Honnedaga Lake Watershed Liming Project

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Greg Lawrence, Barry Baldigo, Jay Siemion – US Geological Survey
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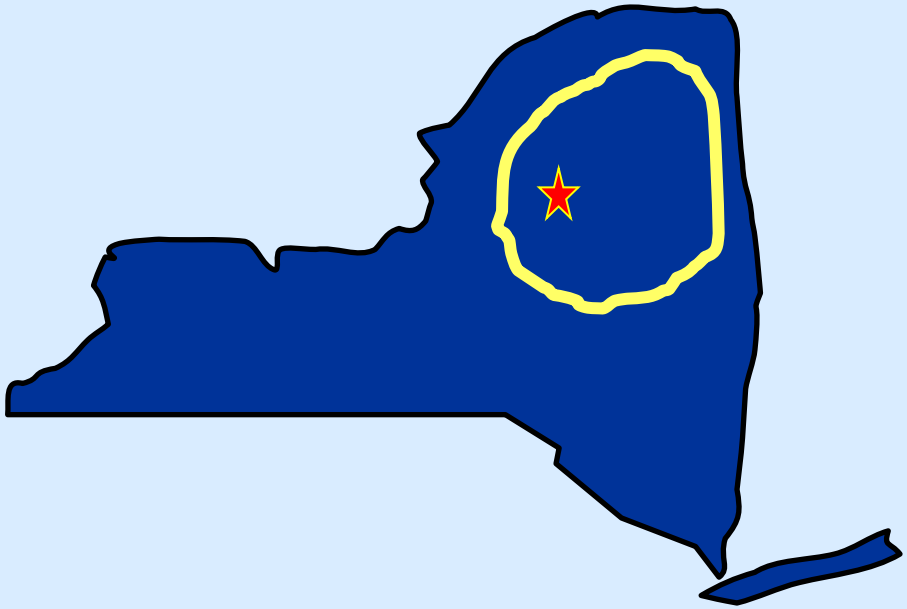
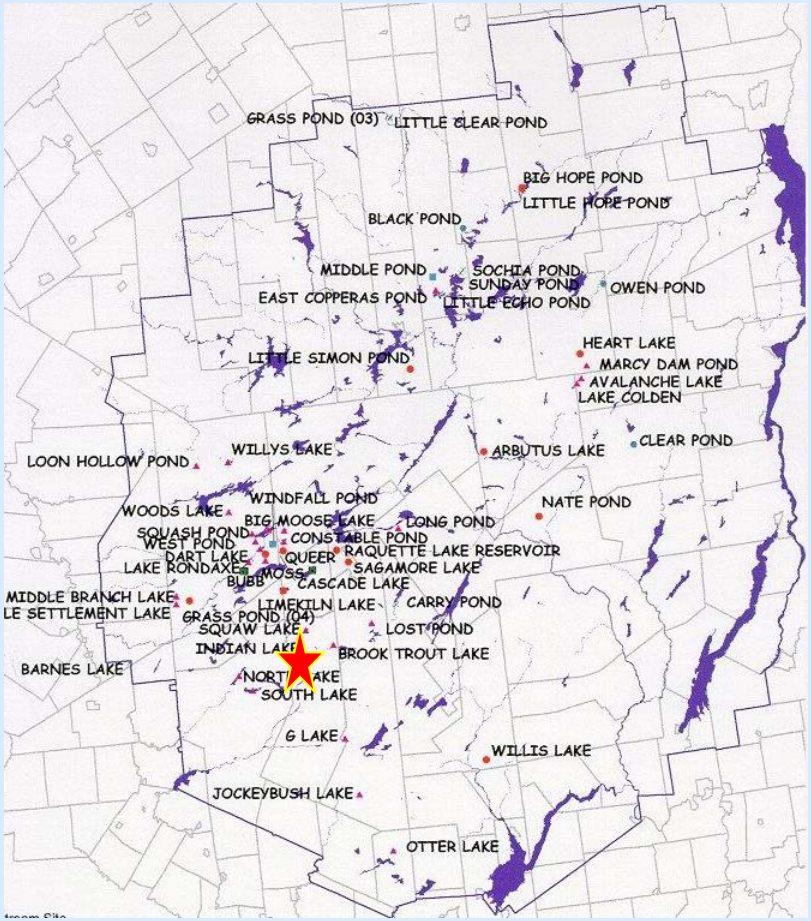
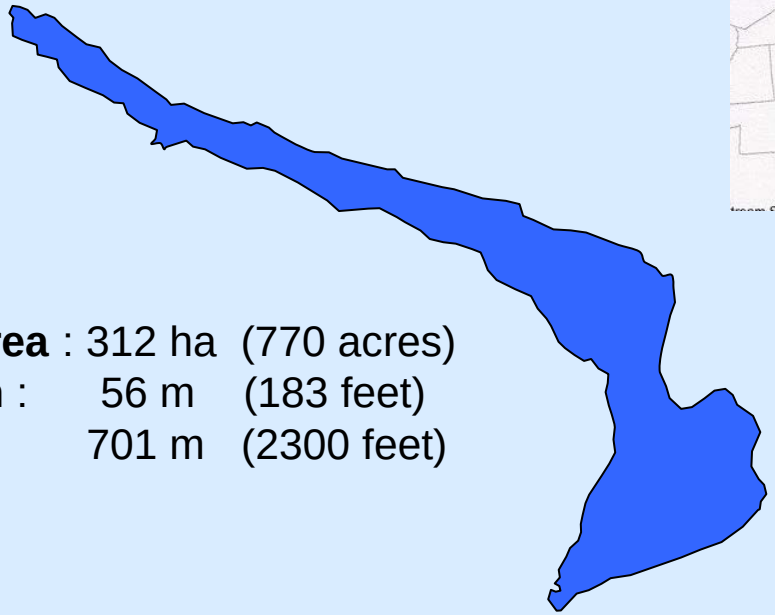


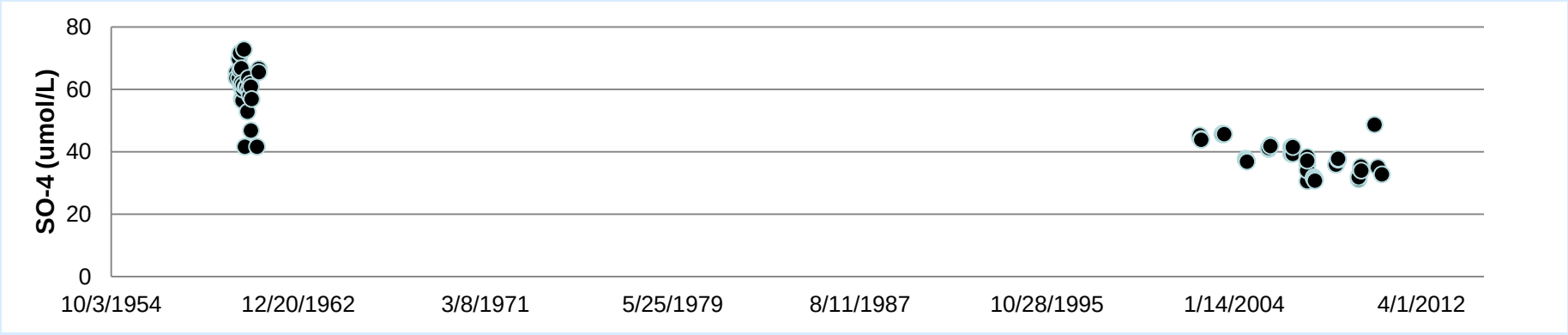


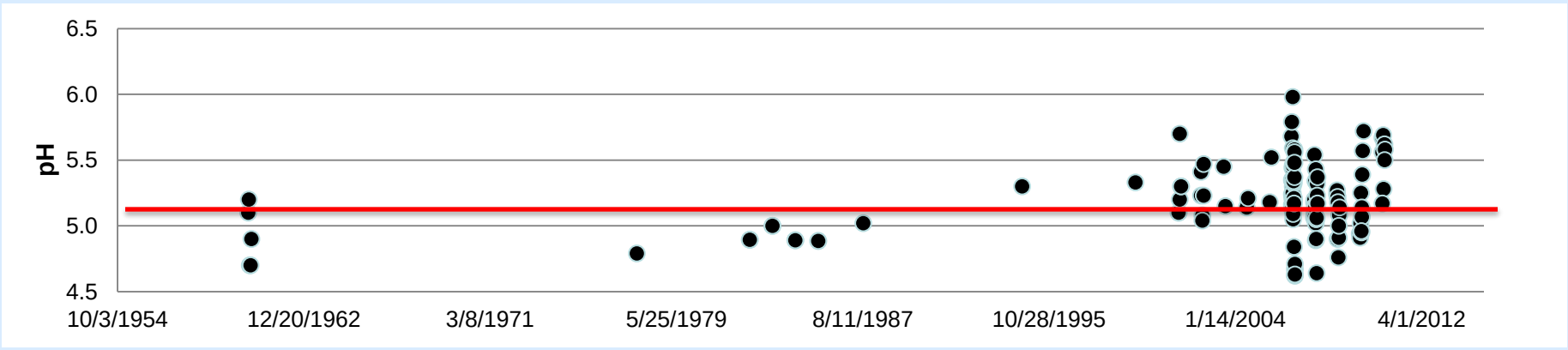
Honnedaga Lake

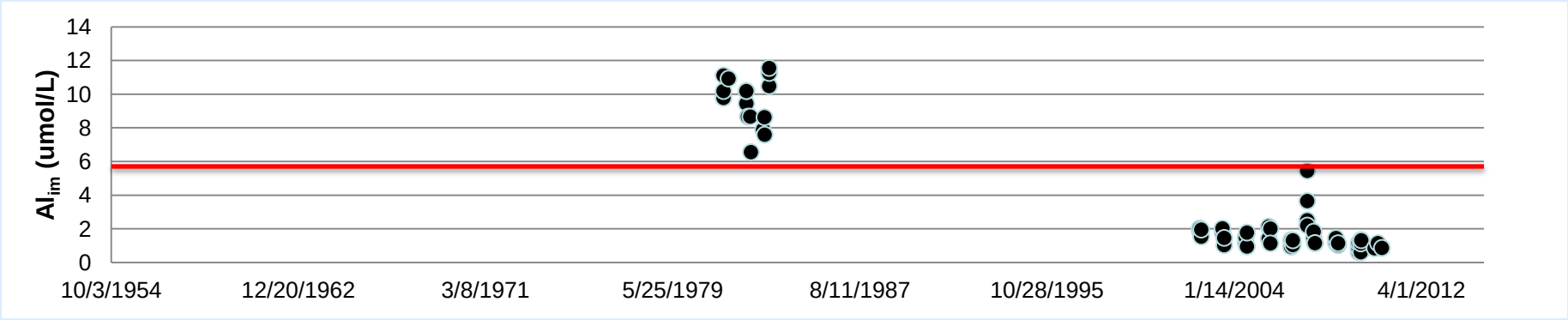


Surface Area : 312 ha (770 acres)
Max Depth : 56 m (183 feet)
Elevation : 701 m (2300 feet)

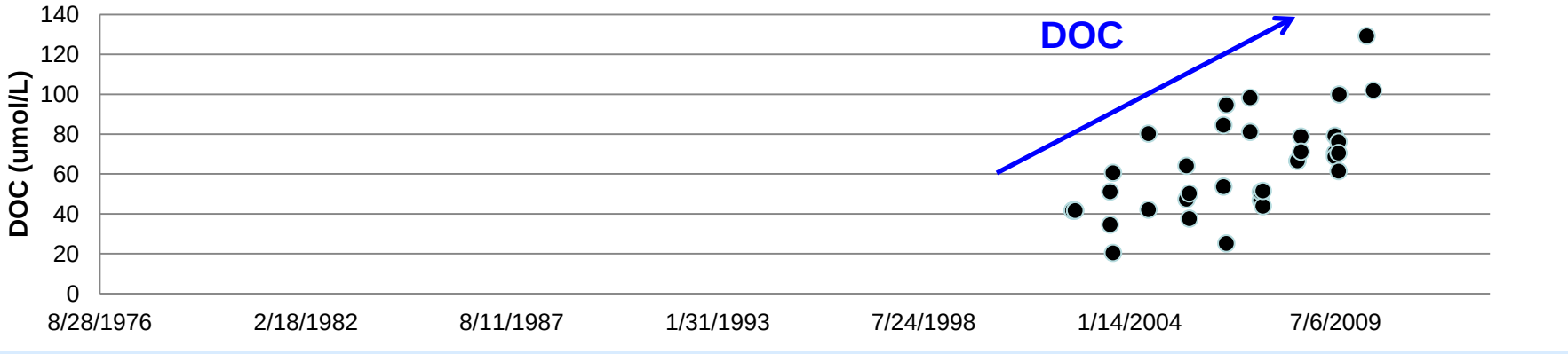
Honnedaga Lake Summer Surface Water : 1959 to 2010

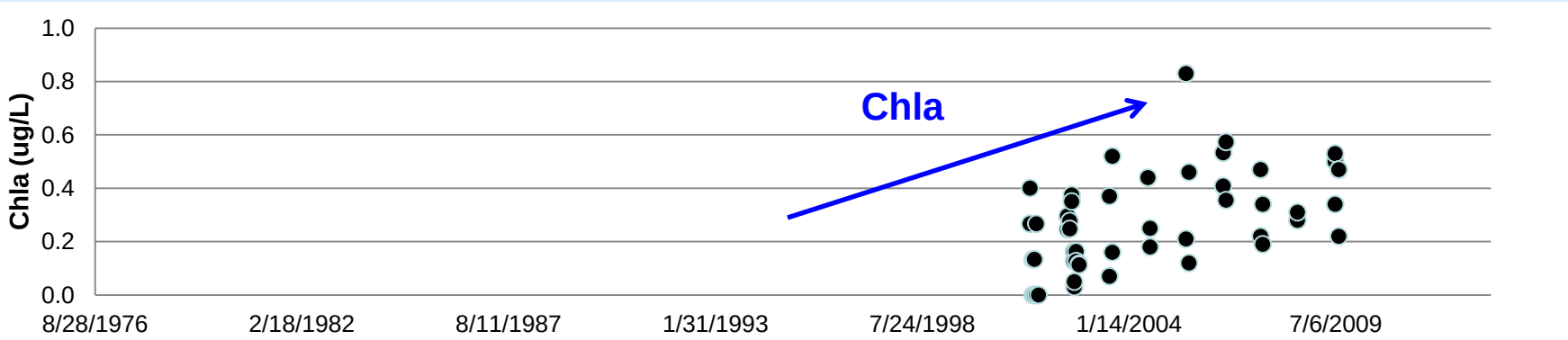


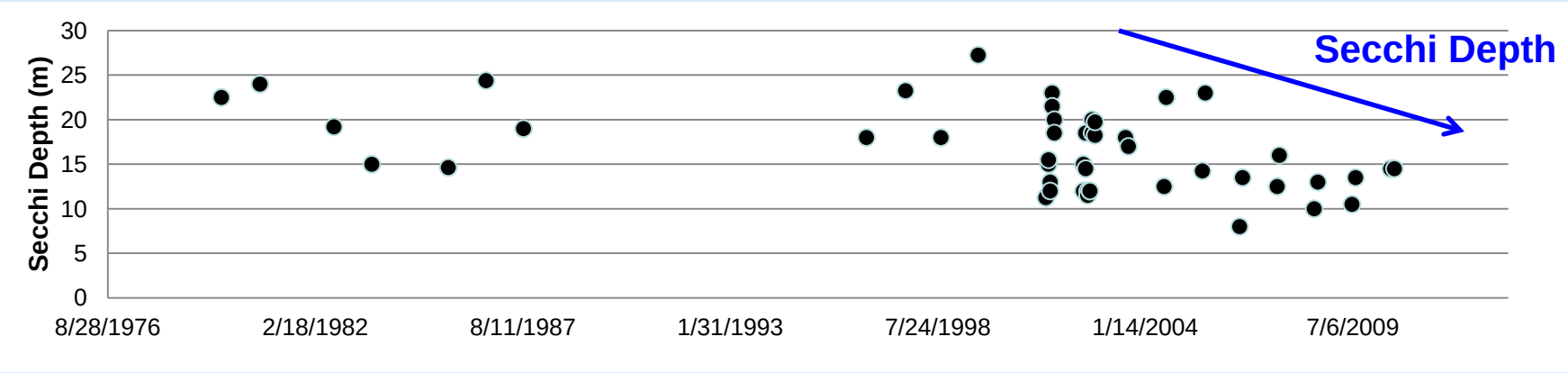




Honnedaga Lake Summer Surface Water : 1980 to 2010

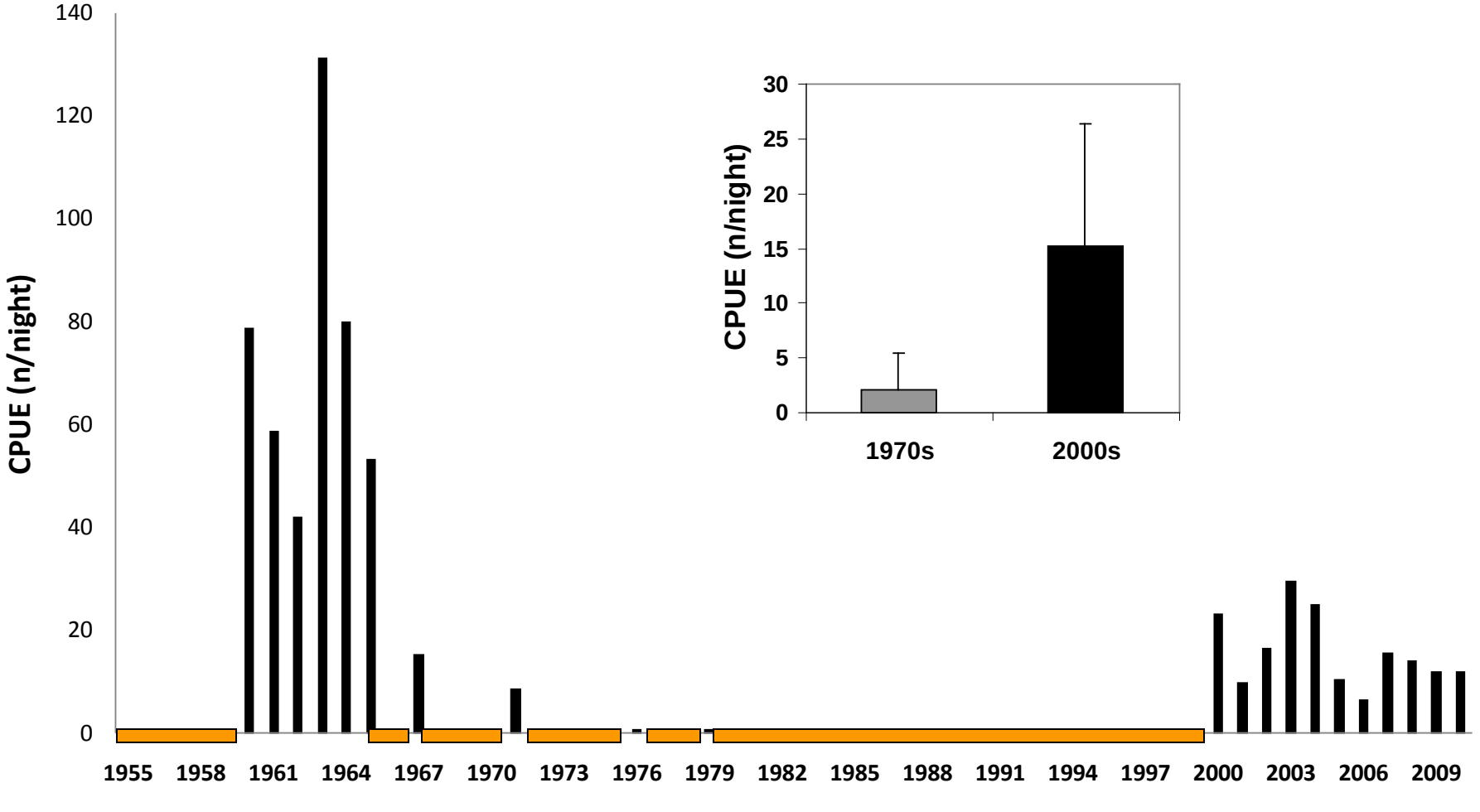




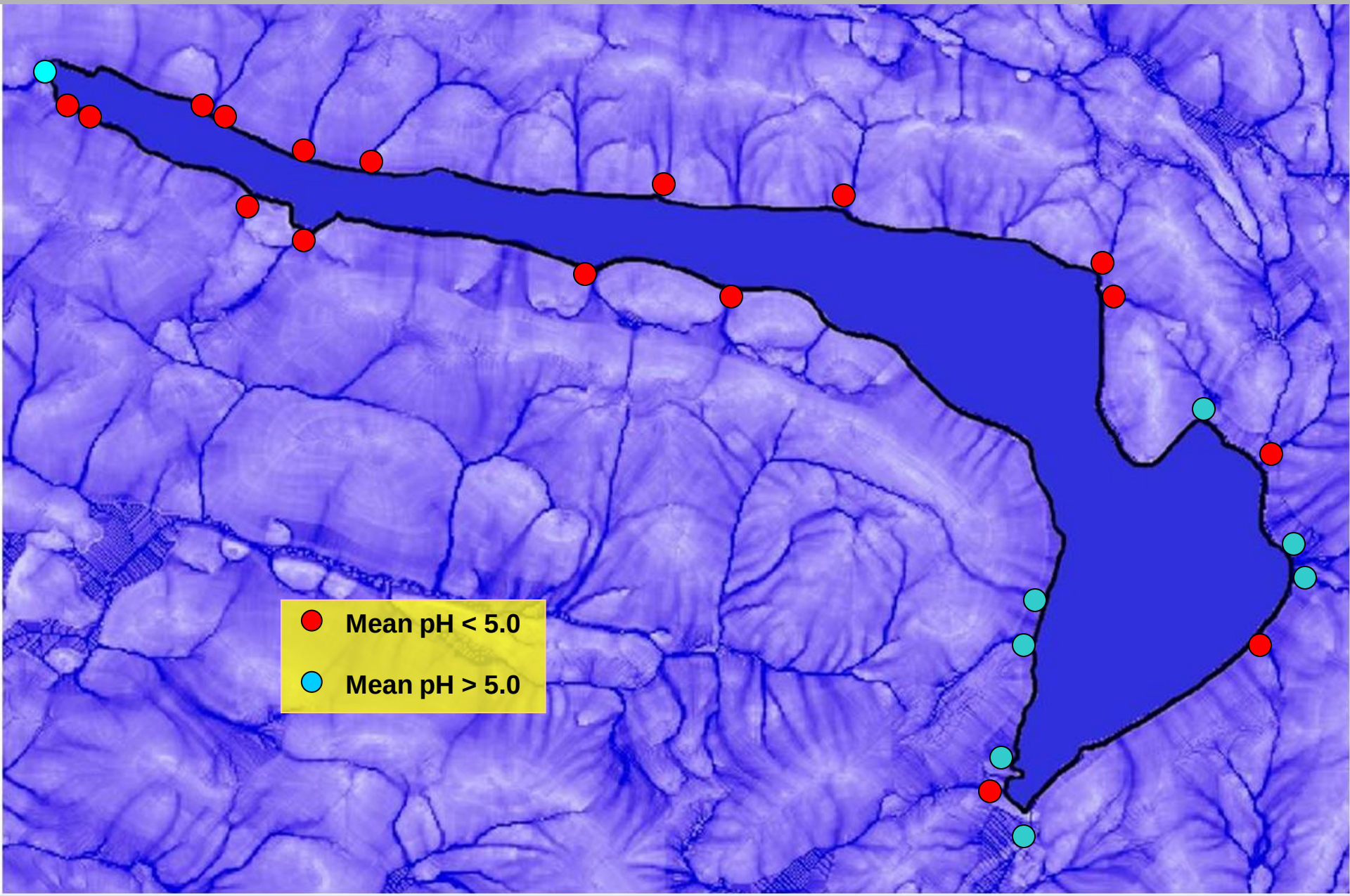


Fall Trapnet Surveys

Fall Trapnet CPUE of Brook Trout



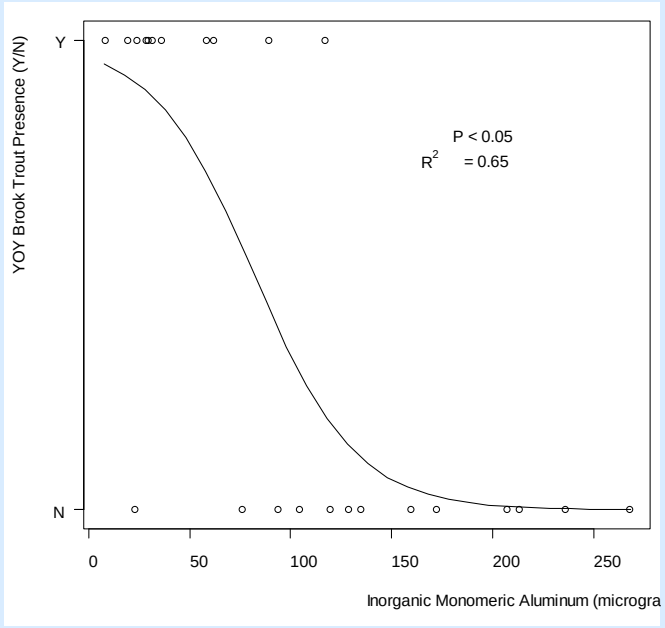
pH in Honnedaga Lake Tributaries



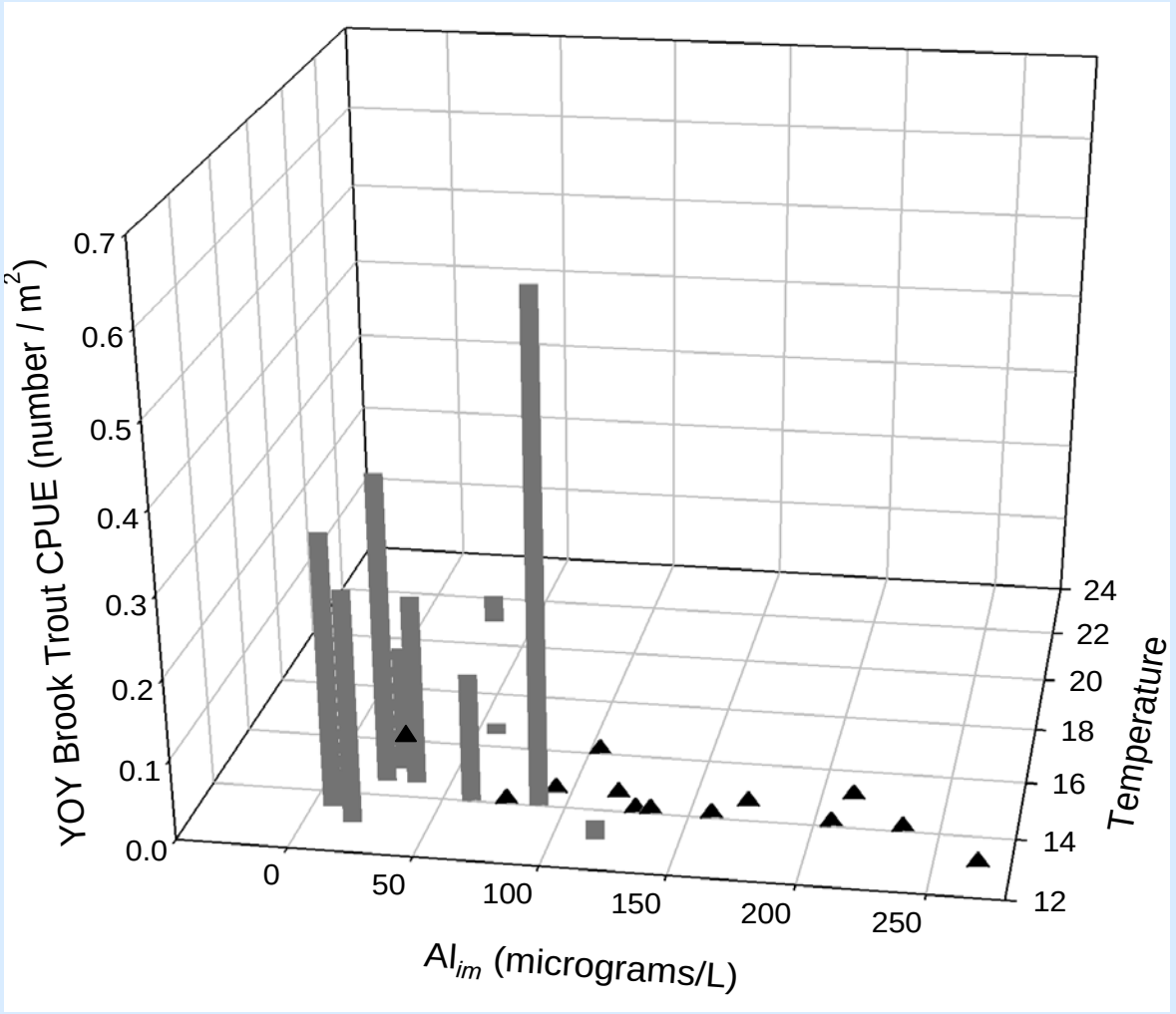
Stream Electro-Fishing Surveys

Young-of-Year Brook Trout and Al_{im} in Tributaries

Presence / Absence

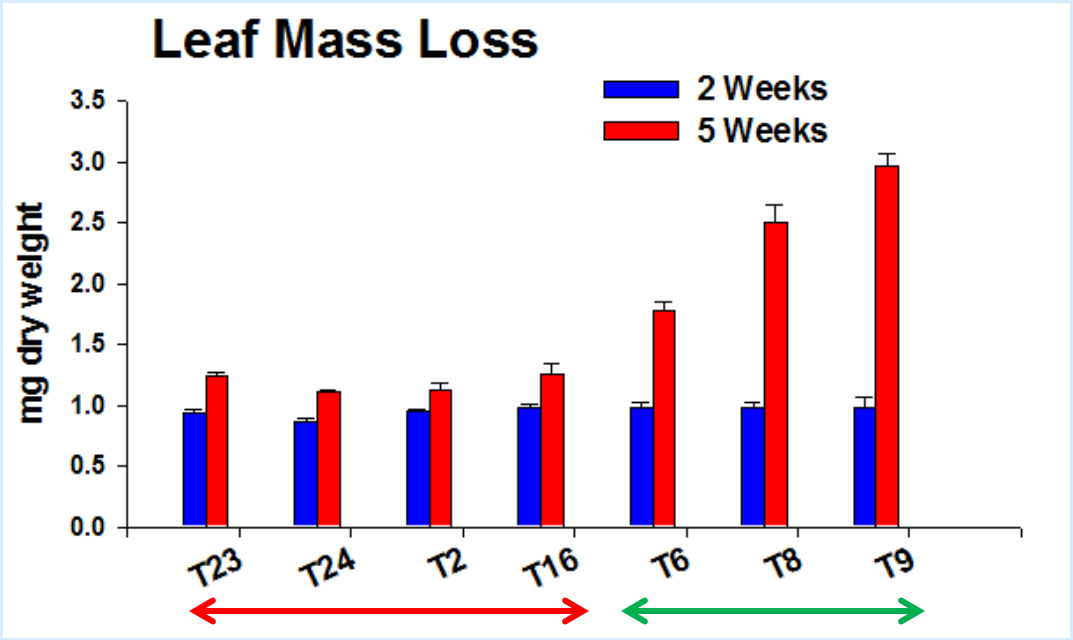


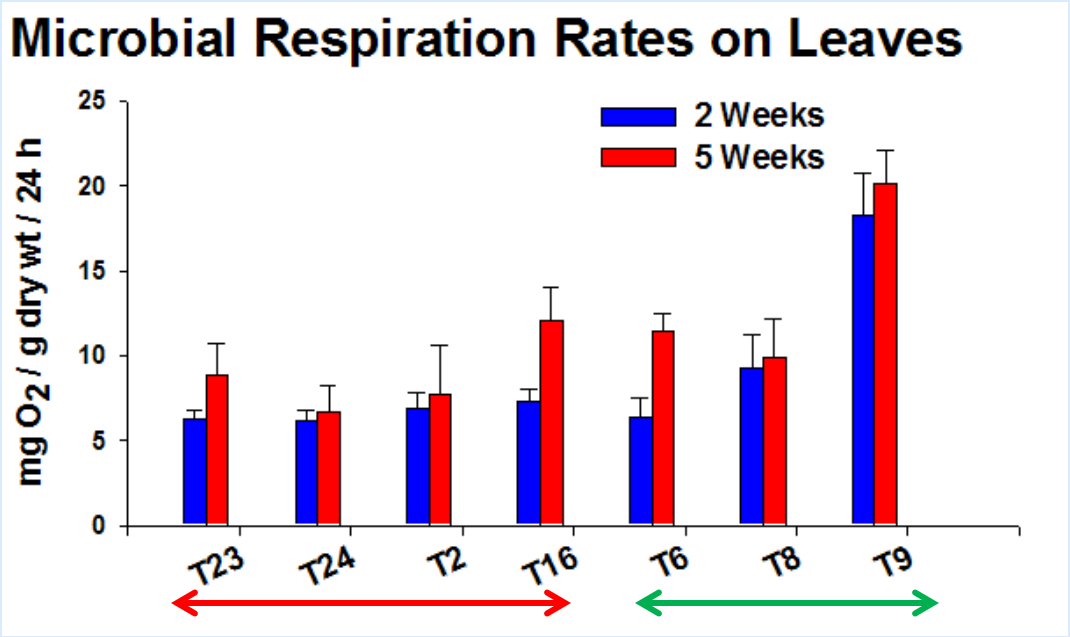
Density

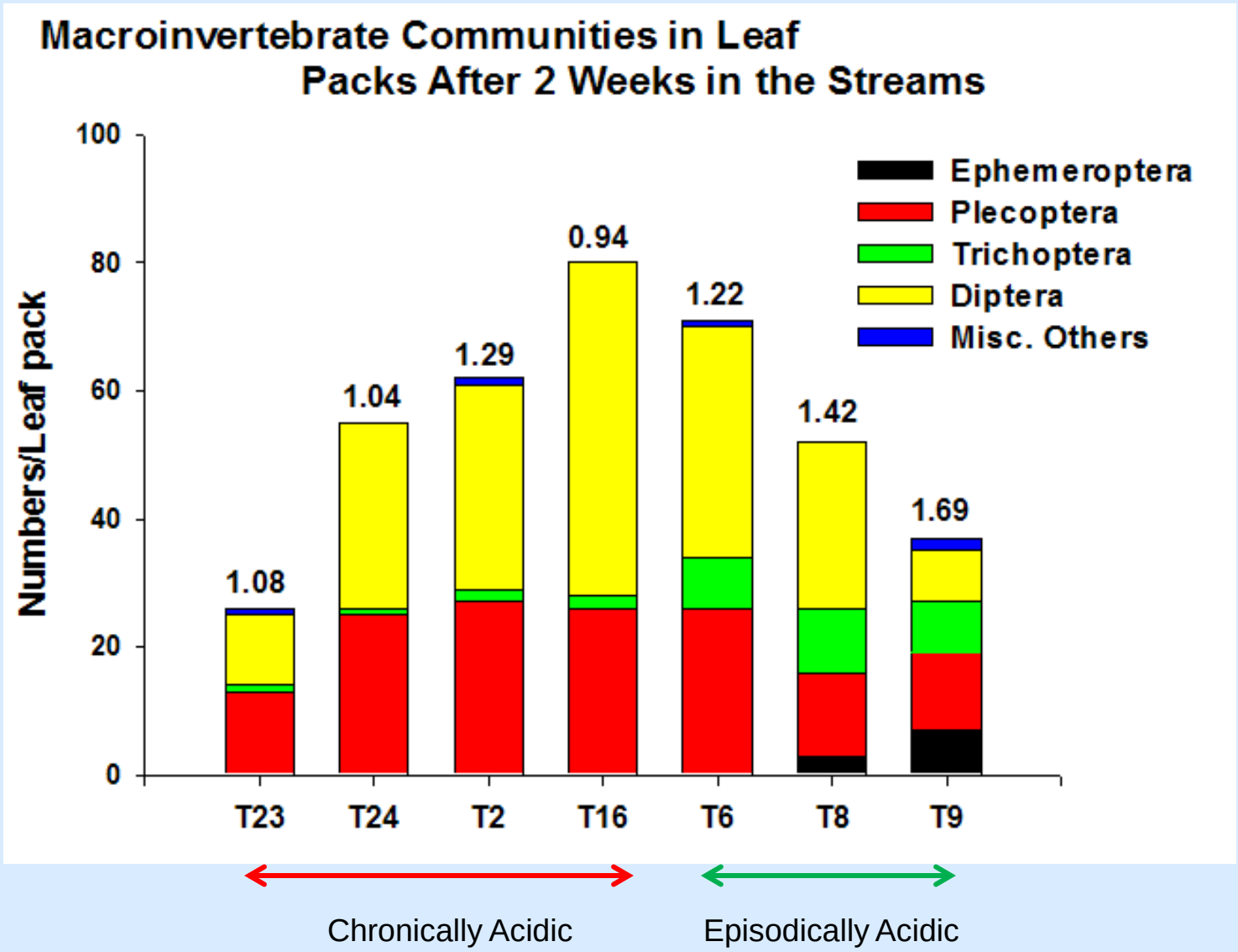


Leaf Breakdown Assessment

3 g Leaf Packs Composed of *Acer rubrum* (Red Maple) Leaves


Leaf Mass Loss
2 Weeks
5 Weeks
mg dry weight
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
T23
T24
T2
T16
T6
T8
T9
Chronically Acidic
Episodically Acidic


Microbial Respiration Rates on Leaves
2 Weeks
5 Weeks
mg O2 / g dry wt / 24 h
25
20
15
10
5
0
T23
T24
T2
T16
T6
T8
T9
Chronically Acidic
Episodically Acidic


Macroinvertebrate Communities in Leaf Packs After 2 Weeks in the Streams
Numbers/Leaf pack
100
80
60
40
20
0
Ephemeroptera
Plecoptera
Trichoptera
Diptera
Misc. Others
1.08
1.04
1.29
0.94
1.22
1.42
1.69
T23
T24
T2
T16
T6
T8
T9
Chronically Acidic
Episodically Acidic

Current Status of the Honnedaga Lake Ecosystem

Since 1990 Amendments to the Clean Air Act

Modest chemical and brook trout population recovery within Honnedaga Lake – reflective of an acid impaired ecosystem

Chronic acidification of numerous groundwater influenced tributaries / catchments within the watershed

The acid impaired state of tributaries likely limits young-of-year and consequently adult brook trout abundance – as well as invertebrate community diversity

Honnedaga Lake remains an acid impaired ecosystem with low probability of recovery in chronically acidified tributaries / catchments

Tributary Watershed Liming

Design and Rationale

Selective in-stream and watershed lime applications to restore habitat for spawning and young-of-year brook trout, macroinvertebrates and forests

Honnedaga Lake Tributaries

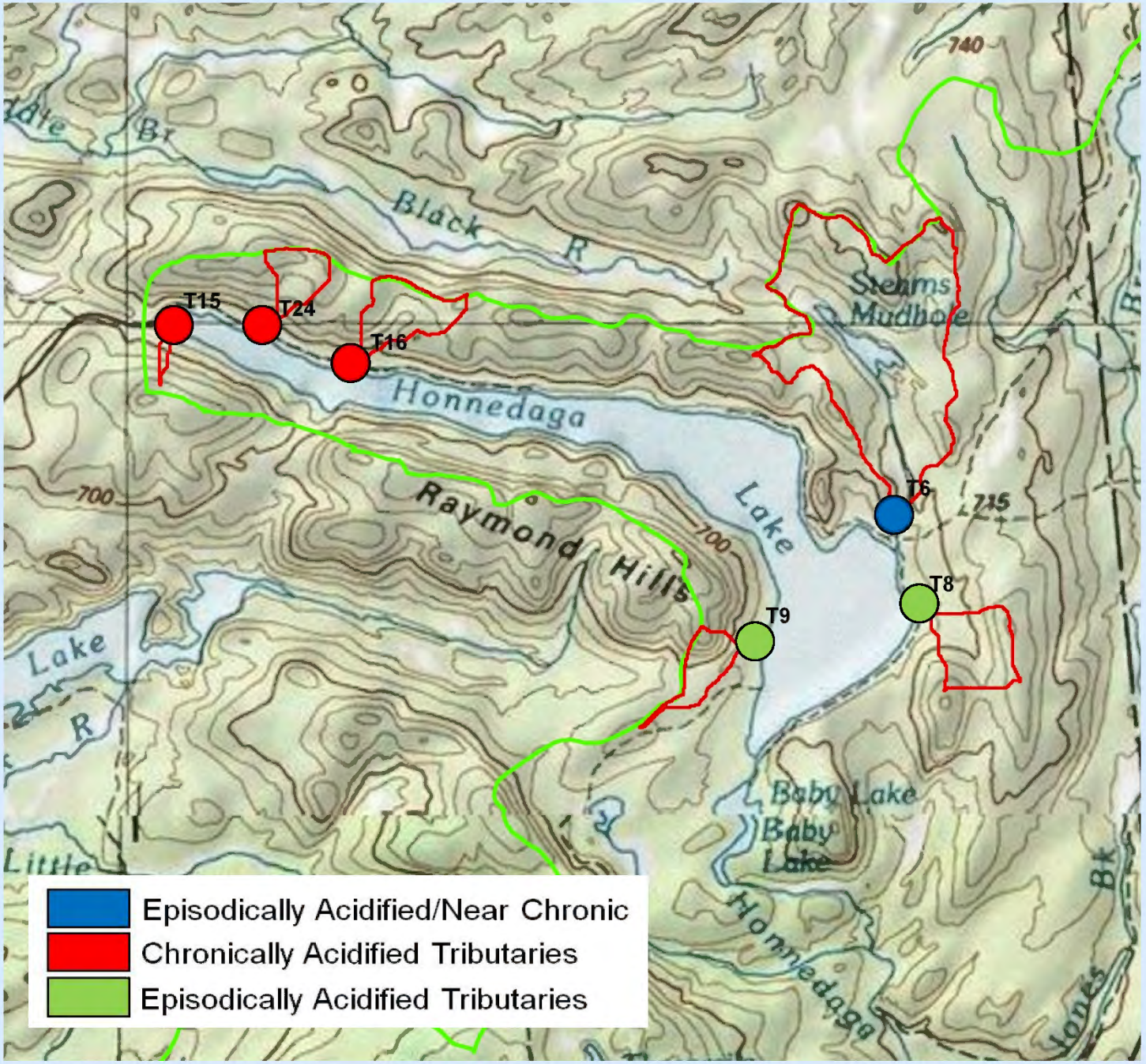
Proposed design for the Honnedaga Lake tributary and watershed liming project:

Chronically Acidified Tributaries

- T24 (control – no lime)
- T15 (instream liming)
- T16 (watershed liming)

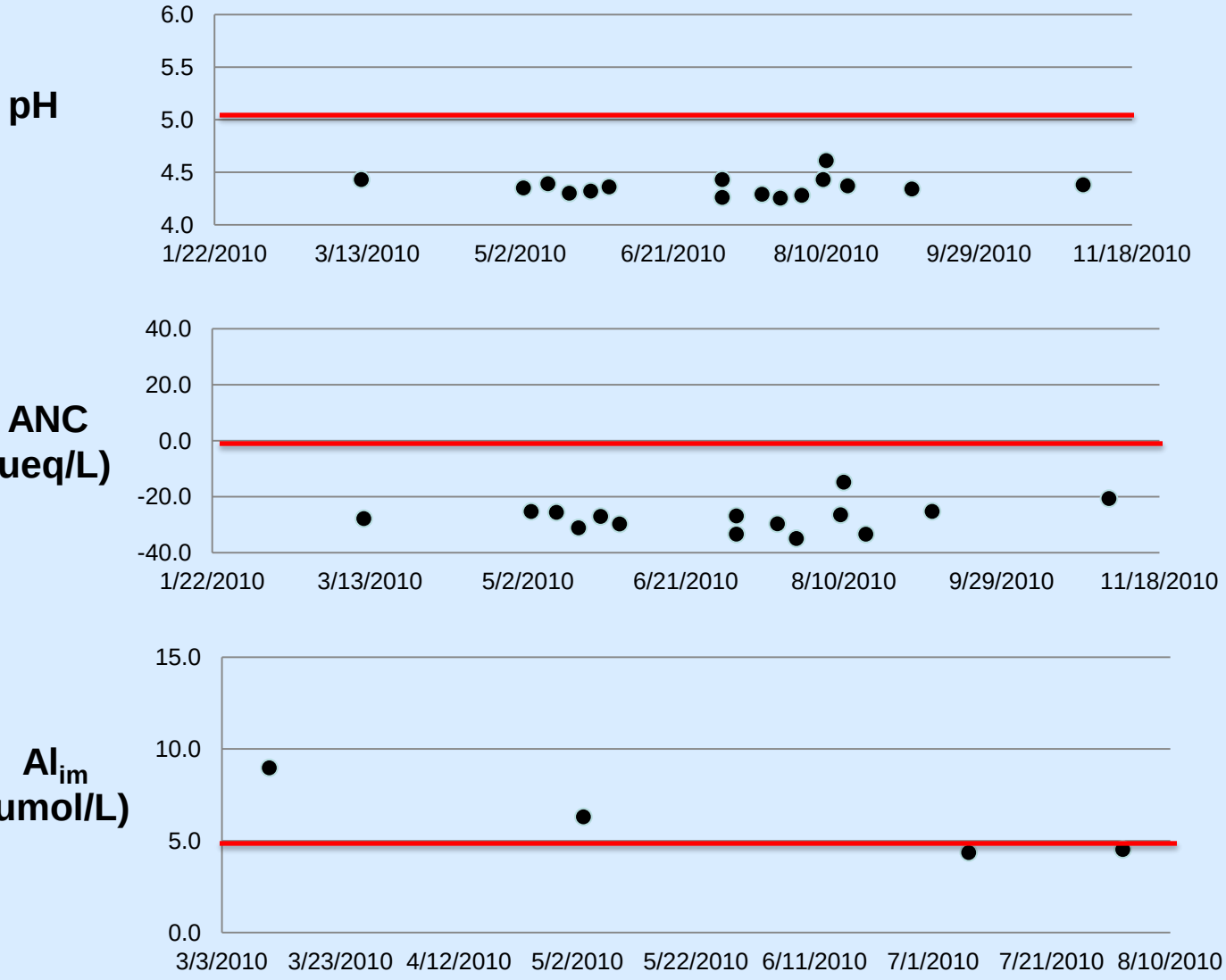
Episodically Acidified Tributaries

- T9 (control – no lime)
- T6 (instream liming)
- T8 (watershed liming)


Black R
Steams Mudhole
T15
T24
T16
Honnedaga Lake
Raymond Hills
T6
T8
T9
Baby Lake
Baby Lake
Honnedaga
740
715
700
700
Episodically Acidified/Near Chronic
Chronically Acidified Tributaries
Episodically Acidified Tributaries

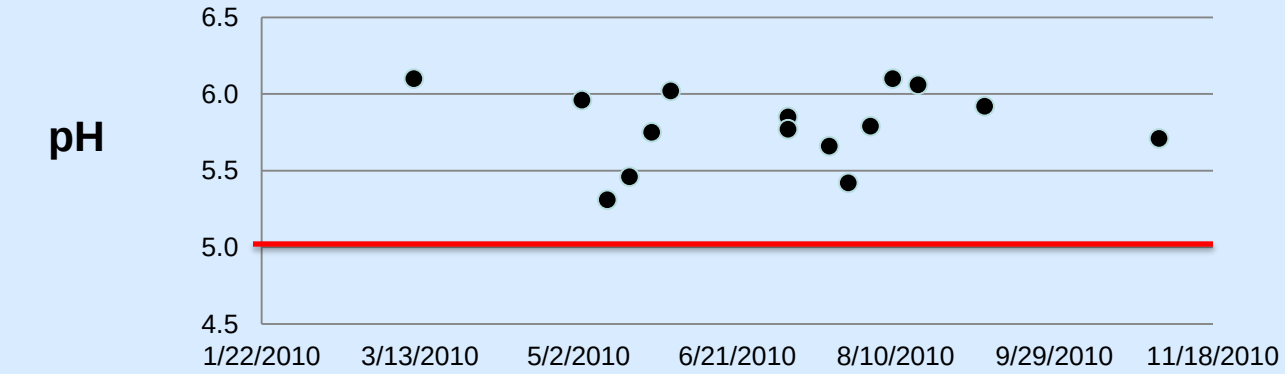
Chronically Acidified Tributaries

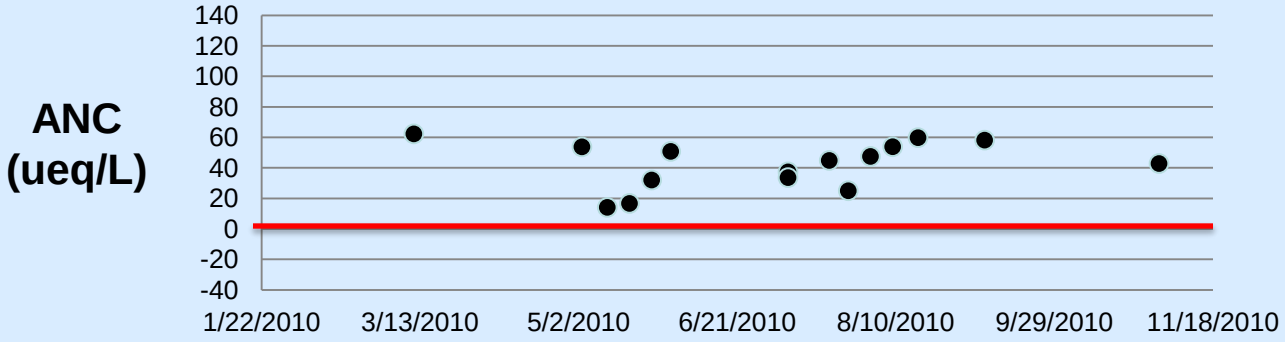
Tributary 16

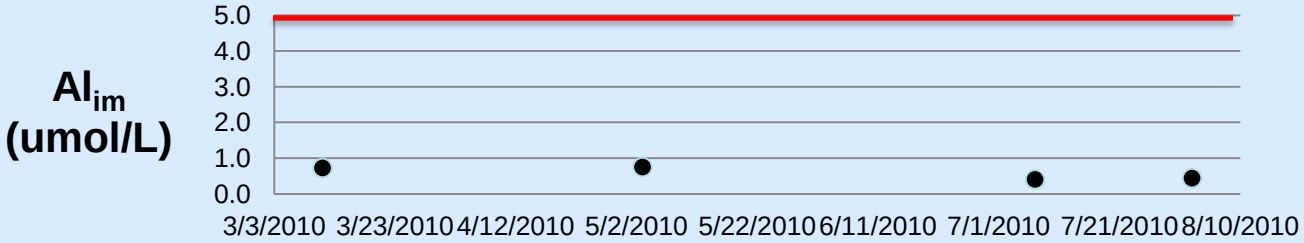


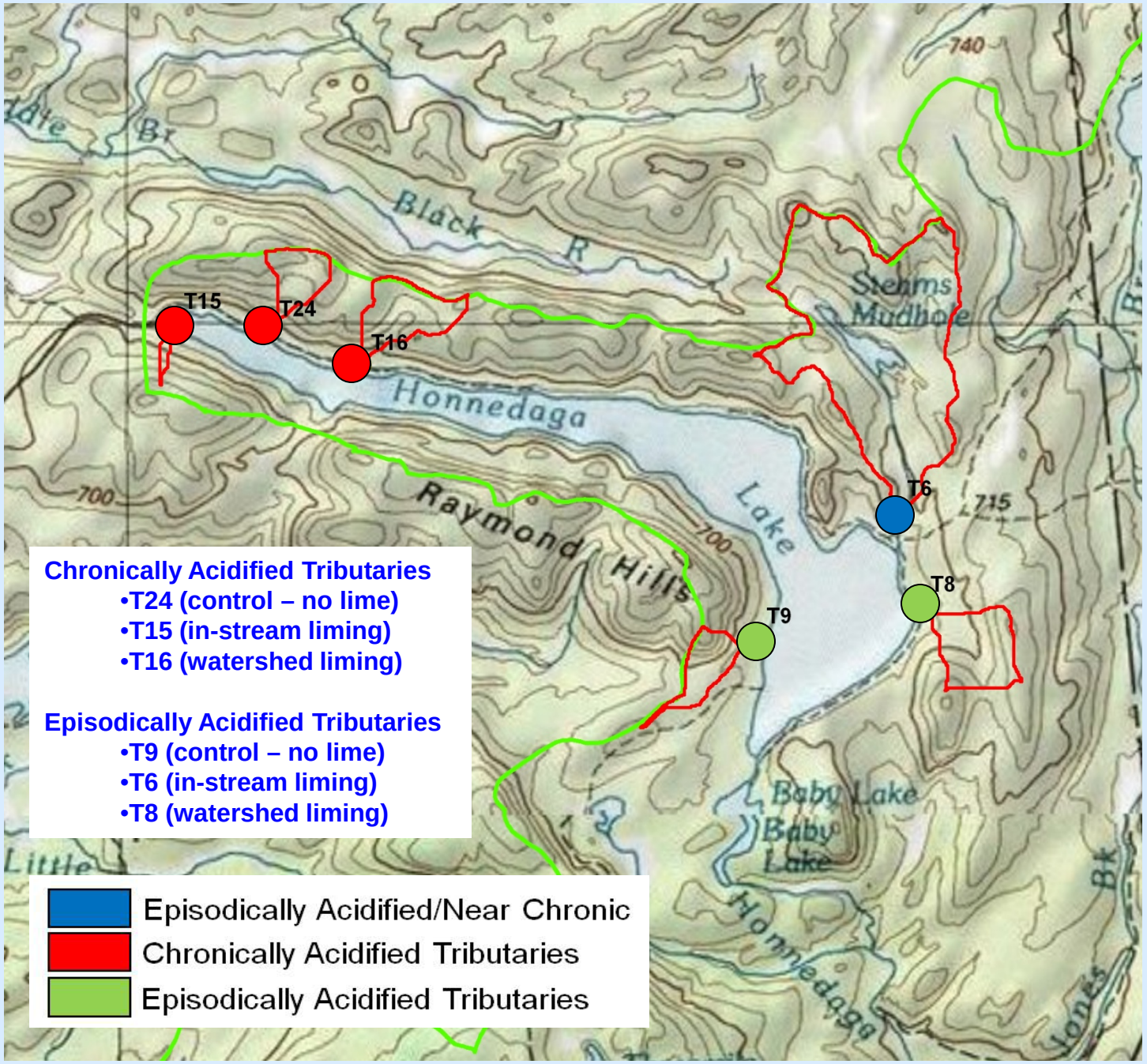
Episodically Acidified Tributaries

Tributary 8








Black R
Honnedaga Lake
Raymond Hills
Stehms Mudhole
Baby Lake
Baby Lake
740
700
700
715
T15
T24
T16
T6
T8
T9
Chronically Acidified Tributaries
•T24 (control – no lime)
•T15 (in-stream liming)
•T16 (watershed liming)
Episodically Acidified Tributaries
•T9 (control – no lime)
•T6 (in-stream liming)
•T8 (watershed liming)
Episodically Acidified/Near Chronic
Chronically Acidified Tributaries
Episodically Acidified Tributaries

Proposed Liming Schedule

In-Stream Lime Applications

Annual applications in June (2012, 2013, 2014)

West Virginia and Clayton Formulas

High calcium sand limestone

T6 (11 tons/yr), T15 (0.5 tons/yr)

Watershed Lime Application

One time application (tentative 2012)

Aerial application of pelletized lime

Amount to be determined for T16 and T8

Tributary Monitoring Program: Pre-Lime and Post-Lime Application

- **Tributary Chemistry and Flow** (stream gages, automated water samplers)
- **Brook Trout Populations** (back pack electro-fishing, redd surveys)
- **Macroinvertebrate Populations**
- **Leaf Litter Decomposition**
- **Forest and Soils**

Tributary Chemistry and Flow

(Stream Gages, Automated Water Samplers)

Anticipated Outcomes from Lime Applications

In-Stream Lime Applications

Improved stream chemistry (⇑ pH, ⇑ ANC, ⇓ Al_{im})

Increased presence and density of YOY brook trout

Increased presence / diversity of macro-invertebrates

Increased leaf litter decomposition rates

Watershed Lime Application

Improved stream chemistry (⇑ pH, ⇑ ANC, ⇓ Al_{im})

Increased presence and density of YOY brook trout

Increased presence / diversity of macro-invertebrates

Increased leaf litter decomposition rates

Improved soil chemistry and forest “health”