

An underwater photograph showing a large number of juvenile salmonids (likely Chinook) gathered around and under a large piece of woody debris (a log) in a river channel. The water is clear, and sunlight filters through, creating dappled light patterns on the riverbed and the fish. The fish are densely packed in some areas, particularly near the log.

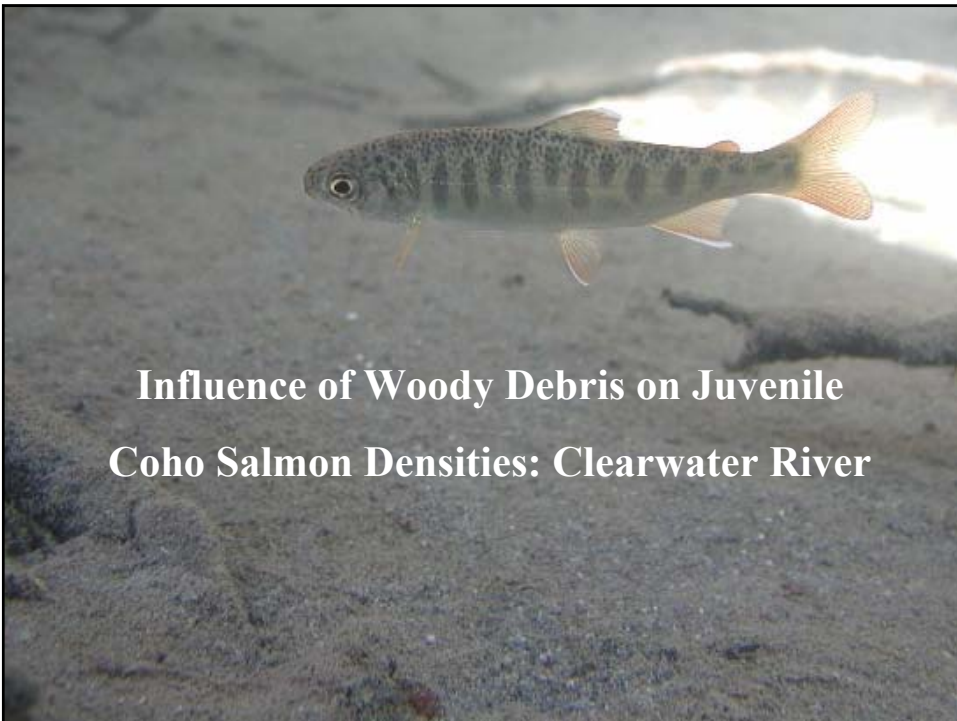
## Habitat Use by Juvenile Salmonids with Special Emphasis on Woody Debris and Large River Channels

**Roger Peters**

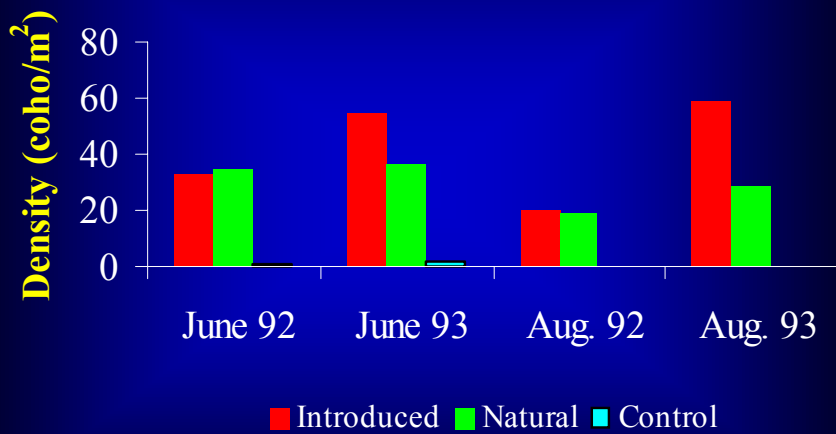
U.S. Fish and Wildlife Service  
Fisheries and Watershed Assessment Division  
Lacey, WA

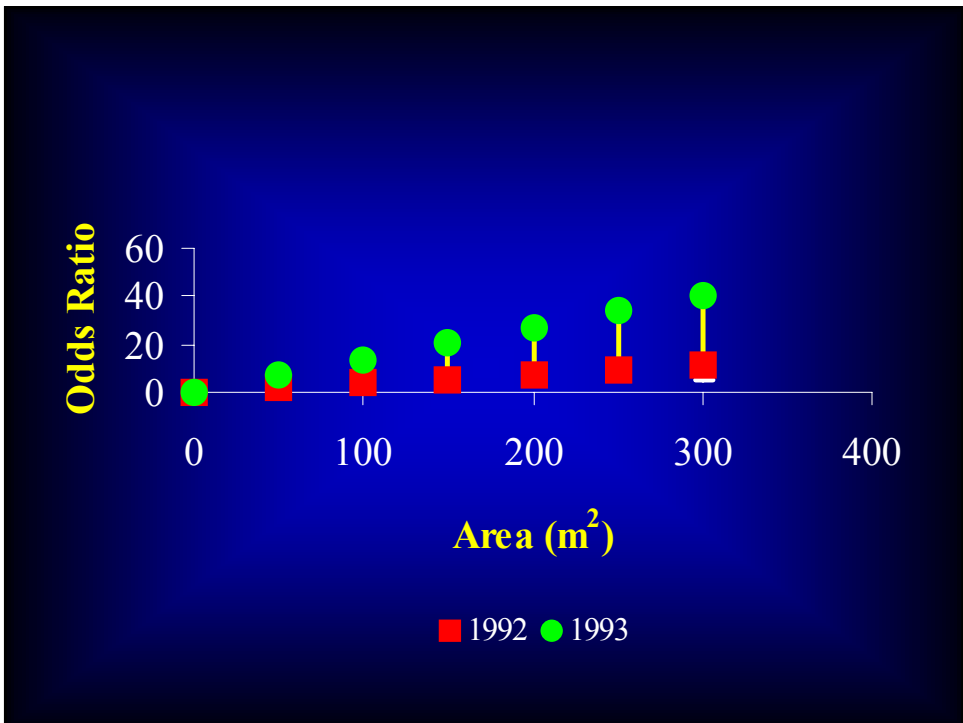
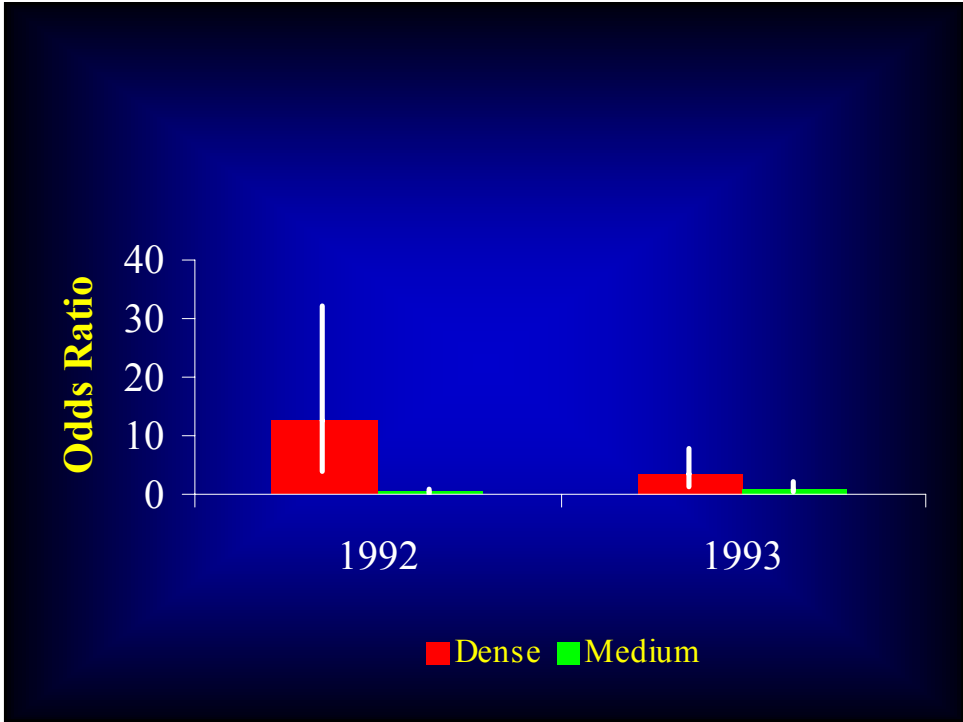
### **Outline**

- Influence of Woody Debris in the Clearwater River
- Fish Densities Near Banks Stabilized Using Different Methods
- Response of Juvenile Salmonids to ELJ's
- Habitat Use by Juvenile Chinook in the Cedar River
- How do fish use habitat?
- Predation: is it an issue?



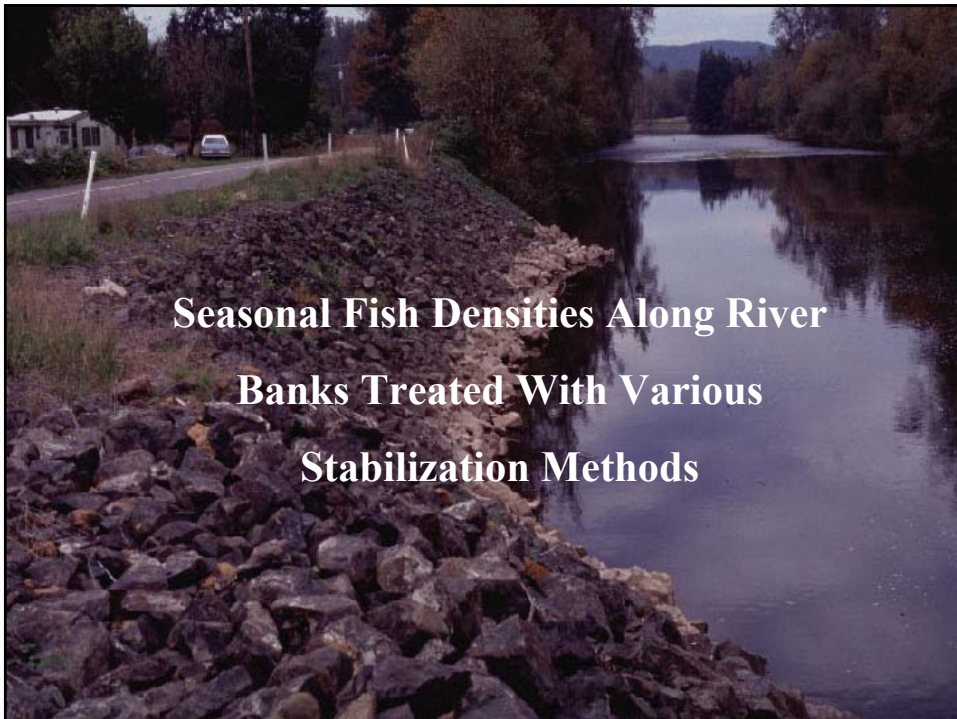
**Influence of Woody Debris on Juvenile  
Coho Salmon Densities: Clearwater River**





# Conclusions

- **Juvenile coho salmon:**
  - Preferred areas with woody debris
  - Presence influenced by debris density
    - Higher probability in dense accumulations than in medium or sparse complex accumulations
  - Probability of occurrence increased with increasing surface area



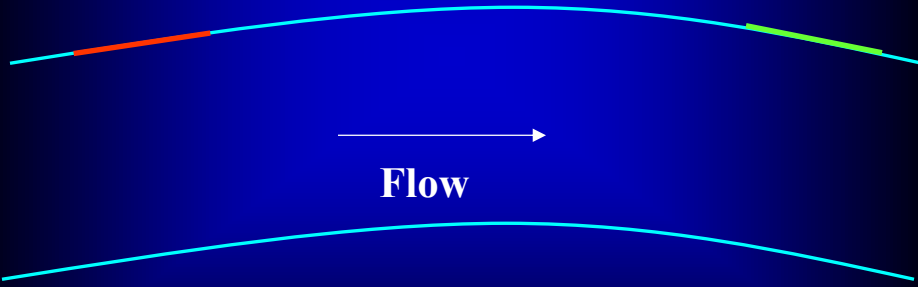
Seasonal Fish Densities Along River  
Banks Treated With Various  
Stabilization Methods

# Study Design

Control

Stabilized

Site



Difference = Stabilized Site – Control

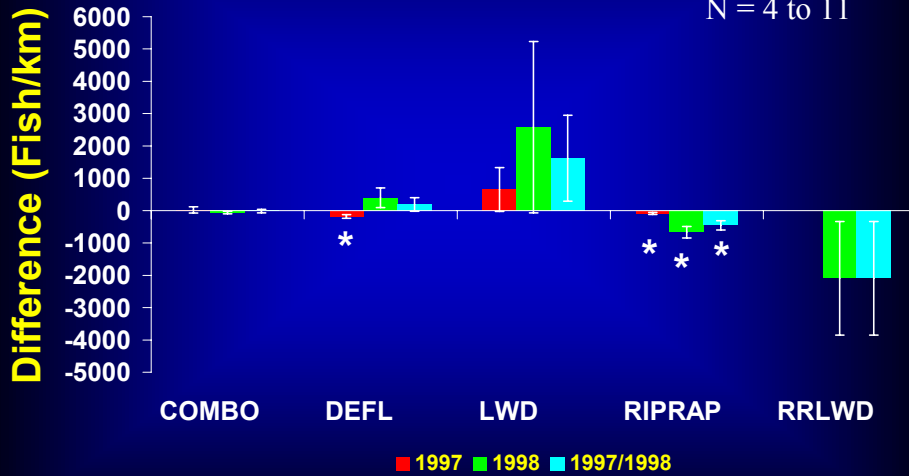
Paired t-test





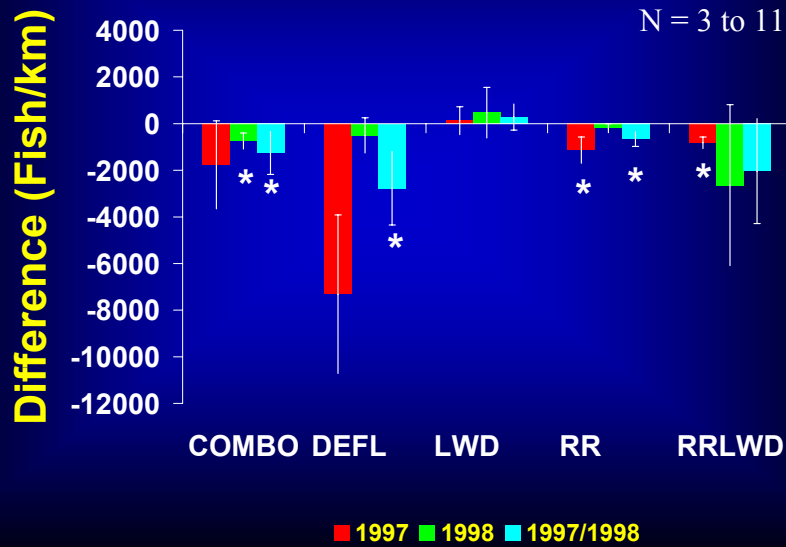
# Chinook Spring

N = 4 to 11

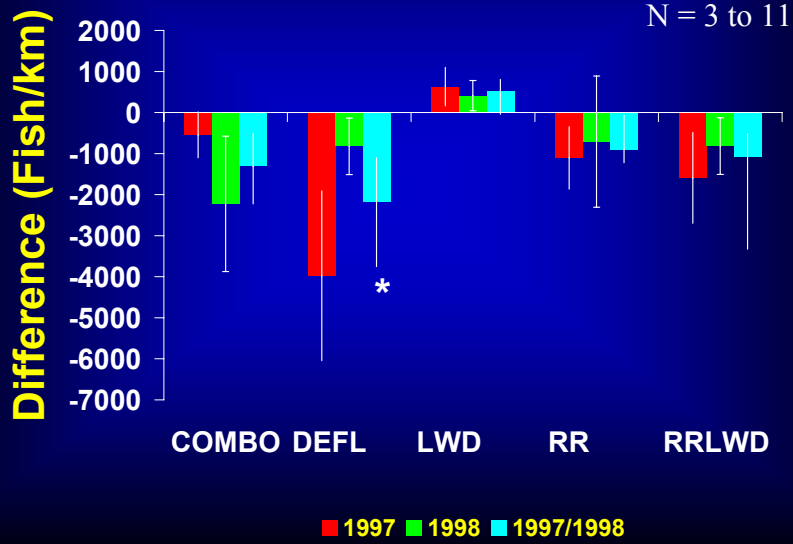


# Coho Spring

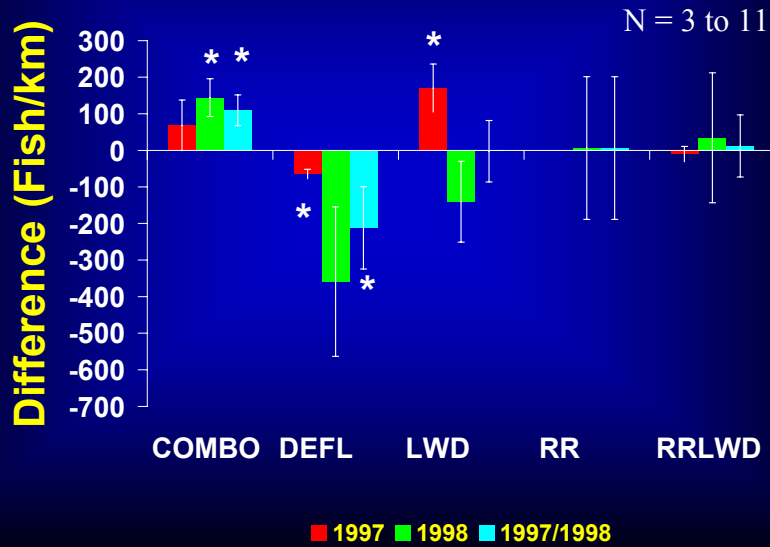
N = 3 to 11



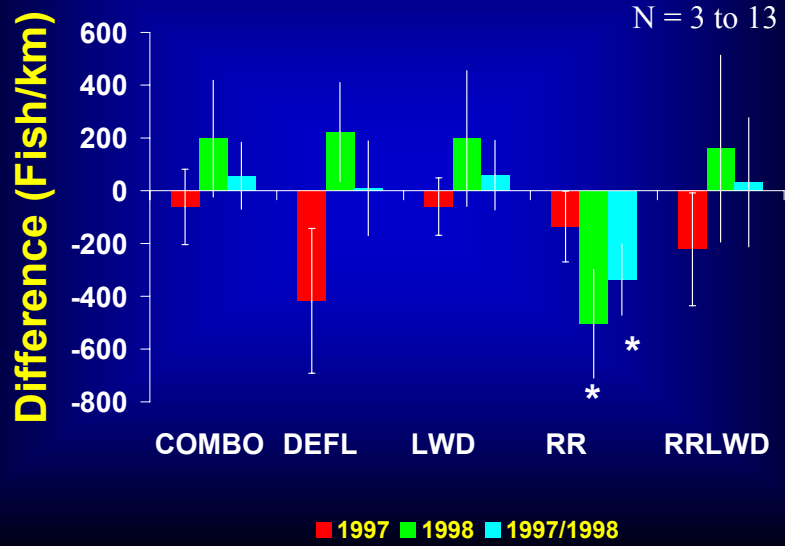
# Coho Summer



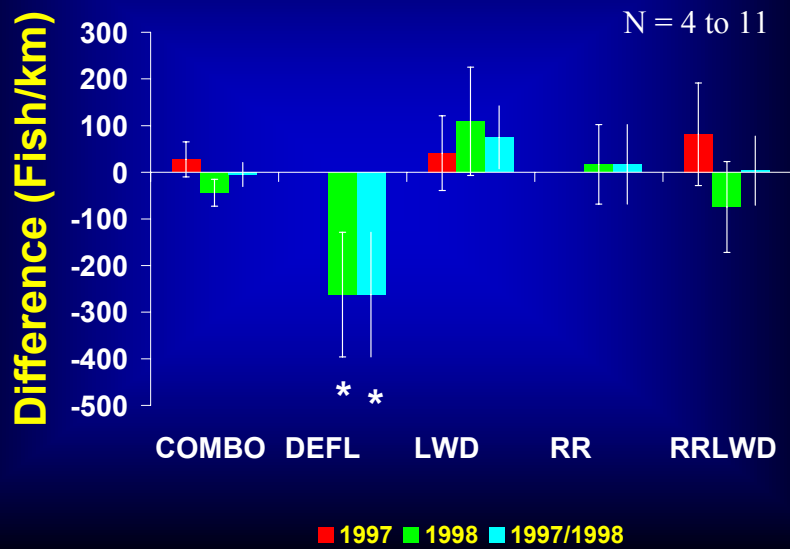
# 1+ Trout Spring



## 1+ Trout Summer



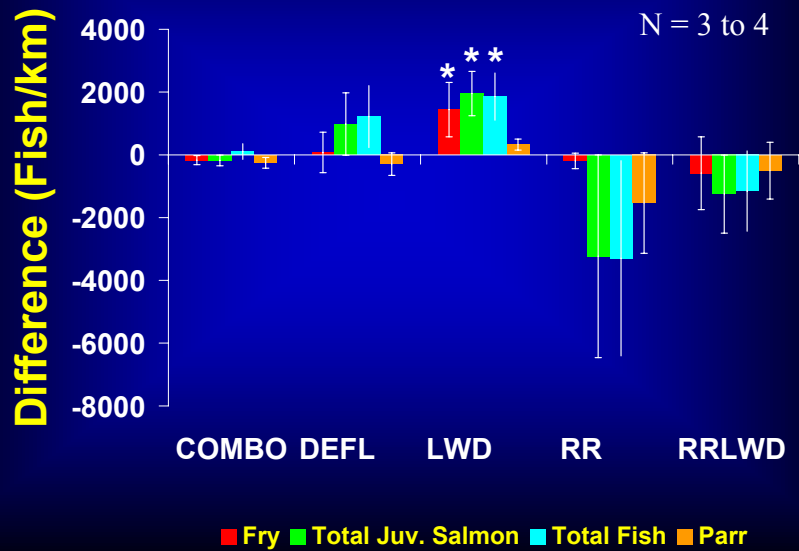
## 2+ Trout Spring



## 2+ Trout Summer

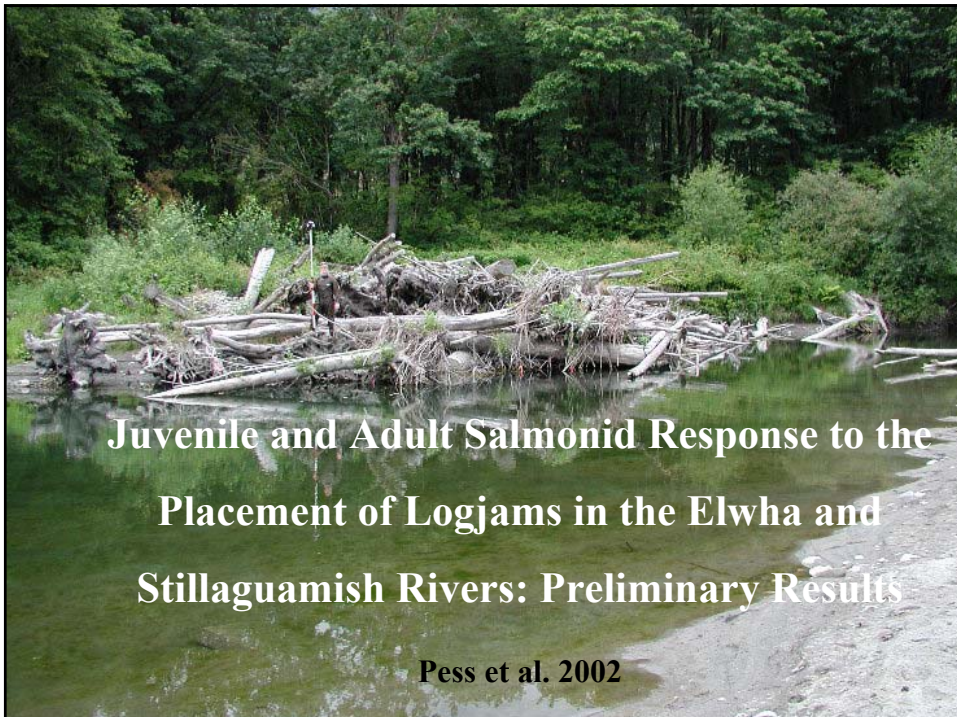


## Winter 1997



## Conclusions

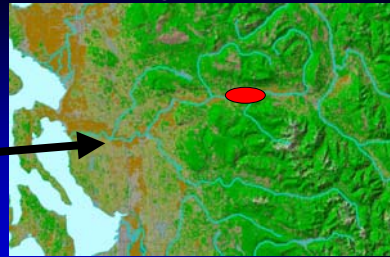
- Only LWD stabilized sites consistently had greater densities than control areas
- Riprap and Riprap with LWD had reduced densities compared to controls
- Reduced densities at deflectors during spring and summer, greater during winter
- Adding LWD to riprap had little benefit
- Adding LWD to deflectors provided some benefit



# Study Areas



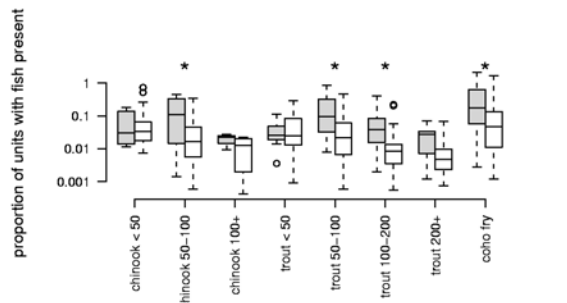
Stillaguamish



Elwha

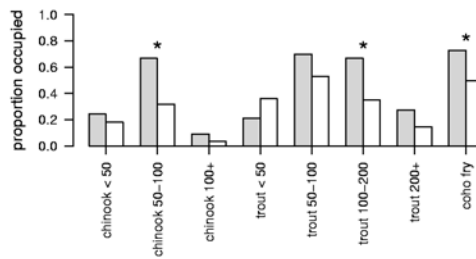


Elwha logjams:  
Fish density

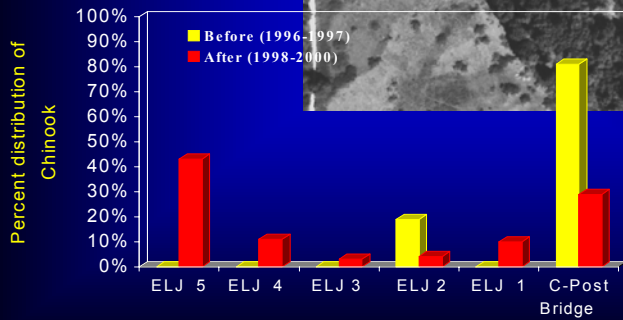


Grey boxes = logjam units  
Clear boxes = non-logjam units

Elwha logjams:  
Fish occupancy



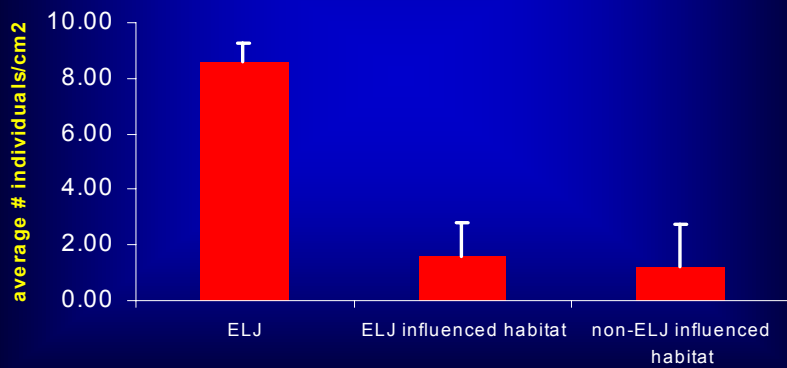
## North Fork Stillaguamish Adult chinook use Pre v. post logjams – RM 21 to 21.5

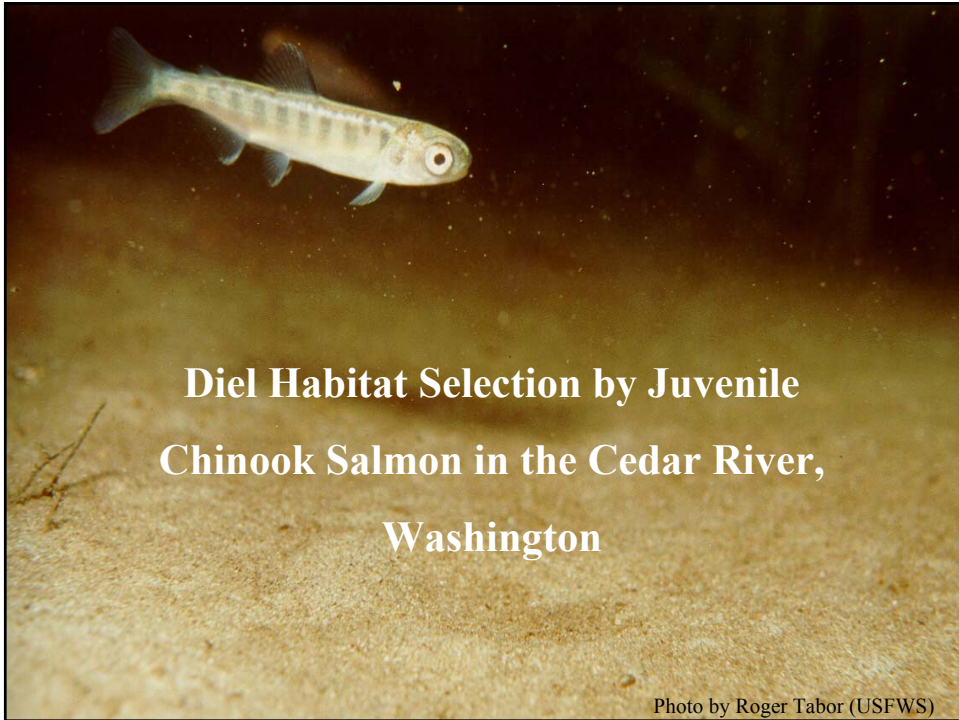


## Secondary producers

Natural substrate collection

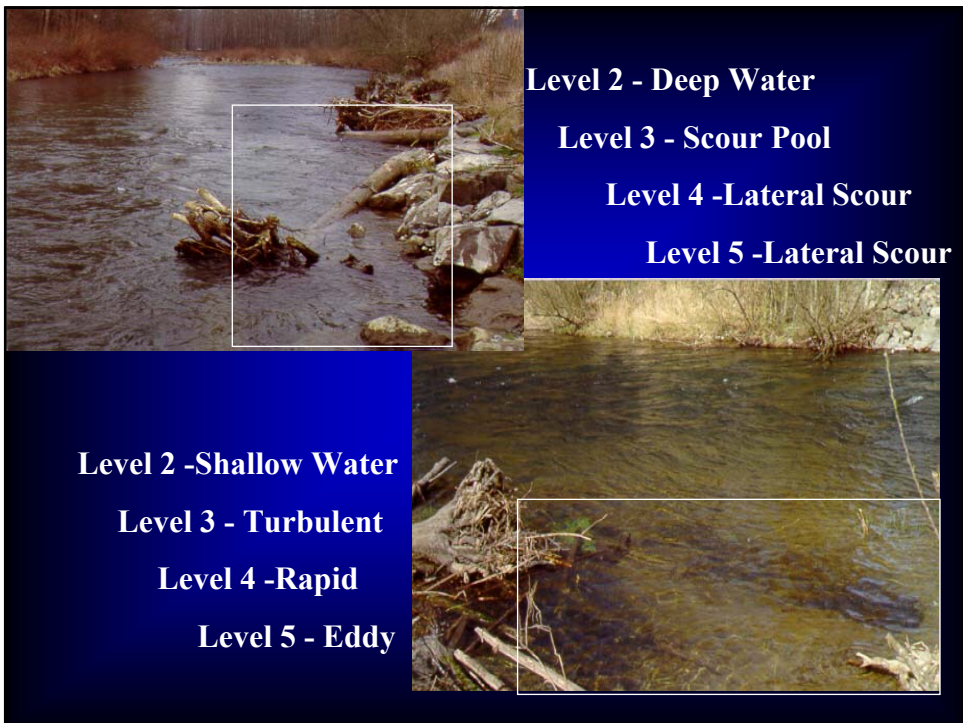
Secondary Producers Collected from Natural Substrate -  
Elwha River - October 2002



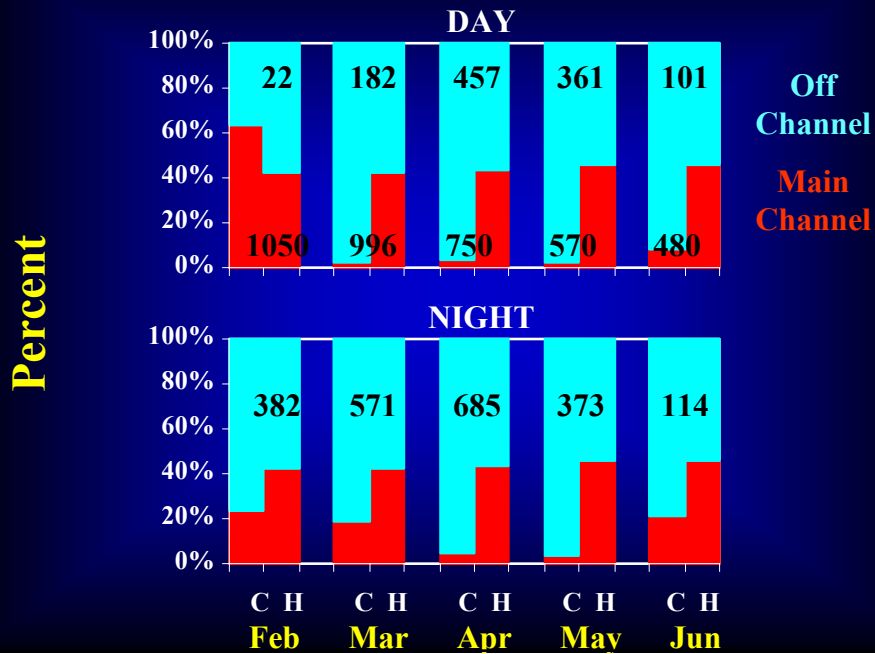


## **Habitat**

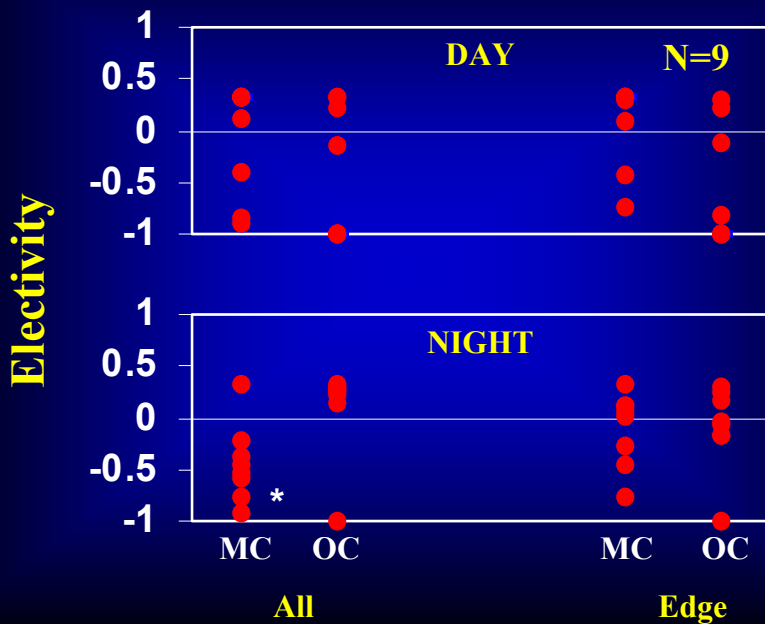
- **Level 1 – Channel Type**
  - **Main, Braided, Side, Overflow, Slough, Tributary mouth**
- **Levels 2-4 – Classify the entire channel width**
- **Level 5 – Classifies secondary channel units >20% of channel width long or wide**



## Percent Use/Availability -Elliott



## Main Channel/Off-Channel Electivity



## Secondary Habitat Electivity

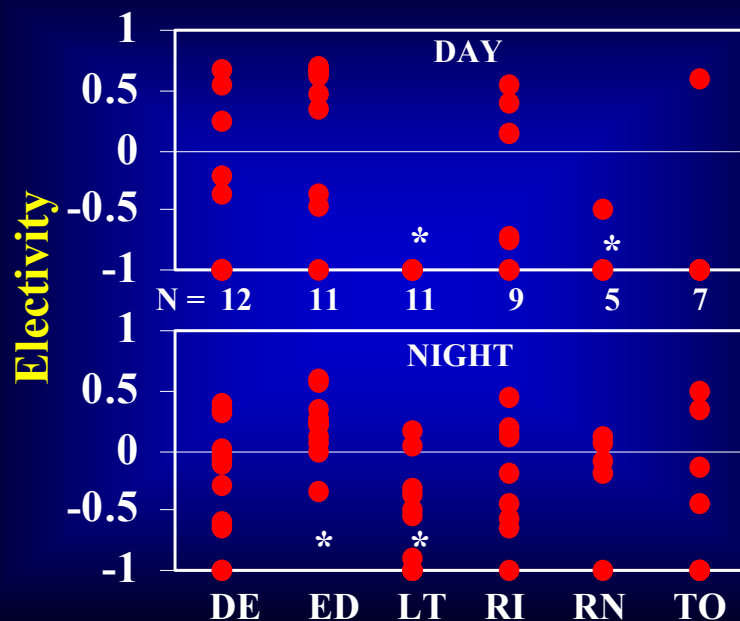
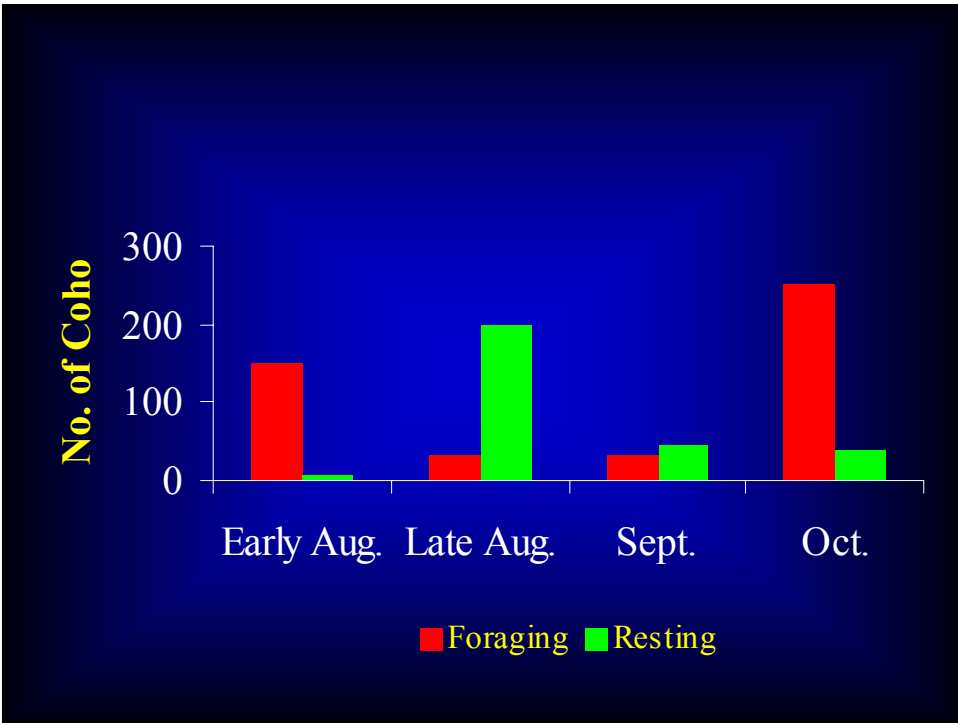
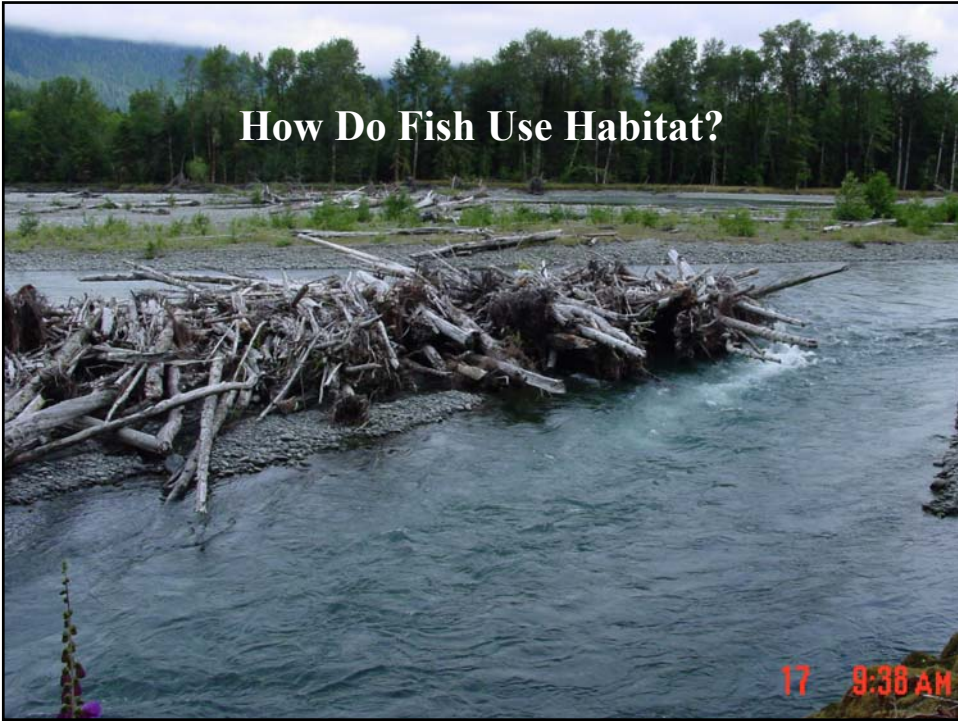
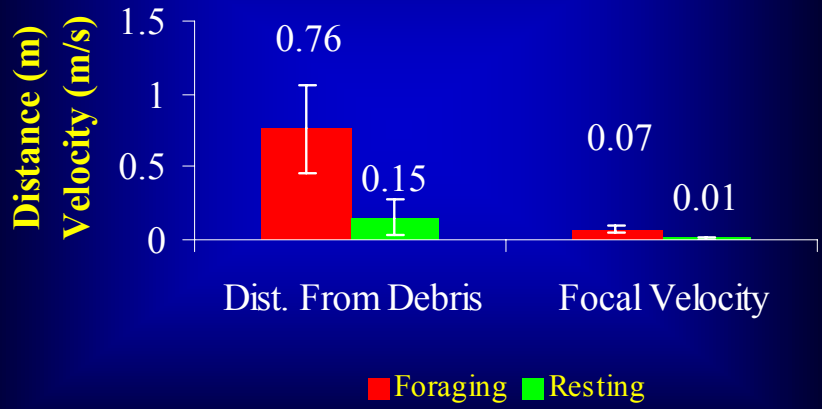


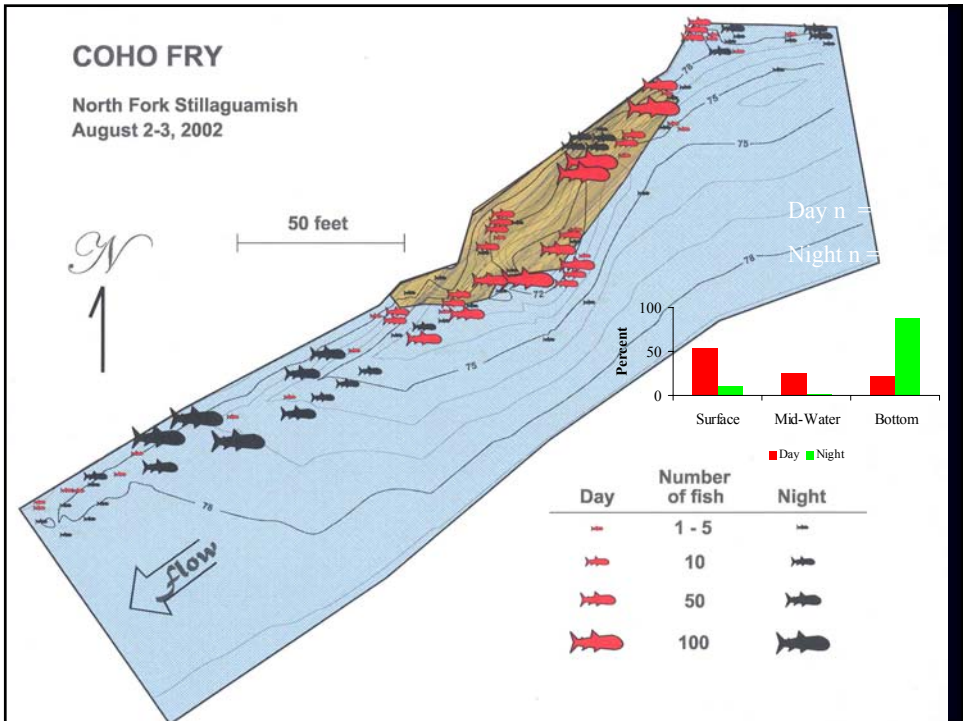
Photo by Roger Tabor (USFWS)

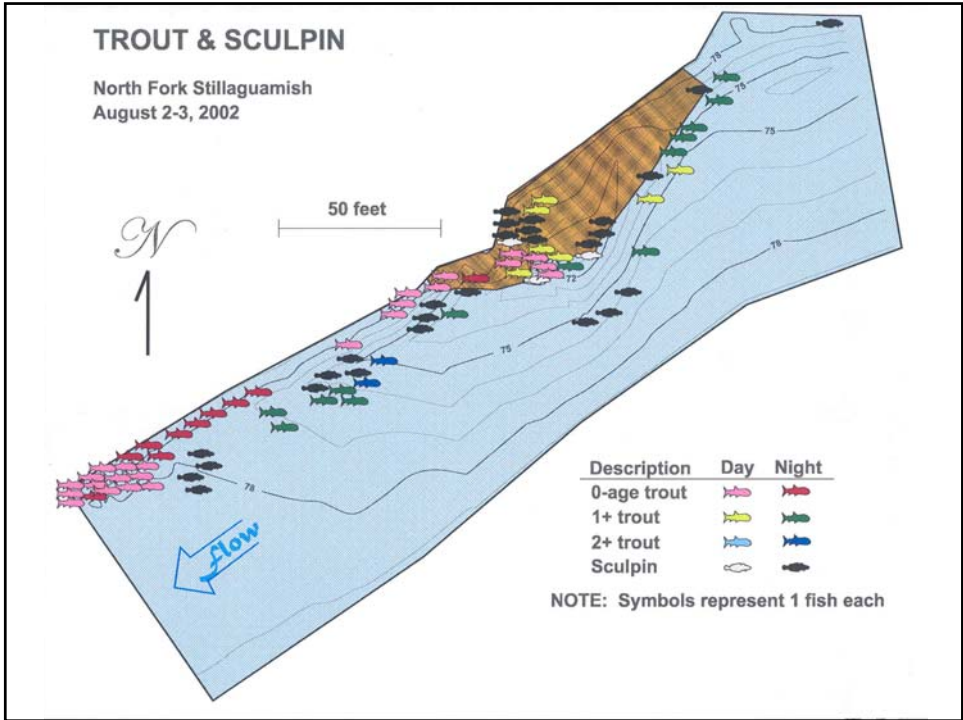
## Summary

- Chinook used off channel habitats extensively
- Juvenile Chinook prefer off-channel areas?
  - When all main channel habitat considered
  - Not when only main channel edge habitat considered
- Showed preferences for level 5 (secondary) habitats
  - Prefer eddies at night
  - Avoid lateral scour pools day and night









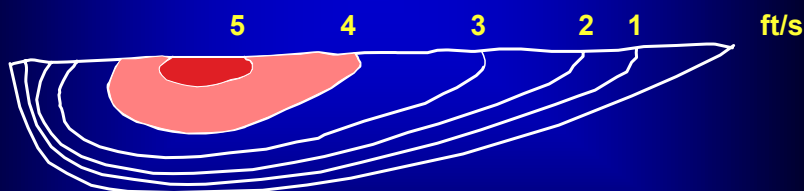
**Predation:**  
**Is it an Issue?**



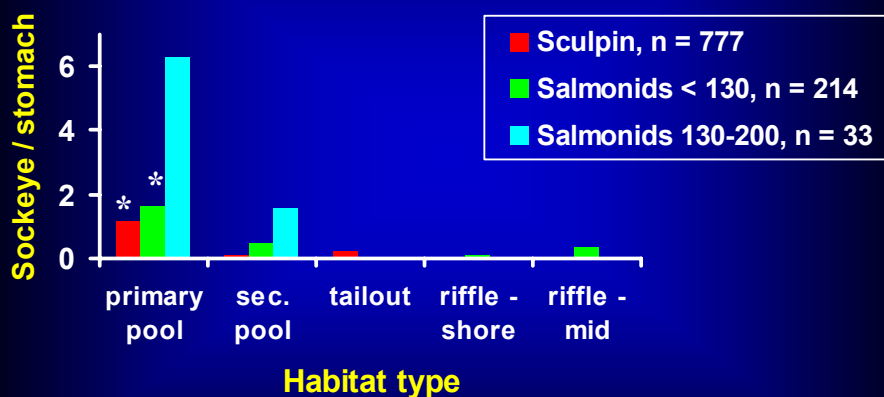
Photo by Roger Tabor (USFWS)

## Background

- Migrate at night
- Migrate soon after emergence
- Select channel areas with high velocities

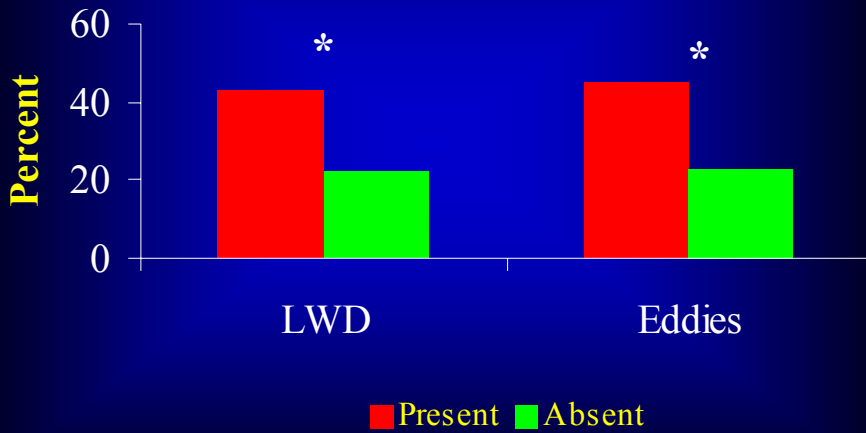


## Predation by habitat type

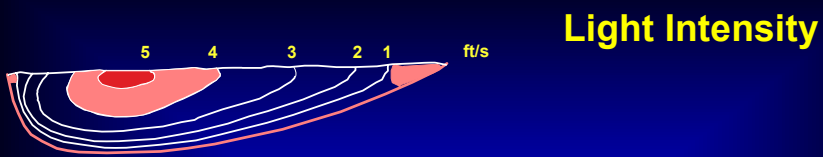


R. Tabor, USFWS, unpublished data

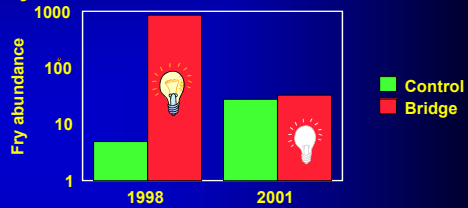
# Sculpin Predation Within Pools



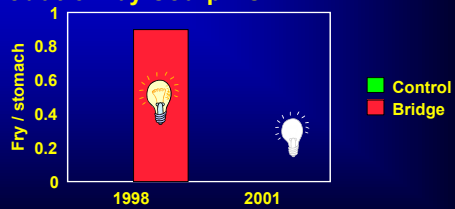
R. Tabor, USFWS, unpublished data



## Fry abundance



## Predation by sculpins



R. Tabor, USFWS, unpublished data

## Conclusions

- Juvenile salmonid densities are greatest in areas with LWD in larger rivers
- Densities appear to be influenced by the size and complexity of LWD accumulations
  - Accumulations providing complex cover preferred
  - Larger accumulations are better than smaller accumulations

## Conclusions

- Other methods of creating complexity (riprap, deflectors) are much less effective than LWD
  - This may be related to salmonid behavior
- Juvenile salmonids display different behaviors temporally
- Large diurnal shifts in distribution

# Conclusions

- **Predation: Is it an issue?**
  - **Probably a bigger issue for chum, pinks, and sockeye**
  - **May alter how restoration is done in areas below spawning areas of these species**
    - + **Smaller structures to maintain open thalweg**
    - + **Reduce eddy formation**
    - + **Locate away from artificial lighting**

