Oswegatchie-Black Stream Survey 2003-2005

NYSERDA

EMEP
Environmental Monitoring, Evaluation, & Protection

USGS
science for a changing world

Adirondack Lakes Survey Corporation

Department of Environmental Conservation
New York State

The University of Texas at Arlington

Rensselaer

Project Investigators

- Greg Lawrence, *U.S. Geological Survey*
- Karen Roy, Sue Capone, *NYS DEC/Adirondack Lake Survey Corporation*
- Howard Simonin, *NYS DEC, Fish, Wildlife and Marine Res.*
- Barry Baldigo, *U.S. Geological Survey*
- Sophia Passy, *University of Texas at Arlington*
- Robert Bode et al., *NYS DEC Stream Biomonitoring Unit*

Adirondack Effects Assessment Program (AEAP) Colloborators

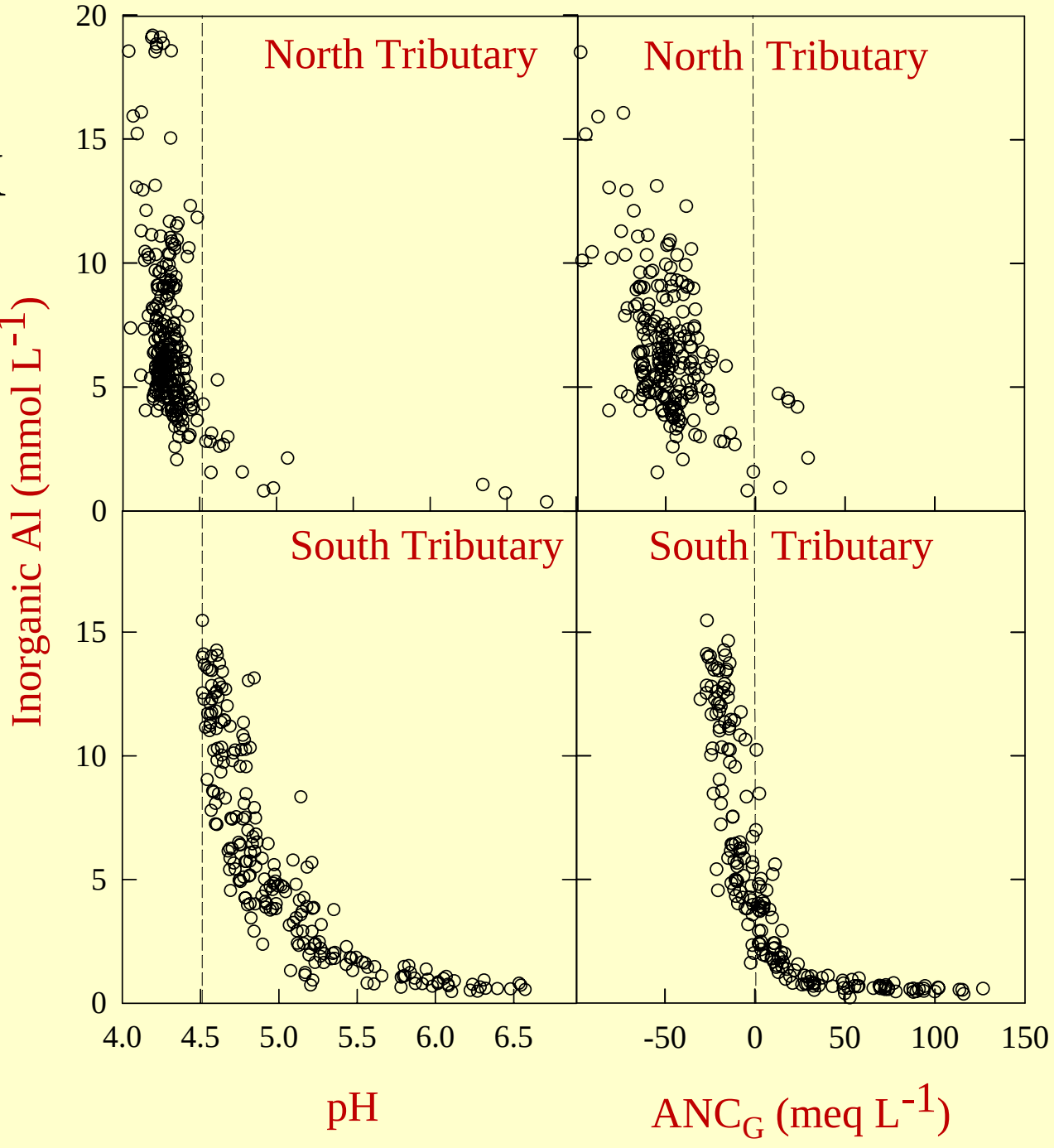
- **Sandra Nierzwicki-Bauer, Chuck Boylen**, *Rensselaer Polytechnic Institute, Troy, NY*
- **Jim Sutherland, Bob Bombard –** *New York State Dept. of Environmental Conservation.*


Lakes ≠ Streams
• Important habitat.
• Reflect terrestrial ecosystem.
• More prone to acidify than lakes.

Assessment Challenges

- Characterizing longitudinal variability.
- Distinguishing between natural acidity and pollution-derived acidity.

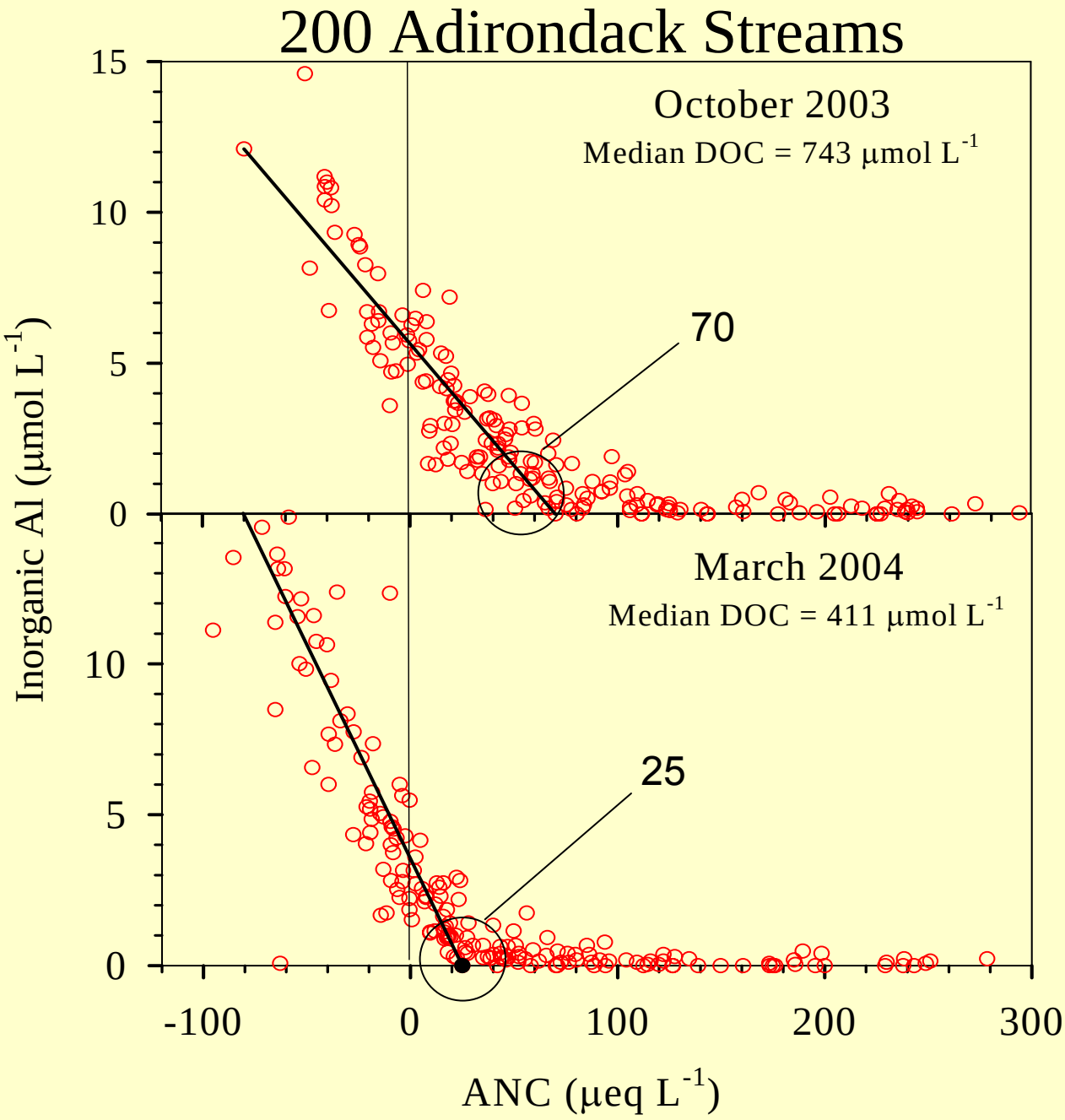
BUCK CREEK


North Tributary
North Tributary
South Tributary
South Tributary
Inorganic Al (mmol L-1)
20
15
10
5
0
4.0
4.5
5.0
5.5
6.0
6.5
pH
-50
0
50
100
150
ANCG (meq L-1)

Biogeochemistry of Acid Rain

$$\frac{\text{Watershed Buffering}}{(Ca+Mg+Na+K)} - \frac{\text{Inputs of Acid Rain}}{(SO_4+NO_3+Cl)}$$

ANC


200 Adirondack Streams
October 2003
Median DOC = 743 µmol L-1
70
March 2004
Median DOC = 411 µmol L-1
25
Inorganic Al (µmol L-1)
ANC (µeq L-1)
15
10
5
0
10
5
0
-100
0
100
200
300

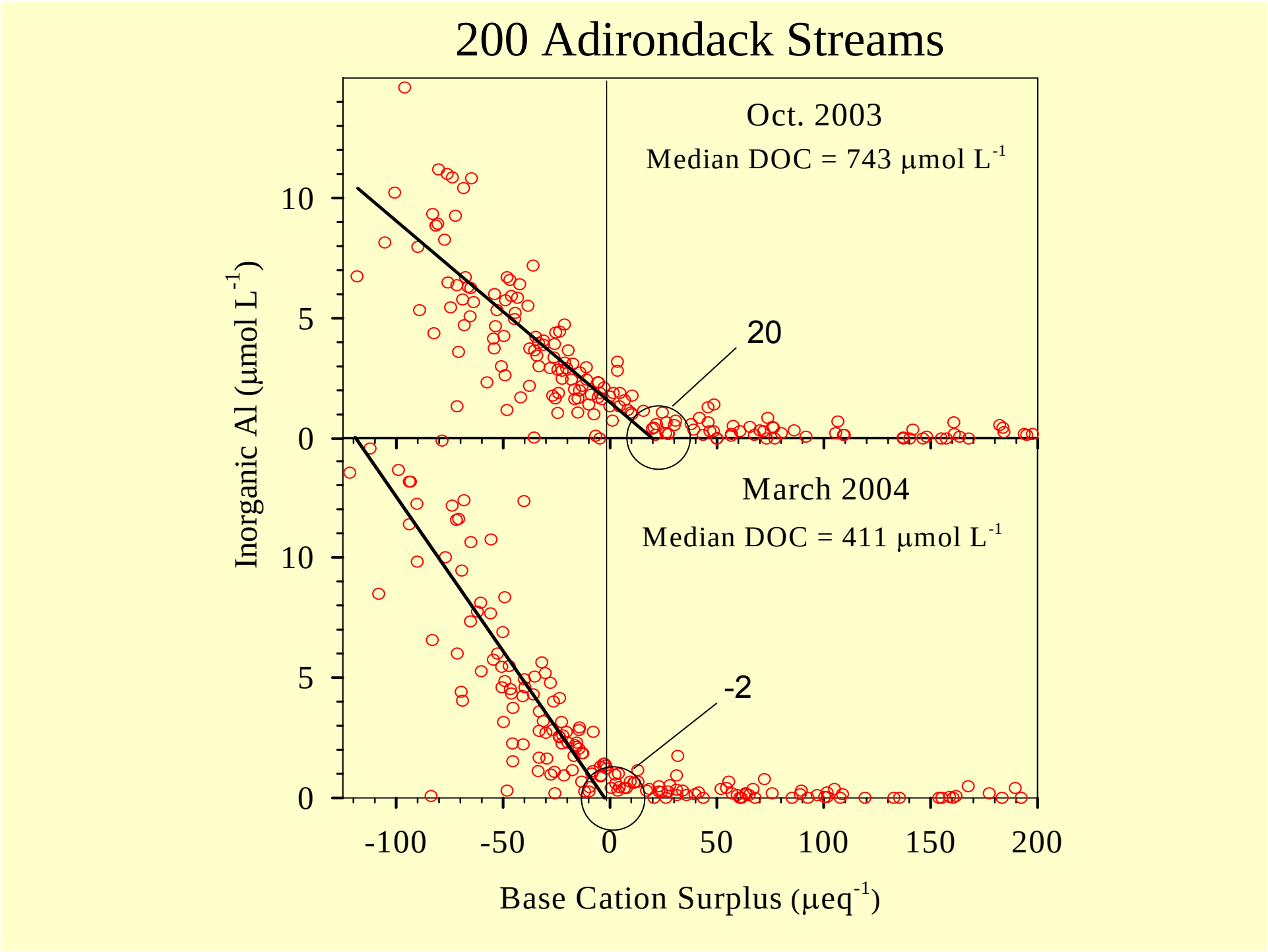
ANC

↓

Base Cation Surplus

$$(Ca+Mg+Na+K) - (SO_4+NO_3+Cl+RCOO_s)$$

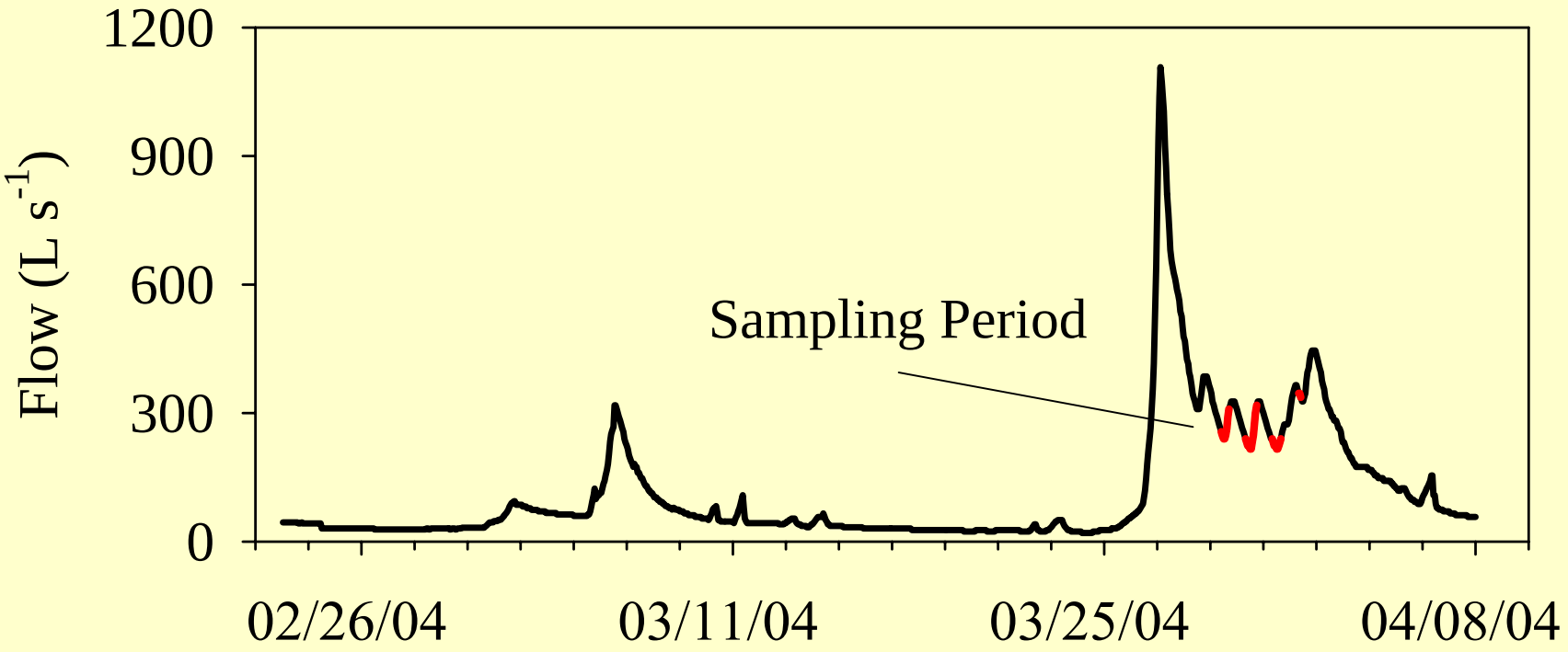
$RCOO^-_s$ = strongly acidic organic anions


200 Adirondack Streams
Oct. 2003
Median DOC = 743 µmol L-1
20
March 2004
Median DOC = 411 µmol L-1
-2
Inorganic Al (µmol L-1)
10
5
0
10
5
0
-100
-50
0
50
100
150
200
Base Cation Surplus (µeq-1)

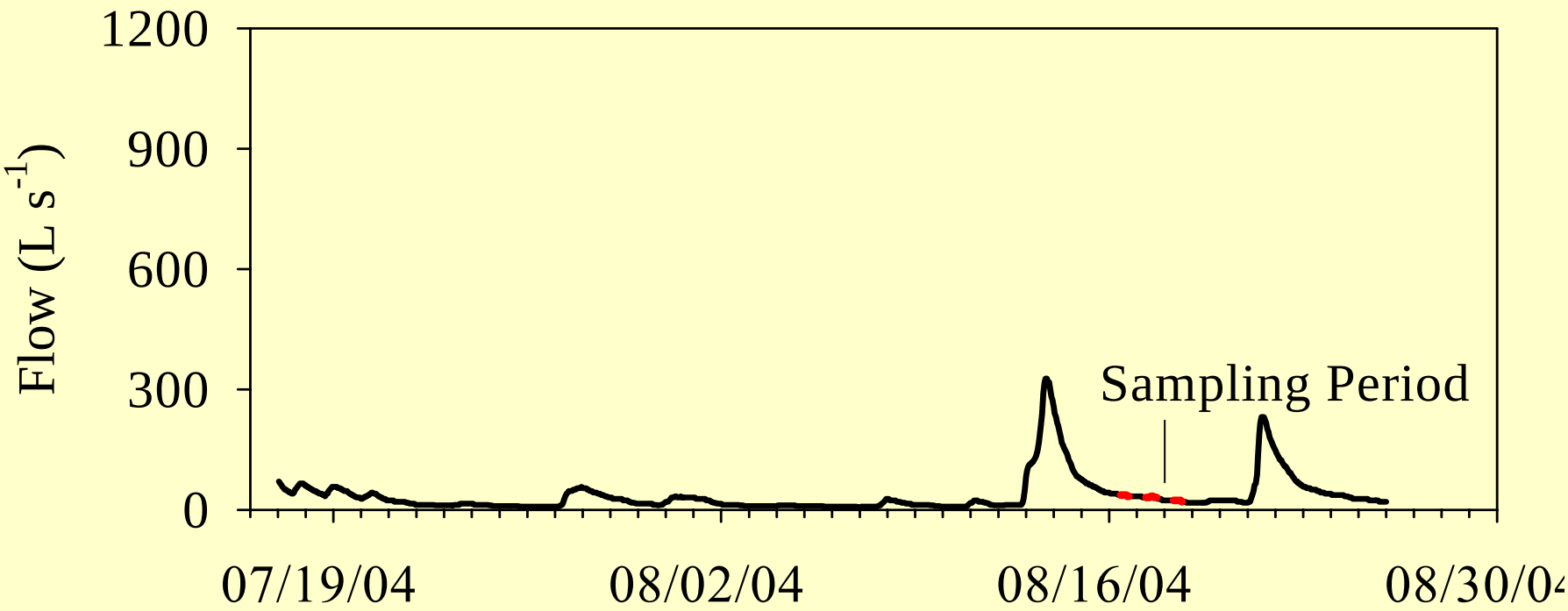
The BCS as an Index of Acidification

- Inorganic Al is best related to the BCS, *not pH or* ANC_g.
- **BCS = 0;** a reference point for assessment.
- Inorganic Al in surface waters is an unambiguous indication of acidic deposition effects.

March 2004 Survey



August 2004 Survey

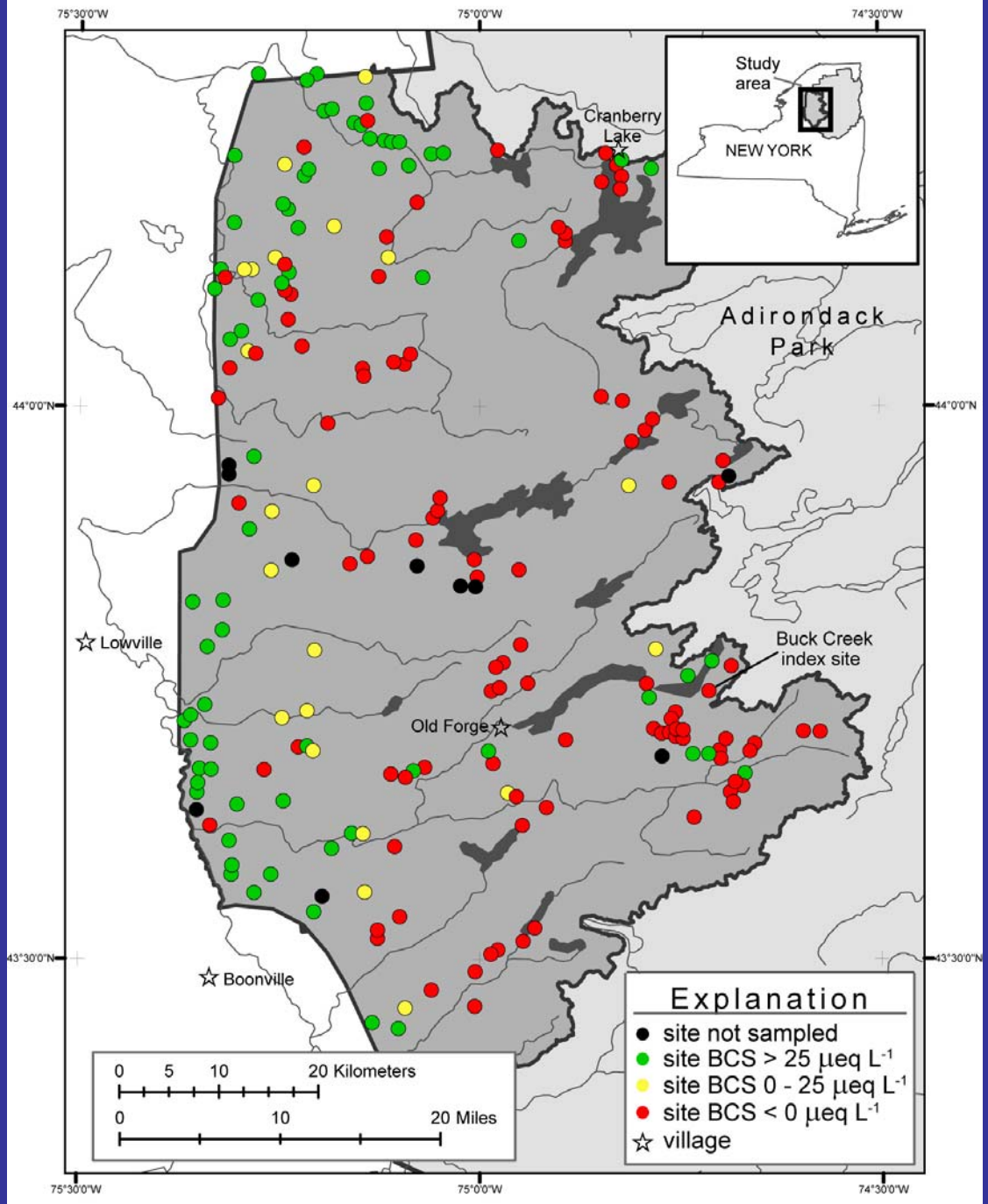


Assessment Results

	March 2004	August 2004
# of streams sampled	**188**	**195**
# of streams BCS < 0	**105**	**57**
# of streams ANC_G < 0	**55**	**29**
# of streams Al_i < 2.0 μmol L^{-1}	**78**	**49**

Assessment Results

	March 2004	August 2004
# of streams sampled	**188**	**195**
# streams BCS < 25	**124**	**57**
Mean SO_4 + NO_3 (% of total anions)	**81**	**62**
Mean $RCOO_s$ (% of total anions)	**16**	**34**


75°30'0"W
75°0'0"W
74°30'0"W
44°0'0"N
43°30'0"N
Study area
NEW YORK
Cranberry Lake
Adirondack Park
Lowville
Buck Creek index site
Old Forge
Boonville
0 5 10 20 Kilometers
0 10 20 Miles
Explanation
site not sampled
site BCS > 25 µeq L-1
site BCS 0 - 25 µeq L-1
site BCS < 0 µeq L-1
village

Stream Length Assessment March 2004

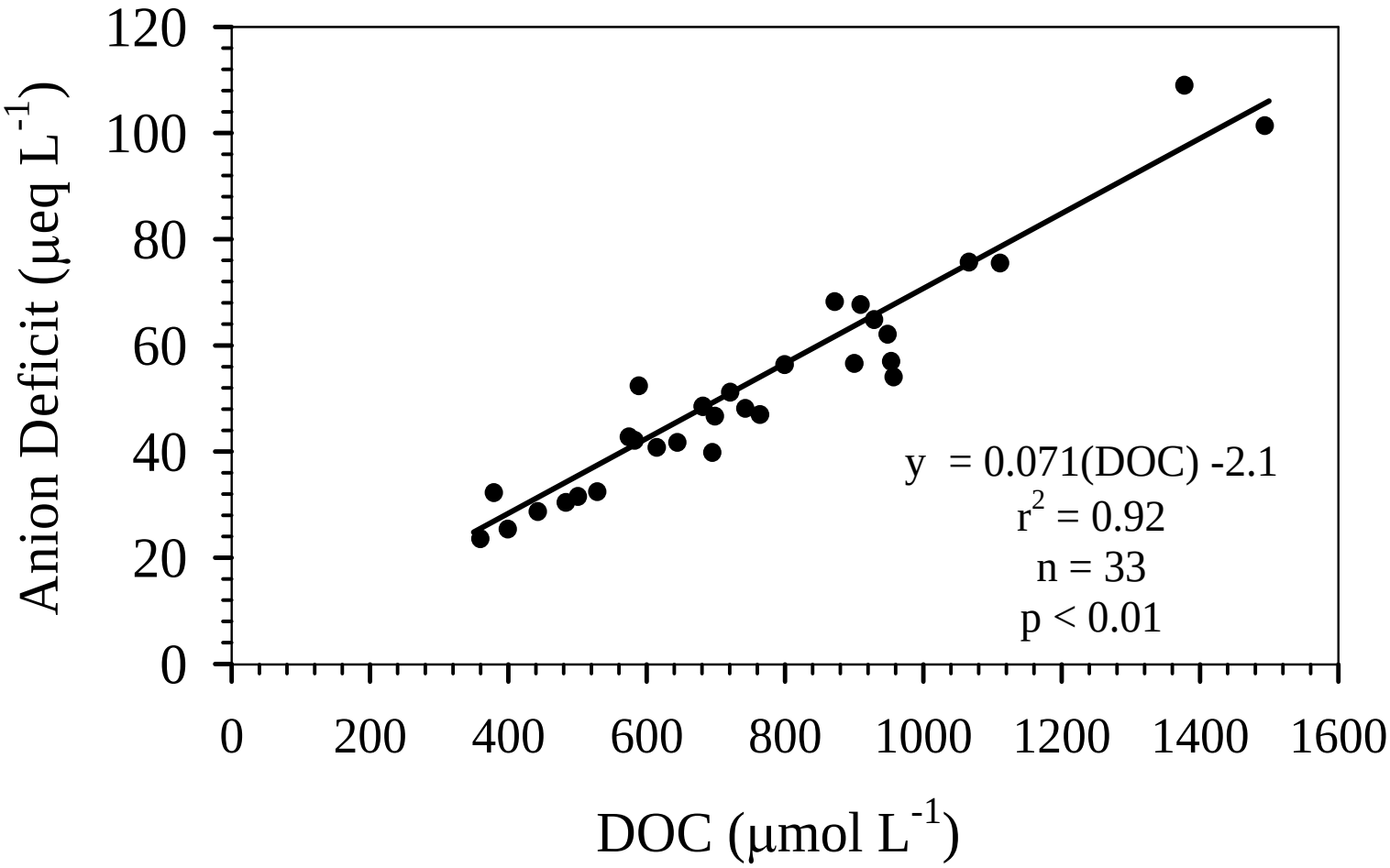
- Accessable stream length = 1,237 km (28%).
- Total length prone to acidification = 718 km (58%).

**Total length not assessed* = 3085 km (72%).

Chronic vs. Episodic Acidification

March 2004 --- August 2004

# of streams sampled	189
# chronically acidified	67
# episodically acidified	57
# non acidified	65


Anion Deficit (μeq L-1)
120
100
80
60
40
20
0
0
200
400
600
800
1000
1200
1400
1600
DOC (μmol L-1)
y = 0.071(DOC) -2.1
r2 = 0.92
n = 33
p < 0.01