Effect of flooding from Tropical Storm Irene on fish assemblages in the Upper Esopus Creek, Catskill Park


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August 28, 2011
Peak Discharge: 29,300 ft³/s
Recurrence Interval: >100 years
**Jowett and Richardson, 1989**

Brown trout in New Zealand pre-flood and post-flood (1986)

- 10-20 cm BT reduced 90-100%
- 20-40 cm BT reduced 62-87%
- >40 cm BT reduced 26-57%

**Carline and McCullough, 2003**

Brook trout in West Virginia pre-flood (1995) and post-flood (1996)

- Age 0+ brook trout reduced 98%
- Age 1+ brook trout reduced 84%
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

Simpson's Index of Diversity (1-D)

Irene
Mean Community Density and Biomass
(All 9 sites)

Density (fish/0.1 ha)

Biomass (g/0.1 ha)
Population age structure histograms for brown trout

(Cumulative for all 9 sites for each year)

Number of Fish vs. Length (mm)

Age 0+  Age 1+  Age 2++

399

Year: 2009

Year: 2010

Year: 2011

Year: 2012

Year: 2013
Population age structure histograms for rainbow trout

(Cumulative for all 9 sites for each year)
Conclusions:

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

![Graph showing density (No/0.1 ha) over time.](image)

- **Density (No/0.1 ha):**
  - 2009: High density
  - 2012: Lower density

- **Irene** event in 2009 significantly increased density.

- **Conclusion:** Floods can be significant events, impacting density and necessitating mitigation strategies.
Conclusion: Floods are Good?

![Graph showing density in 2011, 2012, and 2013. The density in 2012 is significantly higher than in 2011 and 2013. There is a label for Irene in 2011.]

- Density (No./0.1 ha)
- 2011: Low density
- 2012: High density
- 2013: Moderate density
- Label: Irene in 2011
Conclusion: The post-flood years (2012-13) fell well within the range of natural variability
Conclusions

• Scope of sampling period is critical for interpretation
• Flood had no meaningful impact on fish community
• Divergent effects on brown and rainbow trout populations
• Timing of flood and life history is key to population impacts
• Factors prior to Irene depressed community in 2011
Implication for Anglers

Brown Trout per 100 m²

- <200 mm
- >200 mm

2009: (0.69) Brown Trout/100m²
2010: (0.69) Brown Trout/100m²
2011: (0.52) Brown Trout/100m²
2012: (0.38) Brown Trout/100m²
2013: (0.75) Brown Trout/100m²
Questions?

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Continuous Discharge at Esop3a