

Impacts, Monitoring and Trends in Streams and Lakes

Karen Roy¹, Greg Lawrence², and Charles Driscoll³

¹New York State Department of Environmental Conservation

²US Geological Survey

³Syracuse University



Acknowledgements

Adirondack Lakes Survey Corporation staff

NYSERDA Environmental Monitoring,
Evaluation and Protection program

USEPA Temporally Integrated Monitoring of
Ecosystems and Long Term Monitoring
(TIME/LTM) programs

NYS Department of Environmental
Conservation (Air, FWMR, LF)

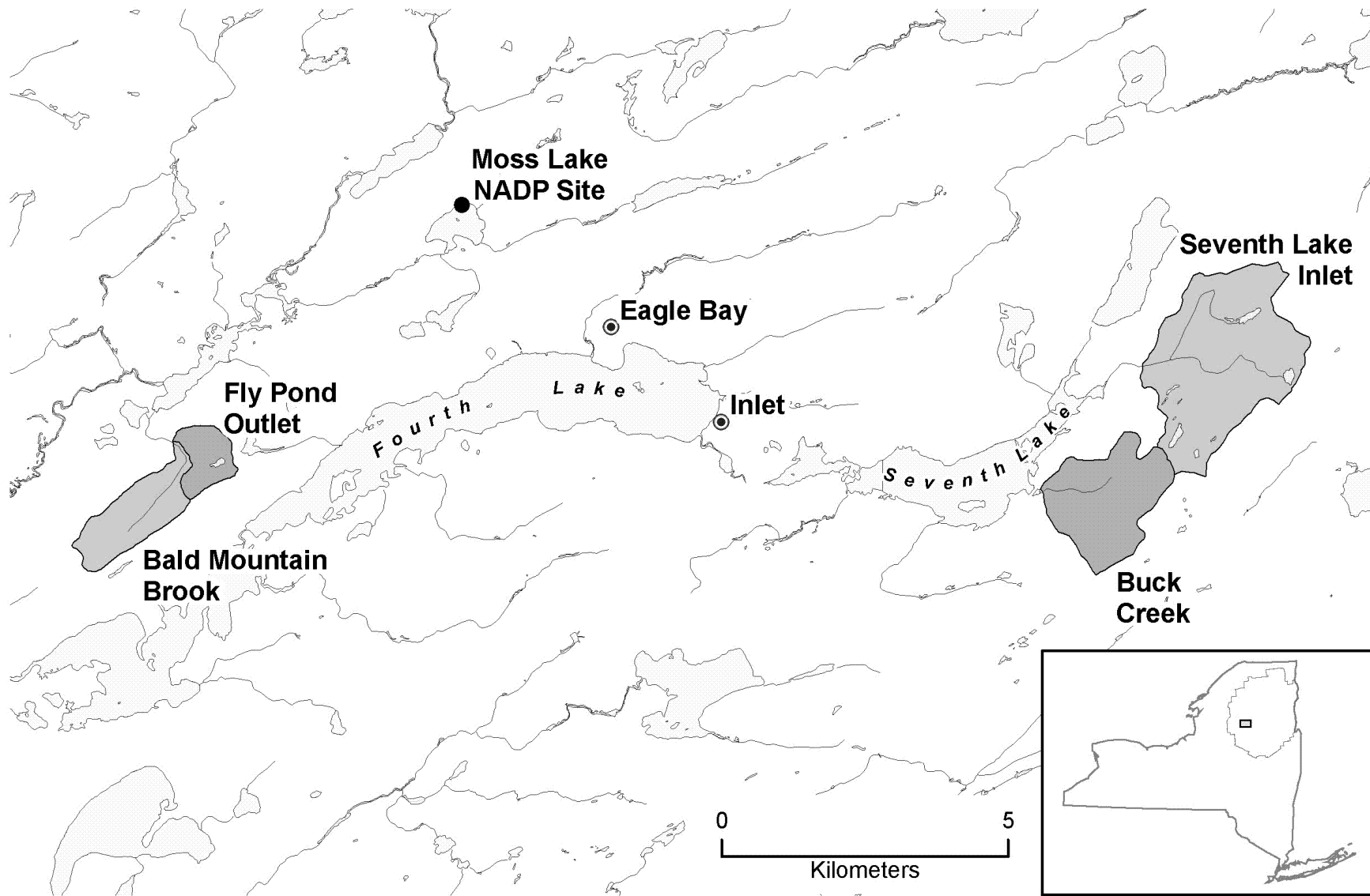
Special thanks to Art Bulger (Univ. Virginia)



Outline

- Streams
- Trends in LTM lakes
- TIME lakes
- Fisheries survey results

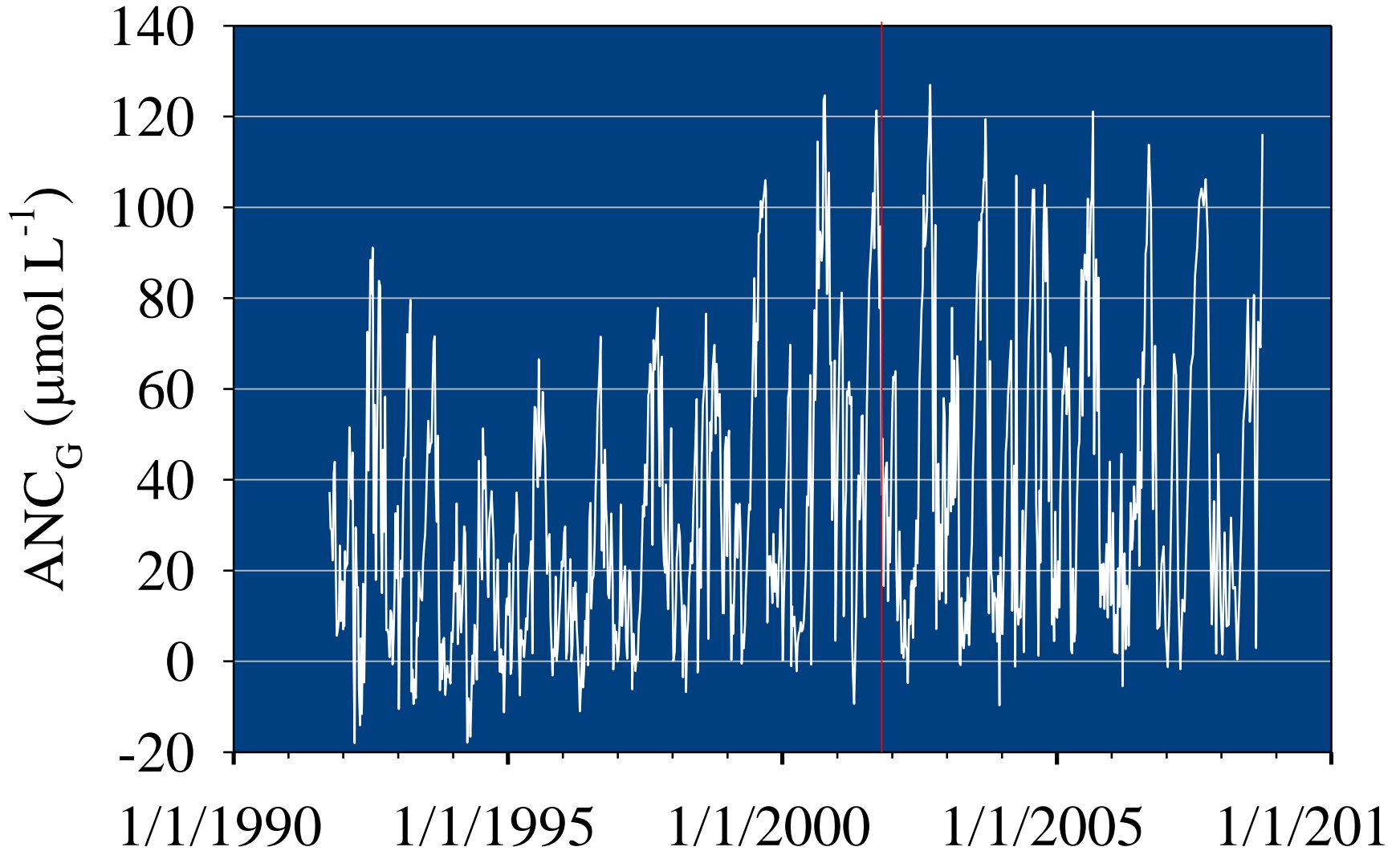




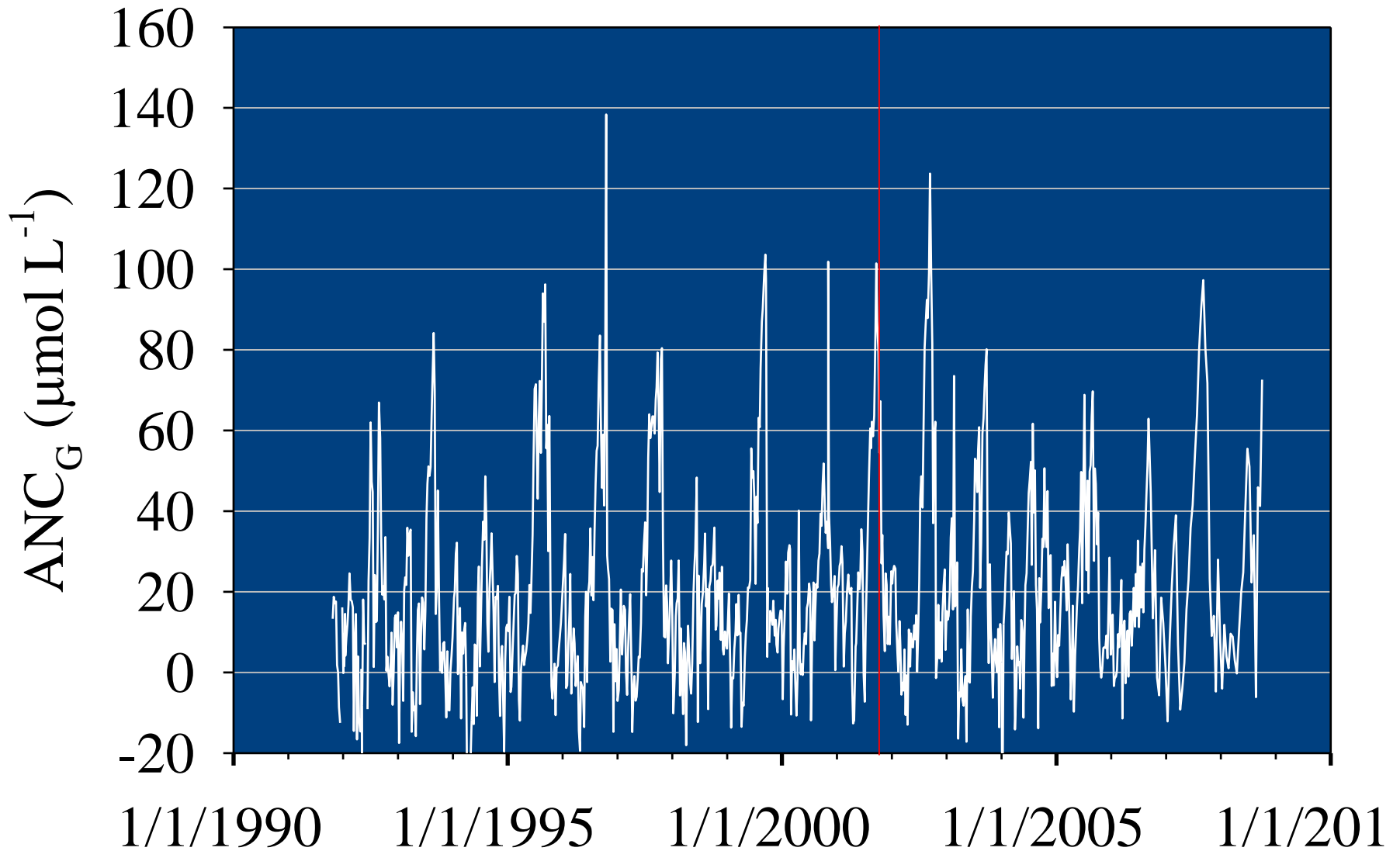
**1988 Episodic Response Project – 4 Adirondack streams
Buck Creek, Bald Mountain Brook continued**



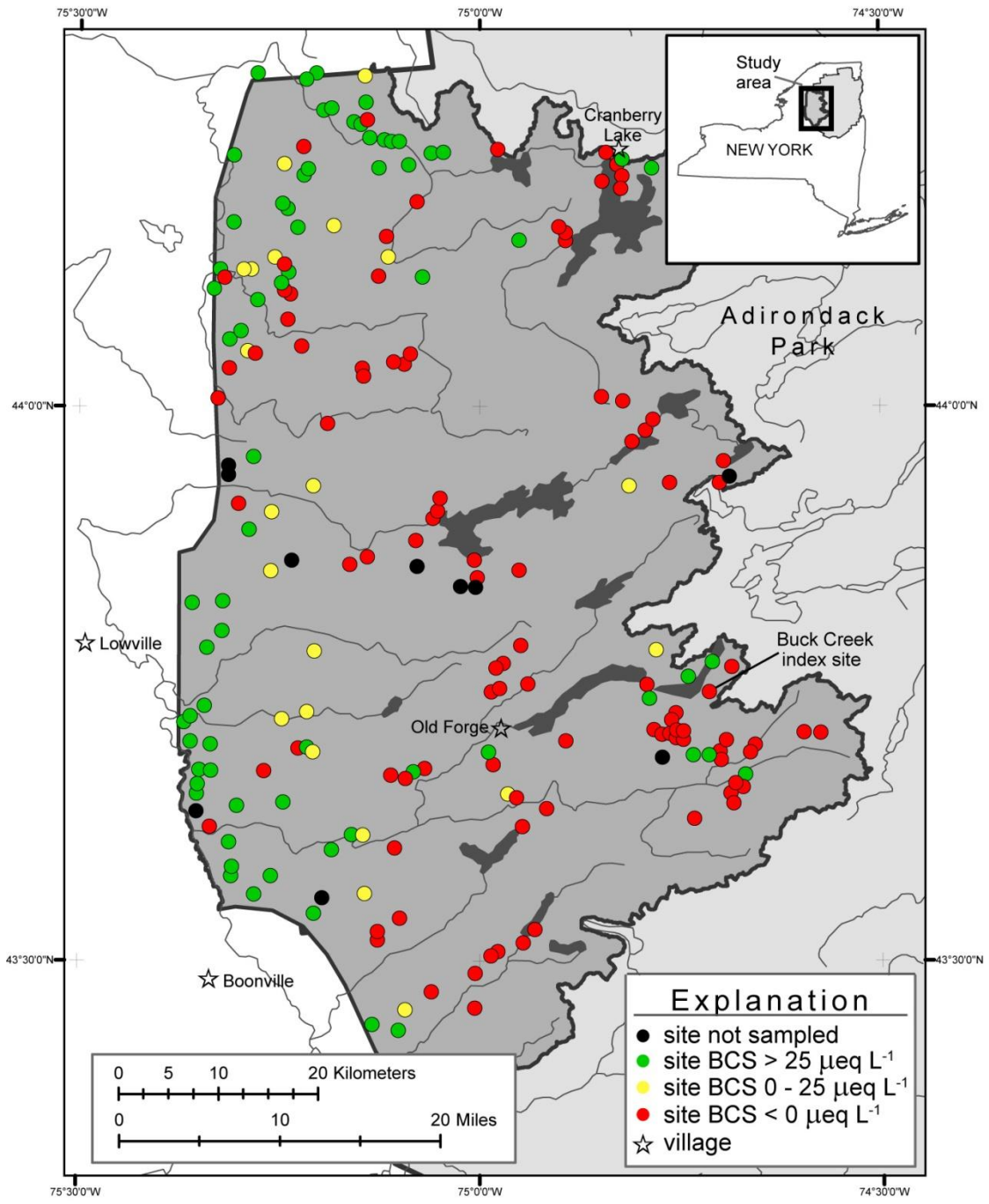
Bald Mountain Brook Adirondack Region, NY



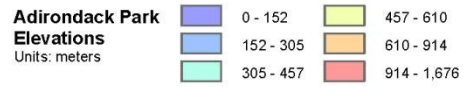
Buck Creek, Western Adirondack Region



March 29-31,
2004



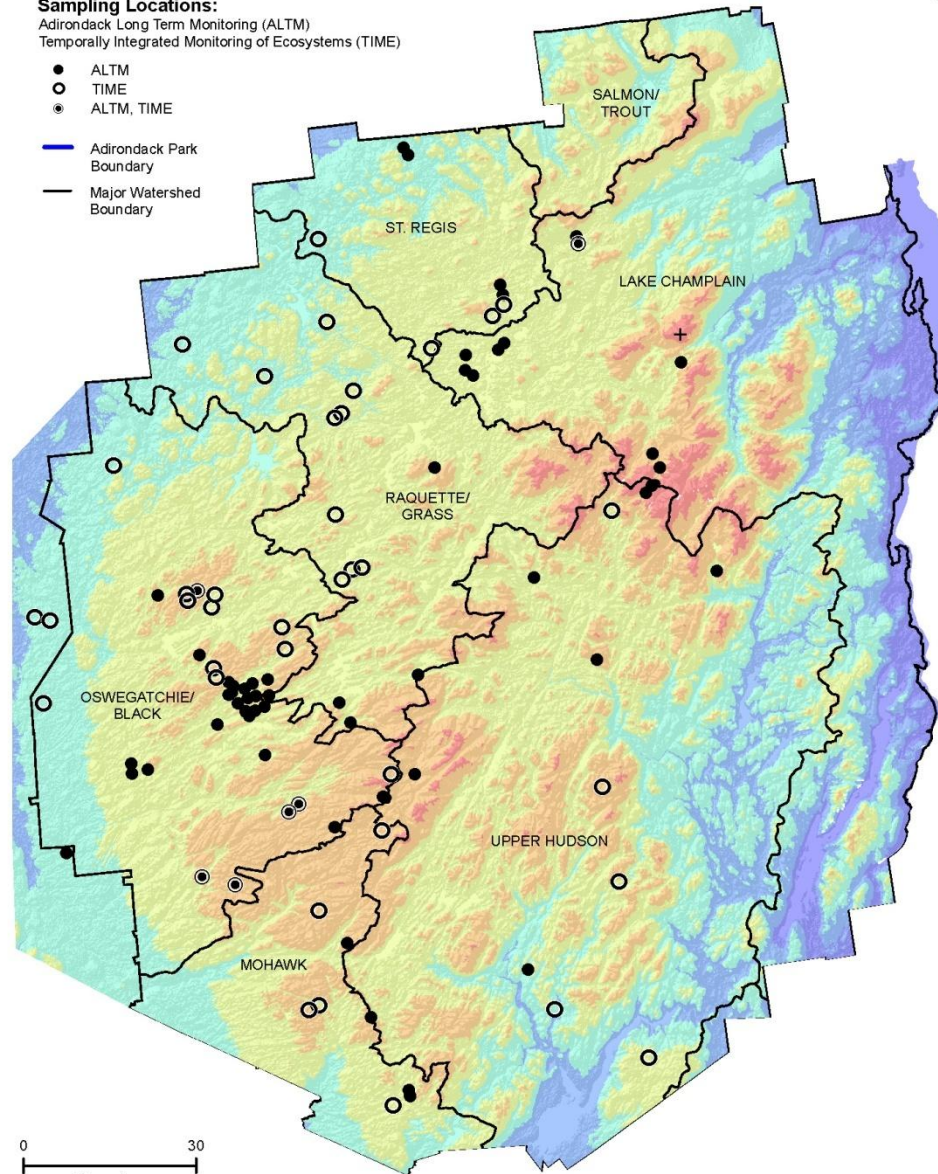
ALTM, TIME SAMPLE LOCATION DISTRIBUTION



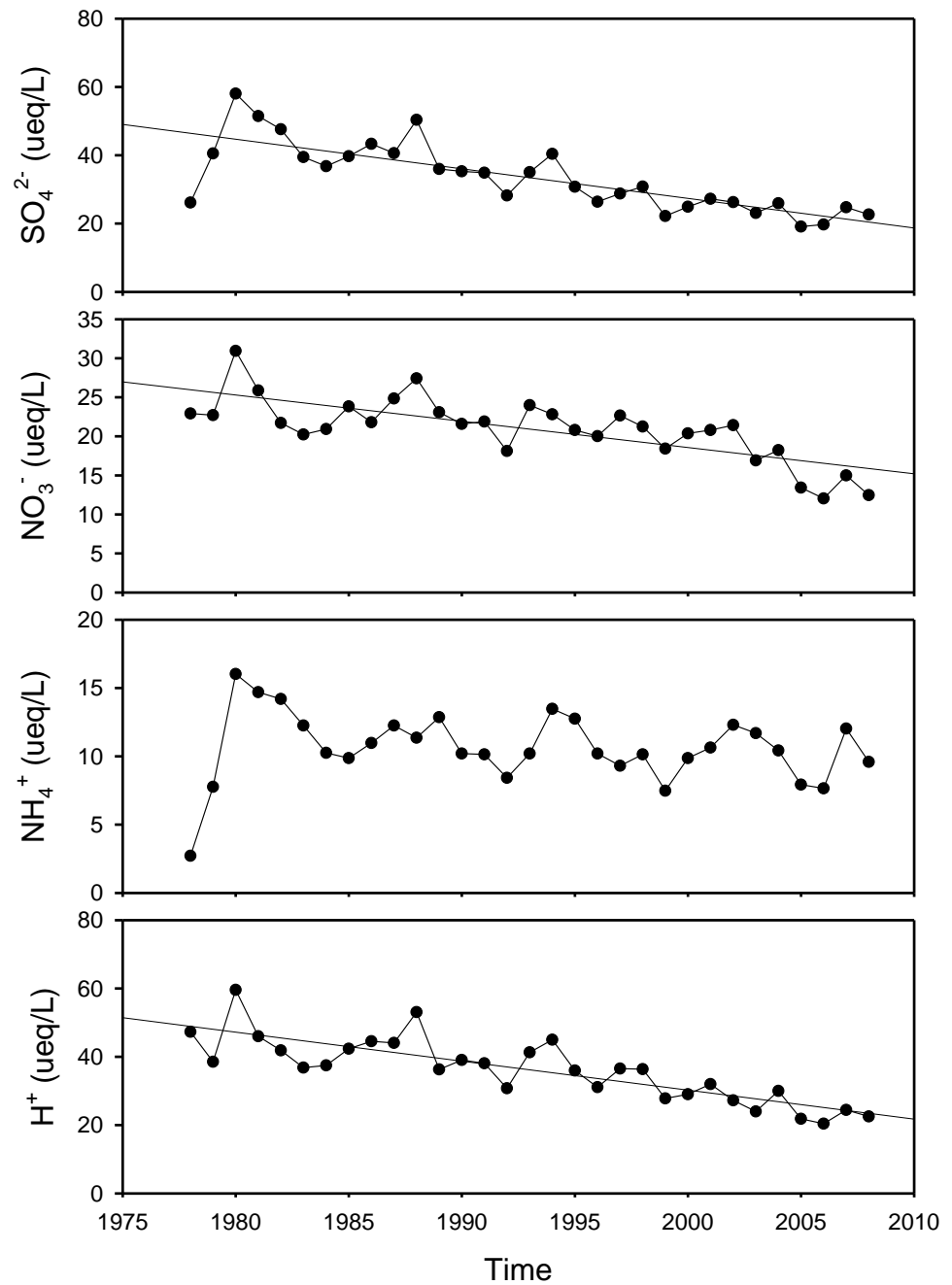
Sampling Locations:
Adirondack Long Term Monitoring (ALTM)
Temporally Integrated Monitoring of Ecosystems (TIME)

- ALTM
- TIME
- TIME

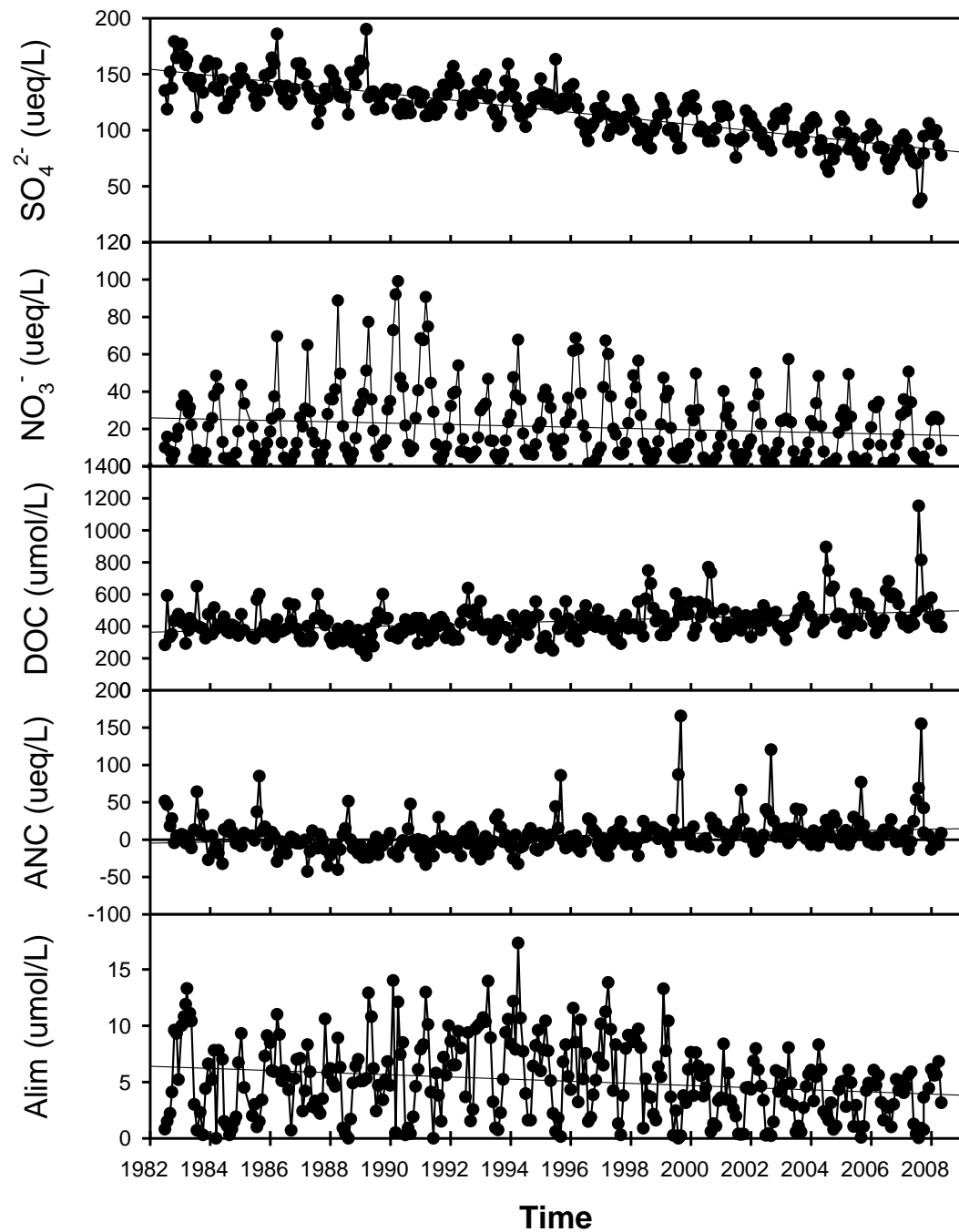
- Adirondack Park Boundary
- Major Watershed Boundary



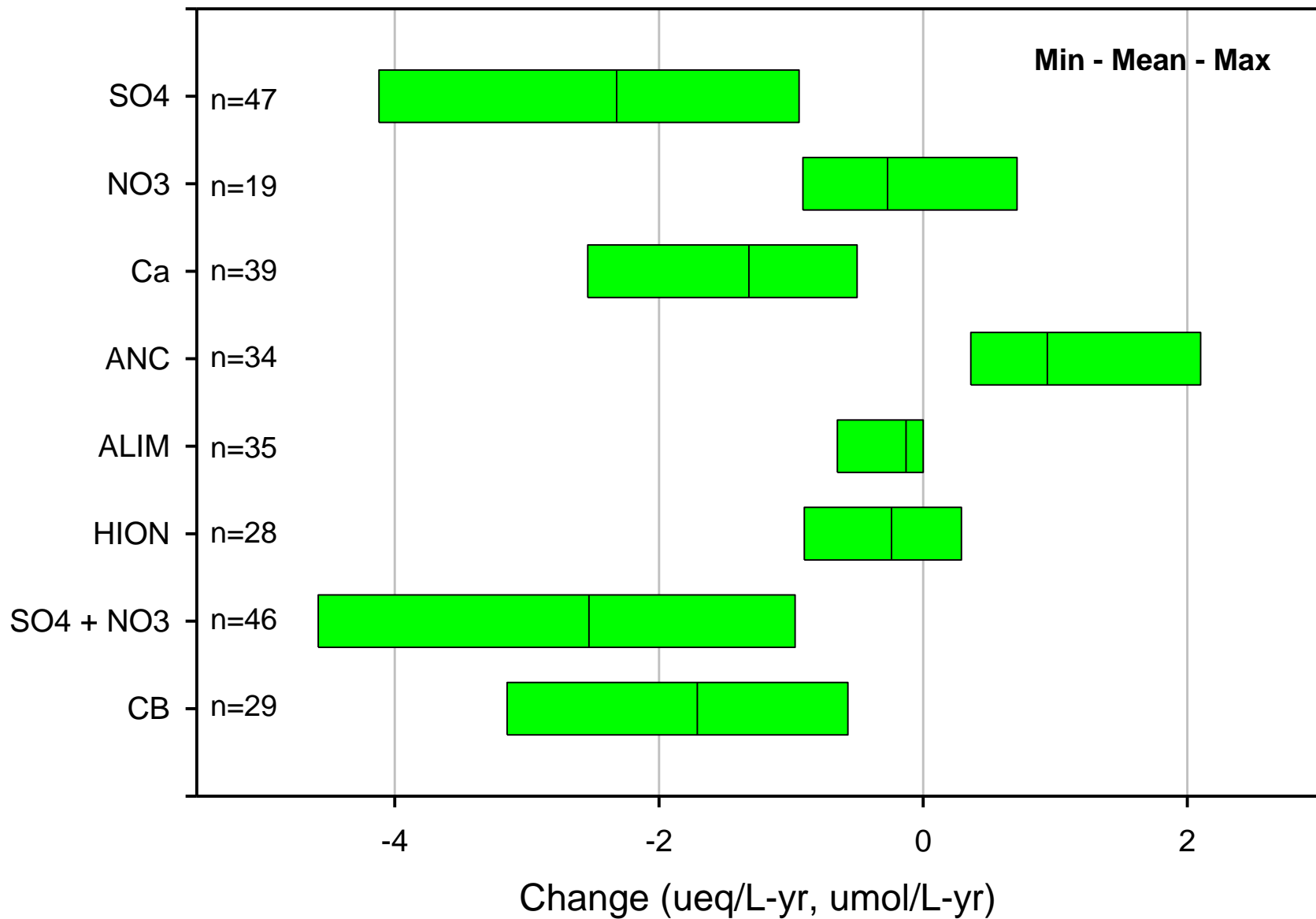
Precipitation trends at NADP Huntington Forest 1979-2008



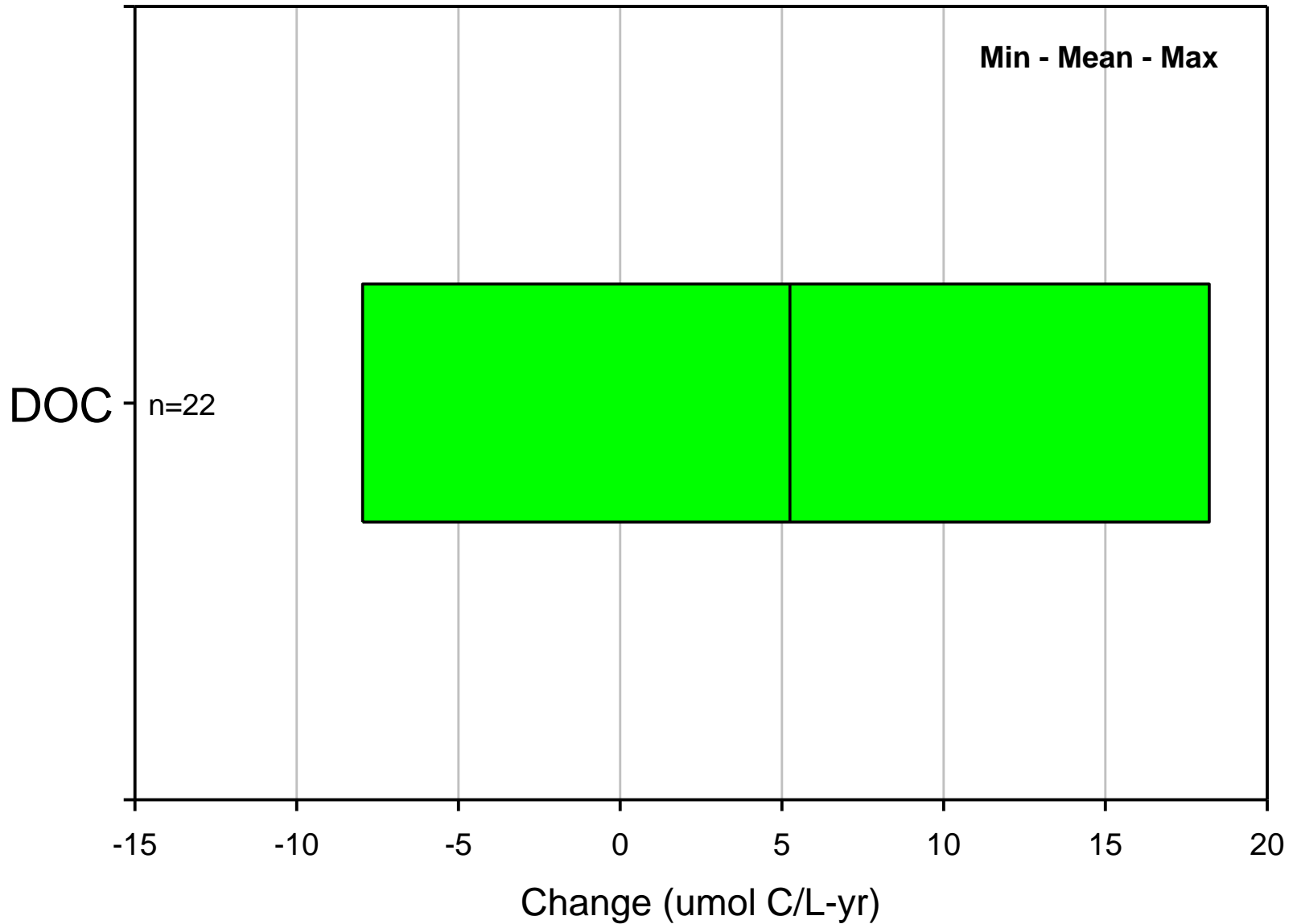
Constable Pond

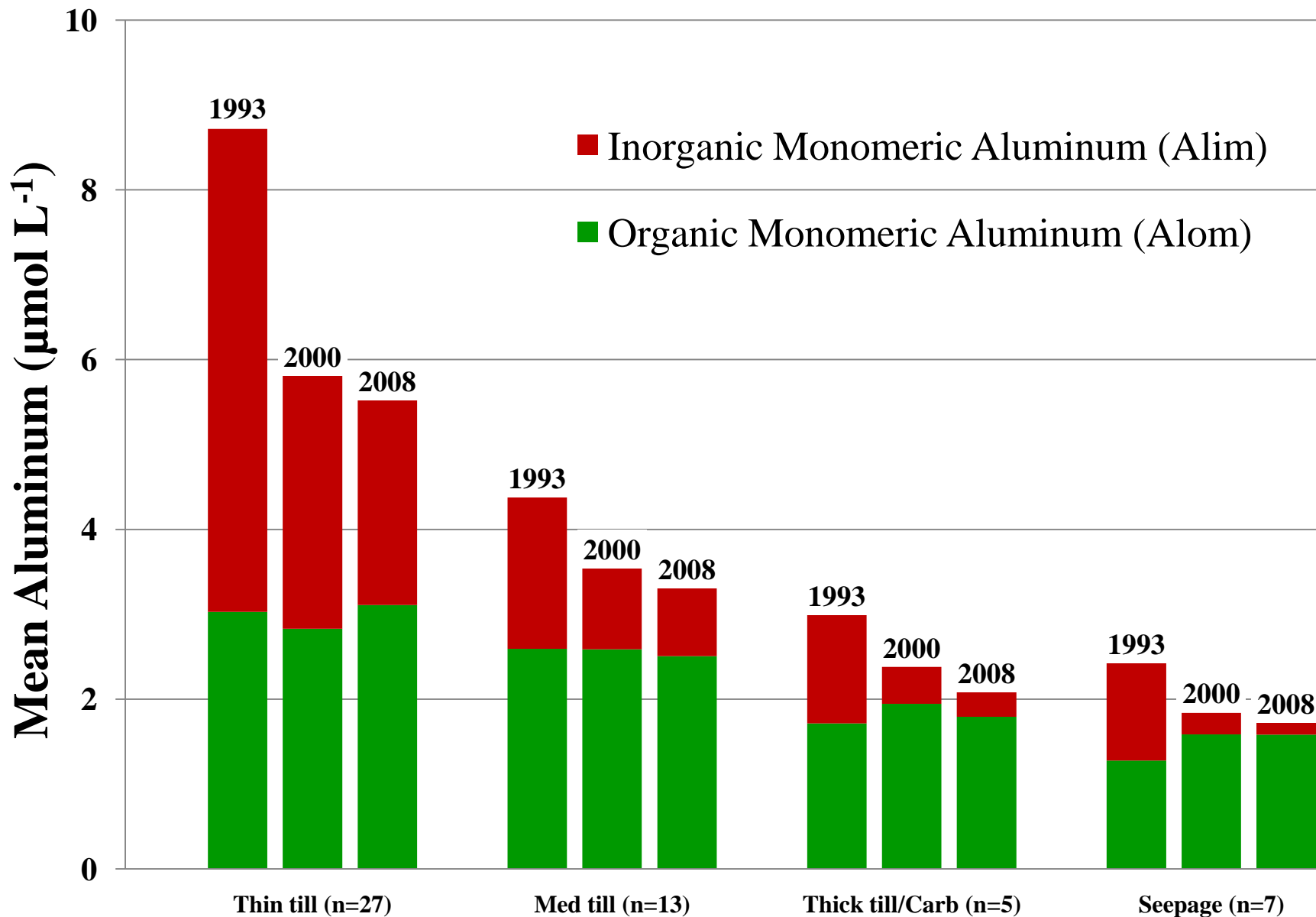


48 Long Term Monitoring Lakes 1992-2008



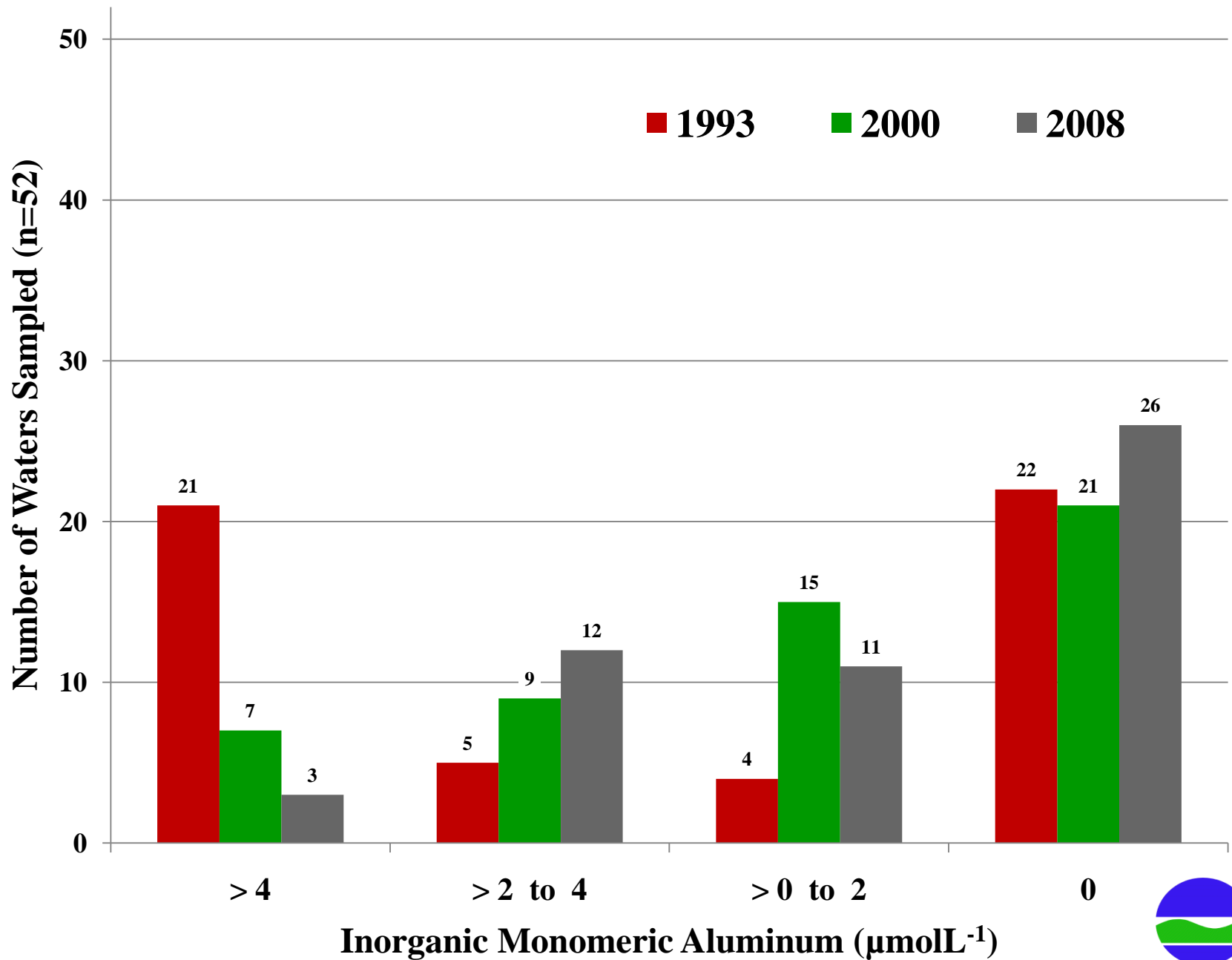
48 Long Term Monitoring Lakes 1992-2008

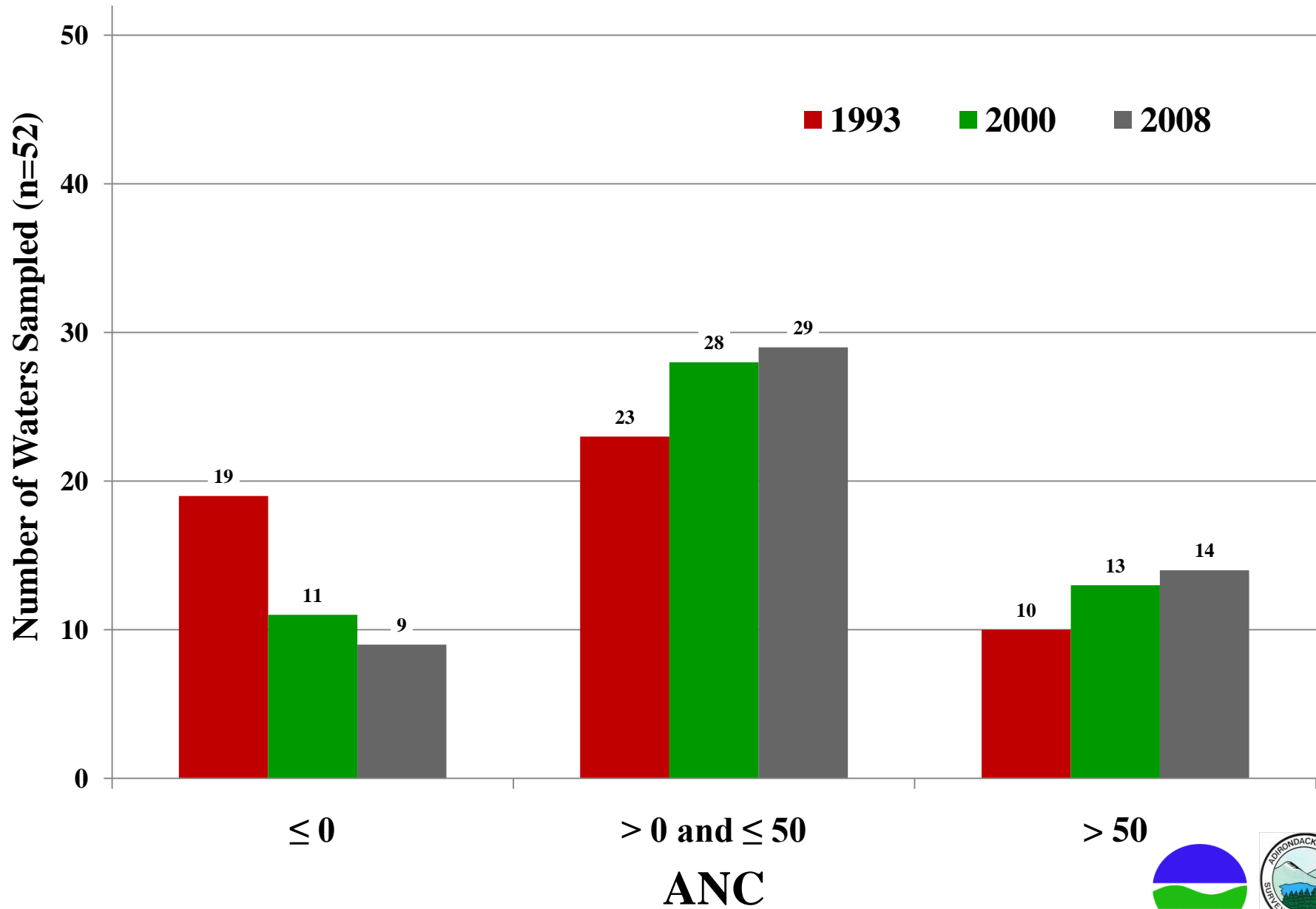




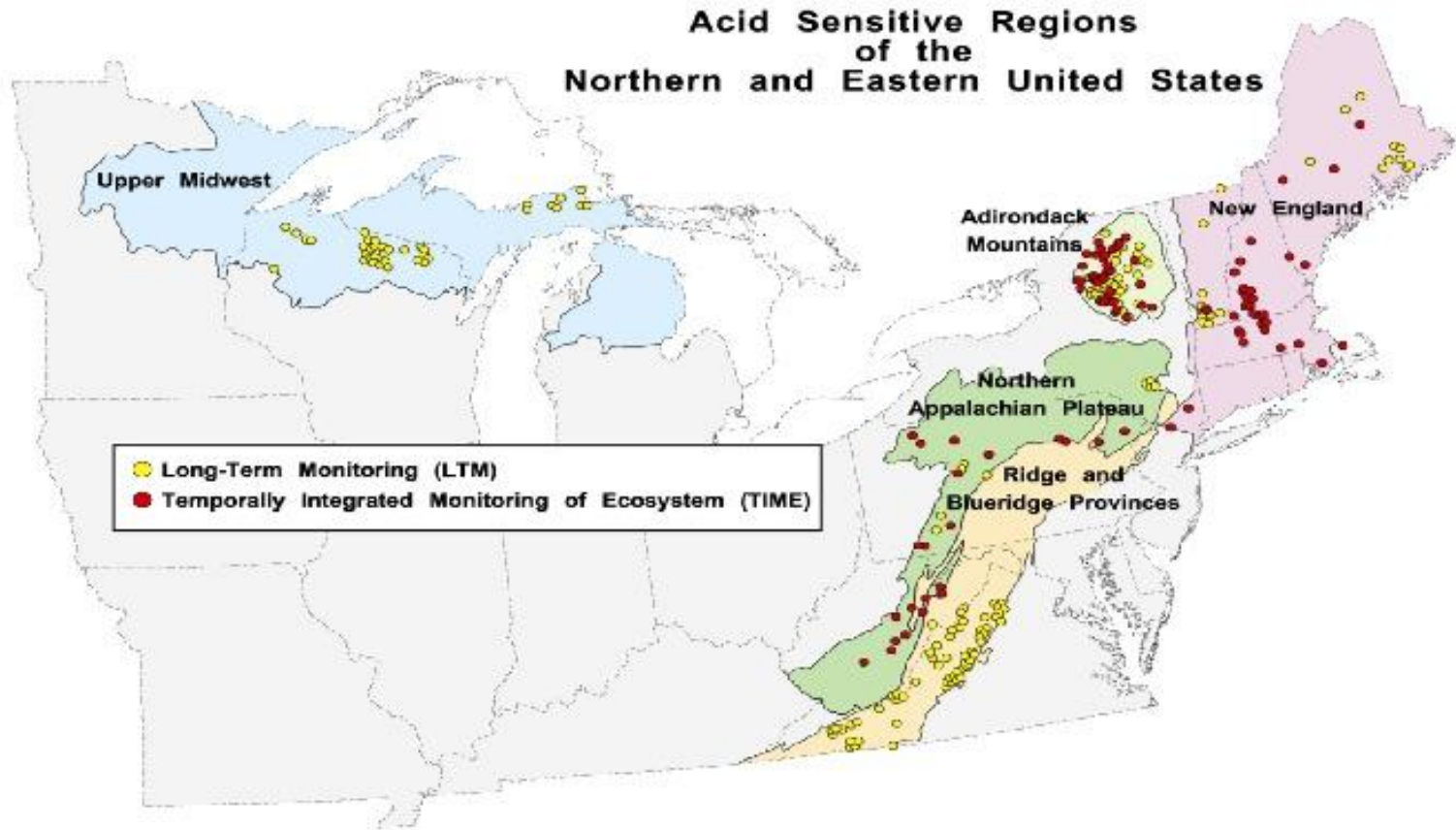
Adirondack LTM Lake Type (n = 52)







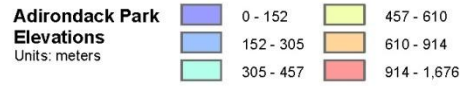
EPA Regional Lake Surveys



Adirondack Lakes Survey Corporation
©2007



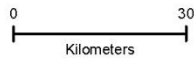
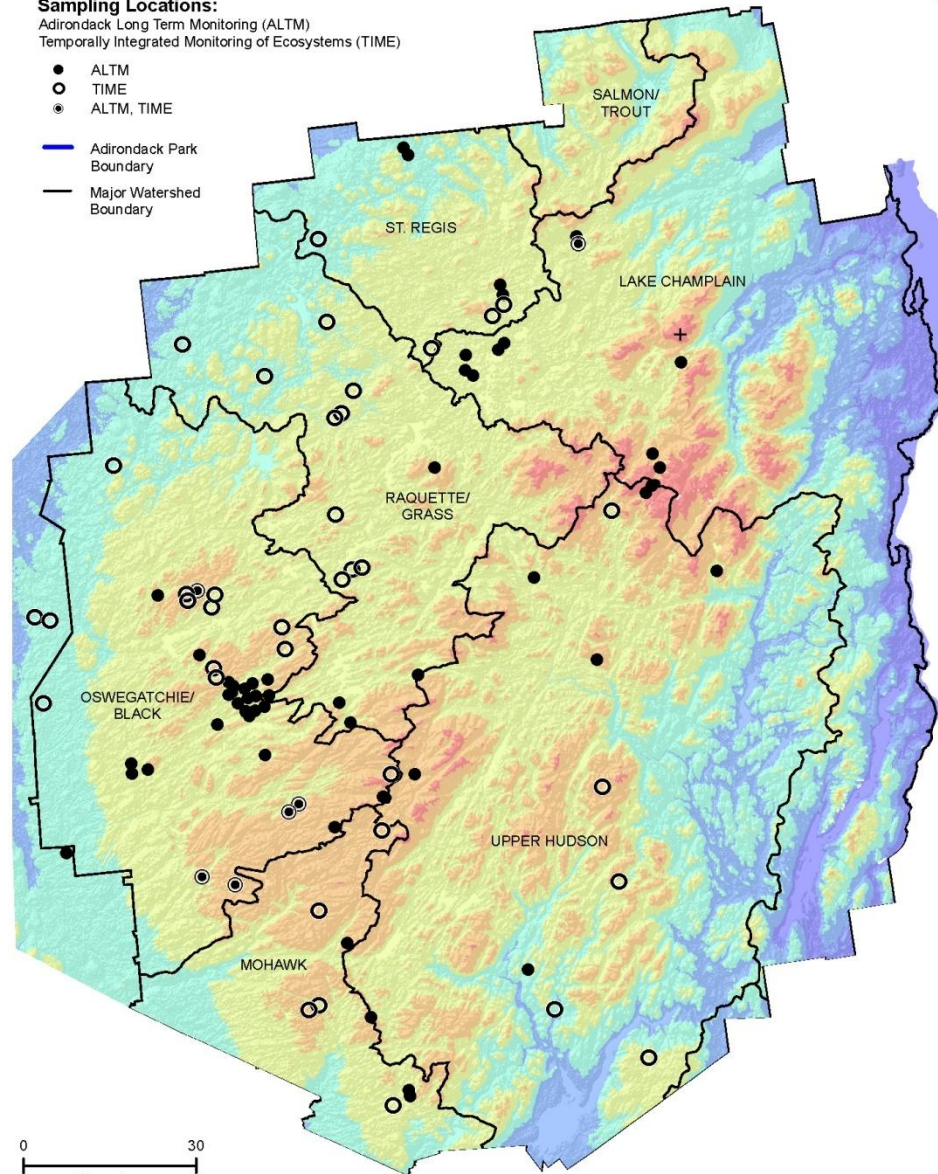
ALTM, TIME SAMPLE LOCATION DISTRIBUTION



Sampling Locations:
Adirondack Long Term Monitoring (ALTM)
Temporally Integrated Monitoring of Ecosystems (TIME)

- ALTM
- TIME
- TIME

- Adirondack Park Boundary
- Major Watershed Boundary



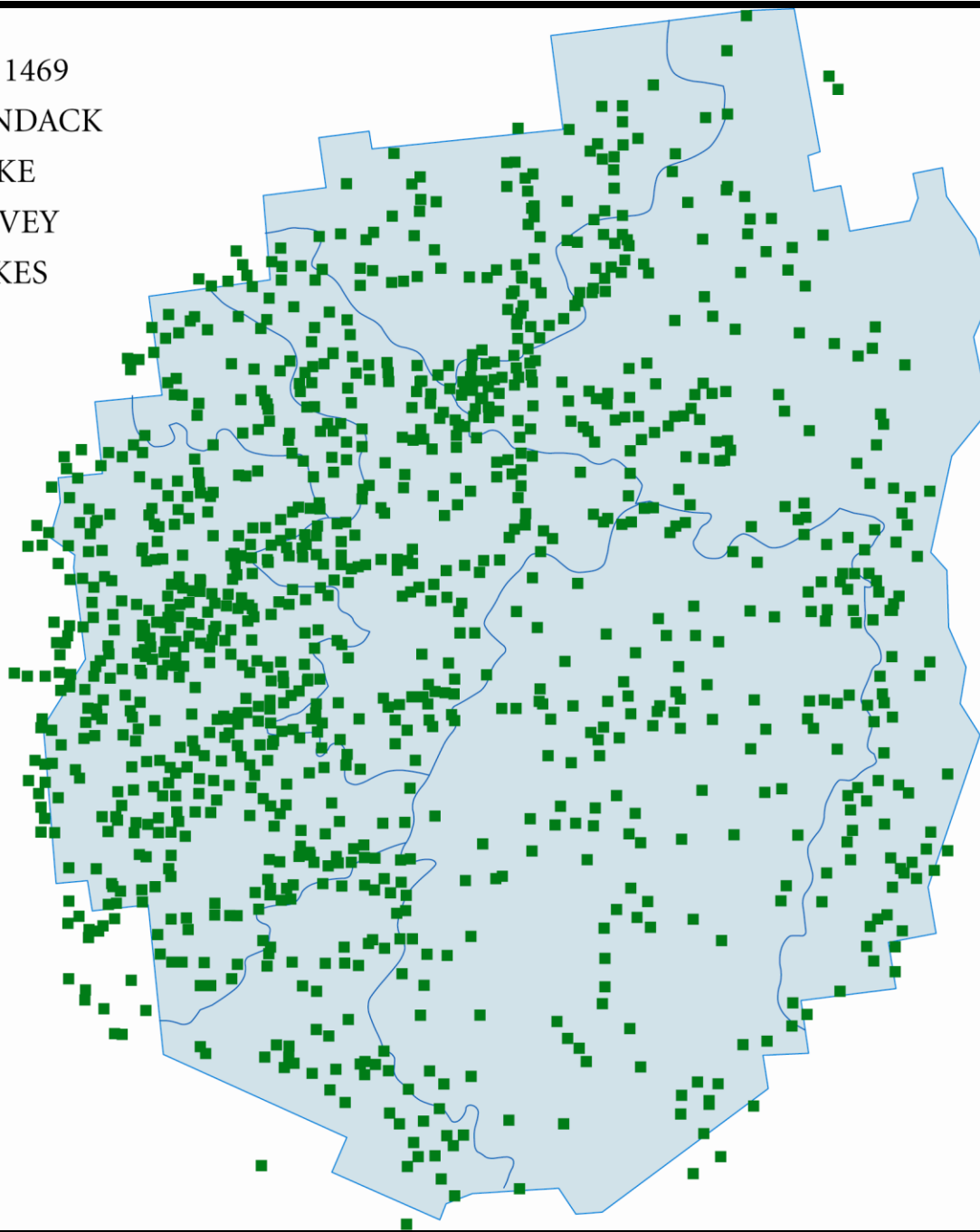


Adirondack Lake Survey Corporation

POND # 240735 DATE: 8/5/16
POND NAME: L. 240735
SIZE CLASS: 240 197
SAMPLER: _____ 79



THE 1469
ADIRONDACK
LAKE
SURVEY
LAKES



Fish population changes (n=42)

Period of Study	All lakes	Median*	Mean*	Maximum*
1984 - 1987	141	3	3.36	10
1995 - 2005	169	4	4.02	12
Change	+28	+1	< 1	+2
*per lake				



Fish species change between surveys by response category.

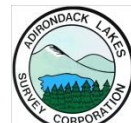
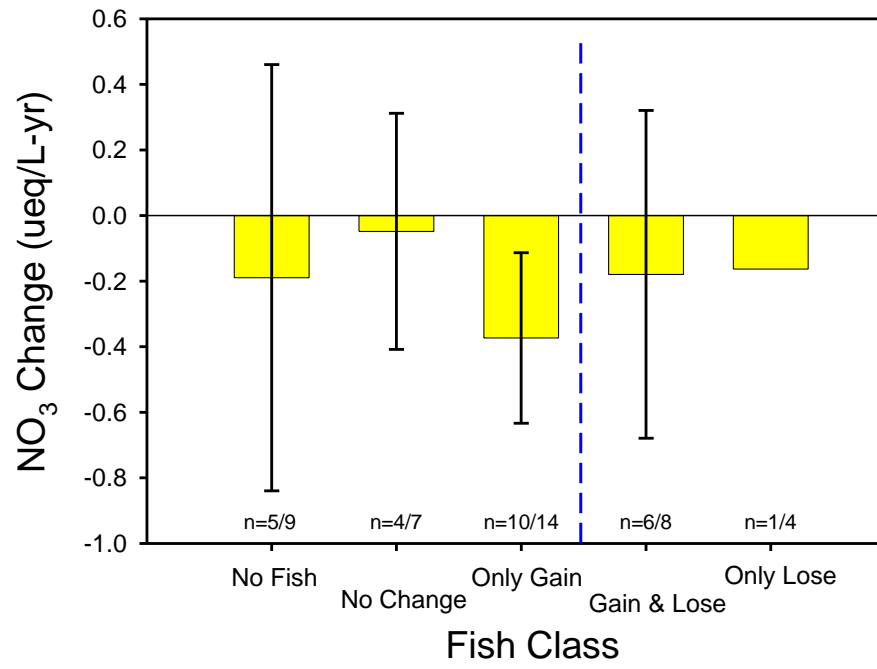
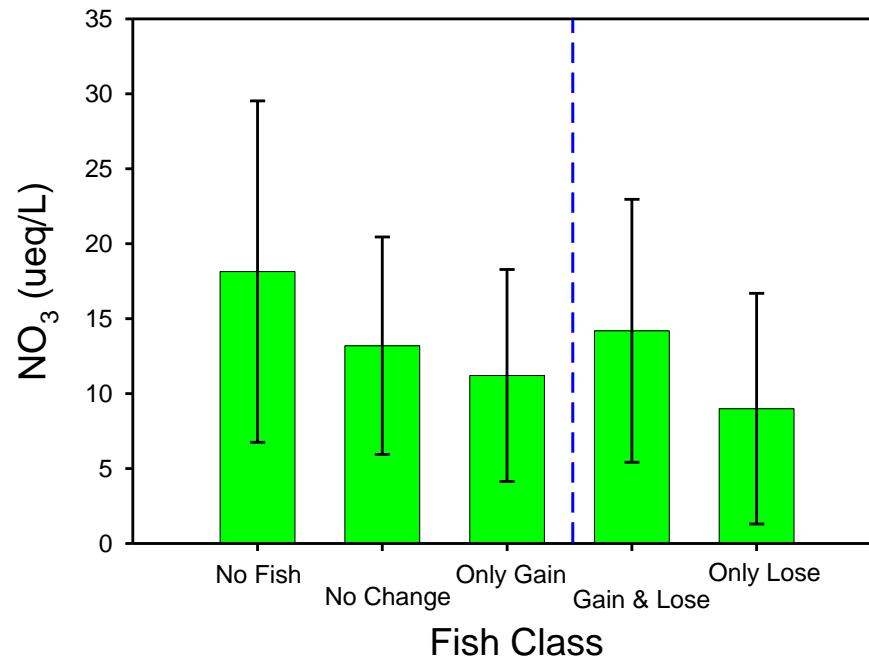
	n	Total species mean	Species change net	Species change ranges	pH median
No fish					
1984-1987	9	0		0	4.71
1994-2005		0	0	0	4.64
No change					
1984-1987	7	1.71		1-4	5.06
1994-2005		1.71	0	1-4	5.29
Gain only					
1984-1987	14	4.3		1-4	5.75
1994-2005		6.2	+1.9	1-4	6.07
Lost only					
1984-1987	4	3.00		1-2	6.34
1994-2005		1.75	-1.25	1-2	6.26
Gain/lost					
1984-1987	8	7.13		(+) 1-4	6.22
1994-2005		7.88	+0.9	(-) 1-4	6.45

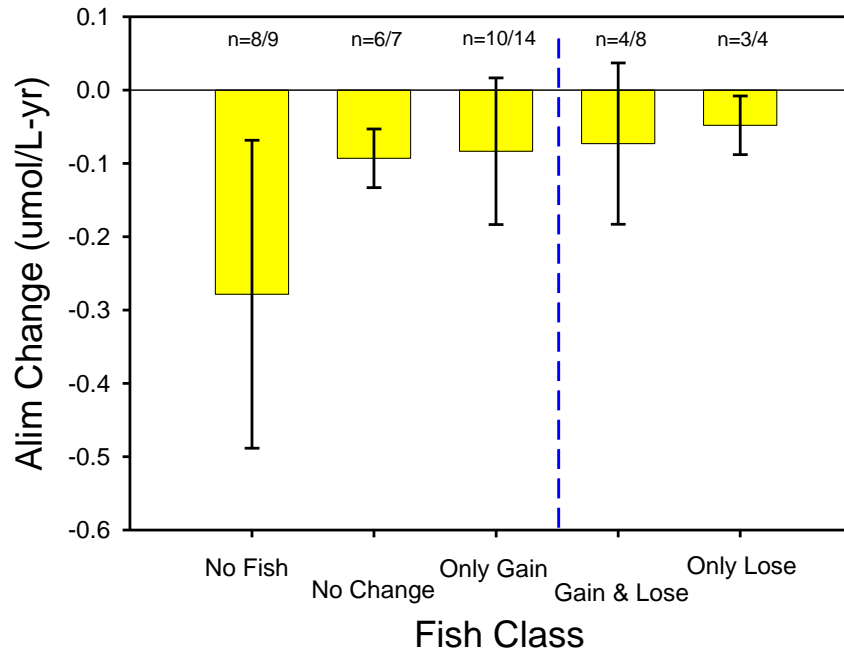
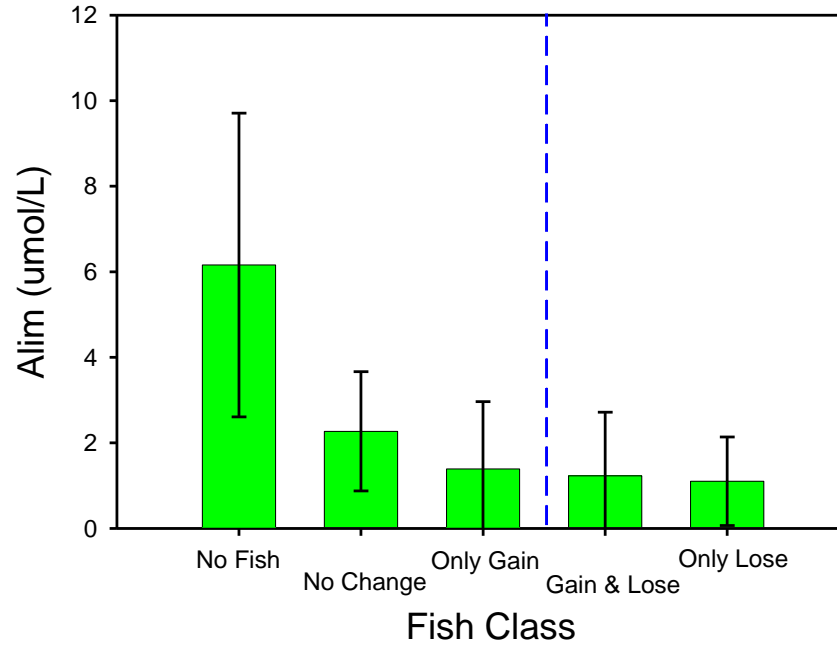


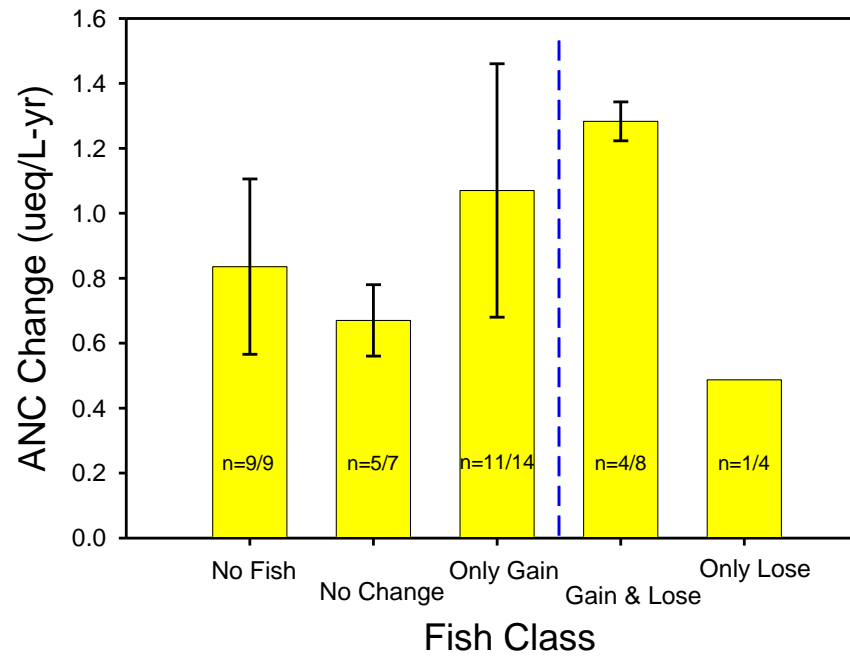
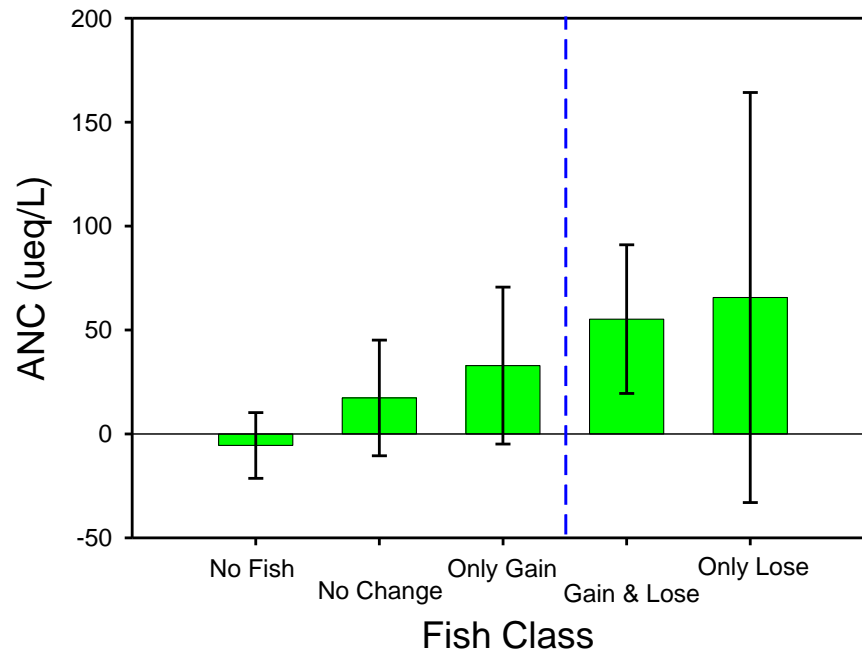
Changes in Fish in Adirondack Lakes (n=42)

				Species Richness		
Category	n	Median pH	Volume (10 ⁴ m ³)	1984-87	1994-2005	Δ
No fish	9	4.7 – 4.6	46	0	0	0
No change	7	5.1 - 5.3	100	1.7	1.7	0
Only gained	14	5.5 - 5.7	198	4.3	6.2	+1.9
Only lost	4	6.3 - 6.3	56	3.0	1.75	-1.25
Gained and lost	8	6.2 - 6.5	350	7.1	7.9	+0.9









Populations of potential indicator minnows found in both surveys.

Species	ALS	ALS	ALS	This study		
	Sensitive Minnows	Minimum pH	Total lakes (%) of all 1469 lakes	1984 - 1987	1995 - 2005	
Common Shiner	x	4.86	156	x	6	9
Pearl Dace	x	5.46	58	x	1	0
Blacknose Dace	x	5.59	47	x	1	4
Longnose Sucker	x	5.60	9	x	1	1
Fallfish	x	6.12	29 (2%)	x	0	1
Finescale Dace	x	6.54	2 (<1%)			
Fathead Minnow	x	6.32	40 (3%)	x	0	2
Cutlips Minnow	x	6.61	11 (<1%)	x	1	1
Bluntnose Minnow	x	6.62	46 (3%)	x	1	1
Brassy Minnow	x	6.84	3 (<1%)			
Bridle Shiner	x	6.91	3 (<1%)			
Mimic Shiner	x	6.92	1 (<1%)			
Eastern Silvery Minnow	x	7.08	1 (<1%)			

Note: Highlighted species are more pH sensitive; **bold** are more commonly occurring and are potential indicator species.



Fish survey findings

- There are signs of response/recovery in fish species number in some ALTM lakes over the 14 year interval (1984-87 and 1994-2005);
- The response is modest and mixed, and generally consistent with chemistry trends (ANC, NO_3 and Al_{im});
- The greatest species gains occurred in moderately sized lakes with pH 5.5 – 6.0;
- Fish community sensitivity indices were created along with possible sensitive minnow indicators (fallfish, fathead minnow and bluntnose minnow);
- The majority of lakes are still below critical chemistry indicators (e.g. ANC less than $50 \mu\text{eq/L}$);
- Resurveys continuing with a 3rd round 2008-2012.



Overall streams and lakes

- Stream ANC improvements (1991-2001) do not appear to be continuing at Bald Mountain Brook;
- Buck Creek ANC patterns unchanged;
- Western Adirondack Stream survey (2003-2005) found chemistry status critical; survey of East/Central Adirondacks to begin 2010;
- Lake chemistry improvements continuing but slowing; increasing DOC;
- ANC levels are decreasing in 65% of lakes, but 73% of all lakes remain below 50 $\mu\text{eq/L}$ average annual.
- Toxic inorganic monomeric aluminum levels are decreasing across all lake types but are still high ($> 2 \mu\text{mol/L}$) in 27% of ALTM lakes;
- What will the TIME lakes chemistry show?





www.adirondacklakesurvey.org

