A Clean Air Act success story: Indications of recovering water quality and fish assemblage in acidified Catskill and Adirondack Mountain streams

B.P. Baldigo, S.D. George, M.R. McHale, and G.B. Lawrence
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The response of soil and stream chemistry to decreases in acid deposition in the Catskill Mountains, New York, USA

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ABSTRACT

The Catskill Mountains have been adversely impacted by decades of acid deposition, however, since the early 1990s, levels have decreased sharply as a result of decreases in emissions of sulfur dioxide and nitrogen oxides. This study examines trends in acid deposition, stream-water chemistry, and soil...
Sulfur trends

Biscuit Brook

EPA Acid Rain Program SO2 annual emissions (million tons)

Year

ARP Emmissions
NY68 Deposition
Biscuit Brook

Biscuit NTN annual volume-weighted SO$_4^{2-}$ conc. (µeq/L)
Nitrogen trends

EPA Acid Rain Program NO$_x$ annual emissions (million tons)

ARP Emissions
NY68 Deposition
Biscuit Brook

Biscuit NTN annual volume-weighted NO$_3^-$ conc. (µeq/L)
Relationship between pH and inorganic aluminum at Neversink River sites, 1991-93

\[ y = -1.6x^3 + 30x^2 - 189x + 394 \]
\[ R^2 = 0.87 \]
Community Density in Neversink 1991–93

Density (fish/0.1ha)

- Biscuit Br. (bs01) 600
- Wildcat Mt. (wb03) 500
- Slide Mt. (wb04) 200
- Winnisook (wb05) 0
- Otter Pool (wb02) 700
- West Branch (wb01) 1000
- Main Branch (nv15) 1600
- East Branch (eb02) 100
- New Hill (eb03) 60
- Tisons (eb04) 300
- Braid-2 (eb06) 50
- Braid-1 (eb01) 500
- Deer Cr. (ds01) 100
- Oasis Cr.-1 (oc01) 400
- Oasis Cr.-2 (oc02) 1700

Fish species:
- brook trout
- blacknose dace
- brown trout
- longnose dace
- Atlantic salmon
- slimy sculpin
Community Biomass in Neversink 1991–93

Relationship between pH and inorganic aluminum at Neversink River sites, 1991-93
pH and inorganic Al trends at Biscuit Brook from 1991 to 2017

\[ y = -2 \times 10^{-5}x + 1.03 \]
\[ R^2 = 0.004 \]
pH and inorganic Al trends at Tisons (eb03) from 1991 to 2017

\[ y = -0.0002x + 11.01 \]
\[ R^2 = 0.20 \]
pH and inorganic Al trends at Winnisook (wb05) from 1991 to 2017

\[ y = 4E^{-0.05}x + 3.47 \]
\[ R^2 = 0.224 \]

\[ y = -0.0005x + 25.0 \]
\[ R^2 = 0.22 \]
Fish Biomass in Neversink—2017 update
pH and inorganic Al trends at Buck Creek from 1989 to 2017

\[ y = -0.0006x + 25.631 \]

\[ R^2 = 0.18 \]
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<th>Stream</th>
<th>Air-equilibrated pH</th>
<th>Fish/100 m²</th>
<th>Calcium (mg/L)</th>
<th>Sulfate (mg/L)</th>
<th>Nitrate (mg/L)</th>
<th>ANC (µeq)</th>
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Baldigo, B.P., S.D. George, G.B. Lawrence, and E.A. Paul. In press. Acidification impacts and goals for gauging recovery of Brook Trout populations and fish communities in streams of the western Adirondack Mountains, New York, USA. Trans Am Fish Soc. NA,NA
Summary/Conclusions

- The CAAA of 1990 reduced acid deposition and improved water quality in acid-sensitive streams of NY.
- Decreases in acidity and aluminum reduced (but did not eliminate) toxicity in many streams in both regions.
- Fish assemblages in previously acidified Catskill Mt. streams are beginning to recover from acidification.
- Recovery of fish assemblages in many Adirondack Mt. streams appears to be delayed or just now starting.
- More quantitative fishery (and chemistry) data is needed to better track and interpret biological recovery in NY streams, especially in the Adirondack region.
Acknowledgments for field support:

Questions?
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