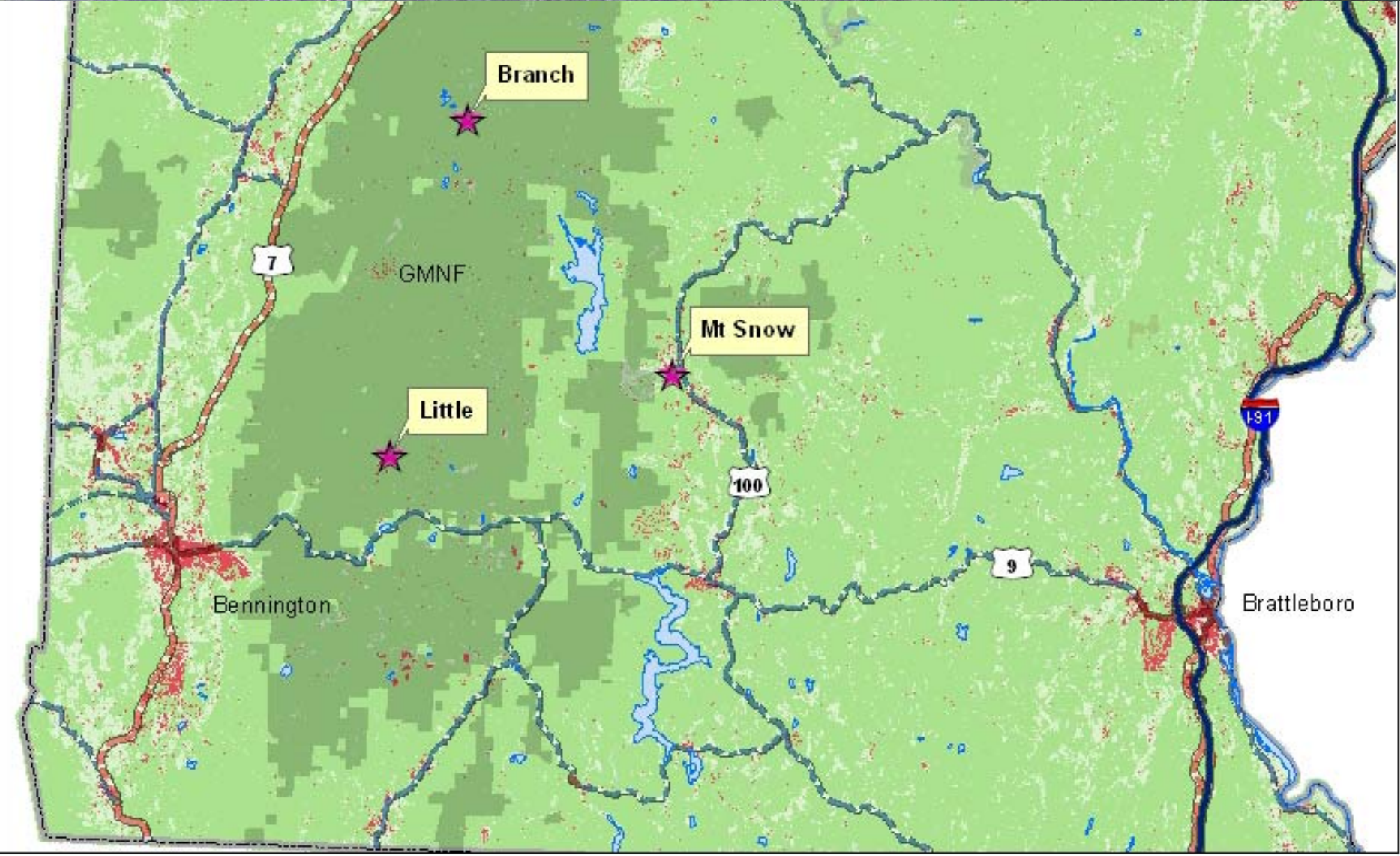


2005 Vermont Acid Lake Biomonitoring Program

Heather Pembroke, VTDEC

Background

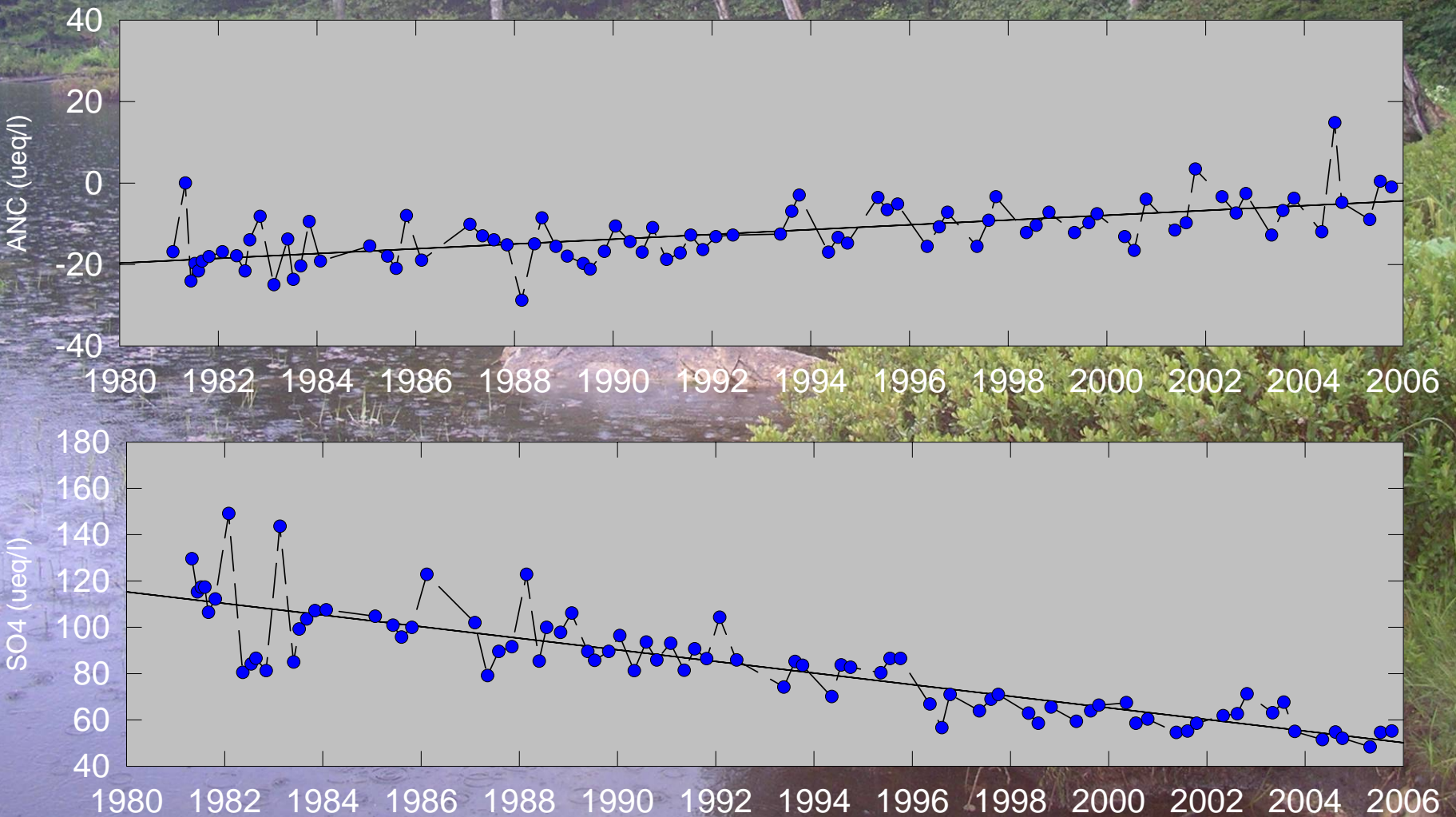
- Chemical improvement well documented on acid lakes (>pH, >alk, <SO₄)
- Evidence of biological improvement sparse. Work 1° on plankton, not much on fish and bugs.
- Vermont Acid Lakes biologically surveyed in early 1980s (bugs, fish, plankton)
- Resurveyed two of 12 LTM lakes in 2005 for bugs:
 - Little (Woodford, VT) and Branch (Sunderland, VT), part of Lye Brook Wilderness



2005 Lake Biomonitoring Sites



Branch Water Chemistry



Objectives

- Characterize and compare current biological community on two acid lakes;
 - a colored, deep pond (Branch)
 - a clear, shallow pond (Little)
- Compare to historical data and assess if any change over time.

Methods

- 2005: VT/NH Biocriteria Methodology (Kamman 1998)
 - Index Period: Once in Late Summer
 - Habitats sampled:
 - Rocky Littoral (3 sites, 10 min. kick net)
 - Muddy Littoral (3 sites, 10 min. kick net)
 - Macrophyte beds (3 sites, subsurface KN sweep)
 - Sublittoral (3 sites, 6" Ekman Dredge)
- 1981-83
 - Index Periods: Spring, Summer, Fall, Winter
 - Habitats sampled: Littoral (kick net), Sublittoral (6" Ekman Dredge), Profundal (6" Ekman Dredge).
 - *Qualitative sampling*

Branch vs. Little

- Branch

- Deep (9 m)
- Medium (34 acres)
- Colored (>70 Pt Co)
- pH ~4.9
- Calcium ~0.60 mg/L
- Alk ~ -0.2 mg/L
- Brook Trout and Brown Bullhead

- Little

- Shallow (<1.5 m)
- Small (16 acres)
- Clear (<10 Pt Co)
- pH ~ 5.2
- Calcium ~ 0.85 mg/L
- Alk ~+0.1 mg/L
- fishless

Both are in undisturbed watersheds on USFS land. In addition to > pH and alkalinity, calcium and magnesium have < over time.

Branch Pond, Sunderland, VT



Little Pond, Woodford, VT



Results

- Current Biological community
 - Overall: Simplified
 - Dominated by chironomids
 - Lacking or very few crustacea, mollusca, mayflies or stoneflies.
 - Little Pond:
 - Community altered due to loss of fish and/or toxicity
 - Branch Pond
 - High DOC may offset toxic effects



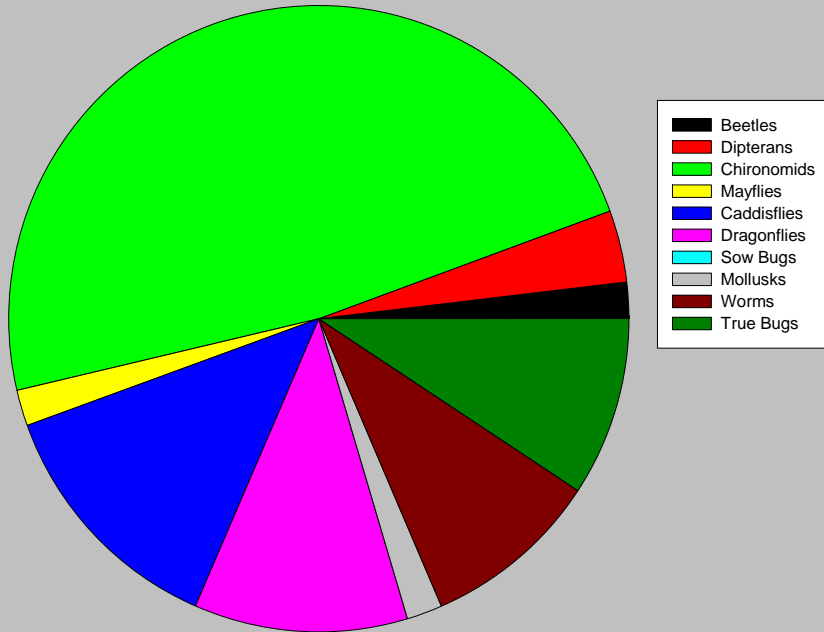
Corixid-
water
boatmen
True Bug



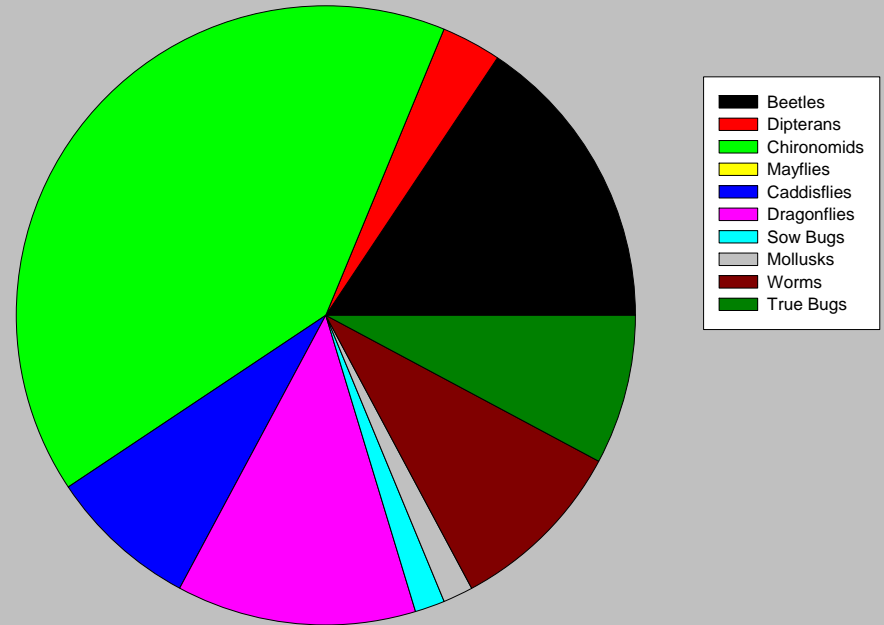
Gyrinid
whirligig
Beetle

Results-Branch vs. Little

2005 Branch Pond Total Species Richness

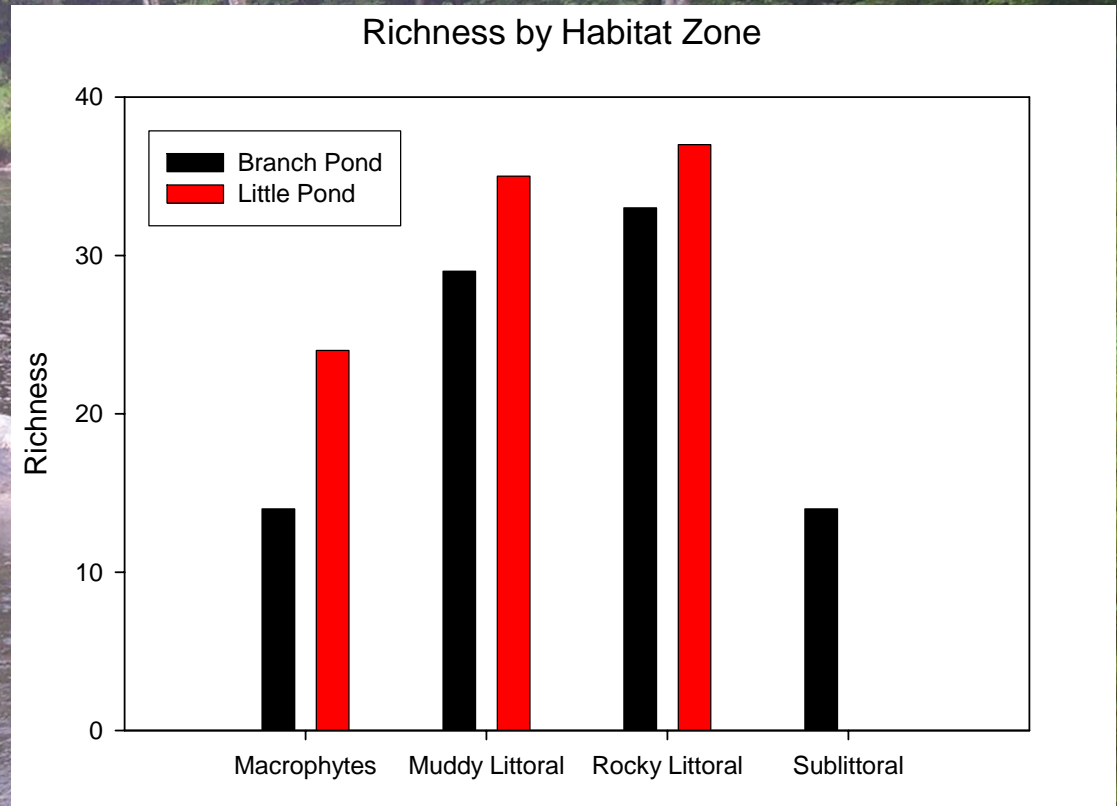


2005 Little Pond Species Richness



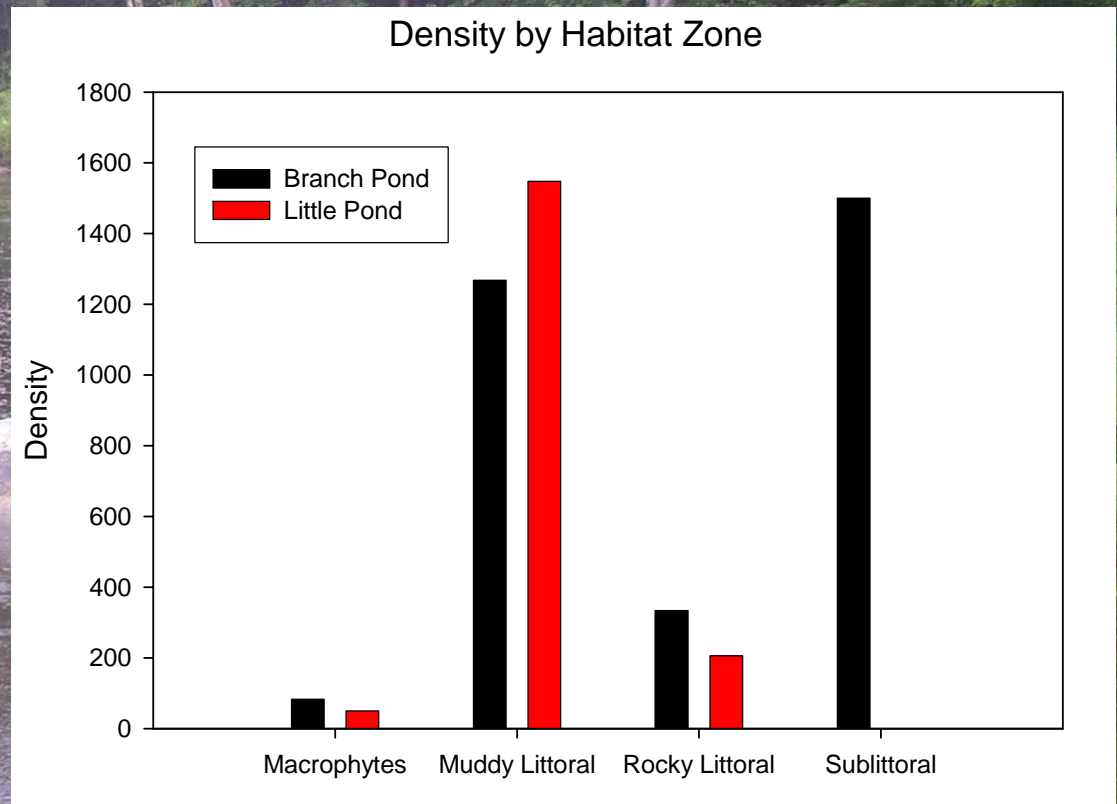
Results- Habitat zones

- Rocky Littoral and Muddy Littoral had the greatest richness for both ponds due to Chironomids.
- Little Pond had more species in each habitat zone.



Results- Habitat zones

- Muddy Littoral and Sublittoral had the greatest density due to dipterans (*Tanytarsus sp.* and *Polypedilum sp.*) and Isopods on Little Pond
- Macrophytes dominated by predators: dragonflies and notonectids (backswimmers)



Results-some sensitive species

- Current Biological community: Snails & Clams
 - Fragile limpet: *Ferrissia californica* (Branch)



pH to 5.1 (Jokinen)

- Pea clam: *Pisidium casertanum* (Branch and Little)



pH to 5.2 (VTDEC)

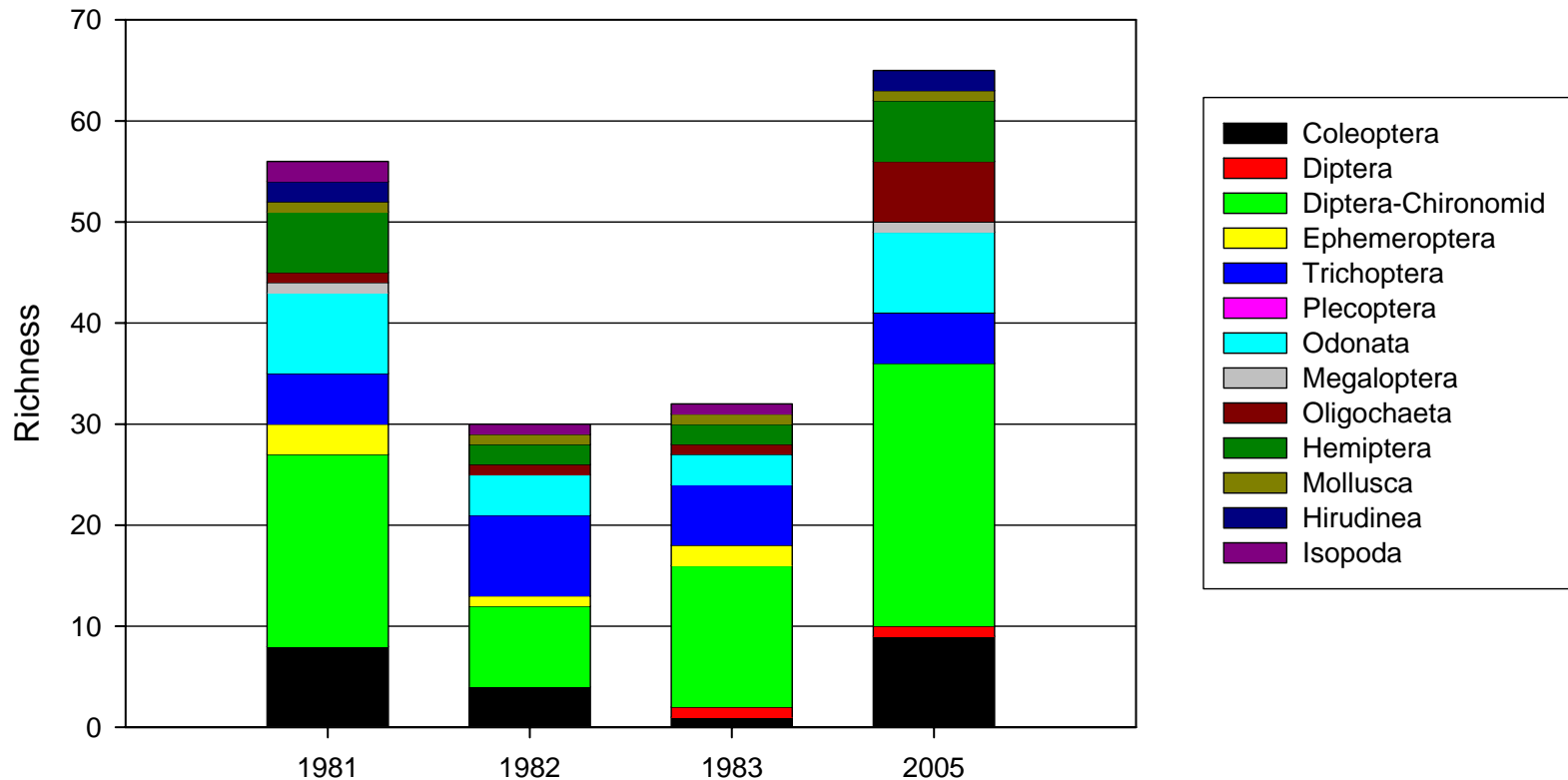
Results-sensitive Orders, tolerant species

- Current Biological community: Mayflies, Caddisflies and Sow Bugs
 - Mayfly: *Leptophlebia* present on Branch (and Little in past) pH ~5 (VTDEC).
 - Caddis: *Ptilostomis* sp. (both Ponds). Caddis tolerates wide range of conditions (vernal pools, lakes..) pH 4.3 (NCDENR)
 - Caddis: *Phylocentropus* (both Ponds) <5.8 (VTDEC)
 - Sow Bug: *Asellus racovitzai* on Little (moderately tolerant)

Results over time

- Little has greater overall richness than Branch. Mostly due to diversity of coleopterans (no fish) and greater identification precision in 2005.

Little Pond Species Richness- all habitats combined

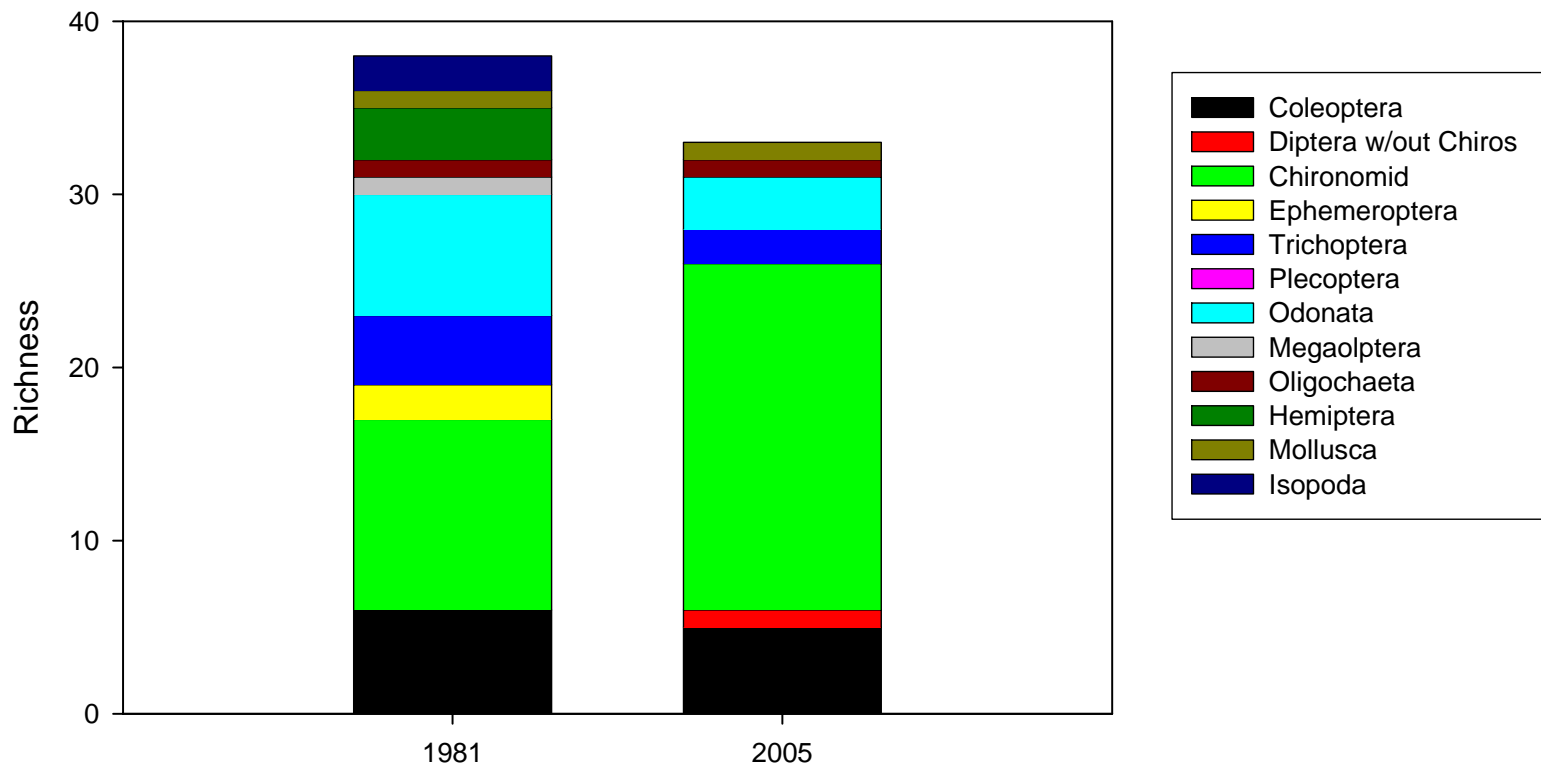


Results over time

- Little Pond Littoral Zone richness only.

Little Pond Rocky Littoral Zone Species Richness*

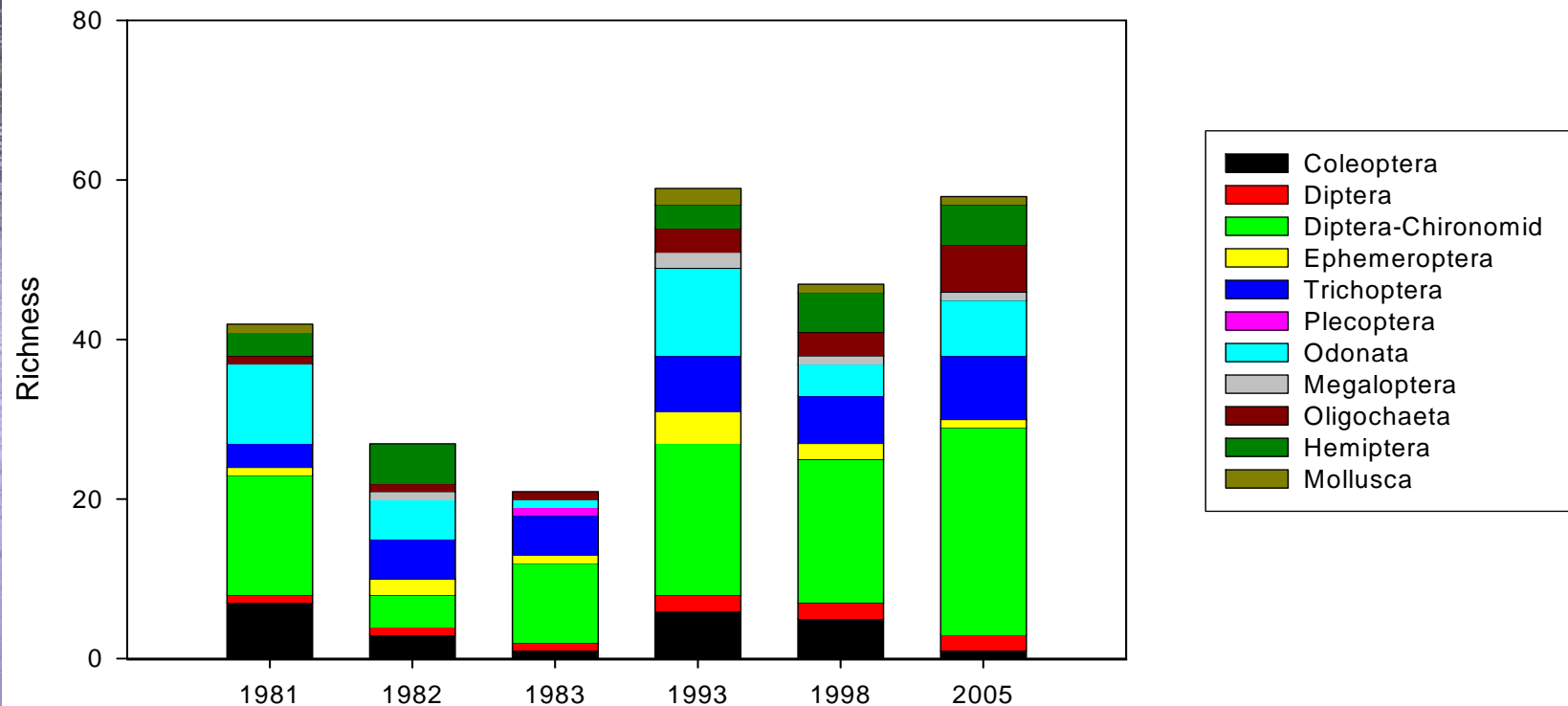
Removed Notonectidae, Corixidae, Hirudinea, Hydrachnidia, Gyrinidae and Neuroptera



Results

- Both ponds had a high % of chironomids, beetles, and odonates.
- Branch had a greater diversity of Caddisflies. Presence of Mayflies and Mollusks may be due to >DOC.

Branch Pond Species Richness-All habitats combined

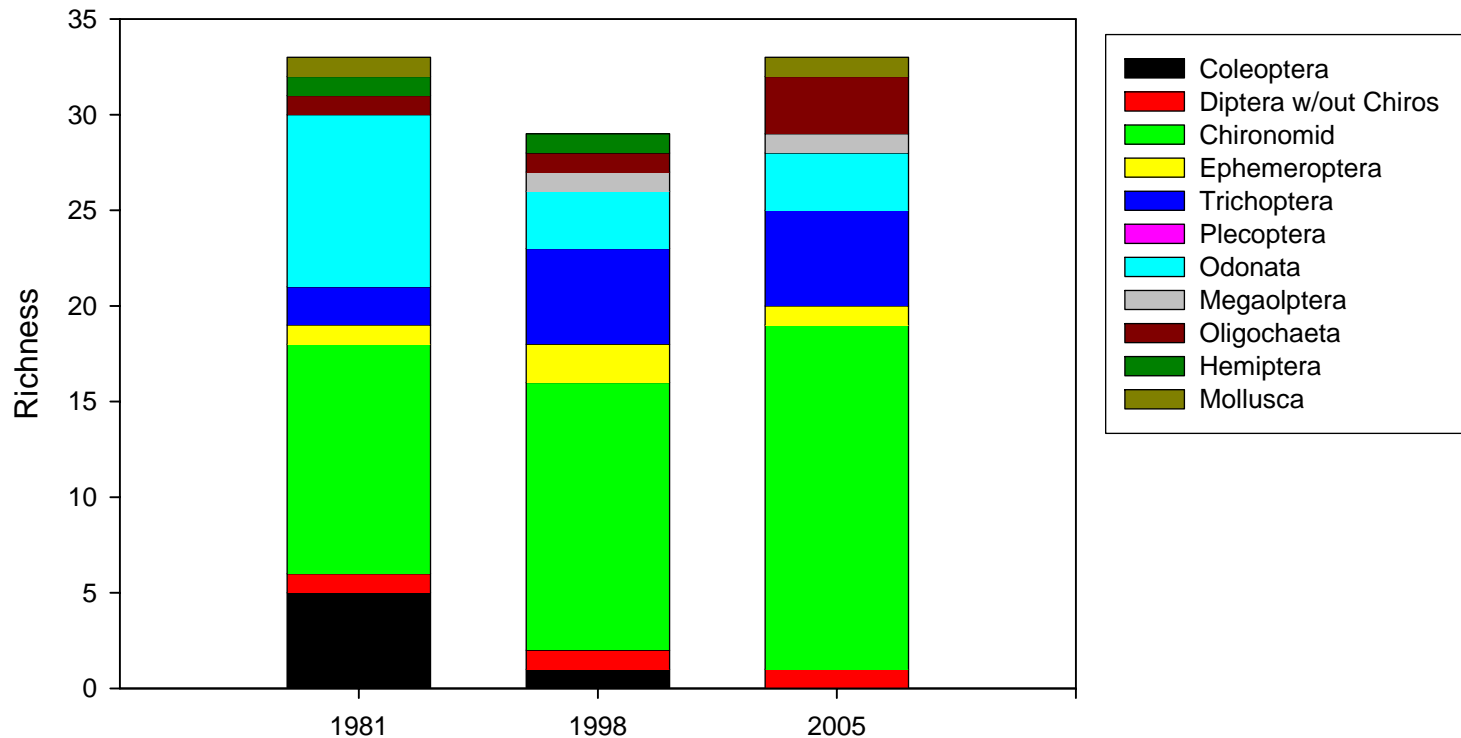


Results

Branch Pond Rocky Littoral Zone Richness

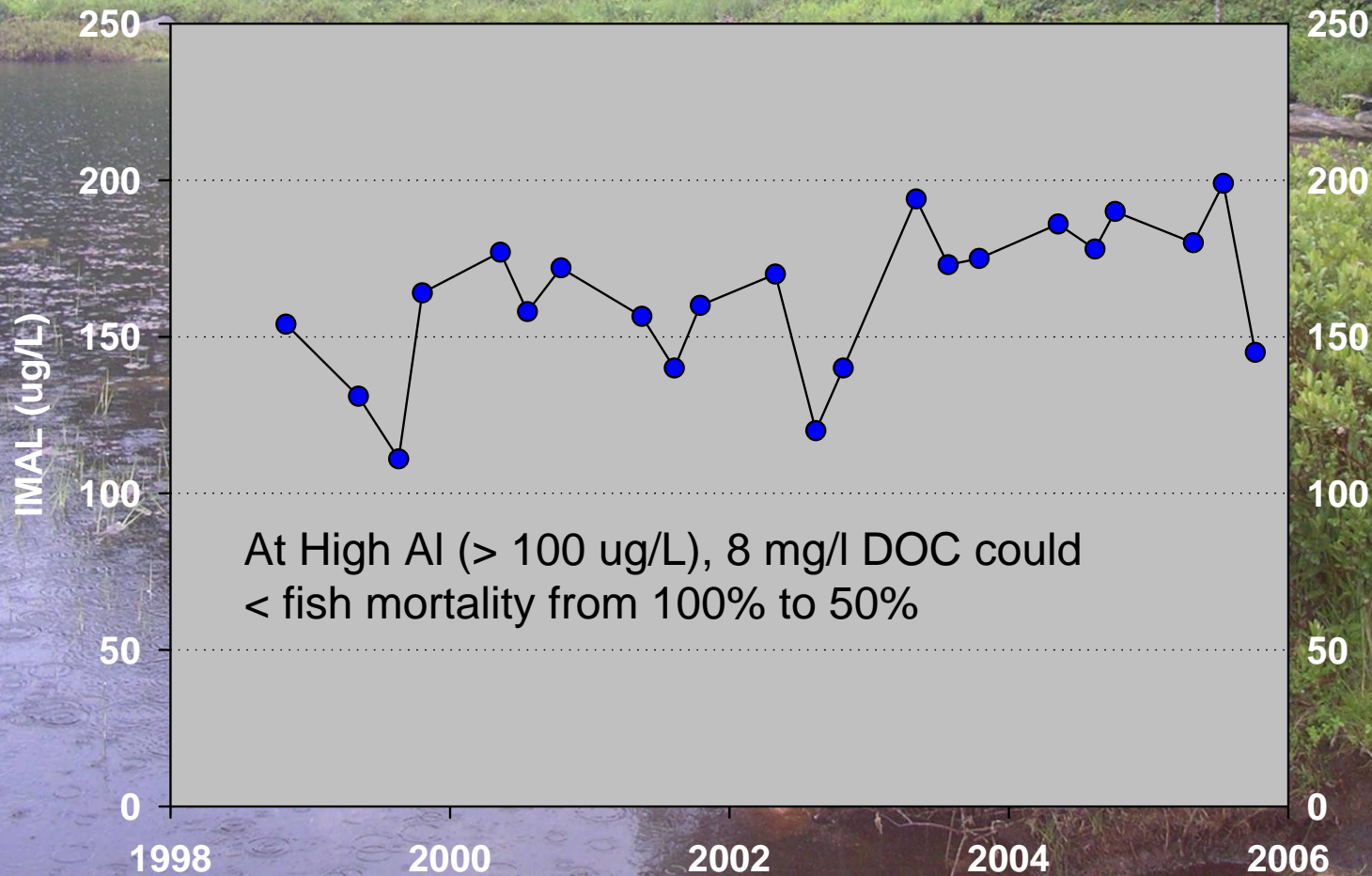
Branch Pond Rocky Littoral Zone Species Richness*

*Removed Notonectidae, Corixidae, Hirudinea, Hydrachnidia, Gyrinidae and Neuroptera



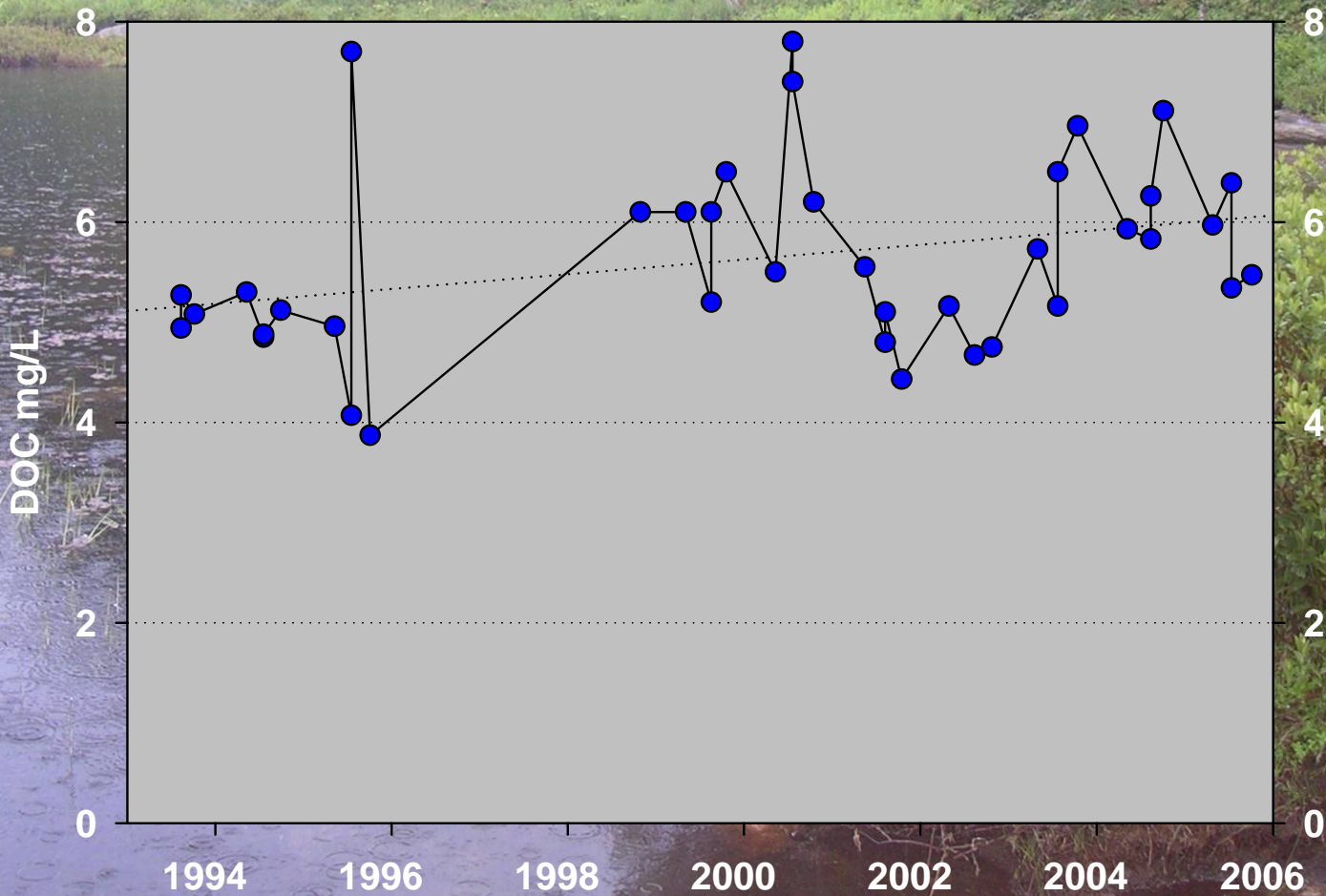
Results

Branch Pond IMAL 1994-2005



Results

Branch Pond DOC 1993-2005



Results-Change over time?

- Challenges:
 - Original Samples Qualitative.
 - IDs evolved from Genus to species calls.
- Sensitive Groups (Crustacea/Mollusca, Ephemeroptera) have shown no improvement.

Conclusions

- Chemical Improvements have not manifested as significant biological improvements.
- Base cation levels <, and Al levels >
- Sample plankton communities
- Apply VT/NH Biocriteria