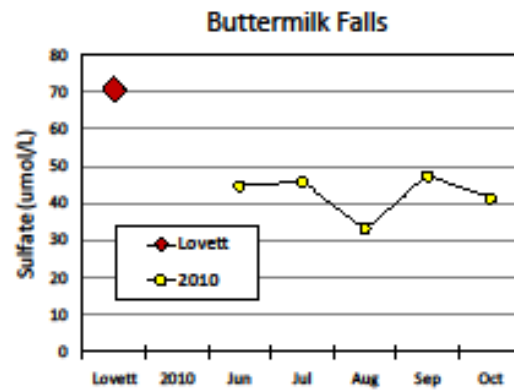
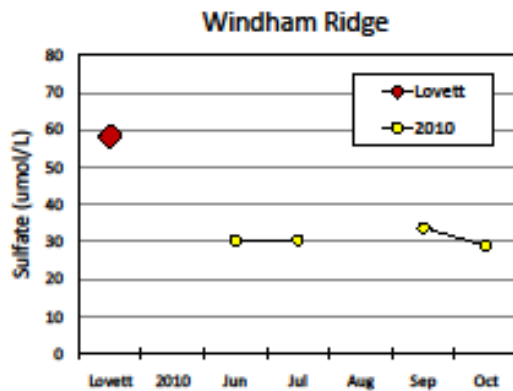
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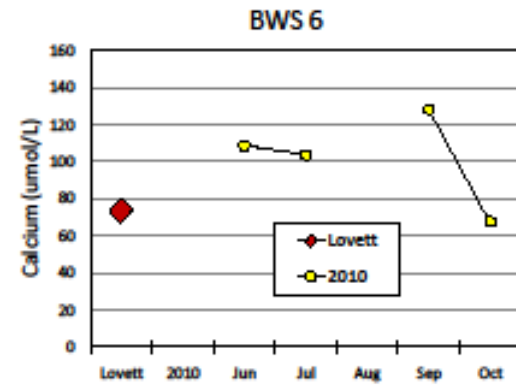
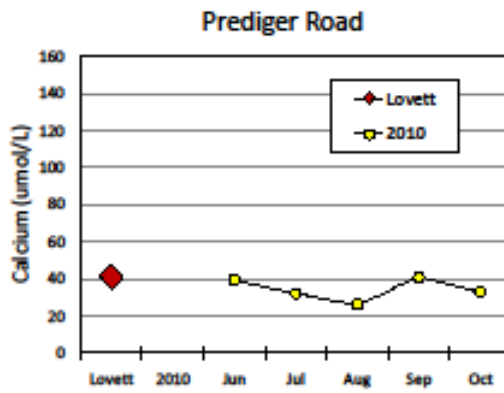
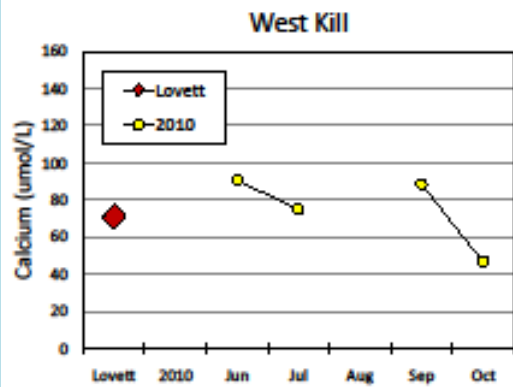
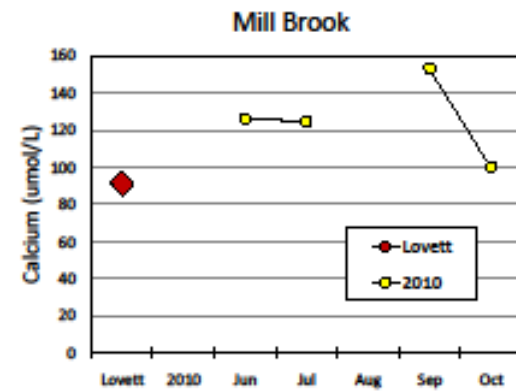
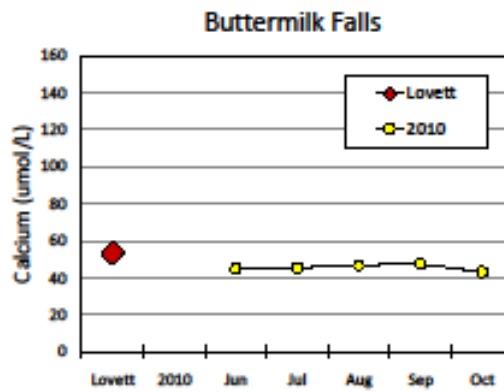
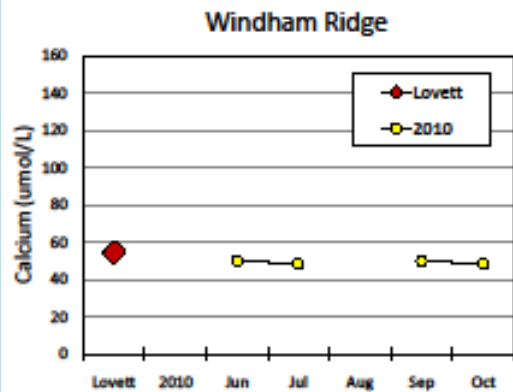
# Catskills Stream Sampling Sites



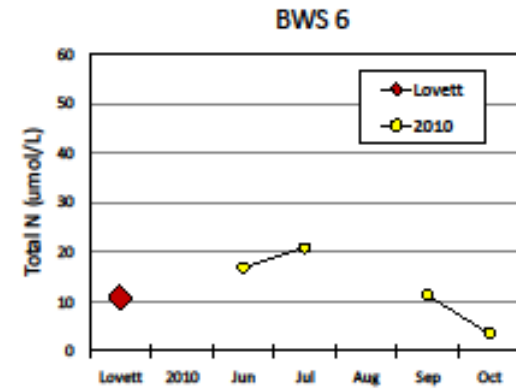
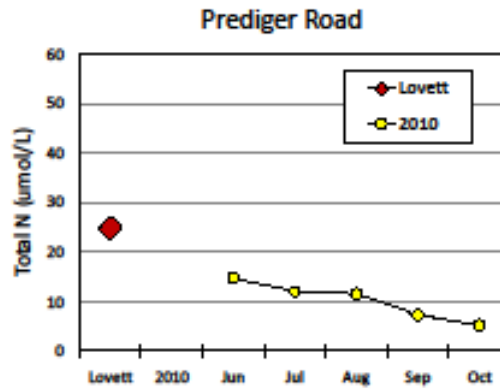
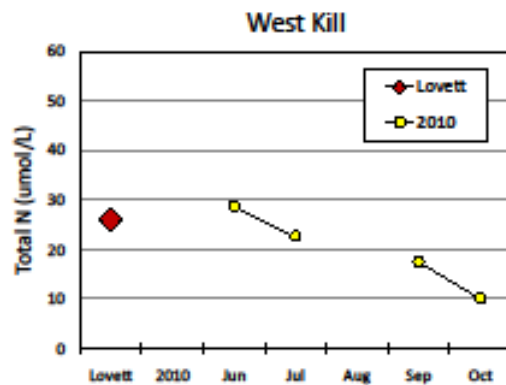
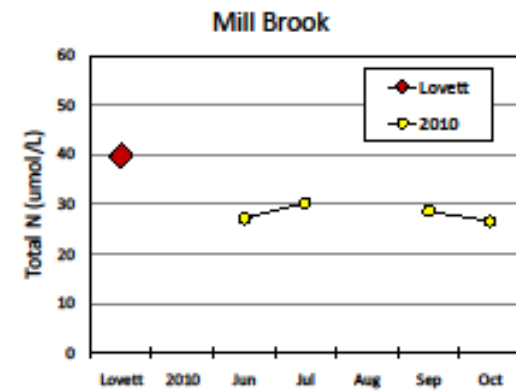
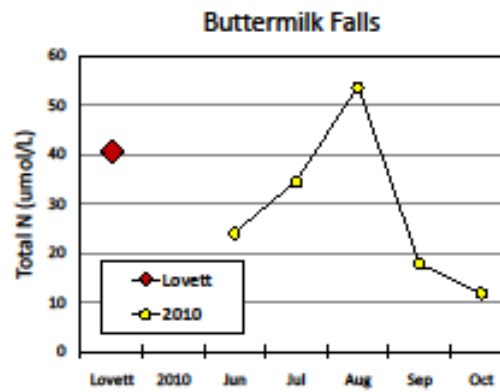
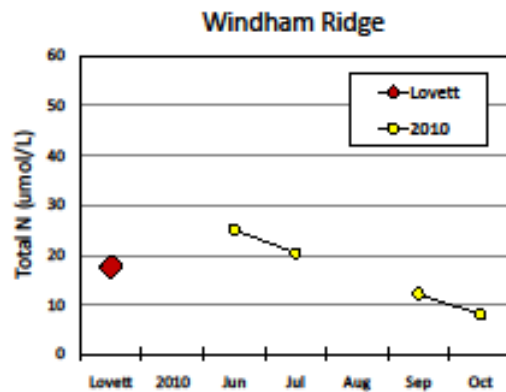
# Stream Sulfate Concentrations



# Stream Calcium Concentrations



# Total Nitrogen Concentrations



# Stream DOC Concentrations

