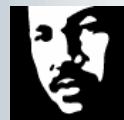


# A process-based approach to monitoring restoration effectiveness

## PART 2: METHODOLOGIES & SYNTHESIS

J. Latterell

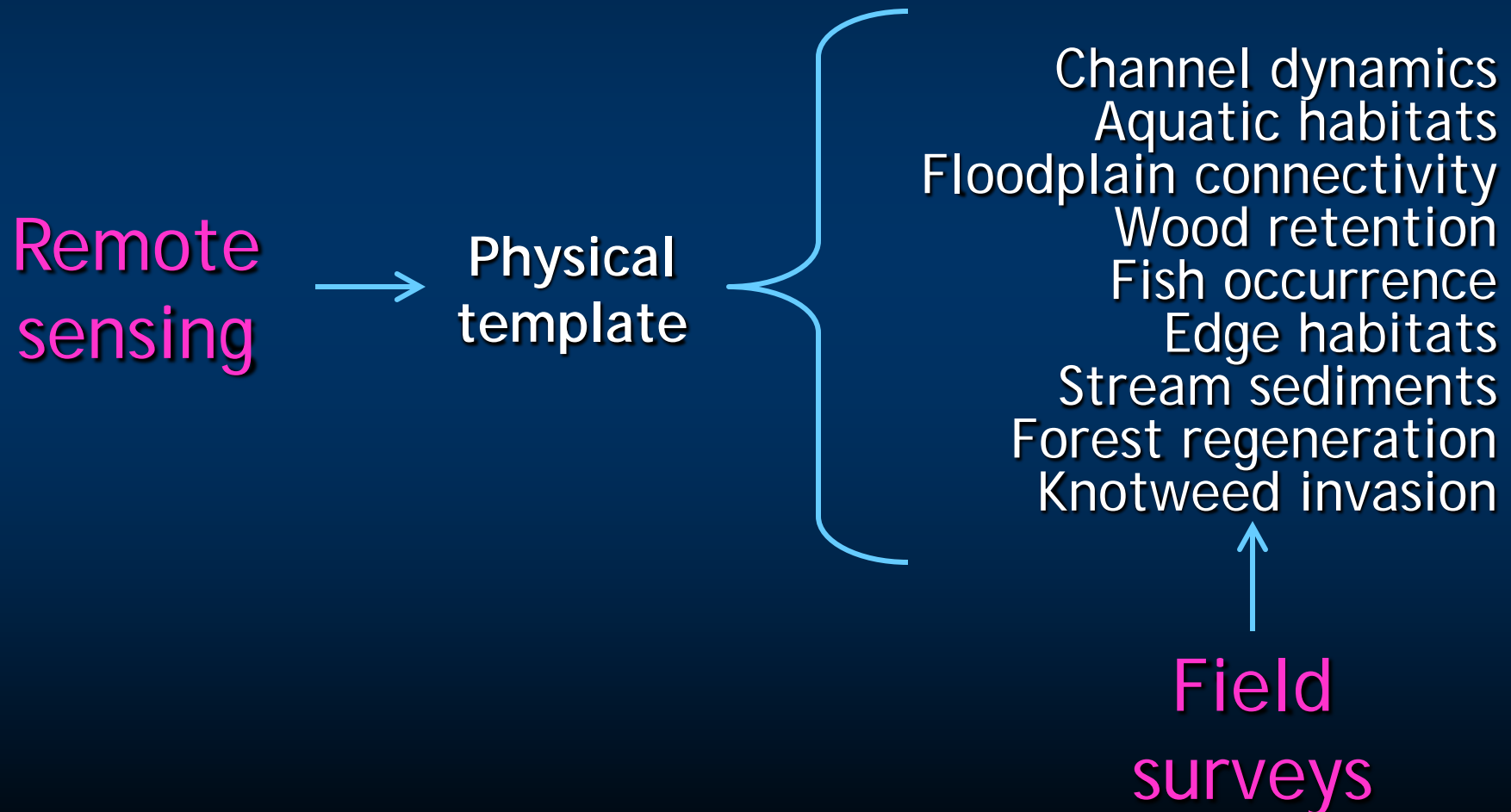
D. Eastman, T. Butler, R. Timm, H. Berge  
King County Water and Land Resources Division (DNRP)



**King County**

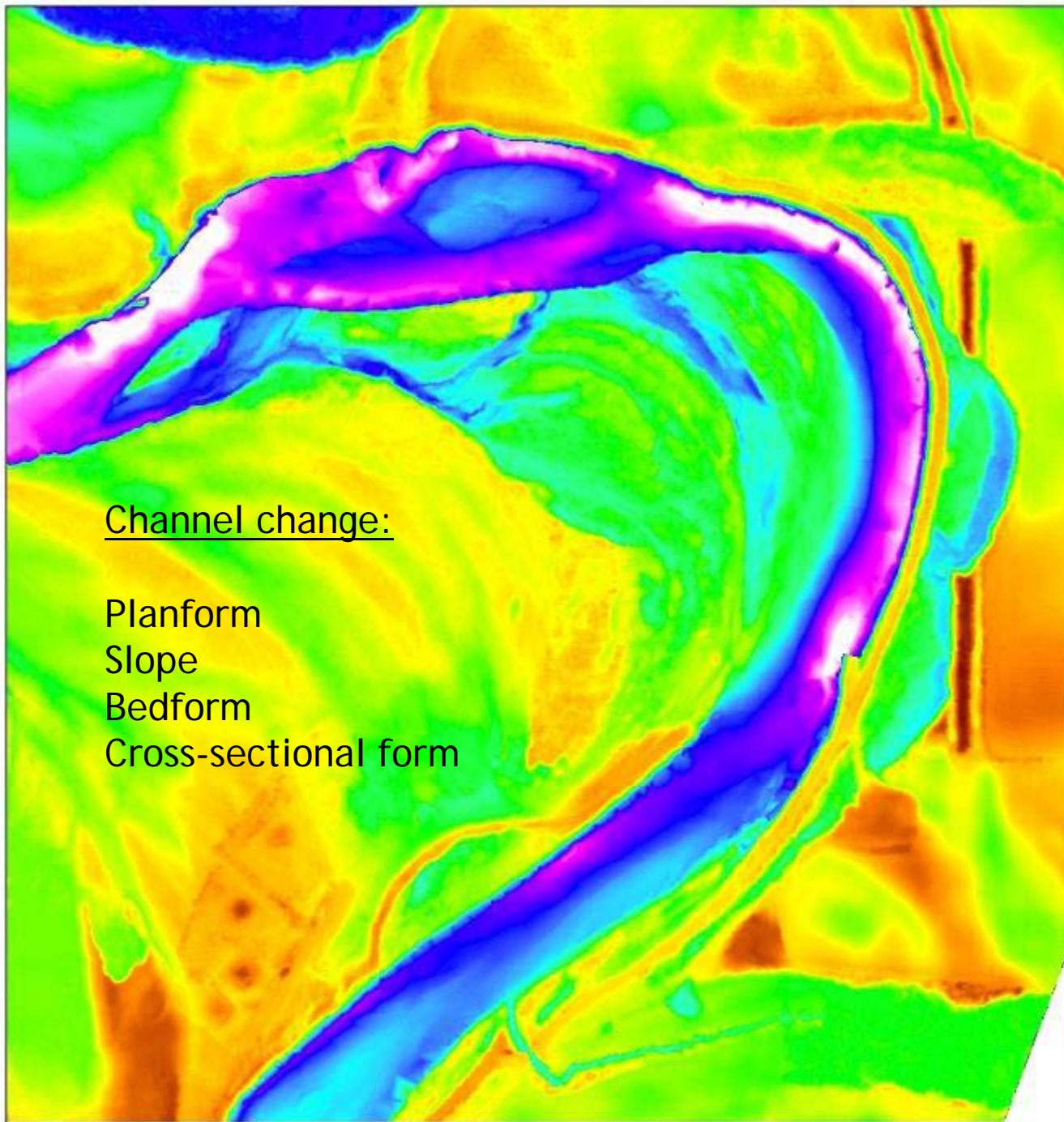


# Approach & Indicators



# Remote Sensing

- Laser mapping (1,800 acres at +/- 30 cm)
- Orthophotos (1,800 acres at 6")
- Bathymetry (3.1 miles + 69 x-sections)
- Floodplain connectivity
- Historical analysis

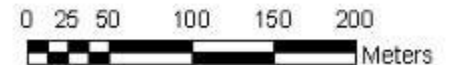


Channel change:

Planform  
Slope  
Bedform  
Cross-sectional form

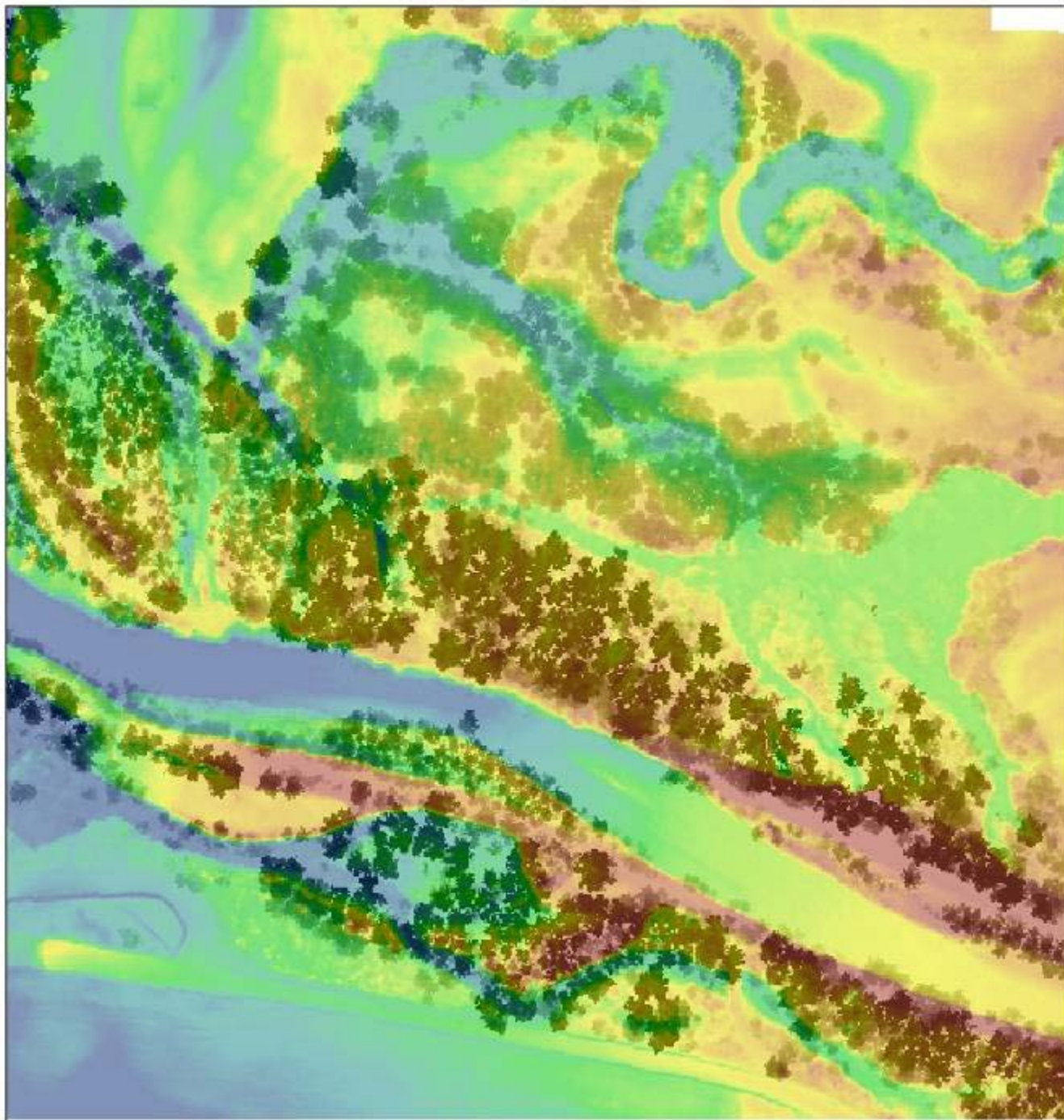
Aquatic and floodplain habitats will increase in number and become more diverse/complex.

Channel meandering will increase and be similar to Larsen model predictions.



Snoqualmie River  
Project Effectiveness  
Monitoring

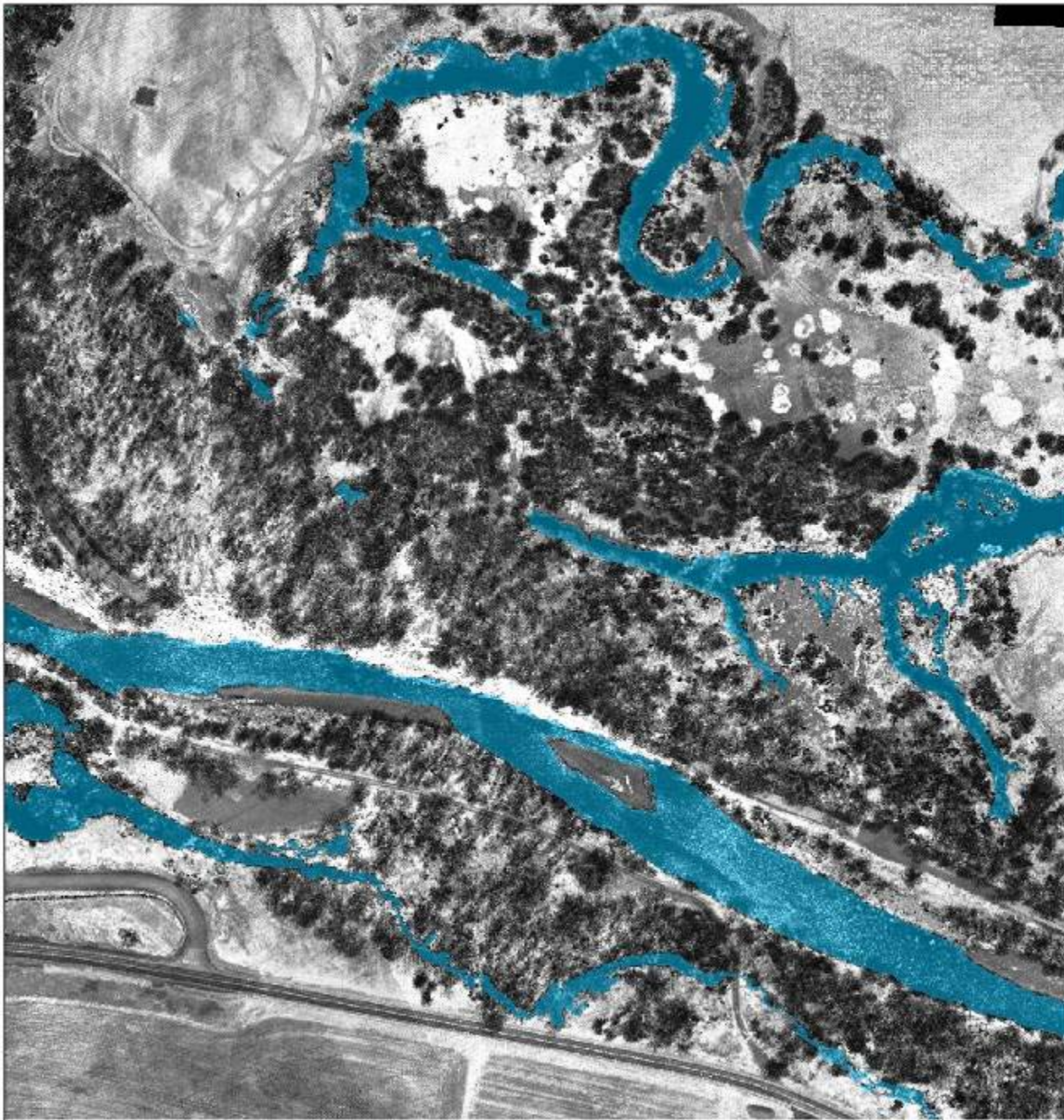
2009 Integrated Elevation Map



0 12.5 25 50 75 100  
Meters

### Tolt River Project Effectiveness Monitoring

LiDAR (Ground and Treetops)



Aquatic and floodplain habitats will increase in number and become more diverse/complex.

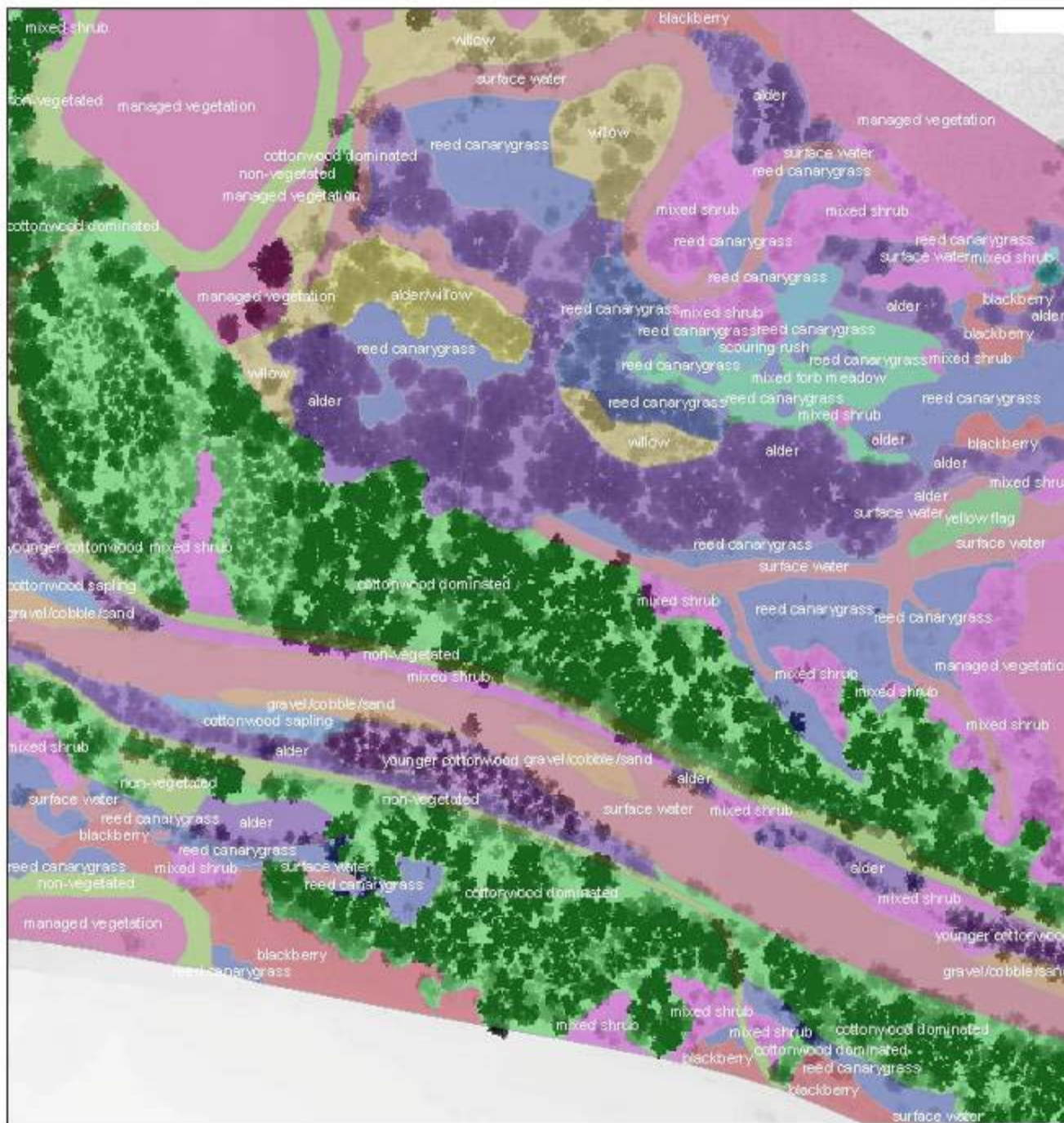
All channels  
Bar and bank edges  
Backwaters  
Pools and ponds  
Scour holes  
Spring brooks  
Riffles



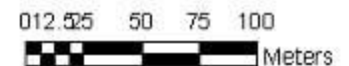
0 12.5 50 75 100  
Meters

Tolt River  
Project Effectiveness  
Monitoring

2009 Lidar Water Bodies



Cottonwood stands will erode at higher rates increasing wood delivery.



**Tolt River  
Project Effectiveness  
Monitoring**

Vegetation Map



Natural logjams will become more frequent and existing jams will grow.



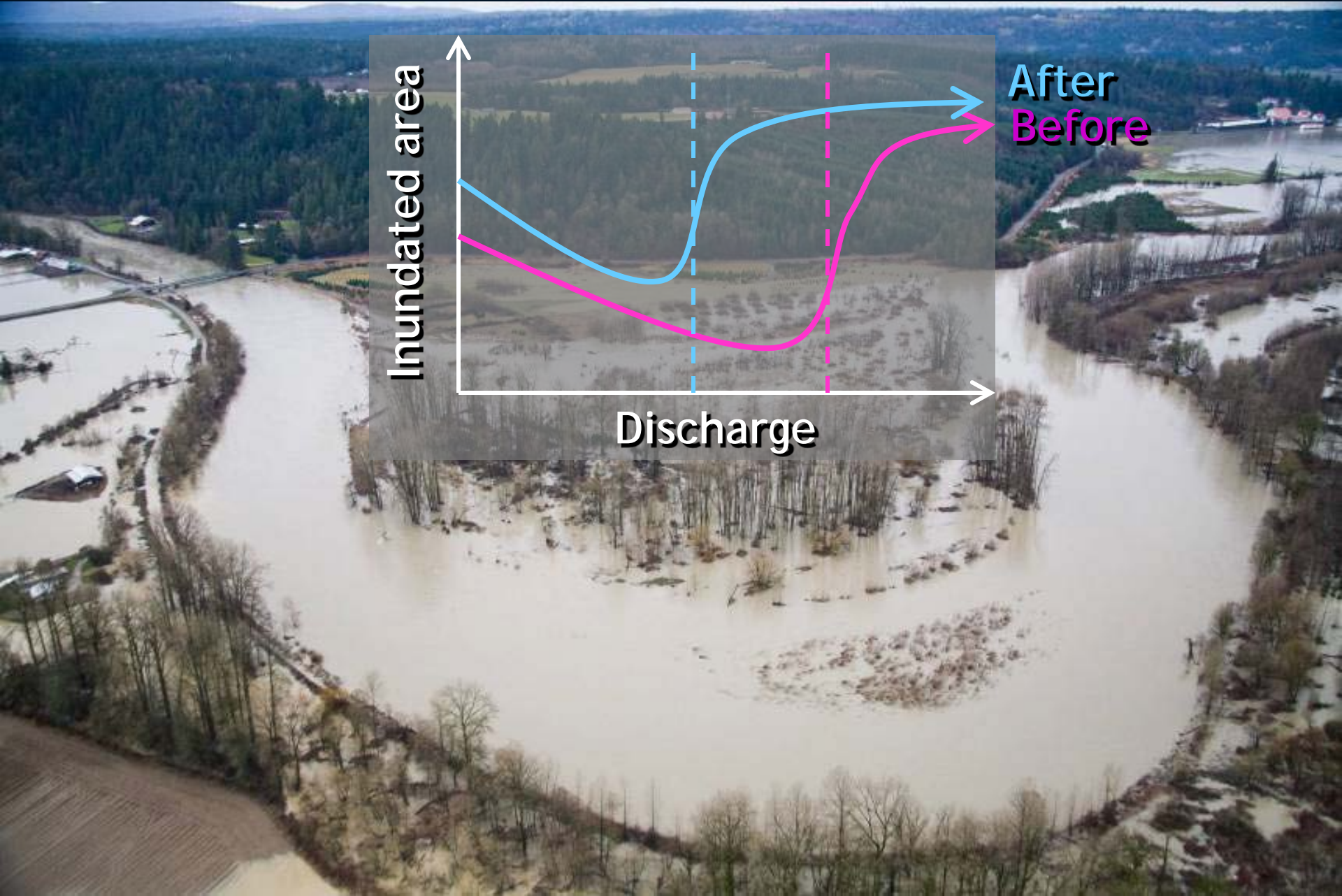
0 25 50 100 Feet

2009 Natural jams

Engineered wood structures  
will remain stable and  
perform as intended.



The floodplain will be more frequently and broadly inundated.



Inundated area

Discharge

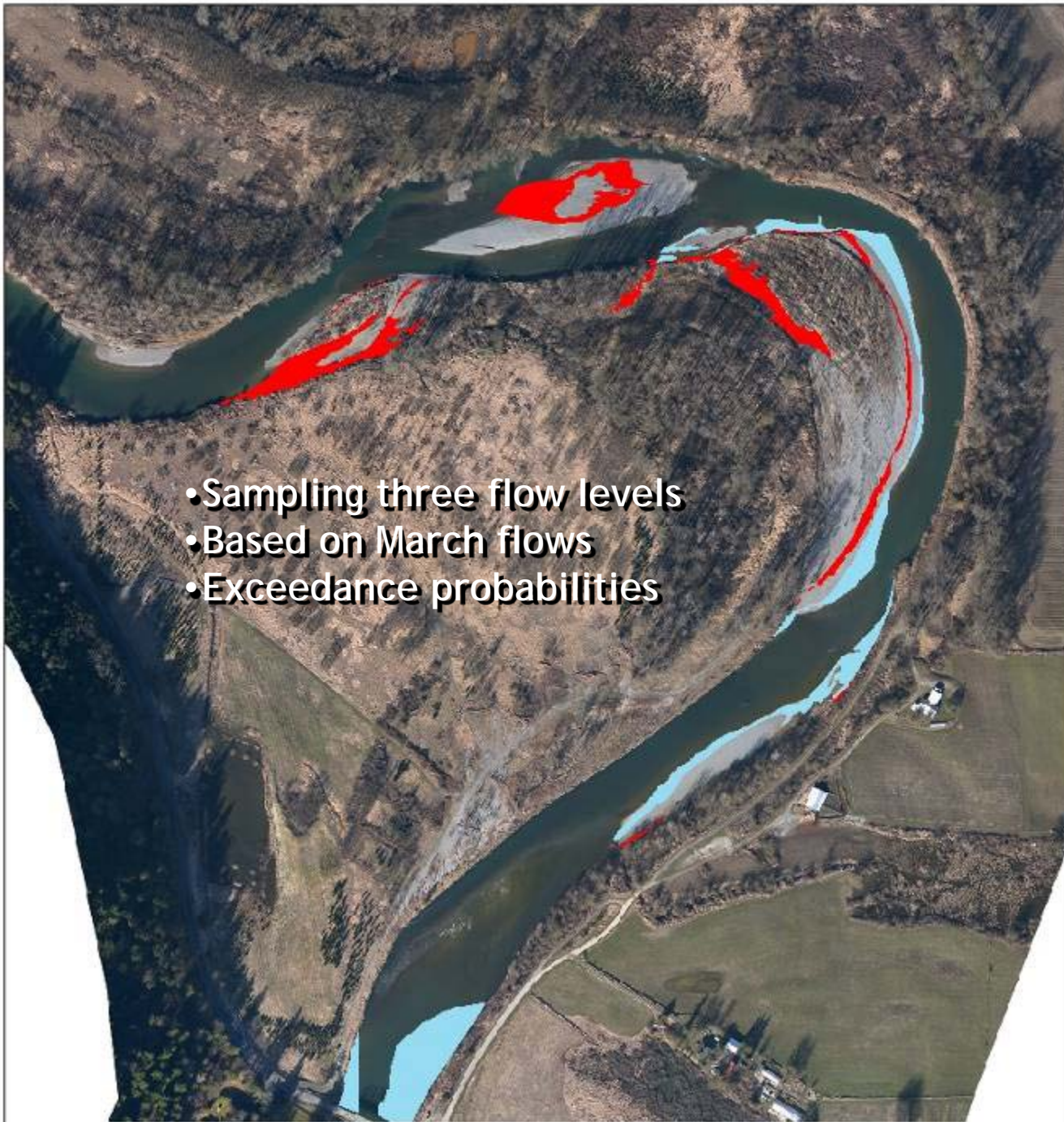
After  
Before

# Field Surveys

- Sediments & Wood
- Slow-water habitats
- Juvenile fish
- Redds
- Tree regeneration
- Knotweed extent



R. Peters

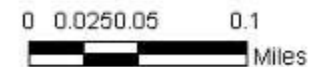


- Sampling three flow levels
- Based on March flows
- Exceedance probabilities

Slow water rearing habitat will increase and vary with flow stage

Juvenile salmonids will use rearing habitat created by restoration actions and use will vary with flow stage and habitat type

Redd density will increase in the vicinity of the project sites



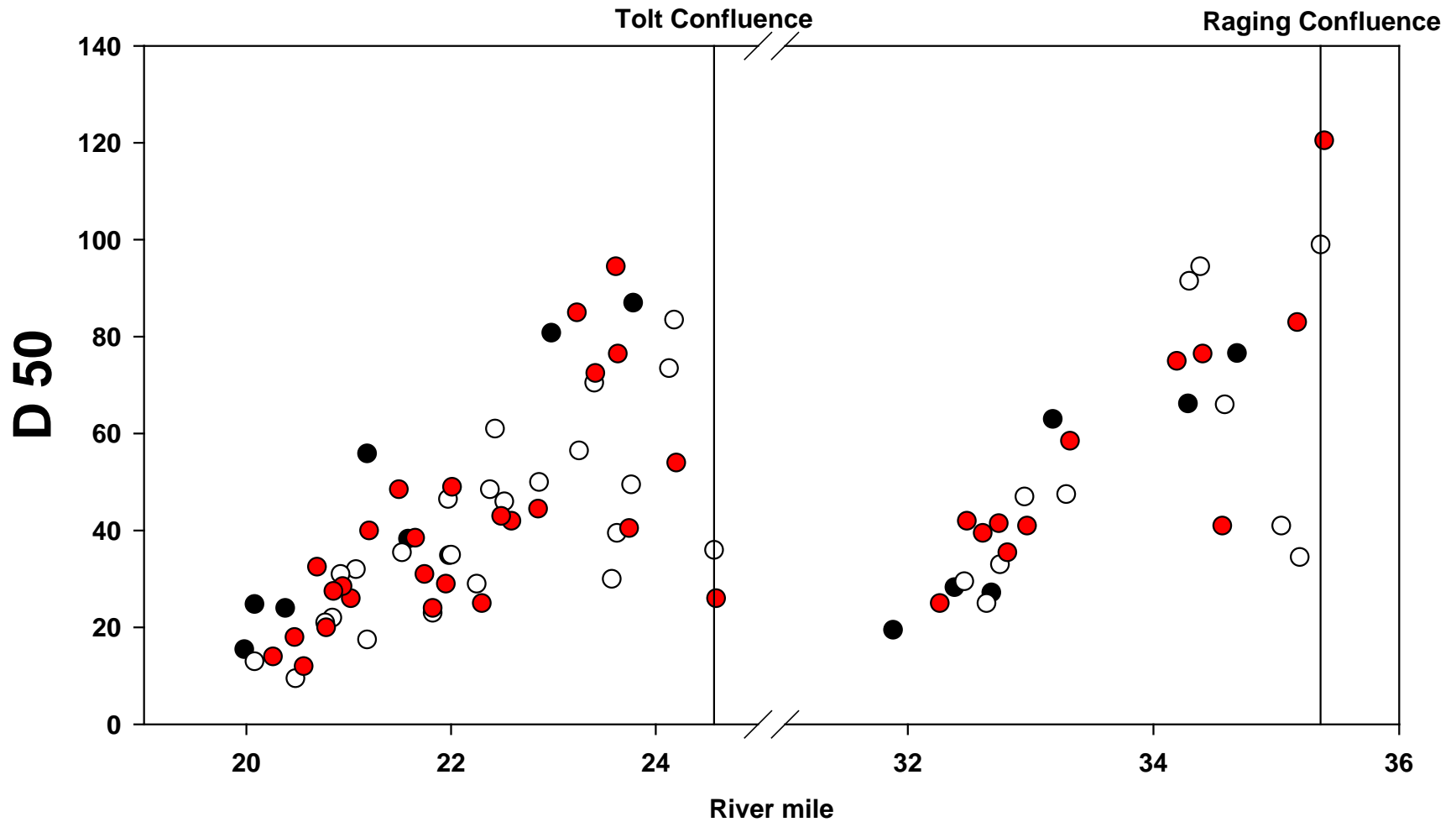
Project Effectiveness Monitoring

Edge Habitat Area



**Sediment texture will become more patchy near restoration sites, but the overall extent of spawning substrates will not change**

# Snoqualmie substrate size



- 1989
- 2008
- 2009



Trees will naturally regenerate on disturbed alluvium.



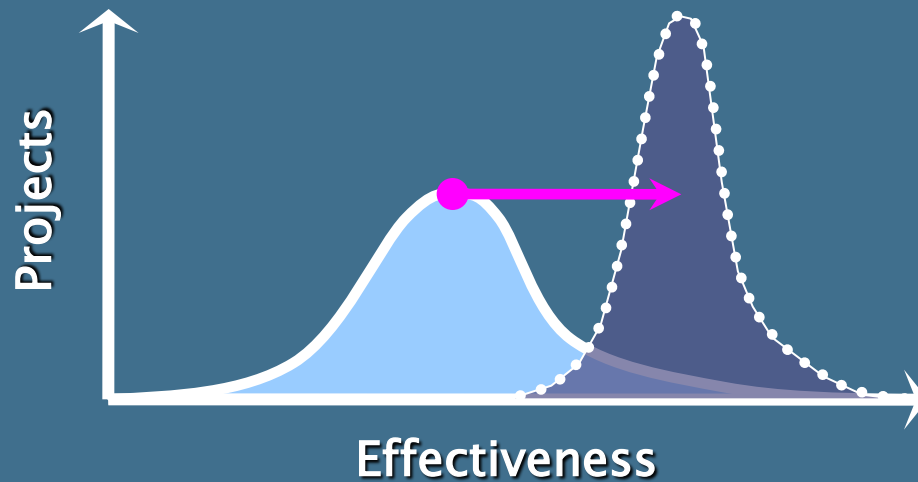


Knotweed control will prevent spreading through project sites

# Status

- 2009 baseline surveys completed
- 2010/11 funding secured
- Analysis ongoing
- Partnership opportunities
- Transferable approach?
  - Comparison with SRFB survey, WFC

# Outcome



**Monitoring**  
Meet objectives  
Reduce uncertainty

# Acknowledgments



- King Conservation District
- WRIA 7
- King County WLRD staff
- City Light (Powell, Albow, Chapin)
- NOAA Fisheries (Pess, Beechie, Roni)
- SRFB/Tetra-Tech (O'Neal)
- Wild Fish Conservancy (Wait, Glasgow)