

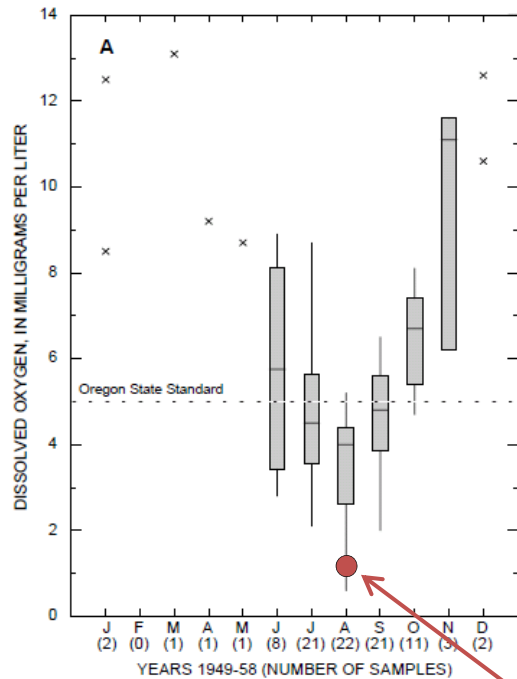
# Dissolved Oxygen Response to Forest Management in the Alsea Watershed Study Revisited

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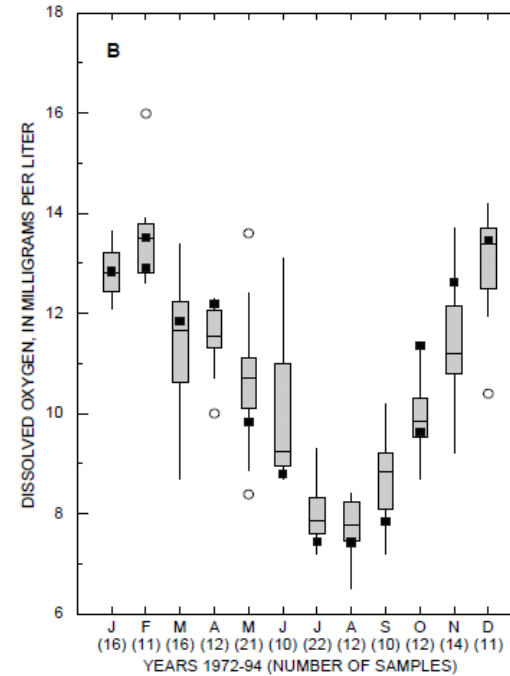
Watersheds Research Cooperative Workshop  
Corvallis, OR  
April 18, 2013

# Dissolved Oxygen Concentrations in Lower Willamette River, Oregon (USGS 1996)

1949-58



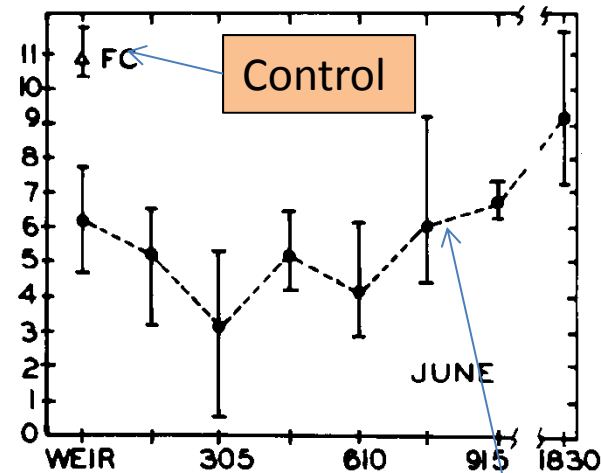
1972-94



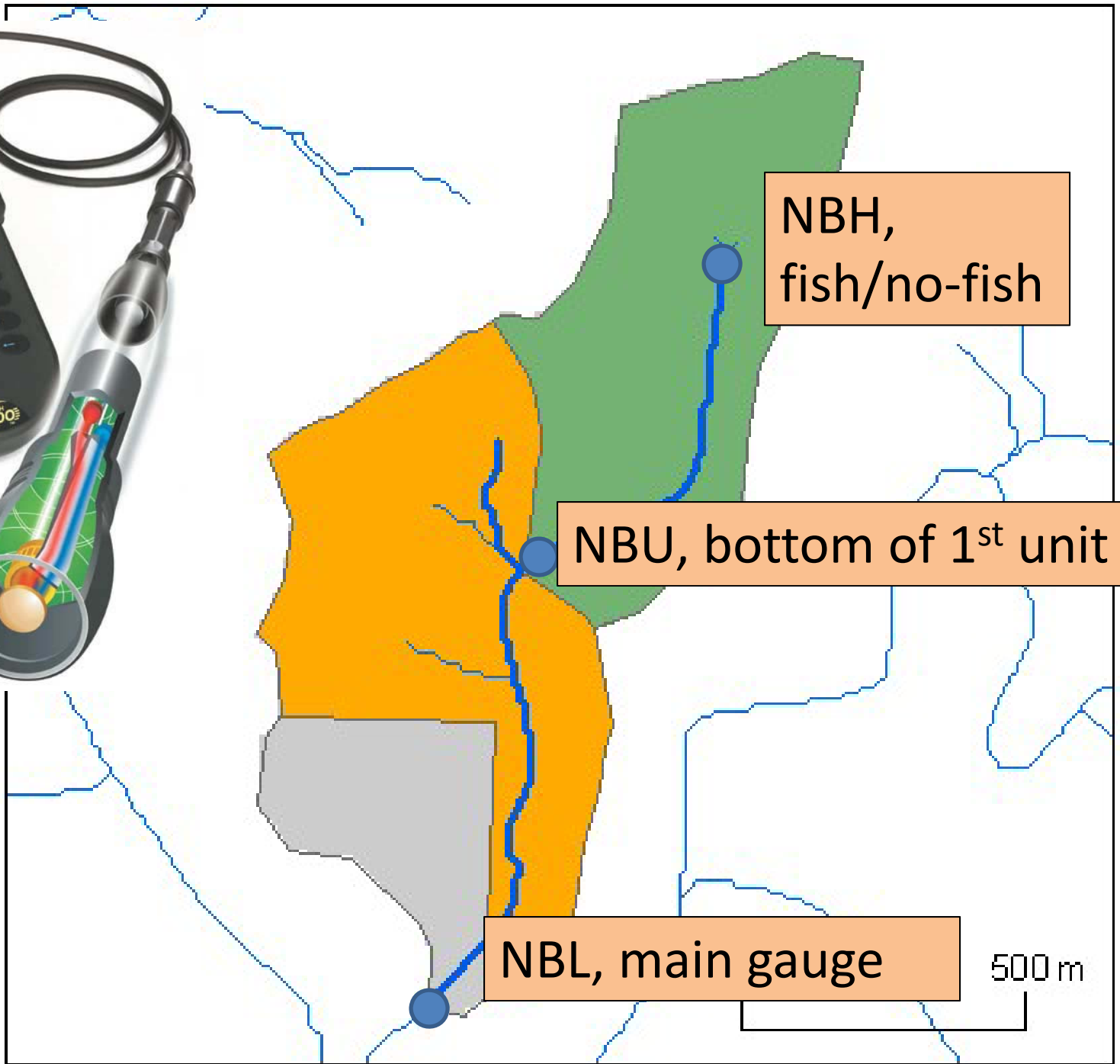
1920s and 1930s less than 1 mg/L throughout entire reach of Willamette River mainstem

# Original Study Response to 1966 Harvest

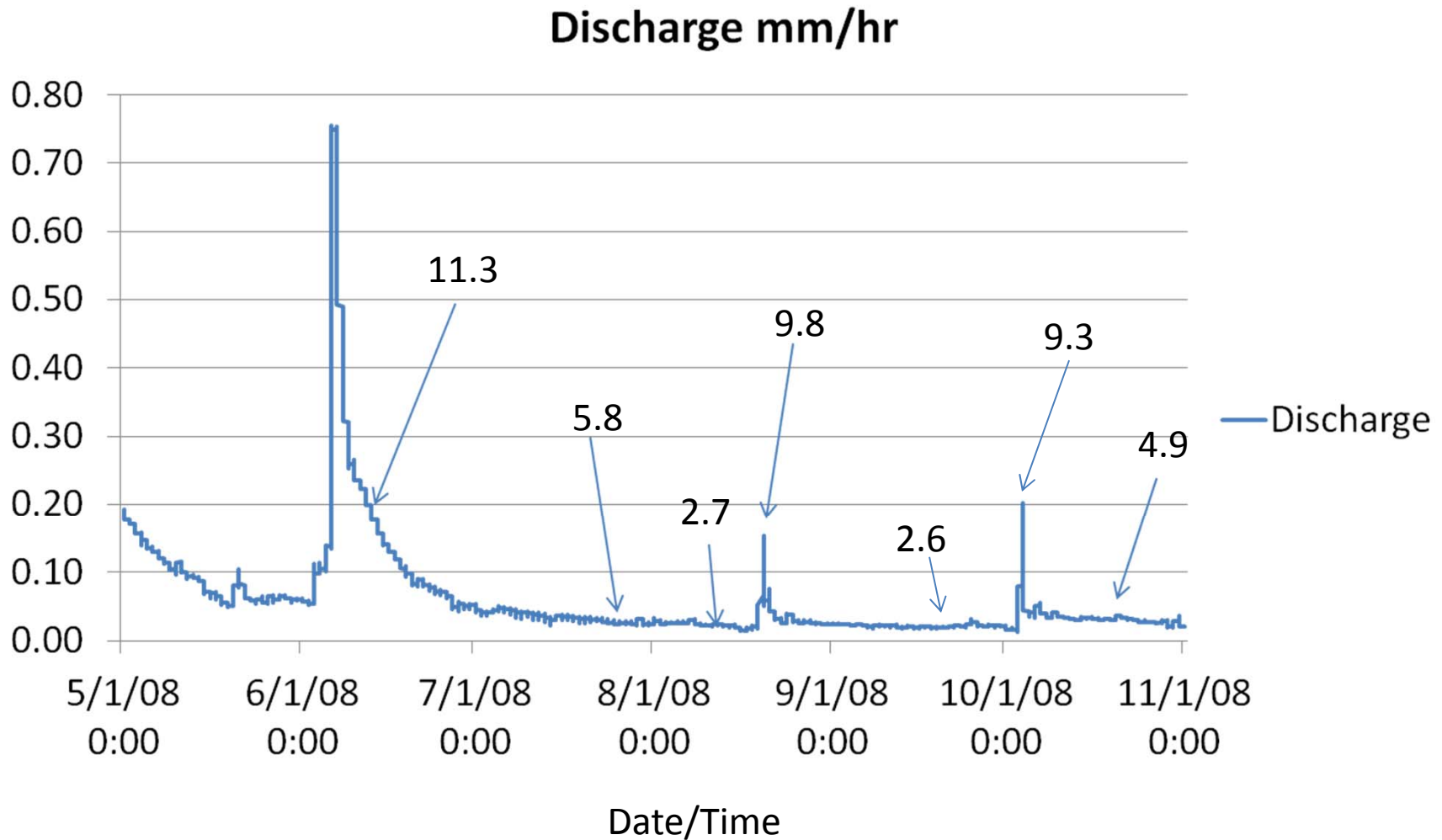
- Much lower DO concentrations than observed in control watershed (Flynn Creek)
- Depressed DO concentration due to fresh slash, impoundment and reduced turbulence, and increased water temperatures



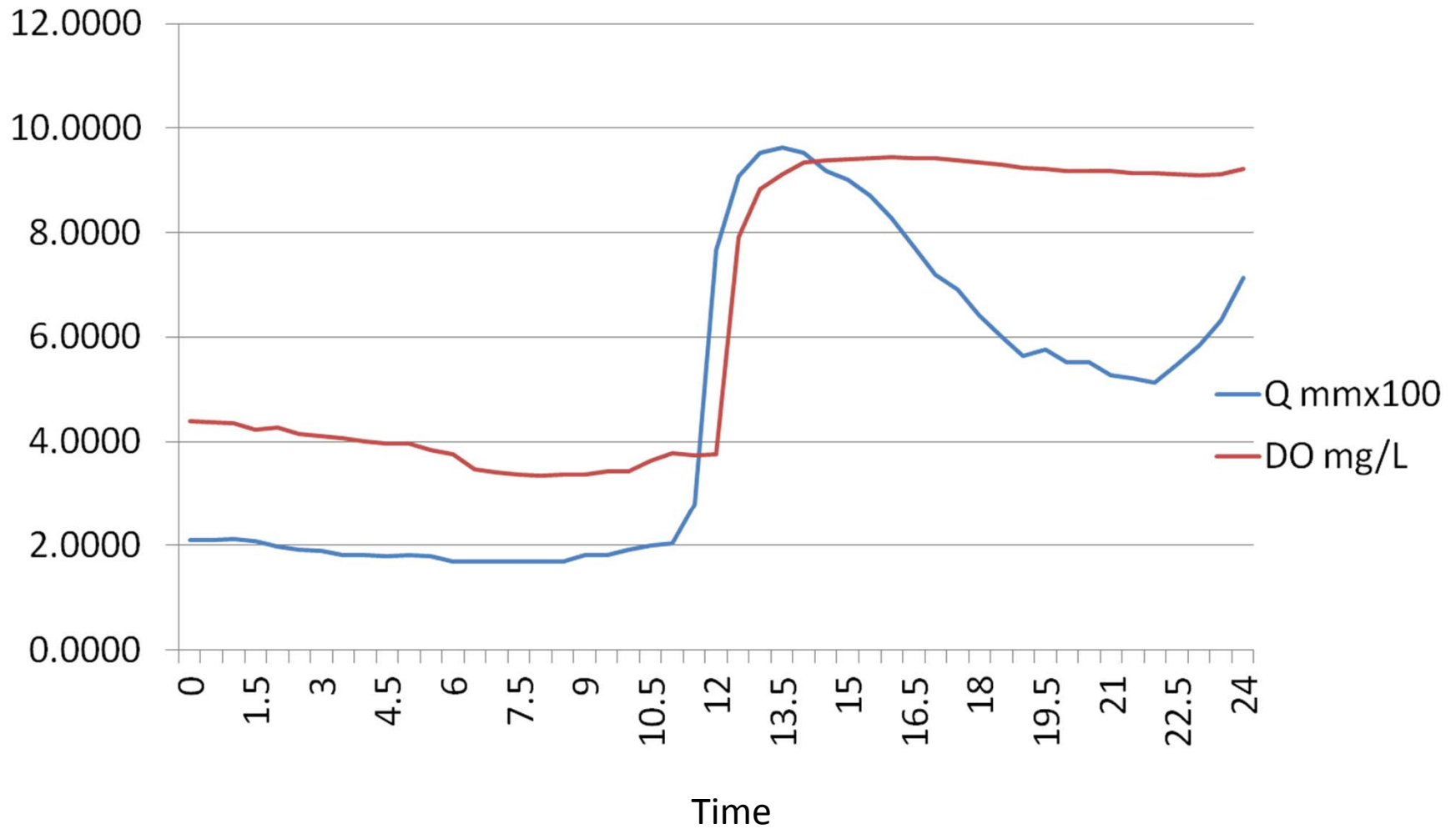
Clearcut watershed  
with no buffer



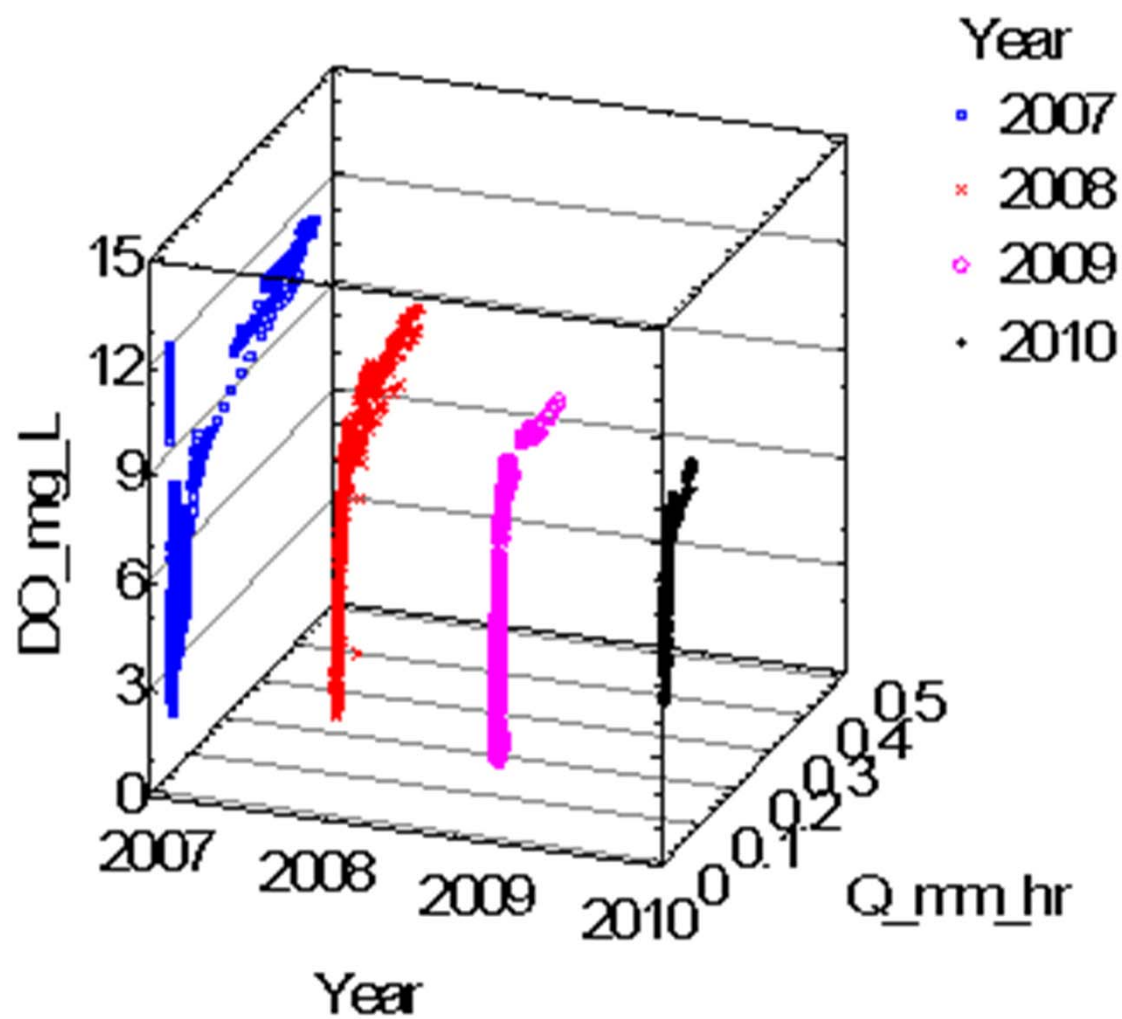
# 2008 NBU Hydrograph (May-October) and DO Response (mg/L)



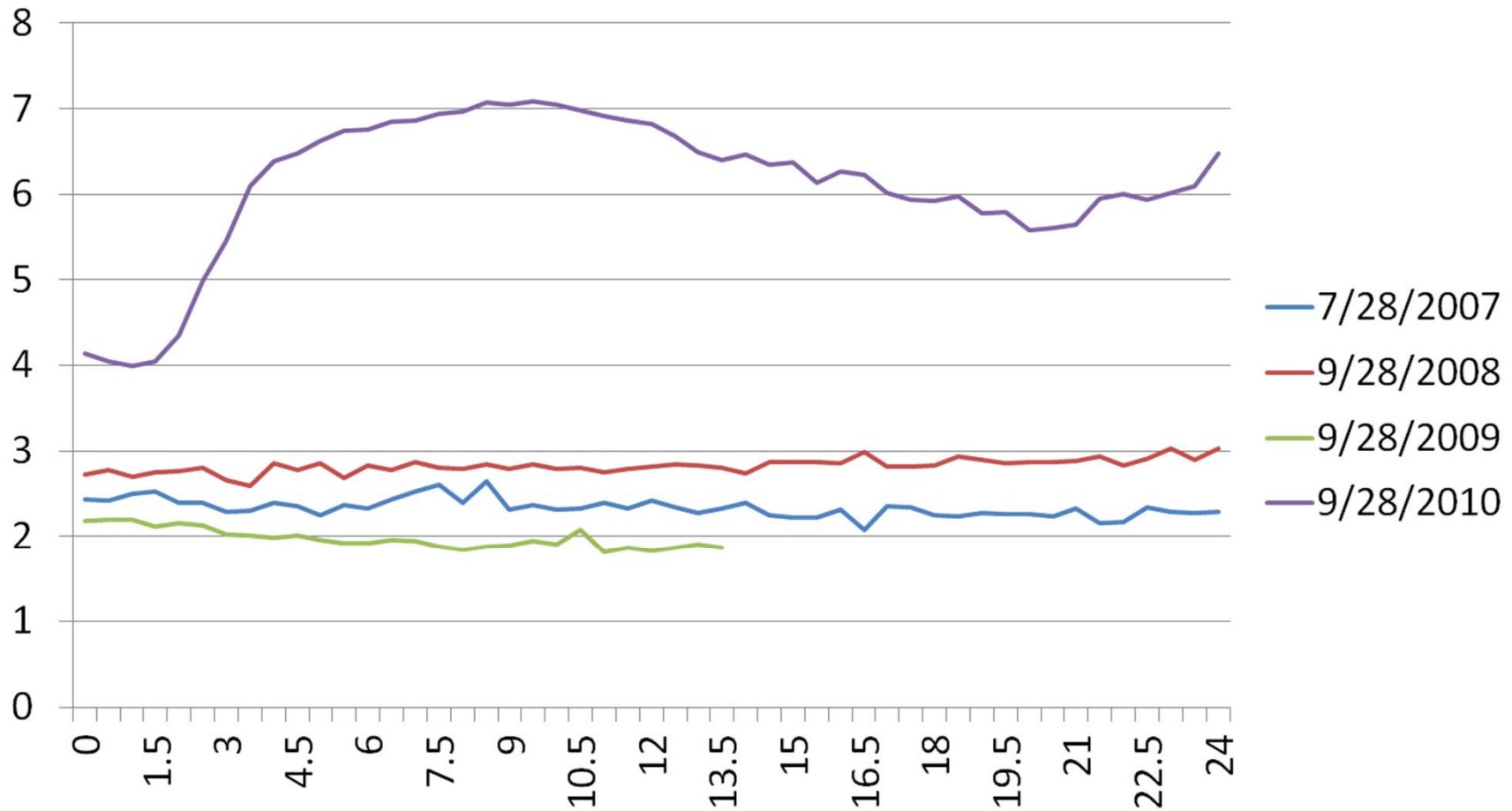
# Storm Response noon to noon (8/19-20/2008)



# Upper Needle Branch



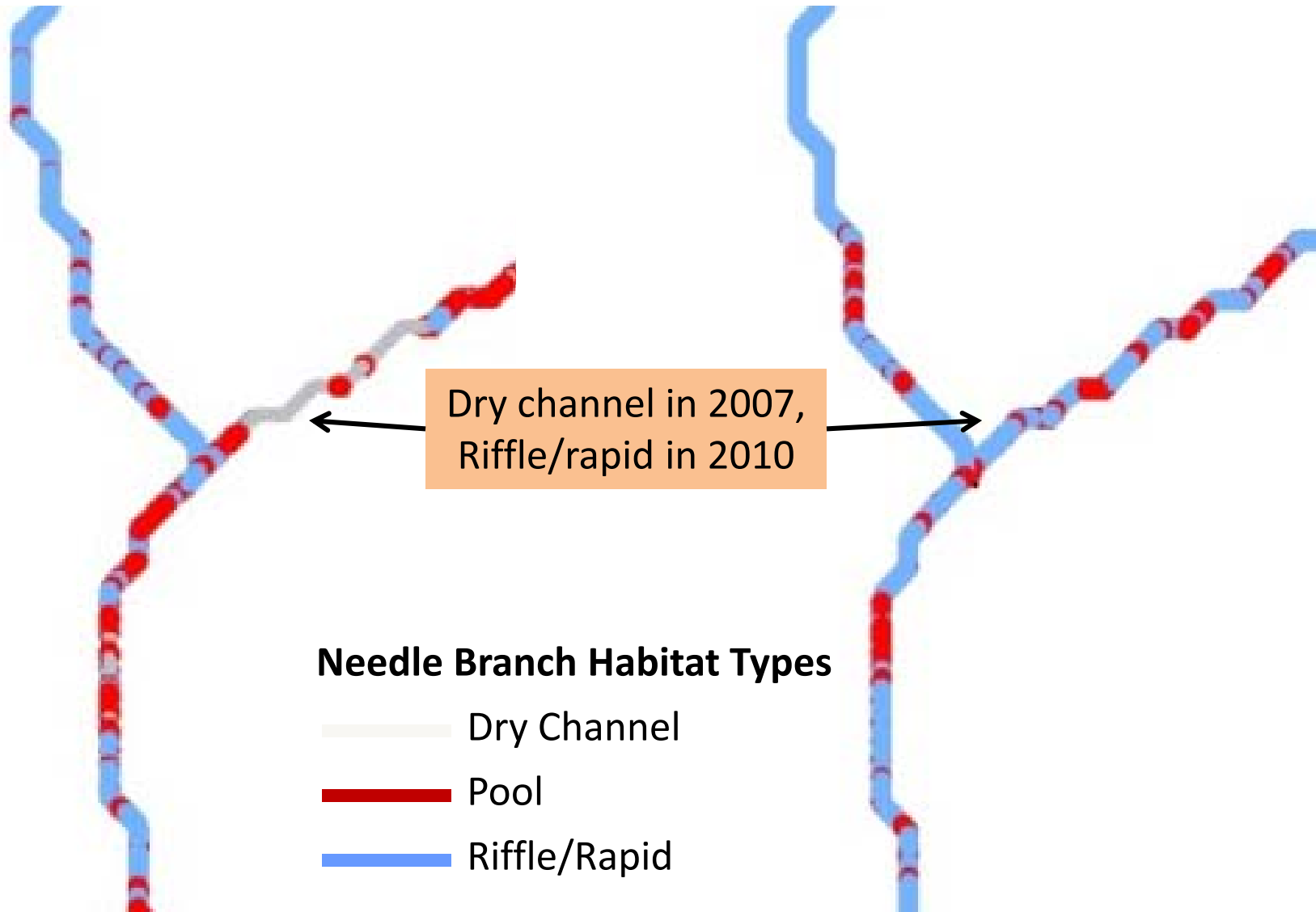
# Diel Dissolved Oxygen Pattern (lowest DO day recorded for year)





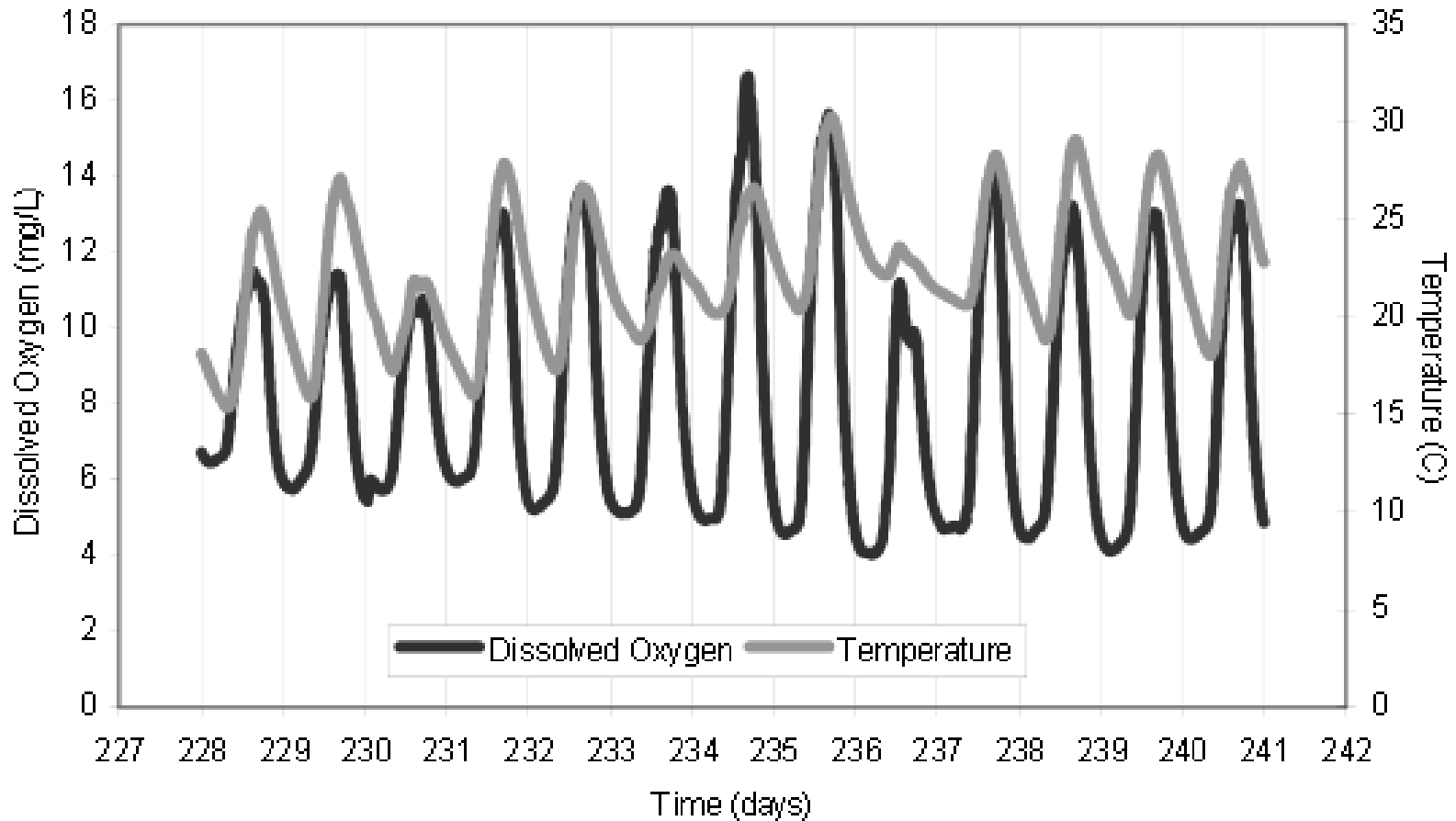
Needle Branch,  
2007 Habitat

Needle Branch,  
2010 Habitat

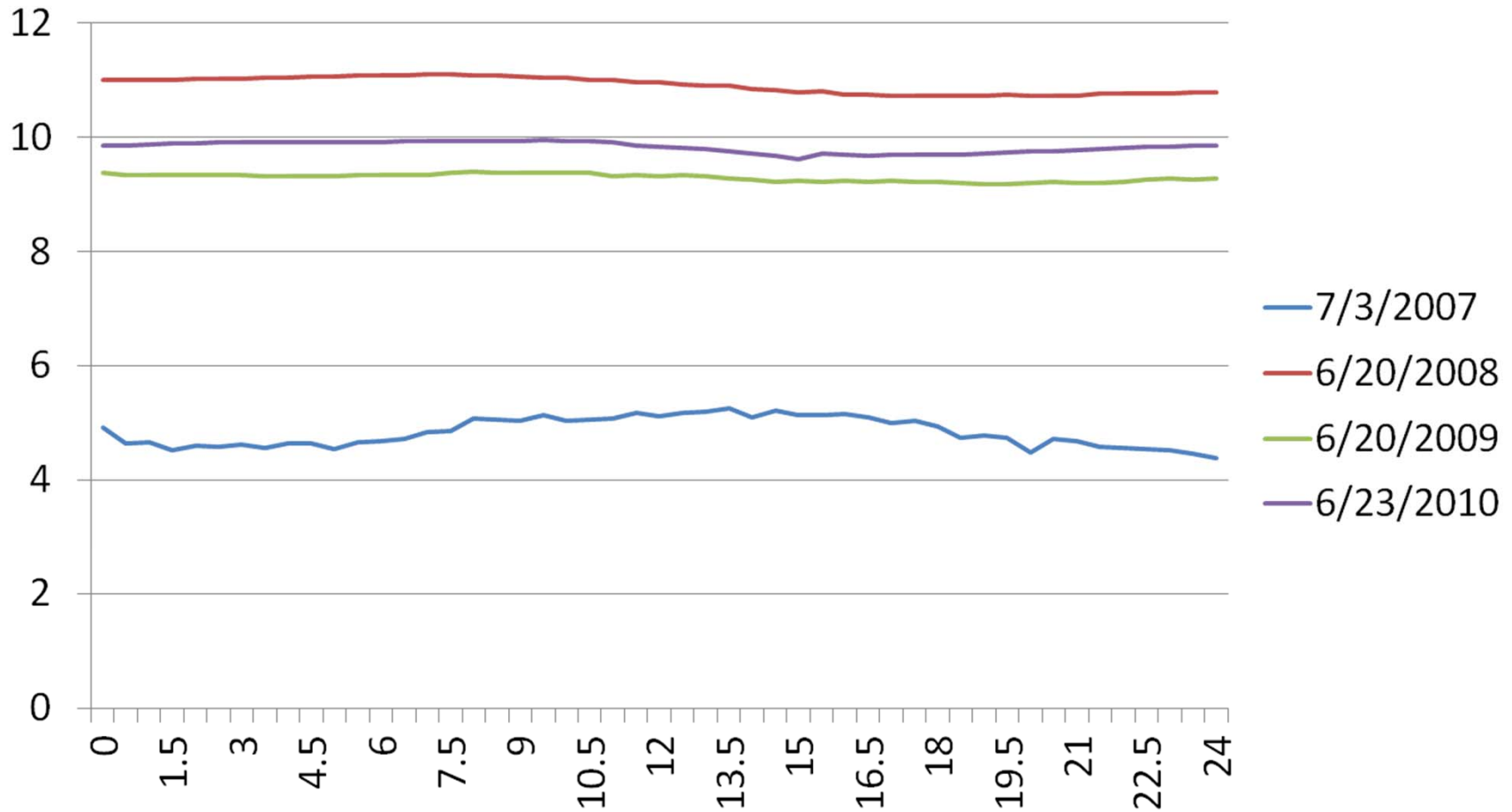


# Daily Temperature and DO Fluctuations in Big Muddy Creek, KS

Big Muddy Creek



# Diel Dissolved Oxygen Pattern (near solar maximum)



# Oregon Water Quality Standards

- Active spawning areas through fry emergence 11.0 mg/L; however, if minimum intergravel DO is 8.0 mg/L or greater then DO criteria is 9.0 mg/L
- If barometric pressure, altitude, and temperature preclude attainment of above, then must be not less than 95% of saturation
- Intergravel DO must not fall below 8.0 mg/L
- Some conditions Dept. can allow: not less than 90% saturation and 30 day mean minimum of 8 mg/L; 7 day minimum mean of 6.5 mg/L; may not fall below 6.0 mg/L as an absolute minimum

# Findings

- While the perennially-flowing control watershed is always near saturation, Needle Branch (NB) (discontinuously perennial) experiences DO concentrations well below saturation, dropping to 2-4 mg/L each year during periods of minimum discharge
- Low DO concentrations (coupled with low water temperatures) indicate groundwater or hyporheic water controls observed DO patterns
- 1966 harvest did depress DO (based on DO/discharge relationship we have observed)

## Findings (continued)

- Analysis is still ongoing but there is little evidence of a forest management signature in DO data following 2009 NB harvest except perhaps in response to increased flow (increased DO)
- There is little evidence of strong diurnal fluctuations in NB that would indicate a eutrophic condition
- “Clumpy” fish distribution in NB may show fish moving to higher DO reaches (high reaeration rates)
- Despite supporting resident trout and salmon spawning and rearing, NB cannot achieve state WQ criteria even without forest management