Ecosystem disturbance in Catskill Mountain streams: Coincidence or indicators of climate change?

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Doug Burns, USGS
Pete Murdoch, USGS
A.J. Smith, NYSDEC

USGS science for a changing world

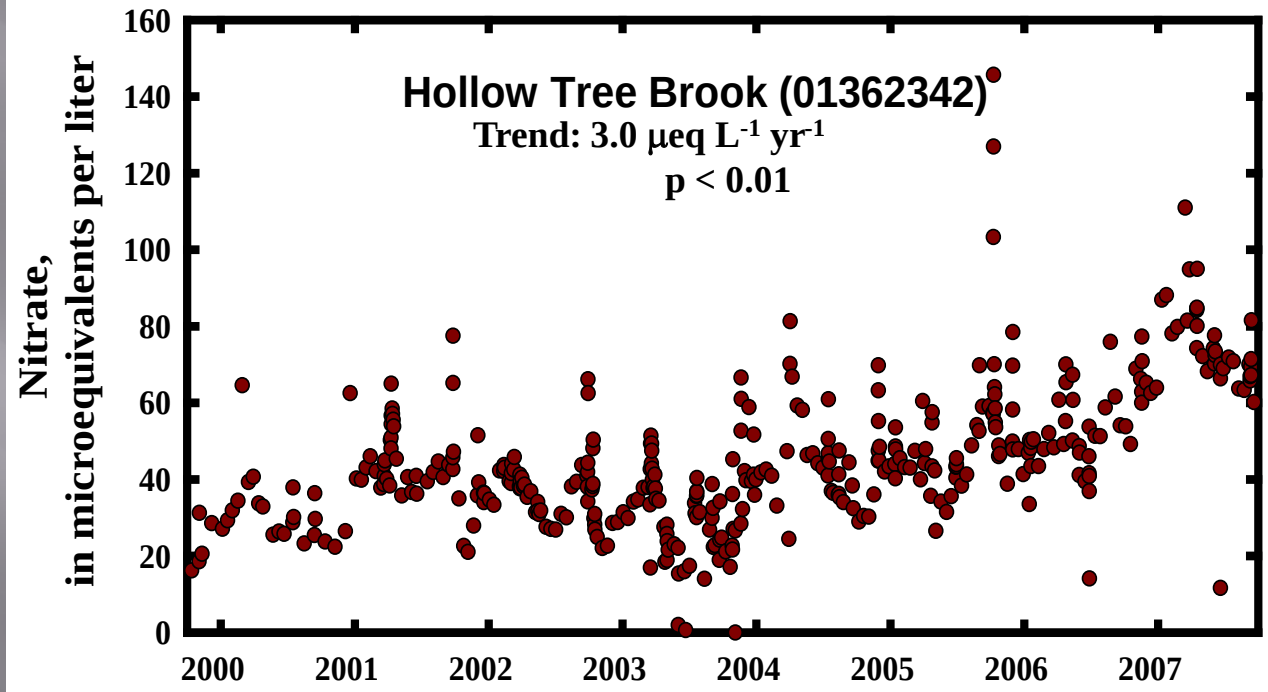
NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION DEP

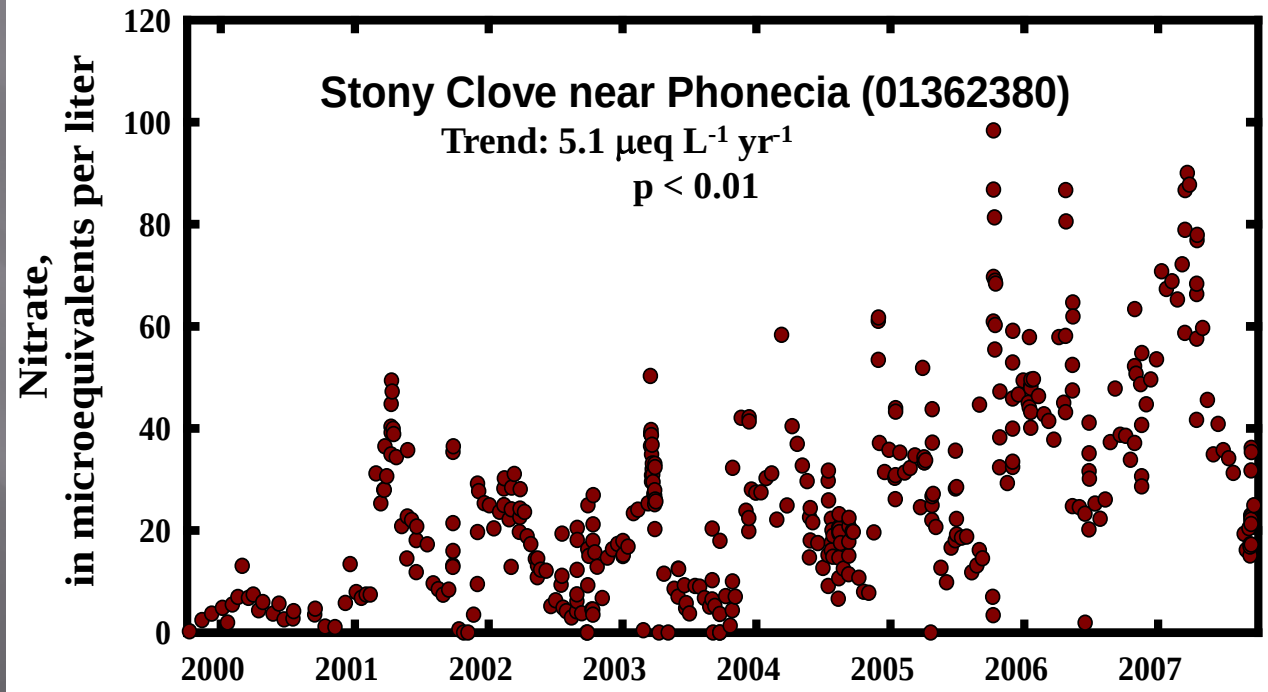
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE

NYSERDA

USDA


Hollow Tree Brook (01362342)
Trend: 3.0 μeq L-1 yr-1
p < 0.01
Nitrate, in microequivalents per liter
160
140
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
2005
2006
2007

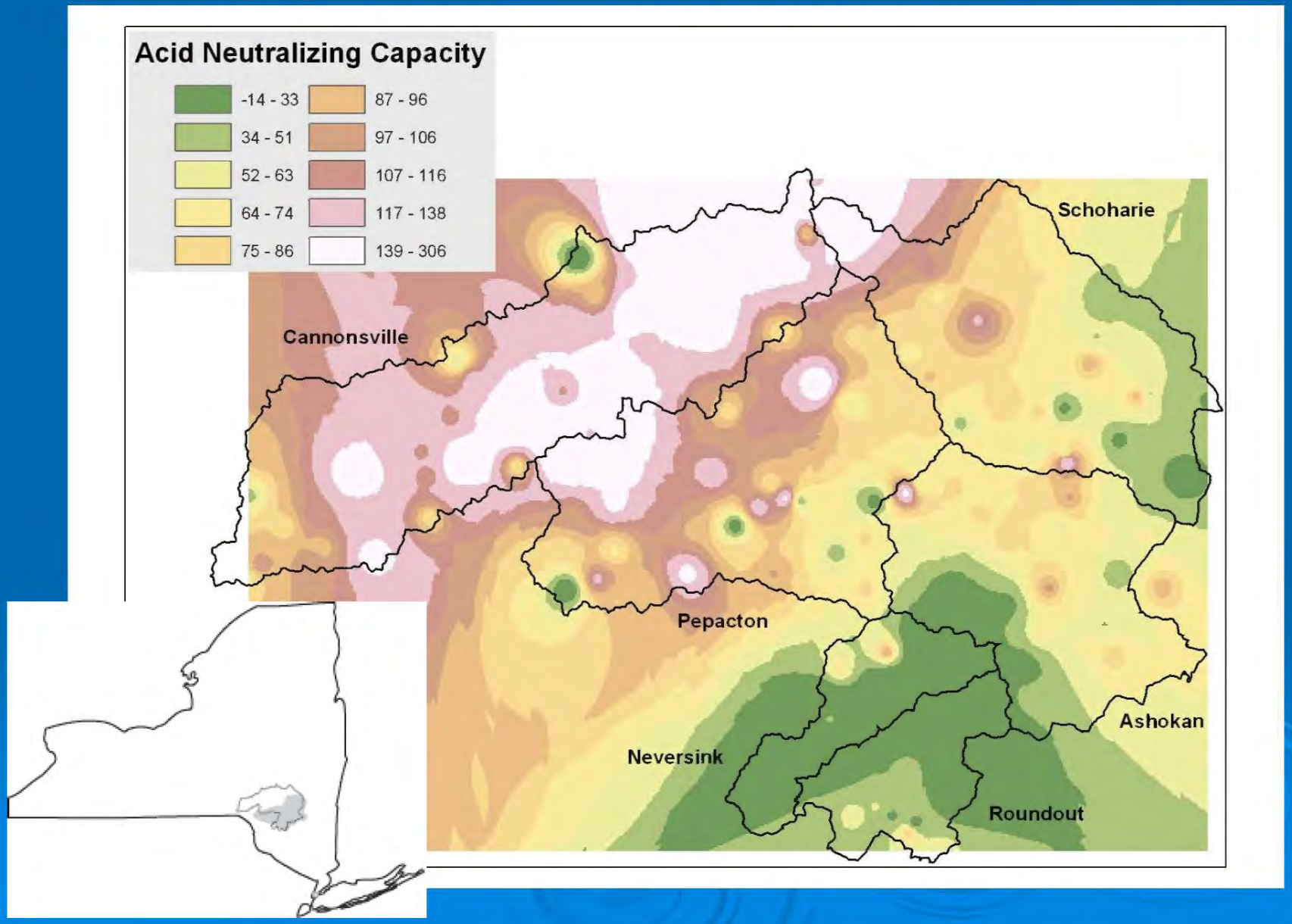

Stony Clove near Phonecia (01362380)
Trend: 5.1 μeq L-1 yr-1
p < 0.01
Nitrate, in microequivalents per liter
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
2005
2006
2007

1. Background - Stream Chemistry
2. Clear Cut Study
   (chemistry & toxicity tests, 1993-2001)
3. Indicators of Climate Change
4. Implications and Linkages
5. Impacts on stream ecosystems?



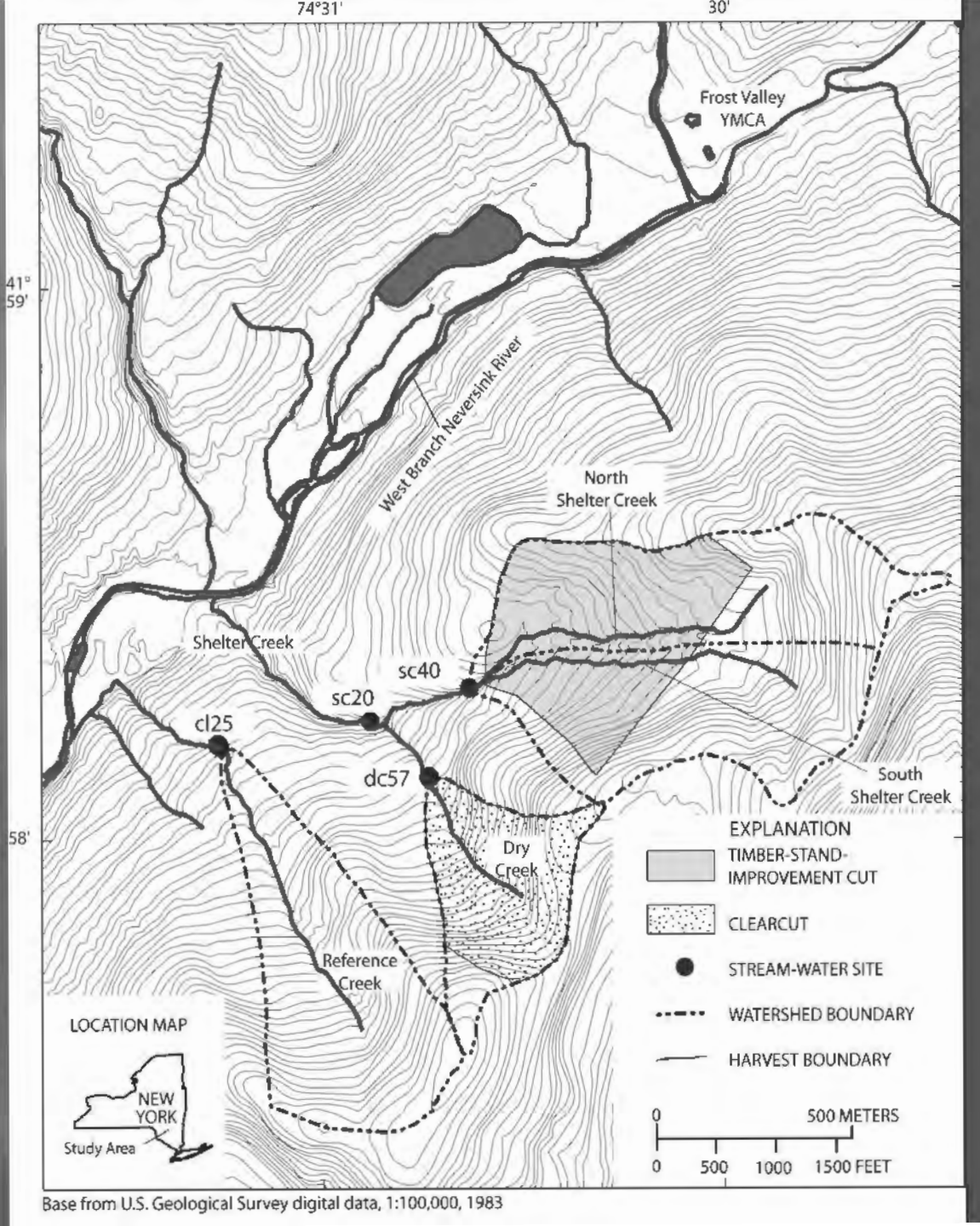


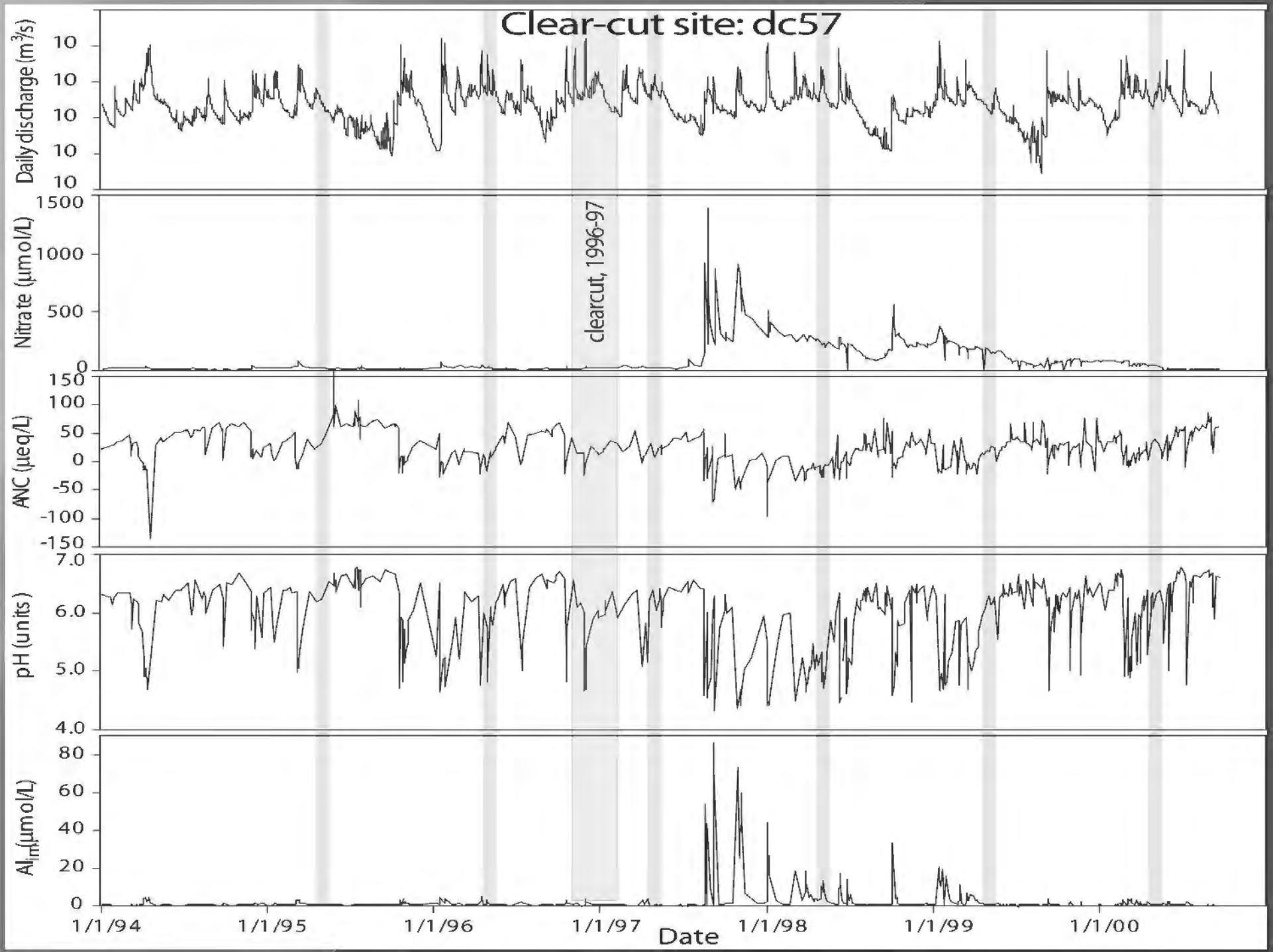
Catskill Stream Survey: ANC (N=180)

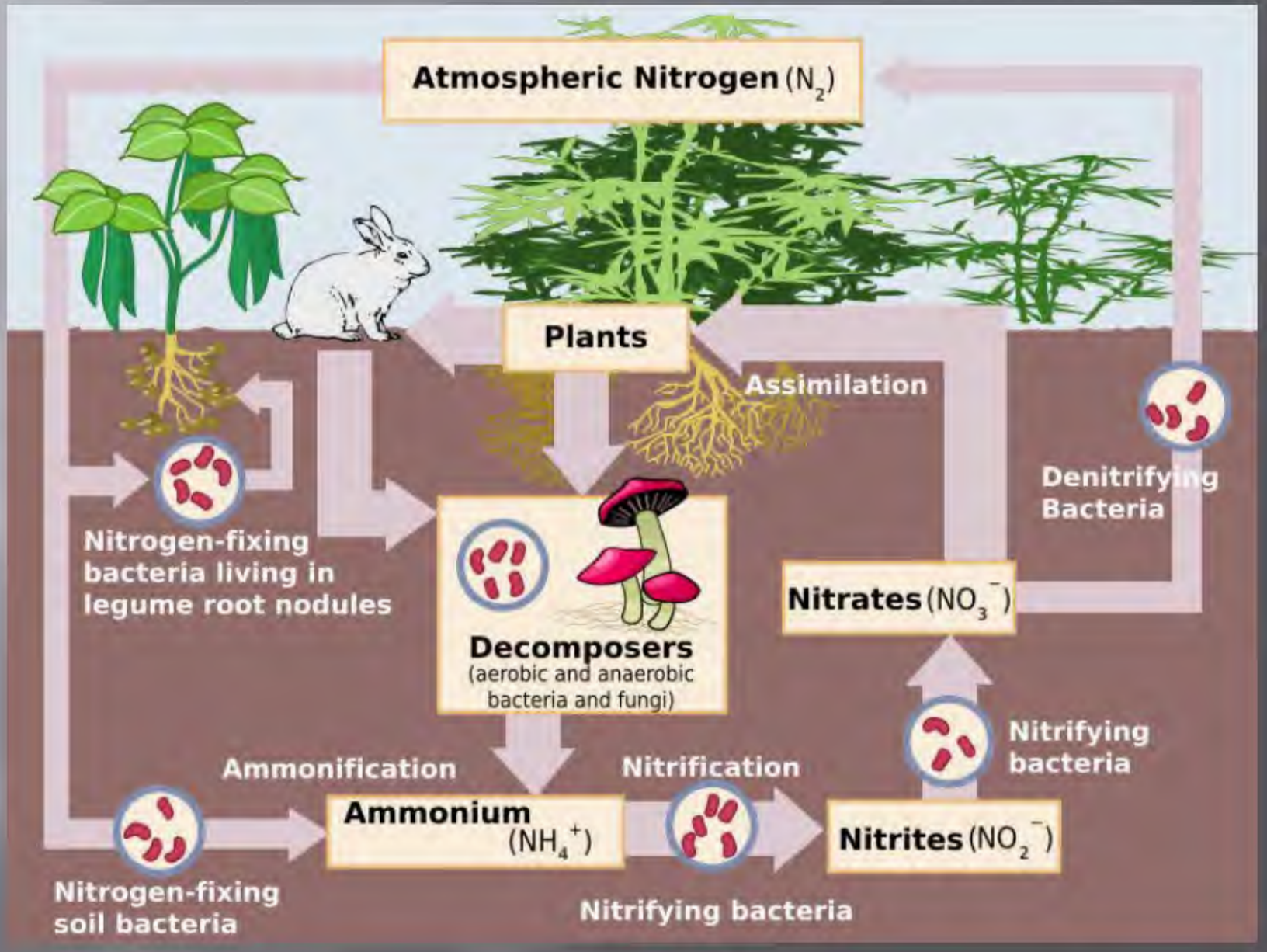


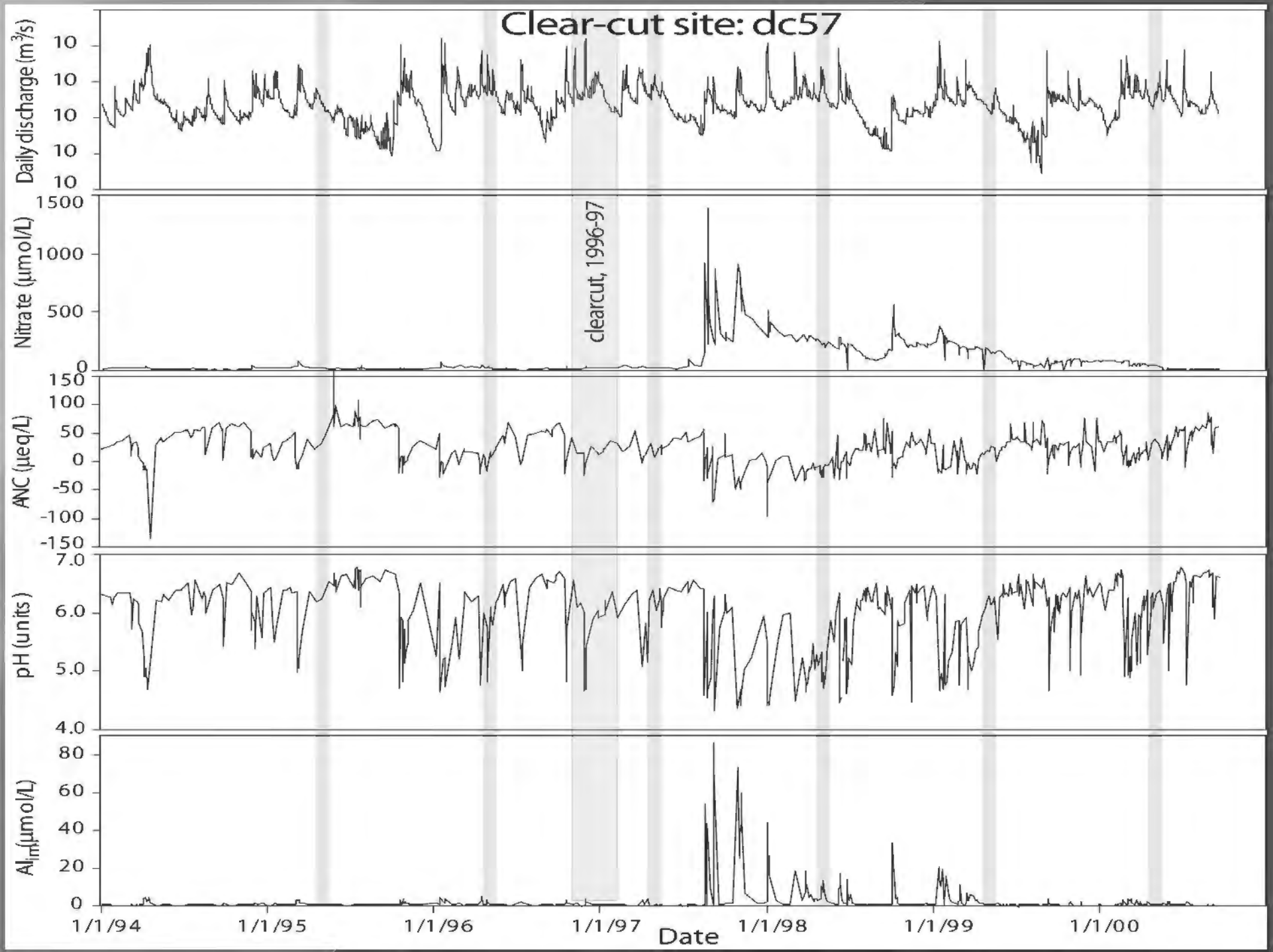
NYCDEP-USGS Nitrate Study:

Clear cut, Partial cut, and Control Watersheds, 1993-2001




Clear-cut site: dc57
Daily discharge (m3/s)
10
10
10
10
10
Nitrate (µmol/L)
1500
1000
500
0
clearcut, 1996-97
ANC (µeq/L)
150
100
50
0
-50
-100
-150
pH (units)
7.0
6.0
5.0
4.0
Alim (µmol/L)
80
60
40
20
0
1/1/94
1/1/95
1/1/96
1/1/97
1/1/98
1/1/99
1/1/00
Date


Atmospheric Nitrogen (N_2)
Plants
Assimilation
Denitrifying Bacteria
Nitrogen-fixing bacteria living in legume root nodules
Decomposers
(aerobic and anaerobic bacteria and fungi)
Nitrates (NO_3^-)
Nitrifying bacteria
Ammonification
Nitrification
Ammonium (NH_4^+)
Nitrites (NO_2^-)
Nitrogen-fixing soil bacteria
Nitrifying bacteria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1/1/98
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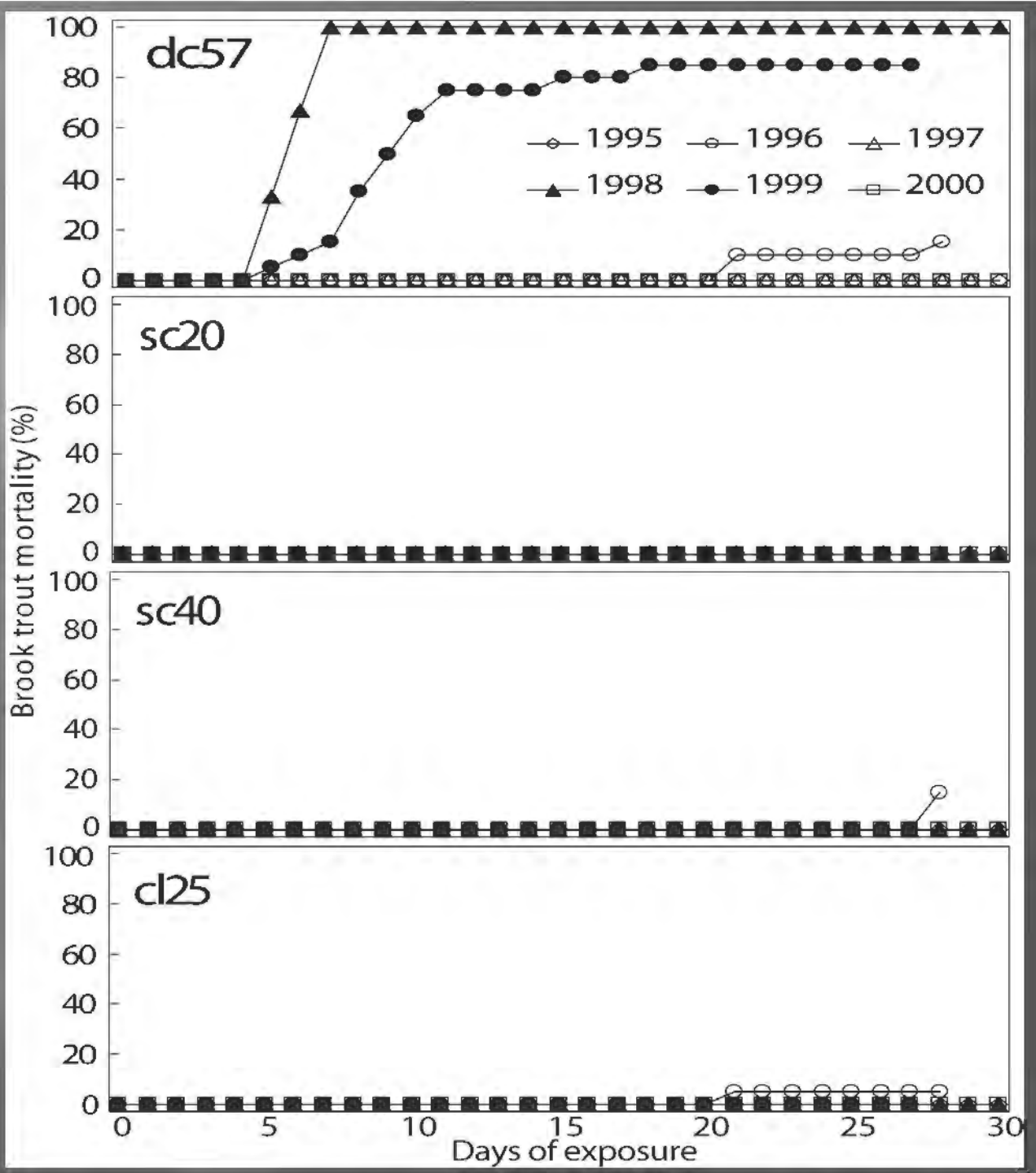
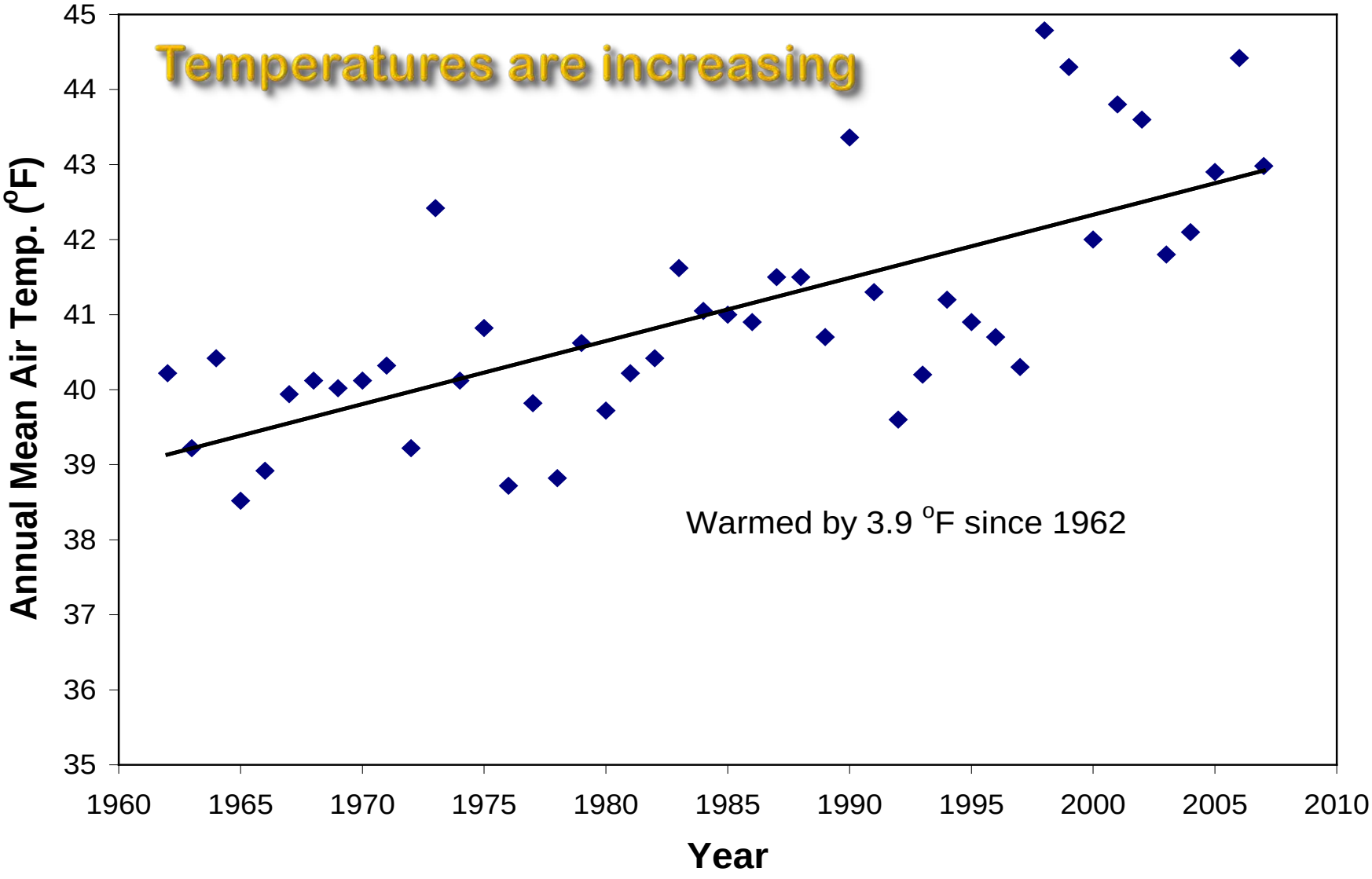
1/1/00
Date

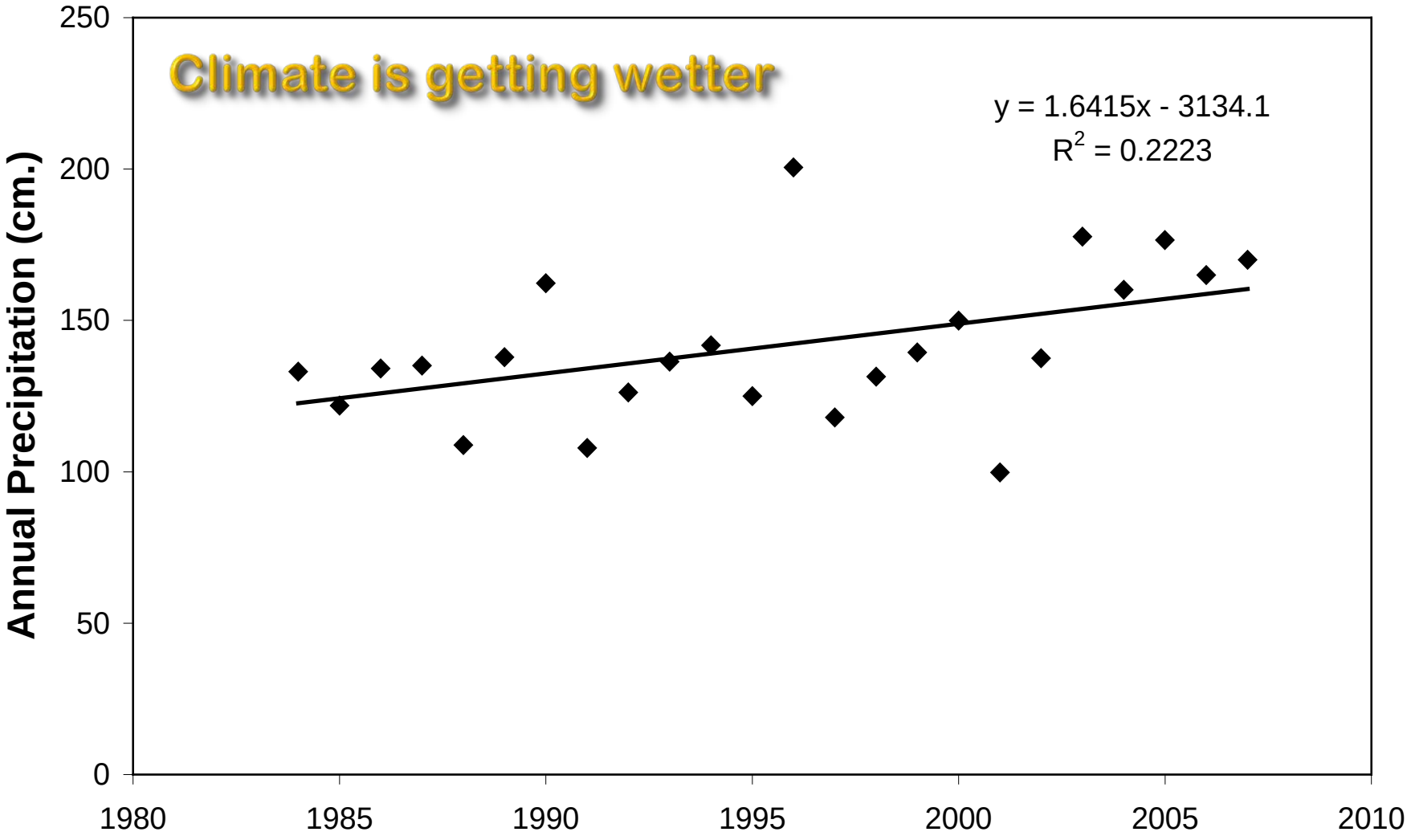
Trout mortality at Clear cut, Partial cut, and Control Watersheds, 1995-2000



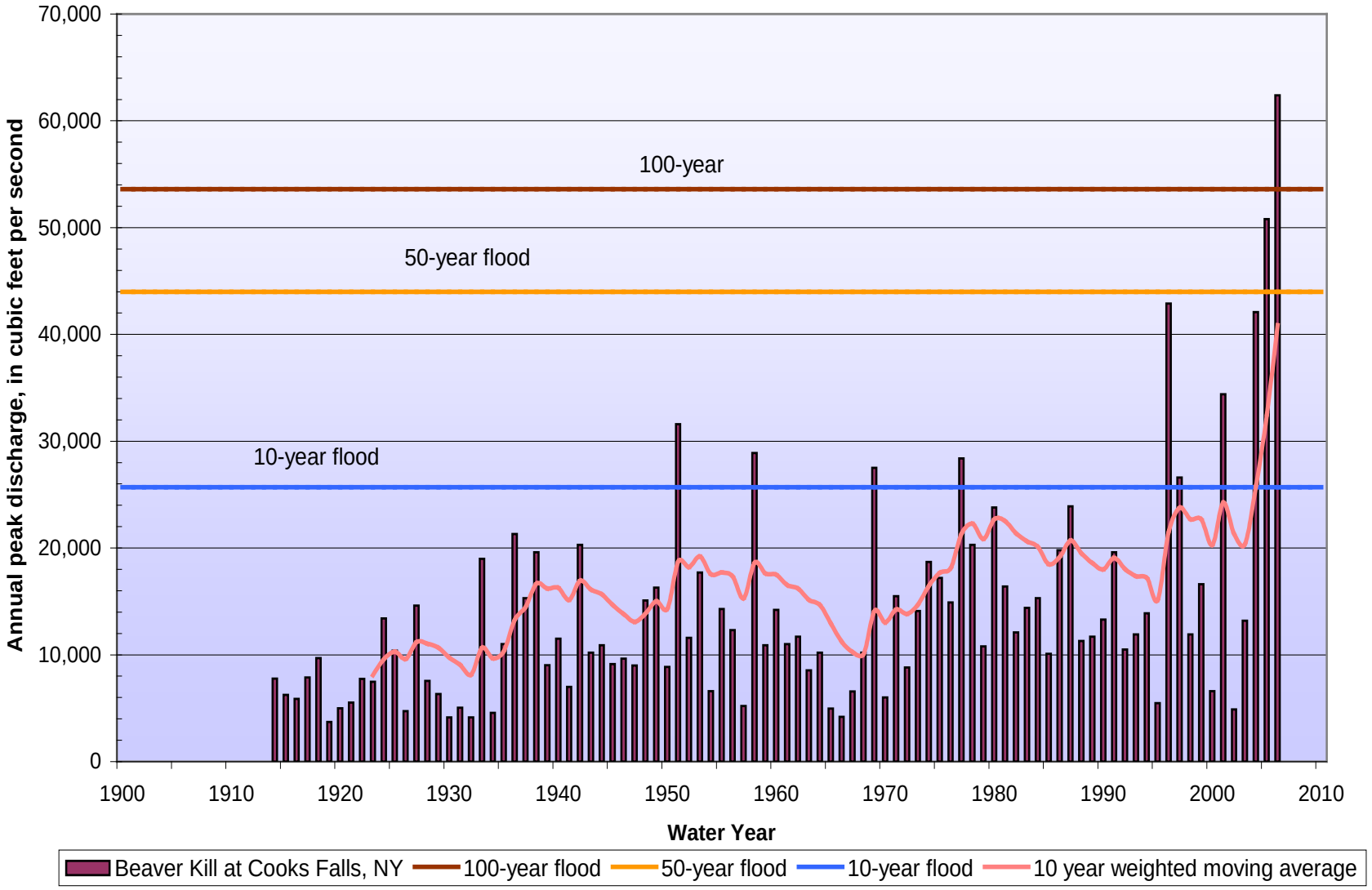
Indicators of Climate Change:



Biscuit Brook NTN Site (NY68)

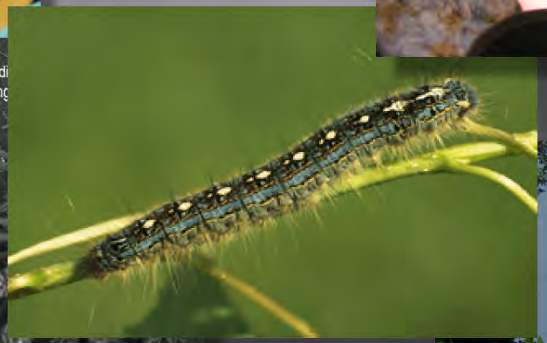


Flow regime is changing in some rivers



Implications: Channel Instability -
flooding, property damage, turbidity, erosion, aggradation, & habitat degradation

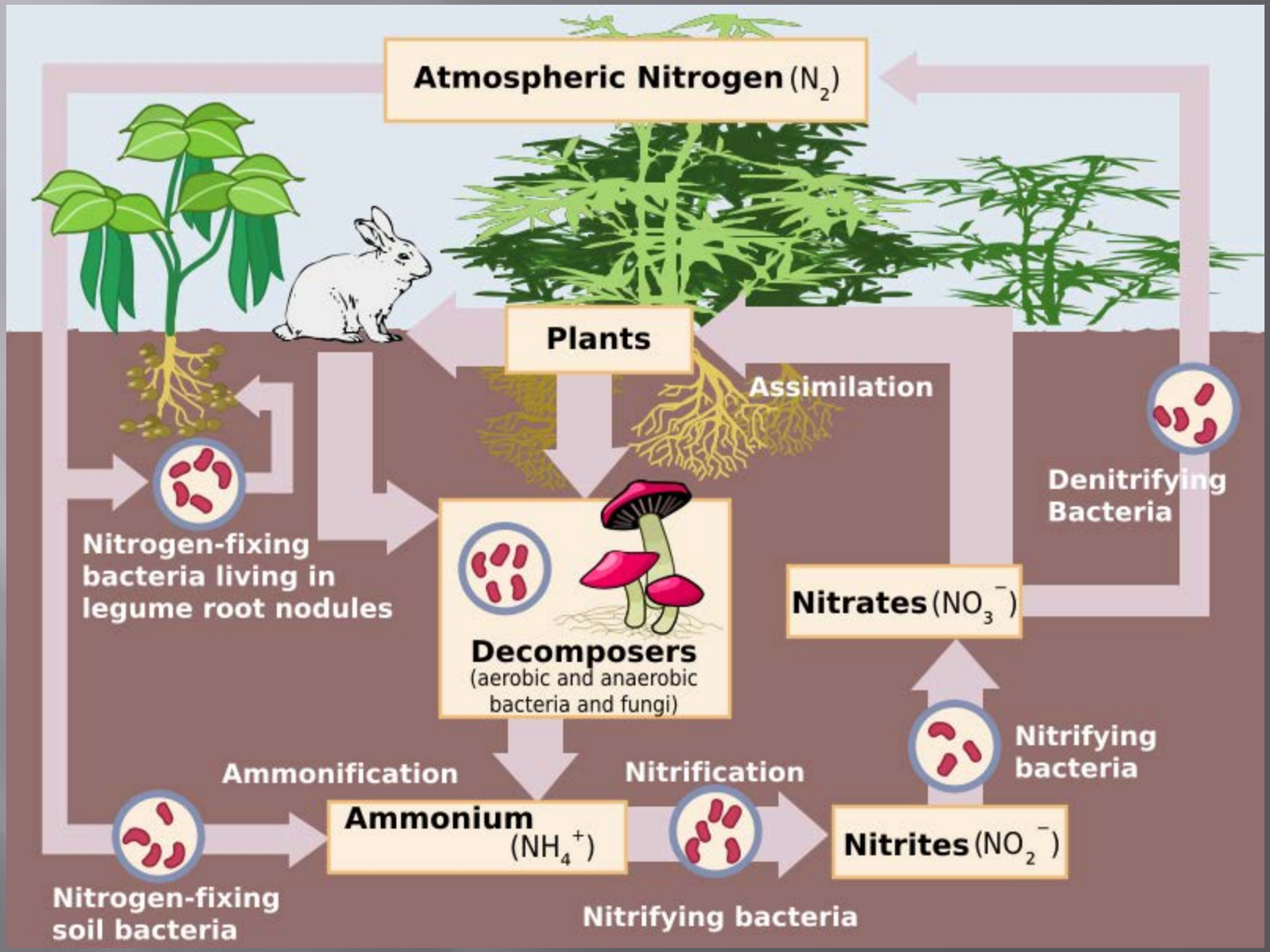
Implications: Increased threats to forest and stream ecosystems



Linkages?

06/28/2005

Phoenicia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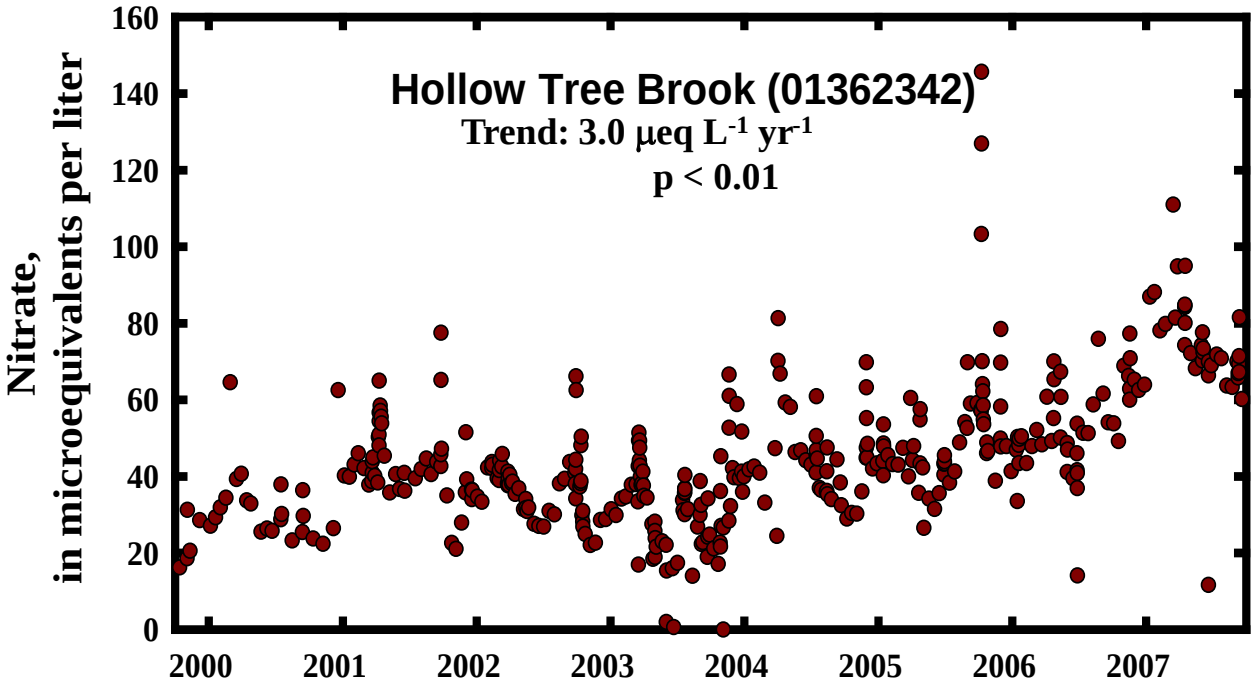
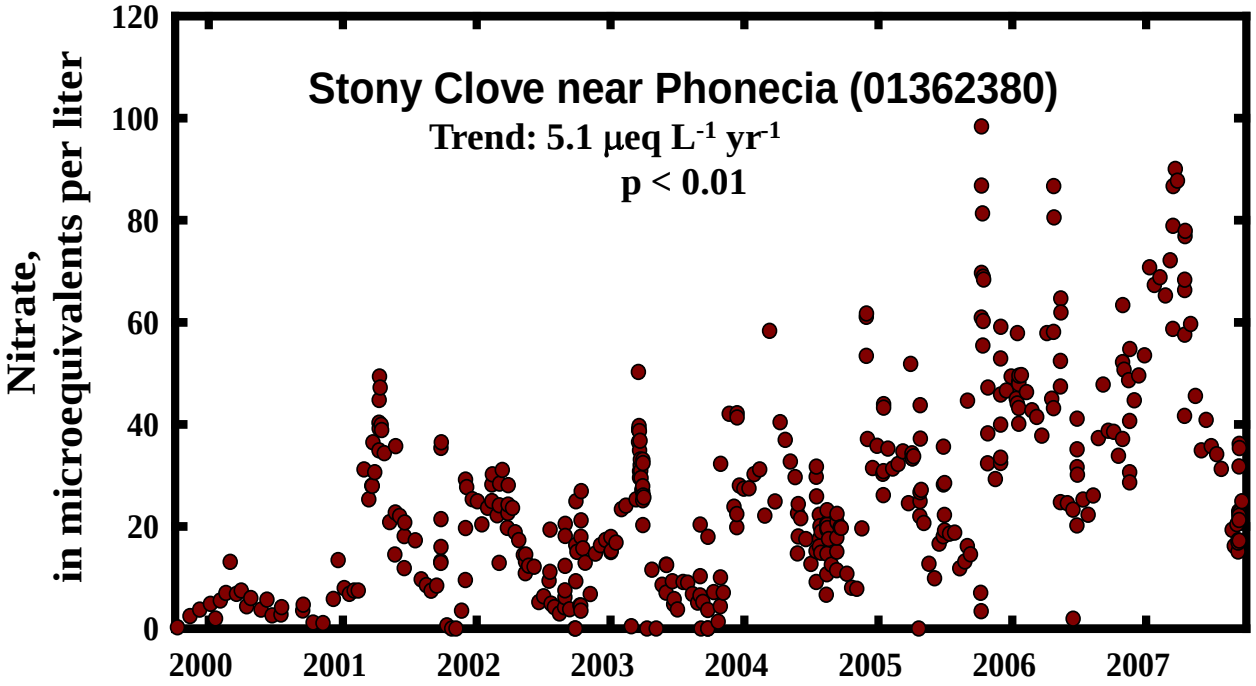
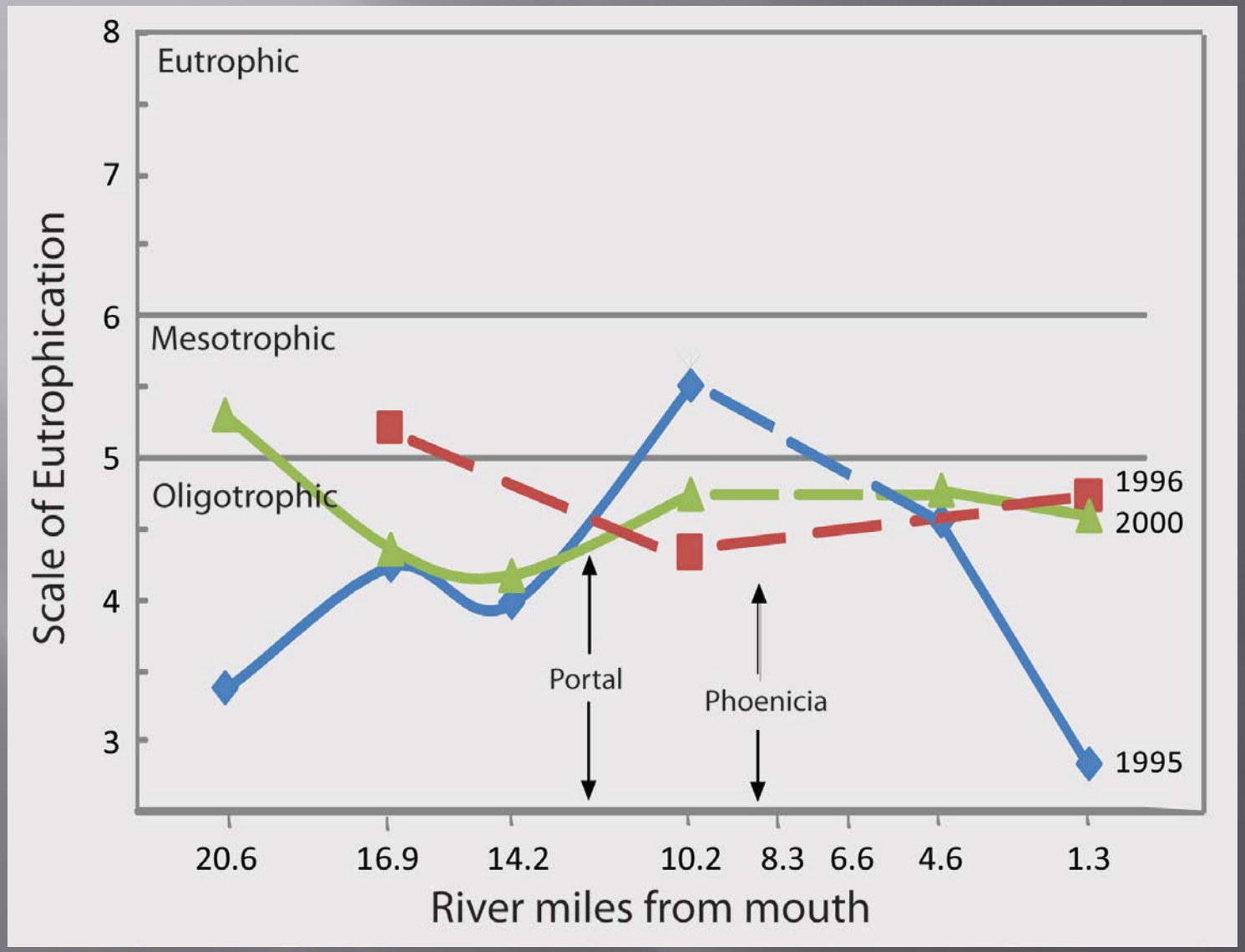
Nitrate trends in two tributaries to the Upper Esopus Creek, 2000- 07





Nutrient Biotic Index, Upper Esopus

(Macroinvertebrate data from the NYSDEC Stream Biomonitoring Unit)



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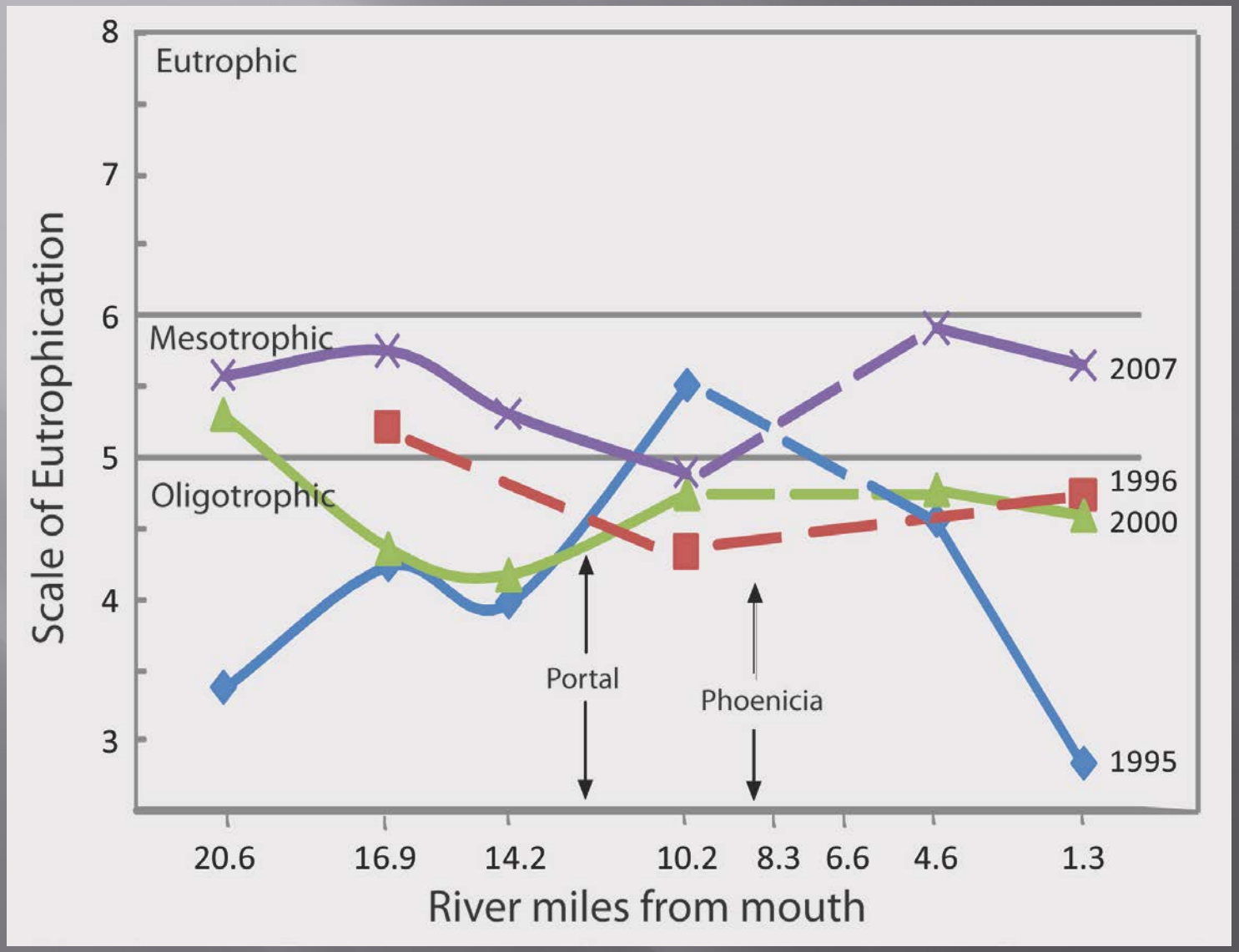

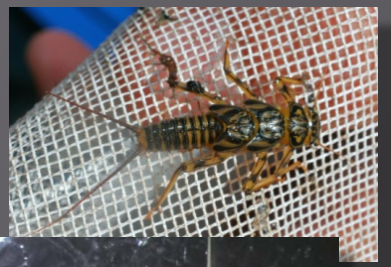

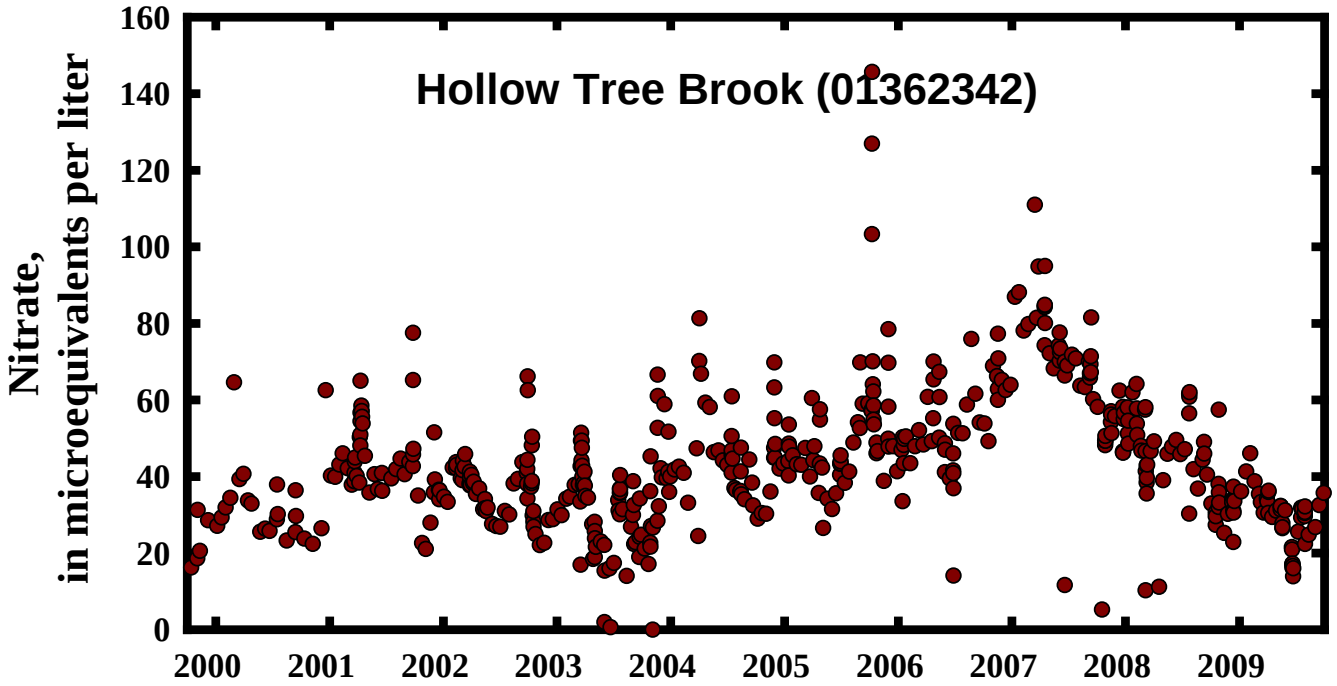
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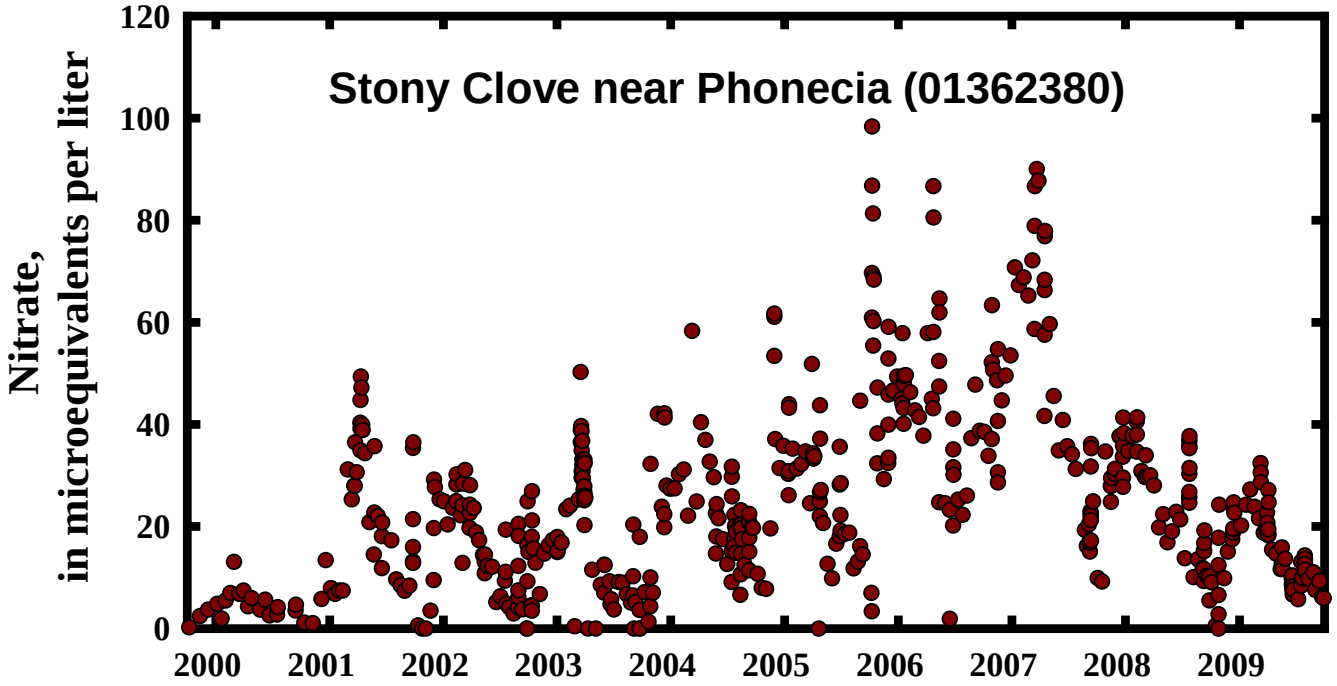
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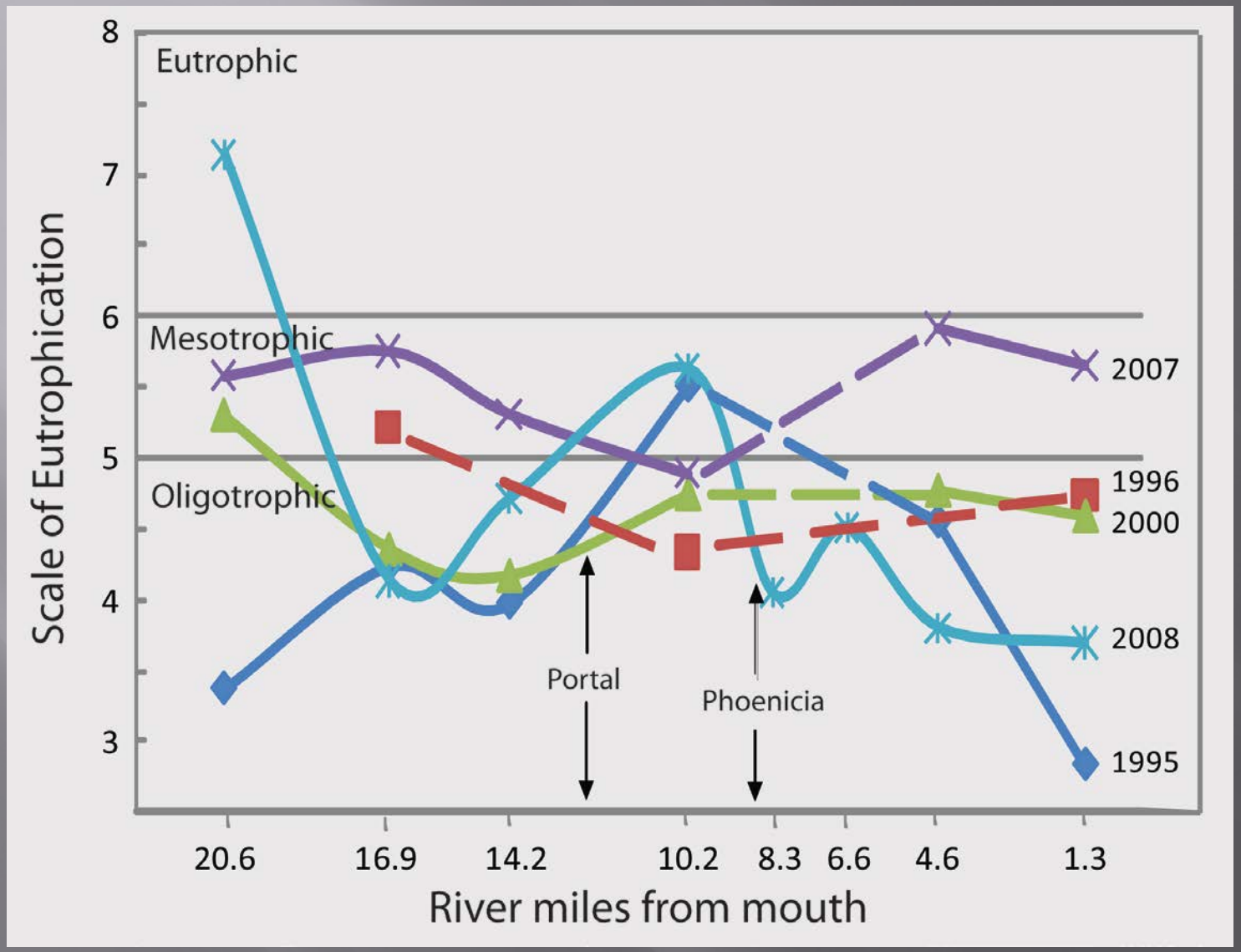


QUESTIONS?
bbaldigo@usgs.gov