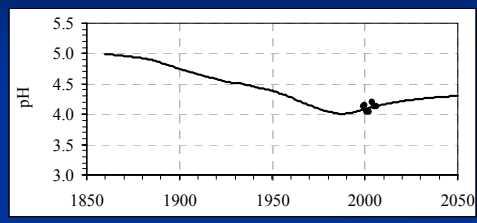
How might climate warming affect recovery from acidification?

The case of a highly acid stream

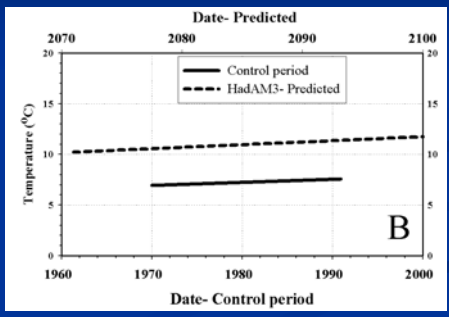
Modeled course of pH
assuming constant atmospheric deposition, T



Very slow and gradual base-line recovery

How might a change in temperature affect this course?

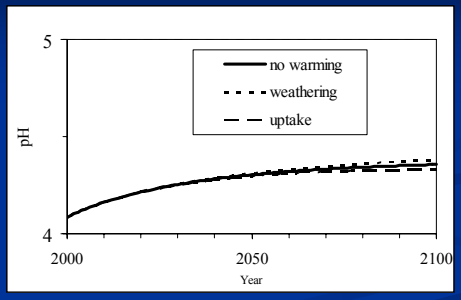
Regional climate model predicts a 4° C increase in yearly average temperature



Incorporating T into model

- Increased weathering by 20% – base cations (Ca2+, Mg2+, K+, Na+)
- Increased N mineralization in soil by 50% – NO3 leaching to water
- Increased decomposition by 15% – DOC release
- Increased forest growth and productivity by 50% – uptake of N and BC

Results of incorporated T increase



Almost no effect on pH!!!

Similar for other parameters – alkalinity, base saturation, etc.

However….

- Ignored seasonal changes – earlier snowmelt, longer growing season
- Ignored precipitation
- Temperature can affect system in other, maybe more important ways, i.e.
  - Amount and timing of episodes
  - Sensitivity to bark beetle infestation

Lessons

- For some highly-affected acidified systems, other factors can overwhelm effects from temperature
- More accurate modeling requires shorter time-steps to capture seasons, episodes
- But, climate models don't yet support finer resolution (i.e. in precipitation)