

**ASSESSING THE EFFECTIVENESS OF  
CONTEMPORARY FOREST PRACTICES:  
COUNTERINTUITIVE RESULTS FROM PAIRED  
WATERSHED STUDIES**

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# Socially Salient Topics

- Sediment or accelerated erosion.
- Stream temperature
- Fish populations
- Watershed hydrology

# Take Home Messages from the Hydrology Literature

- Loss of forest canopy (disturbance) results in increased streamflow.
- Establishment of forest canopy results in decreased streamflow.
- Low flow increases are numerically small but proportionately large.
- Winter flow increases are numerically larger but proportionately smaller.
- In the PNW, we can get predictive.



**Clearcut size limits and  
adjacency constraints**

# We can be predictive with increased streamflow in the PNW

- 1<sup>st</sup> yr result, 100% clearcut w/broadcast burn site preparation – 18% of MAP.
- This result scales by MAP.
- This result scales by % area disturbed.
- For WRC watersheds; disturbance due to timber harvest means an increase in annual streamflow equivalent to 4 – 10 inches of rain.

# Management Related Streamflow Changes

- Changes in streamflow as a consequence of contemporary forest practices are small and chronic.
- They are well within the natural variability of the system ( $< S.D.$  of MAP).
- To the stream, contemporary forest practices are somewhat like a wet winter.

# Watershed Study Sediment Yield Results

Watershed Study	Increase in Sediment Yield (kg/ha/yr)	Increase (%)
HJ Andrews – WS1	86	420
HJ Andrews – WS3	802	3,900
Alea – Needle Branch	251	325
Alea – Deer Creek	183	123
Caspar Creek - SF	1,475 (1 <sup>st</sup> yr increase)	335
Caspar Creek - SF	2,510 (6 yr increase)	212

# Changes in Management Practices

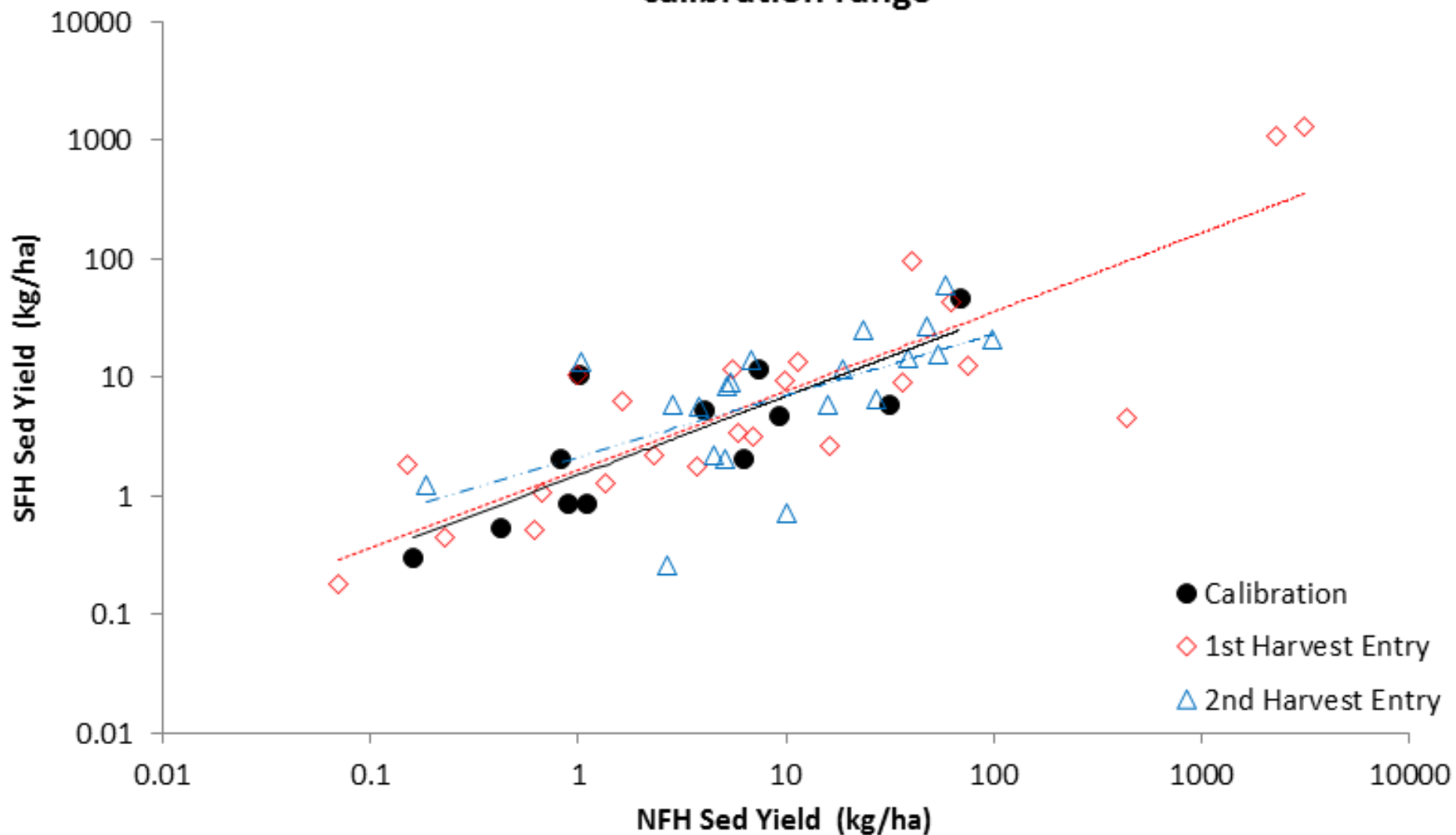
- Buffer strips.
- Clear cut size limits and adjacency constraints.
- Skyline and shovel logging systems.
- Aerially applied chemical site prep.
- Roads: Improved location, quality, maintenance, and, especially, connectivity.



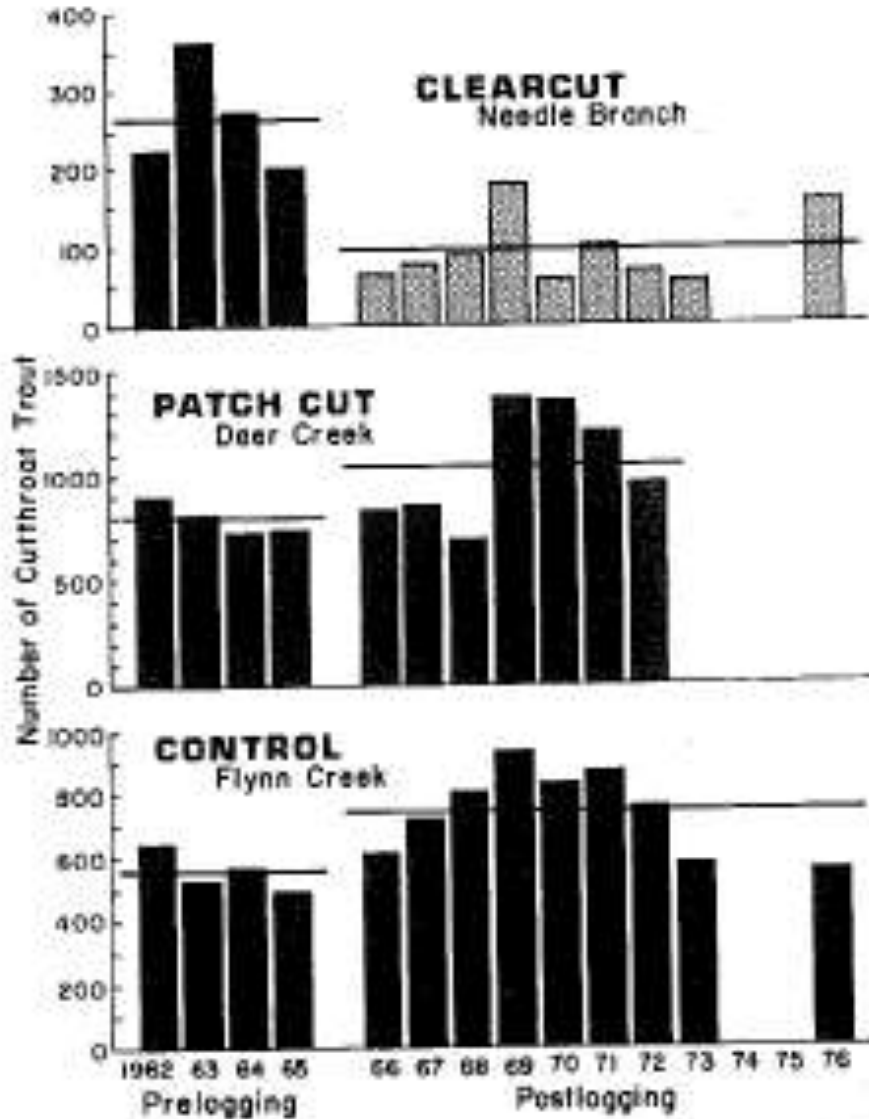
# Contemporary Studies on Sediment

- Caspar Creek Paired Watershed Study
  - Changed to clearcut silviculture from individual tree selection
  - Changed to skyline yarding systems from tractor logging
  - Changed to roads on upper slopes vs stream adjacent roads
  - Buffer strips were prescribed.
- Micah Creek Paired Watershed Study
- Hinkle Creek

## NFH vs SFH Monthly Sediment Yield with points outside of calibration range



# Alsea Watershed Study



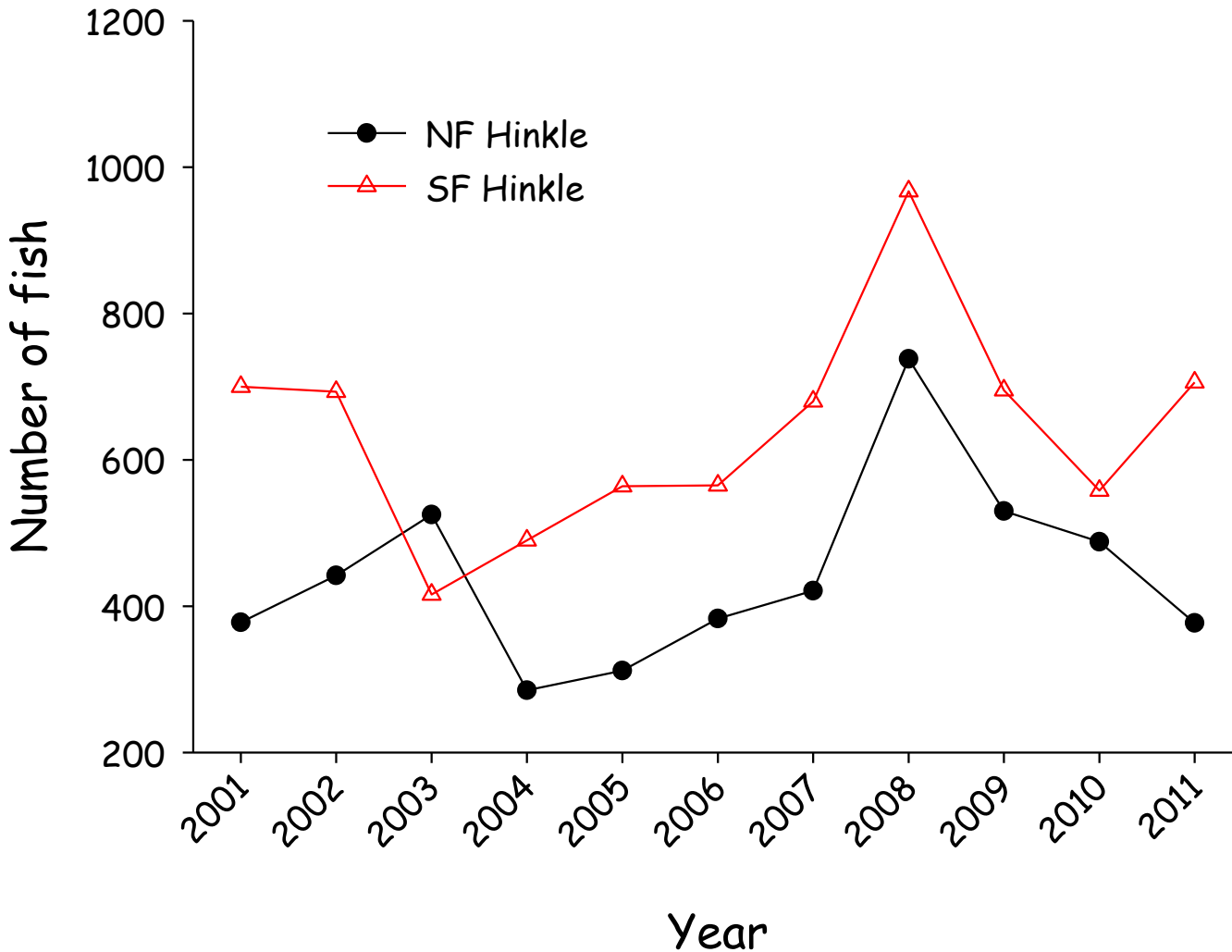
Source: Hicks et al 1991

A photograph of a stream flowing through a forested area. The stream is filled with rocks and has a blueish tint. On the right bank, there is a large pile of logs and debris. The background shows a steep, forested hillside.

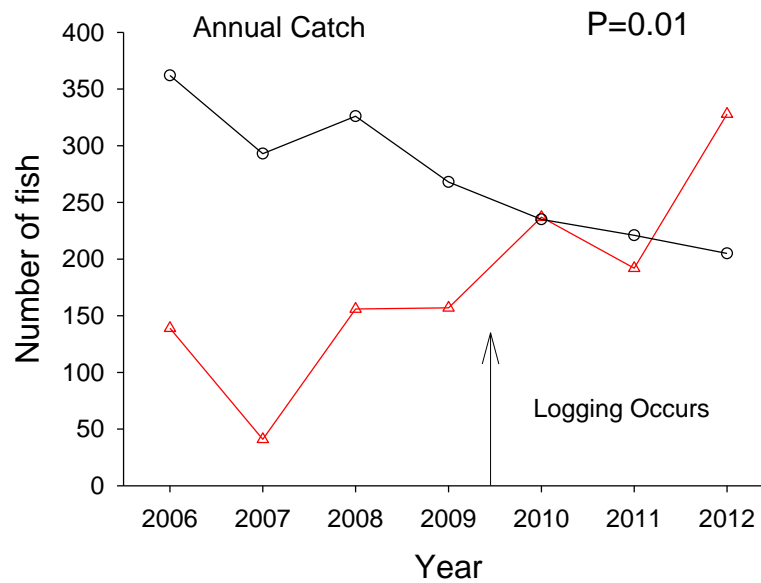
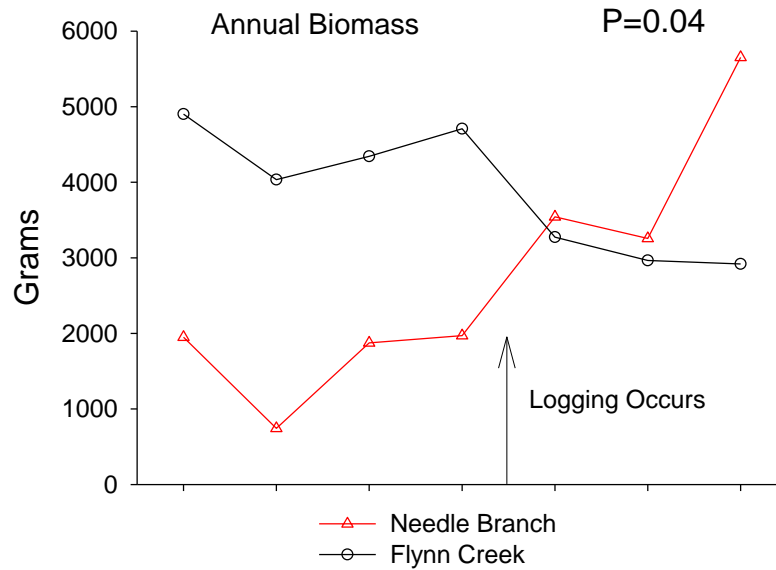
# Changes in Management Practices

- Stopped cleaning streams.
- Started leaving prescribed buffer strips.

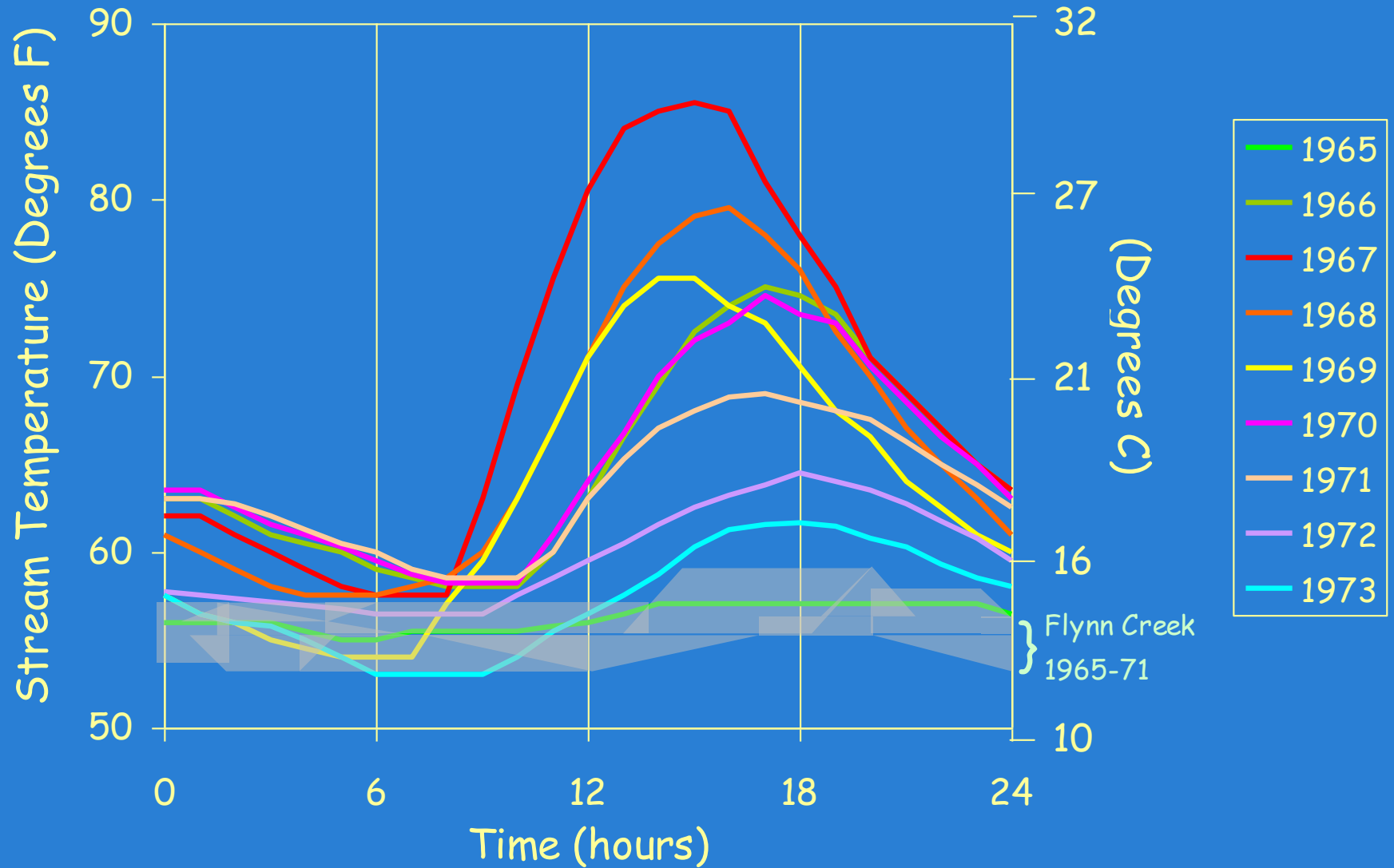
# North and South Forks of Hinkle Creek: Annual Catch of Age 1+ Cutthroat Trout



# Needle Branch and Flynn Creek: Annual Total Biomass and Catch of Age 1+ Cutthroat Trout



# Needle Branch



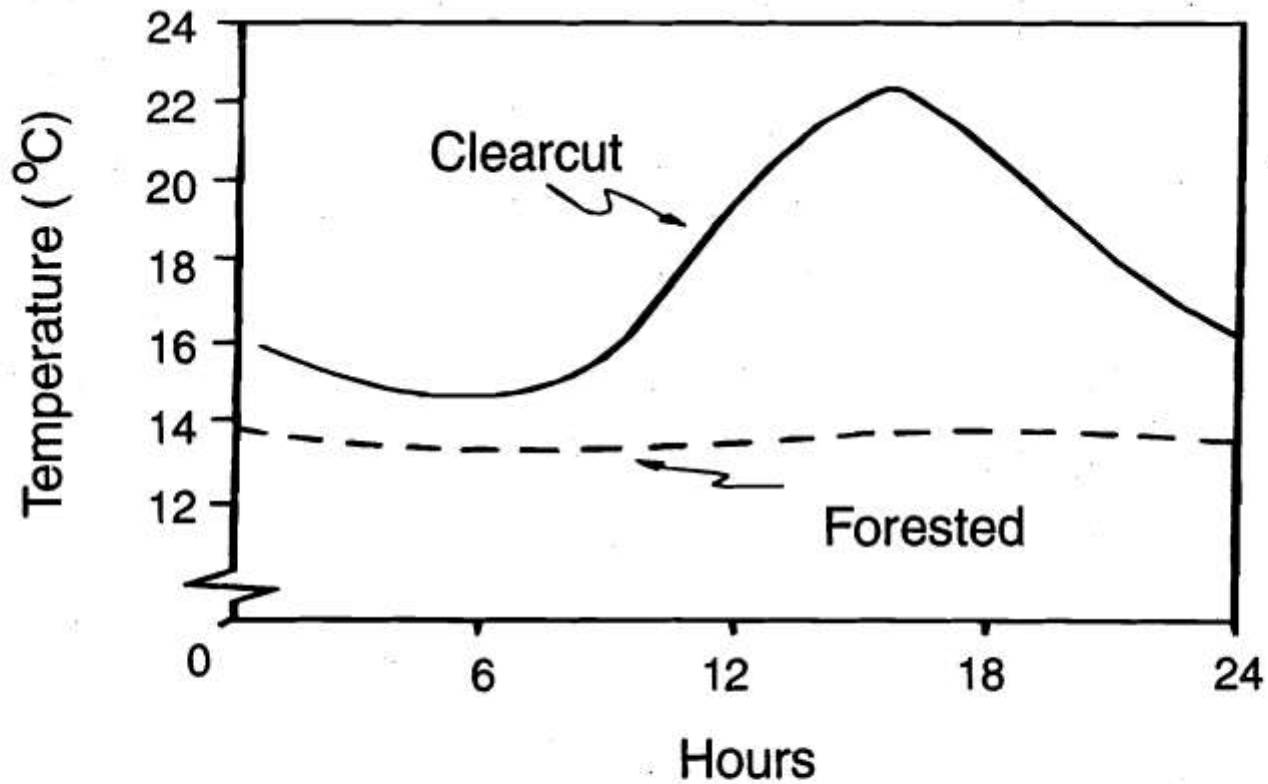


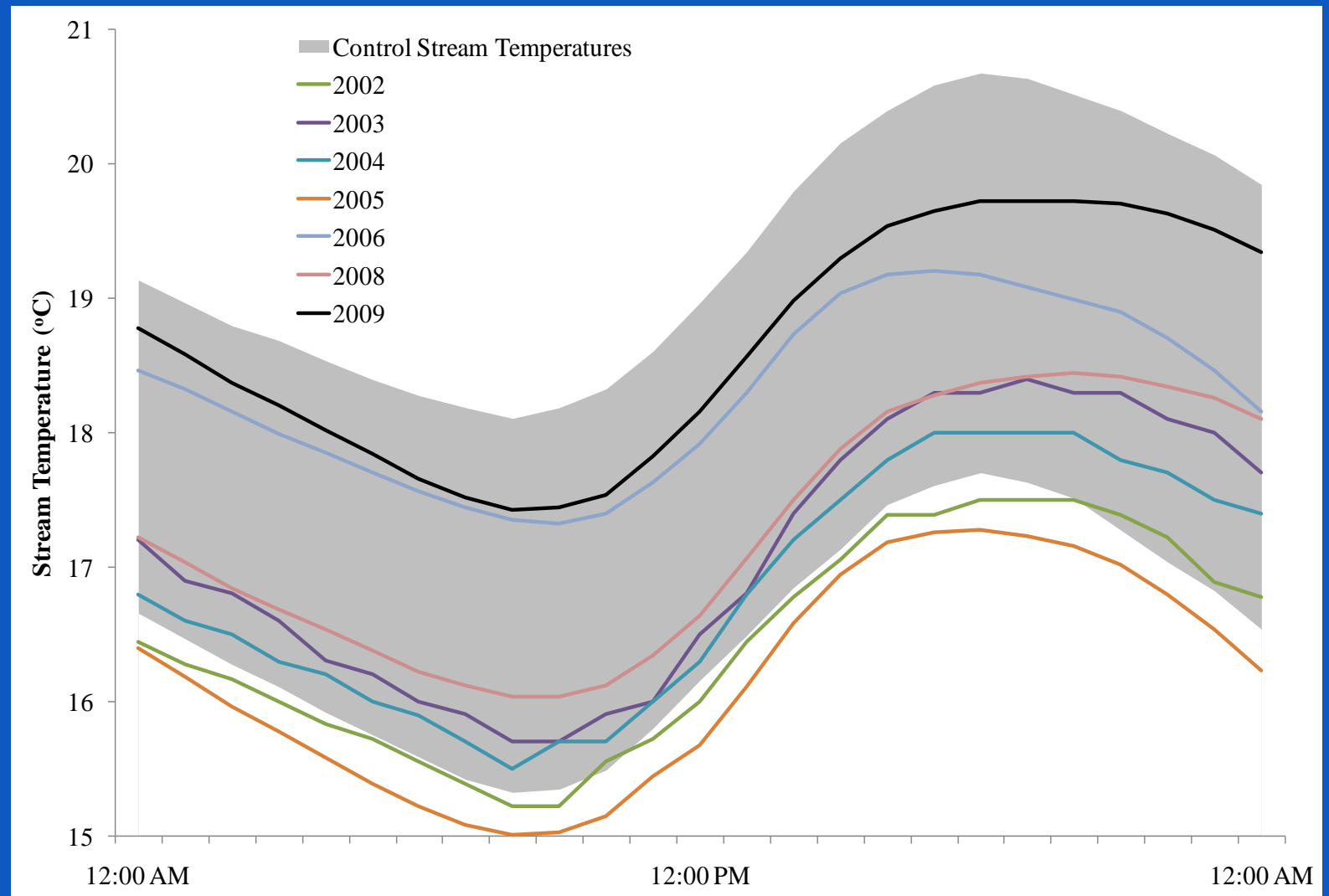
Figure 5.2. Typical daily stream temperature in clearcut and forested streams during clear weather in Oregon's Coast Range. (From Beschta et al. 1987; reprinted with permission from University of Washington, Institute of Forest Resources.)



# Fish-Bearing Streams in Oregon

- Medium and small streams
- Hinkle (in draft form); Ave=0.5°C, max=2.5°C, min=-1.8°C, n=7
- Ripstream (Groom et al 2011); Ave=0.7°C, max=2.5°C, min=-0.9°C, n=33
- Large, acute impacts are not present.
- Results are small, chronic, and equivocal.

# Hinkle Creek



# Non-fish-bearing streams in PNW

- Jackson et al 2001, Janisch et al 2012, Kibler et al (in press), Gravelle & Link 2007.
- First of all, the large, acute, hypothesized impacts were not realized.
- Impacts were detected, they were smaller, chronic, and equivocal.
- The science from small, perennial, fish-bearing streams does not transfer well to non-fish-bearing streams.

# Cumulative Watershed Temperature Impacts

- Hypothesized impact.
  - Large, acute impacts in non-fish-bearing streams.
  - These impacts propagate and accumulate downstream causing acute impacts downstream.
- From Hinkle Creek, there is no evidence that stream temperature can propagate and accumulate downstream (also Micah Creek).
- Further, the stream processes investigated don't support the concept that it can (i.e. advected heat from groundwater and water residence time).

# Final Thoughts

- Contemporary forest practices have eliminated the large, acute impacts associated with intensive forest management.
- Contemporary forest practices do result in detectable impacts however, they are small, chronic impacts and they are equivocal.
- These small, equivocal, chronic impacts are within the range of natural variability in space and/or time.