Effect of flooding from Tropical Storm Irene on fish communities in the Upper Esopus Creek basin


Scott George, Barry Baldigo, and Alexander Smith
Aug. 28, 2011
Peak Discharge: 1,460 ft³/s
Recurrence Interval: 8 years
August 28, 2011
Peak Discharge: 29,300 ft$^3$/s
Recurrence Interval: 100 years
**Figure 2.** — Length frequency distribution of wild brook trout from Vance Run, West Virginia, August 1995 and 1996.
Flood Impacts to Wild Trout Populations in Vermont
Vermont Department of Fish and Wildlife

Trout and other fish populations inhabiting Vermont streams and rivers have evolved to survive and quickly recover from the effects of severe flooding. While physical trauma associated with large scale movement of streambed material and debris, displacement, stranding and physiological stress will take a toll in the short term, these populations will quickly rebound when quality aquatic habitat remains intact.

The Vermont Department of Fish and Wildlife routinely monitors wild trout populations throughout Vermont. This information clearly illustrates the impact of severe flooding from tropical storm Irene in several watersheds, as well as what we can expect from these populations in the future.

Impacts of Irene on Wild Trout Populations:
Stream surveys conducted in 2011 prior to the Irene flood were repeated in several streams within the Mad River and Dog River watersheds, which had experienced severe flooding.

Following the flood, wild trout populations in these streams were reduced to 33-58% of pre-flood levels. Young fish were particularly affected (0-37% of pre-flood levels) while older trout fared better (41-64% of pre-flood levels).

Wild Trout Populations - Before and After Irene
Vermont Department of Fish and Wildlife Surveys

Vermont Department of Fish and Wildlife, 2012.
http://www.vtfishandwildlife.com
Hypotheses

• Reduced community metrics
• Reduced density/biomass of individual species
• Disproportionate effect on YOY trout (loss of 2011 year class)
Mean Community Richness and Diversity

Number of species

Simpsons Index of Diversity (1-D)

2009 2010 2011 2012

Mean Community Richness and Diversity

Irene
Mean Community Density and Biomass
(All 9 sites)

Density (fish/0.1 ha):
- 2009: 2500
- 2010: 1500
- 2011: 500
- 2012: 2000

Biomass (g/0.1 ha):
- 2009: 15000
- 2010: 10000
- 2011: 5000
- 2012: 20000
Mean Species/group Biomass by Year

- **Trout**
- **Sculpin**
- **Minnow**
- **Sucker**
- **Other**
Population age structure histograms for brown trout (Cumulative for all 9 sites for each year)
Population age structure histograms for brown trout

(At one small DA site: Fox Hollow Creek)

Frequency

Length (mm)

2009

2010

2011

2012

Population age structure histograms for brown trout

(At one small DA site: Fox Hollow Creek)
Conclusions:

• Scope of study period is critical for interpretation
Conclusion: Floods are Bad?
Conclusion: Floods are Good?

![Bar chart showing community density (No/0.1 ha) from 2011 to 2012 with an increase in 2012.]
Conclusion: The post-flood year (2012) fell well within the range of natural variability
Conclusions

• Scope of sampling period is critical for interpretation
• Flood had no significant impact on fish community metrics (at basin level)
• Magnitude of flood varied among sites (variable effects)
• Age structure of trout populations shifted (due to Irene and several other factors)
• Timing of flood and life history is key to population impacts
Bibliography


Questions?

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NEVERSINK

Bar chart showing biomass (g/0.1ha) over different years for East Branch Neversink and Biscuit Brook.