The Alsea Paired Watershed - Revisited

Harvest Effects on Stream Temperatures

Jeff Light, George Ice, V. Cody Hale, Jeff McDonnell, and Mark Teply
Key Questions

• Are Pre-Harvest Temperatures Comparable Between the 2 Studies?
• Did Needle Branch Warm after Harvest?
  – If so, by how much?
  – What does this mean to fish?
• Was There a Temperature Response in the Unbuffered Portion of Needle Branch?
• Was There a Response Farther Downstream?
Design

• Before, After – Control, Impact (BACI)
Baseline – Then vs. Now

Relationship Between Temperatures in Flynn Creek (Control) and Needle Branch (Treatment)

95% prediction limits
Baseline – Then vs. Now

Relationship Between Temperatures in Flynn Creek (Control) and Needle Branch (Treatment)

Flynn Creek Max Monthly Temperature (°C)

Needle Branch Max Monthly Temperature (°C)

Harvest Period
- Original AWS Pre-Harvest (1959-1996)
- AWS Revisited Pre-Harvest (2000-2005)
Pre- and Post-Harvest Relationship between Flynn Creek and Needle Branch Temperatures for the Alsea Watershed Study Revisited (2006-2012)

Needle Branch Upstream of Upper Gage Site (NB6)

Daily Maximum Temperature (°C)

Upper Flynn Creek (FC12) Daily Maximum Water Temperatures (°C)

June-August

2006
2007
2008
Pre- and Post-Harvest Relationship between Flynn Creek and Needle Branch Temperatures for the Alsea Watershed Study Revisited (2006-2012)

June-August

- Pre-Harvest (2006-2008)
- Post-Harvest (2010-2012)
How Much Did It Warm?

Average Post-Harvest Increases in Needle Branch Daily Maximum Water Temperatures (°C) Near Lower End of Harvest Unit

P<0.001
Was it Too Warm for the Fish?
Comparison of 7-day Maximum Stream Temperatures After Harvest in the Original and Current Alsea Watershed Studies

Observed annual peak temperatures in the Alsea Watershed Study - Revisited

Numeric Criterion for Core Cold Water Rearing Areas

Harvest

- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
Comparison of 7-day Maximum Stream Temperatures After Harvest in the Original and Current Alsea Watershed Studies

Estimated Post-Harvest Peak from Original Study

Numeric Criterion for Core Cold Water Rearing Areas

Harvest

Estimated Post-Harvest Peak from Original Study

Year

2006 2007 2008 2009 2010 2011 2012
What Was the Temperature Response in the Unbuffered Portion of Needle Branch?
Was Warming Detectable Downstream?

Average Post-Harvest Increases in Needle Branch Daily Maximum Water Temperatures (°C)

*Some sets of randomly drawn data showed statistical significance (0.01<P<0.05)
Summary

- Small but statistically significant warming (0.7°C) occurred in the buffered portion of the harvest unit.
- Small and marginally significant warming (0.5°C) occurred in the unbuffered portion of the harvest unit.
- Some evidence that warming occurred at the downstream end of Needle Branch, but reasons for this are unclear.
- Temperatures in the harvested areas were well below numeric WQ criteria.
- Temperature effects of contemporary harvest BMPS were far less than were observed using historical BMPS.