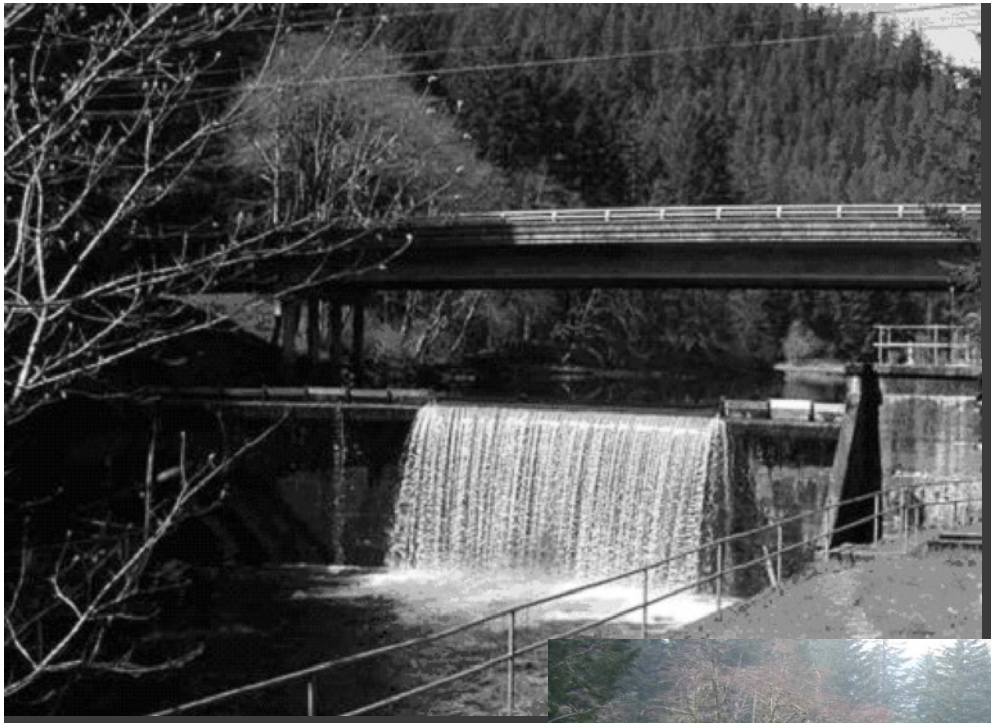
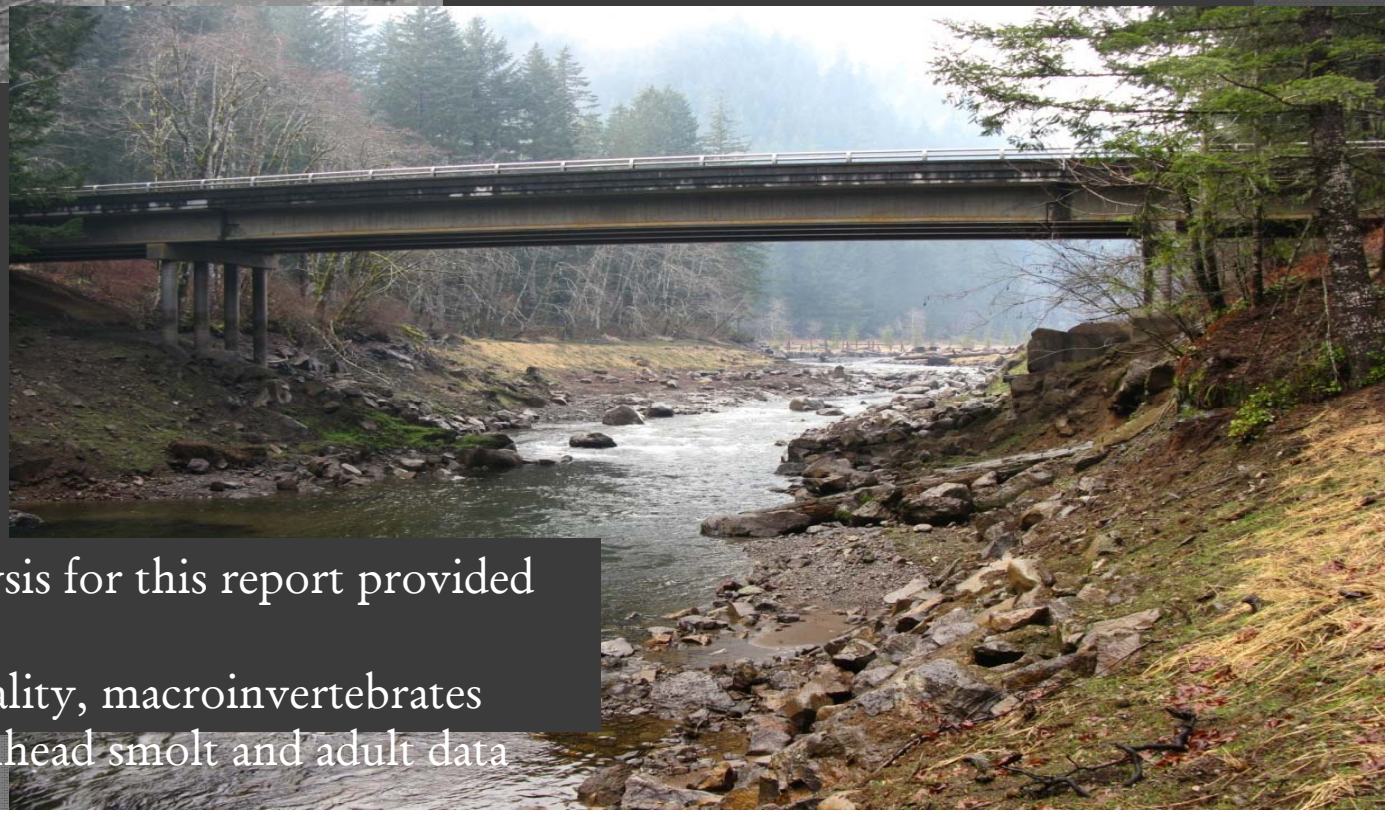


Hemlock Dam Removal and Trout Creek Recovery



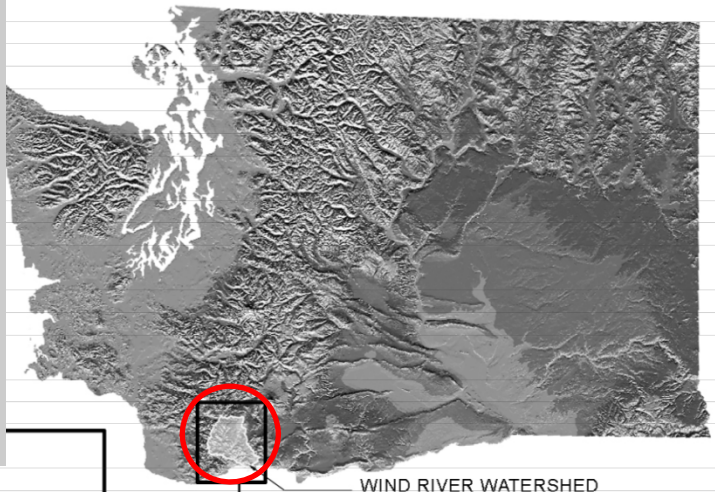
Data collection and analysis for this report provided by:
USFS: habitat, water quality, macroinvertebrates
USGS and WDFW: steelhead smolt and adult data

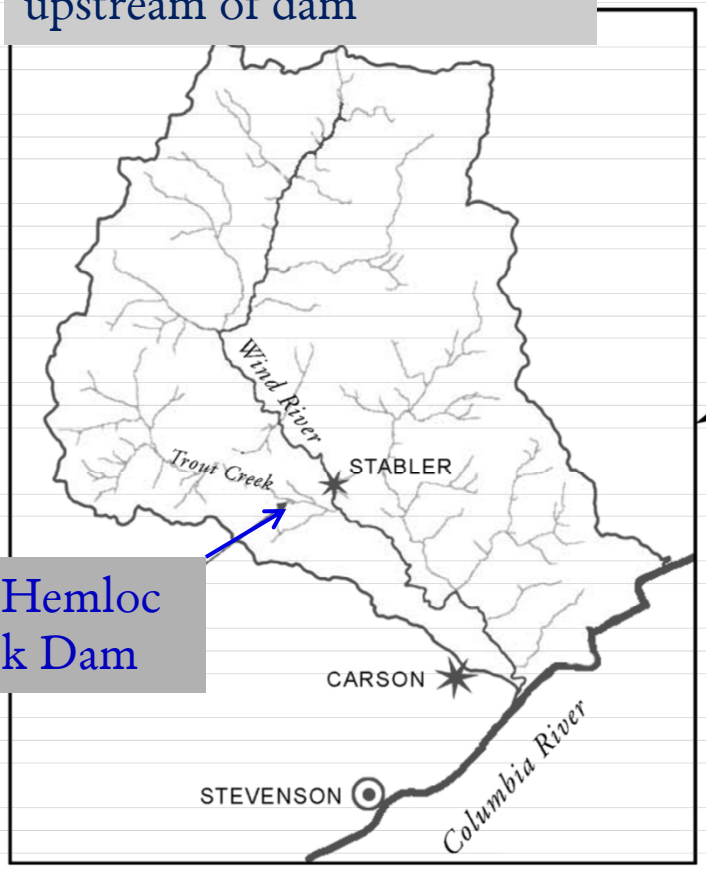
Presentation Outline

- Background / History of Hemlock Site
- Dam Removal
- Before and After Photos
- Monitoring Results

Trout Creek Subwatershed

- 30 square mile drainage area
- Summer low flow: 10 cfs
- Bankfull flow: 2000 cfs
- 100% national forest upstream of dam





Hemlock Dam

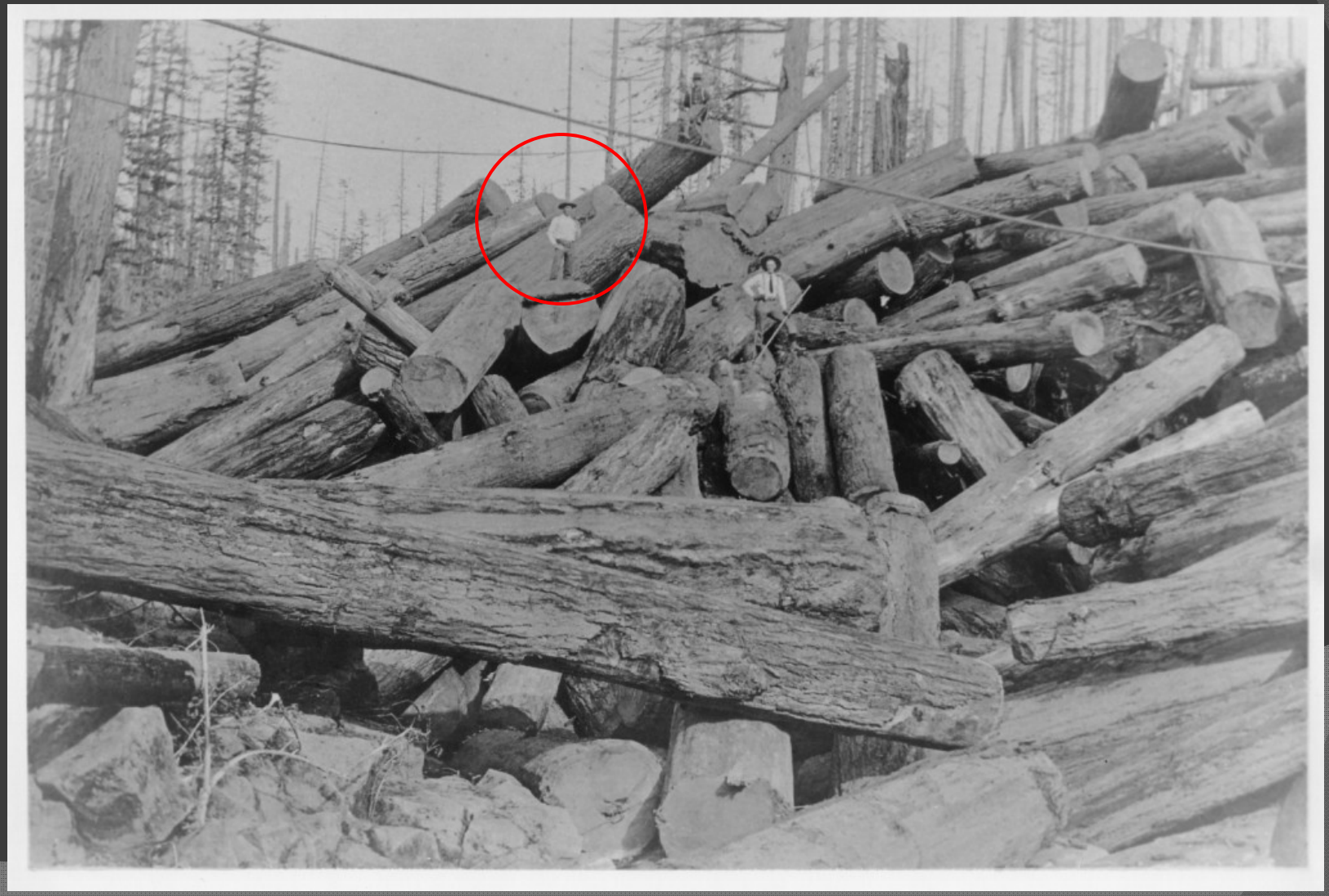
Wind River Watershed

- 223 square mile drainage area
- Rain on snow hydrology
- LCR Steelhead – only native anadromous fish
- No hatchery supplementation of steelhead

Pre-Hemlock Dam: Wind River Logging Camp ca. 1909

Splash Dam at the Hemlock Site 1902 - 1935

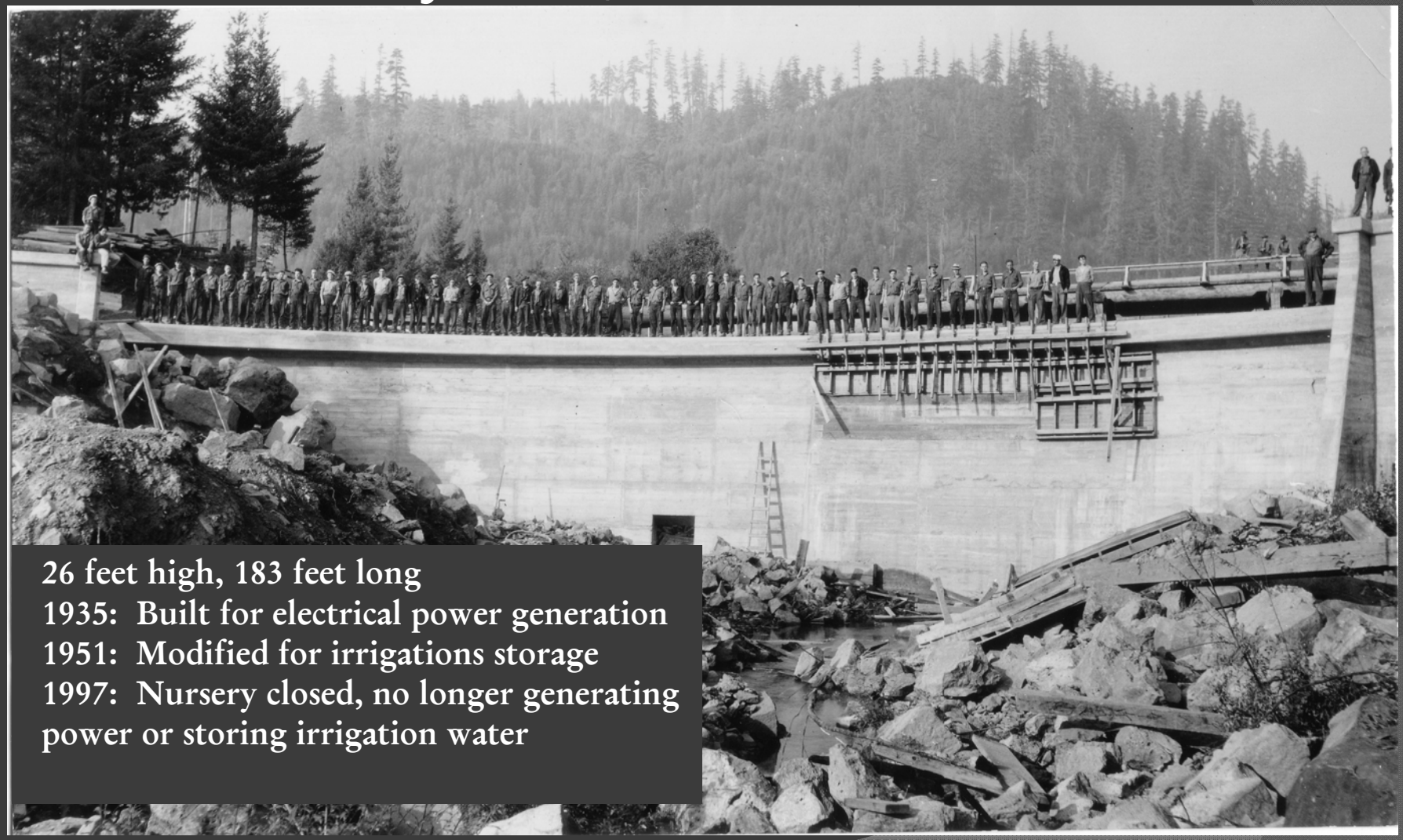
Logging in the Wind River, early 1900s



Log Drive


- 222 -
JUNCTION TROUT CREEK AND
WIND RIVER. LOG DRIVE
CARSON WASH.

Hemlock Dam
Constructed by CCC, 1935



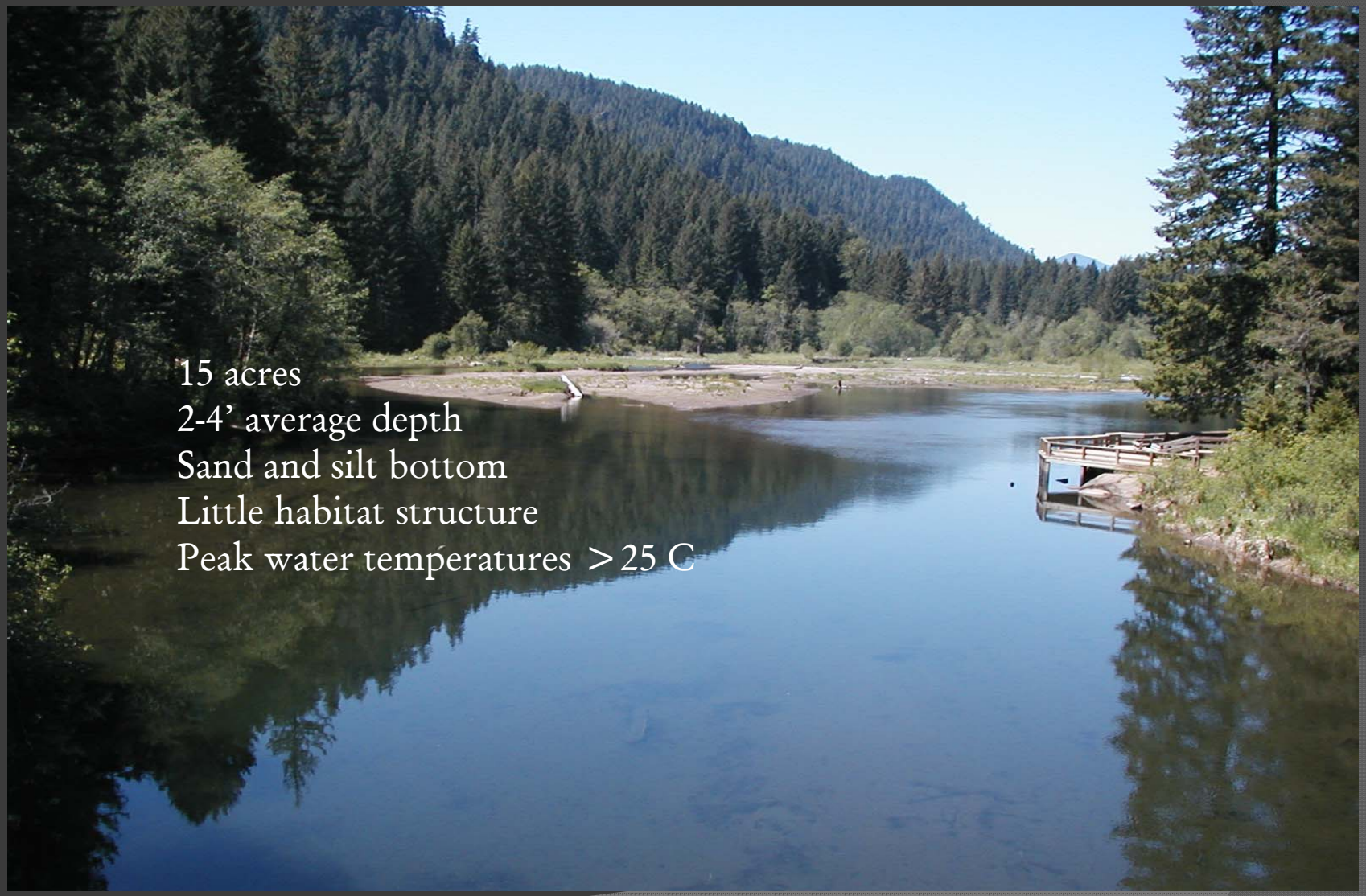
26 feet high, 183 feet long
1935: Built for electrical power generation
1951: Modified for irrigations storage
1997: Nursery closed, no longer generating power or storing irrigation water

Hemlock Site


Spring flow


5-yr flood stage
29 14:32

Hemlock “Lake”



Getting to Dam Removal

1997: Dam no longer used for irrigation or power generation but continues to affect passage for steelhead, water temperature, habitat quality, sediment transport to lower Trout Cr

1998: LCR Steelhead listed under ESA. Trout Creek is critical habitat for steelhead

2003: Draft EIS proposes “blow and go”

2004: Final EIS proposes to mechanically remove sediments and reconstruct channel

Project Objectives

1) **Improve upstream and downstream migration**
2) **Restore water temperature regimes**
3) **Restore channel processes, sediment routing**
4) **Increase habitat diversity and complexity**

Implementation: July 1-Aug 15, 2009

June 30, 2009

- July 2, 2009

July 2-6: Fish Removal

Excavation begins—55,000 cubic yards

Building Channel

Layering the Banks

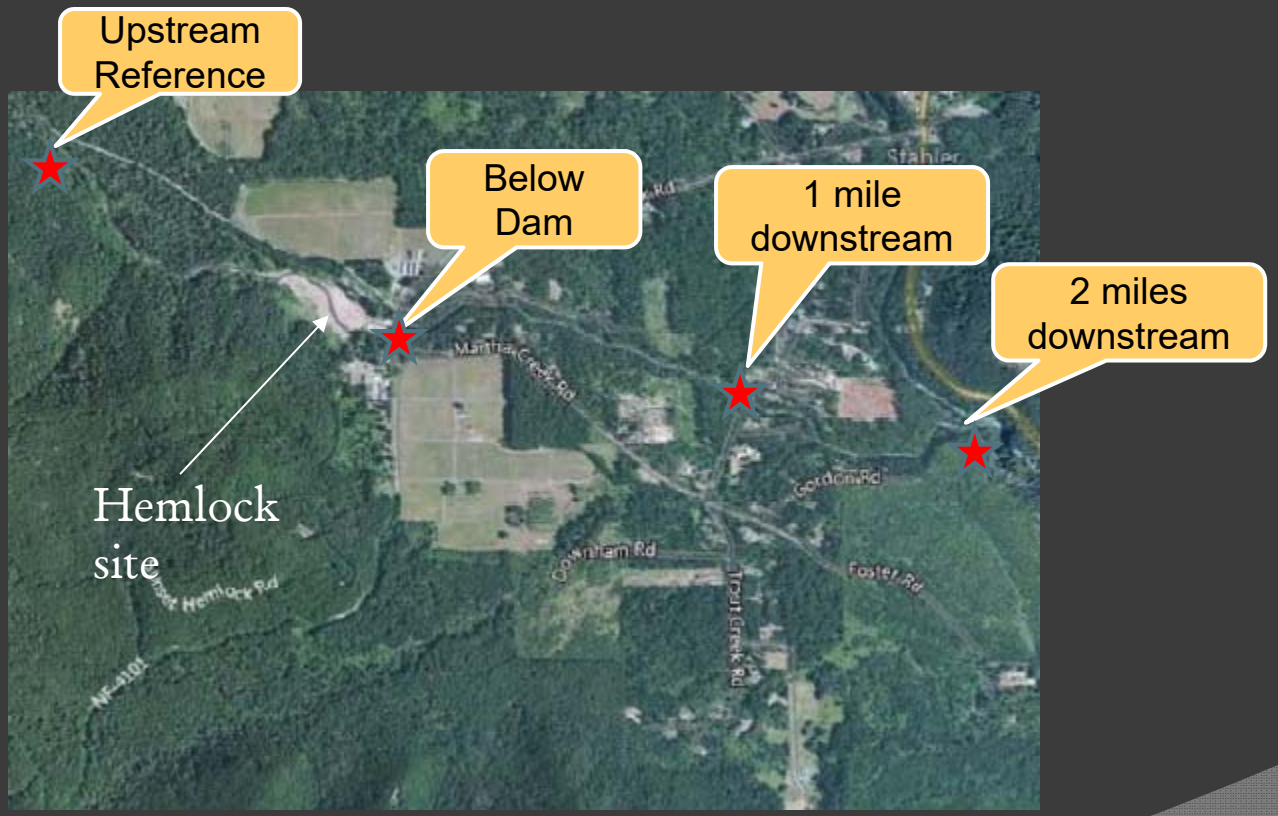
Splash Dam Remains

Splash Dam Exposed

Dam Removal

August 14, 10:00 am
Rewater the Channel

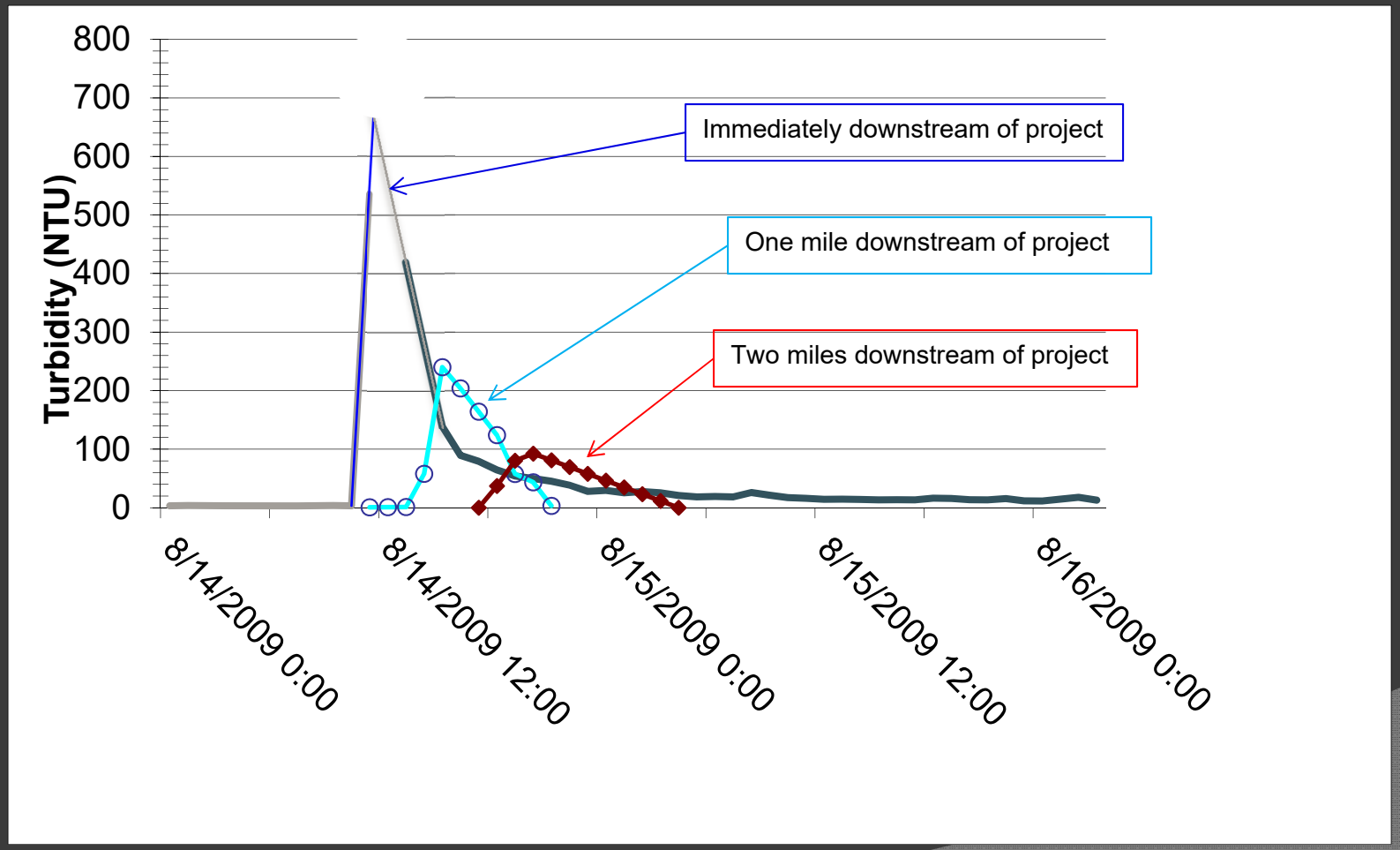
Turbidity Monitoring During Rewater



★ Turbidity monitoring station

Turbidity Monitoring

48 hour period immediately after rewatering the channel



Before

After

Reservoir Before

Reservoir After

One year later

Six years later

Before

After

6 years later

2009

2010

2009

2010

2011

Monitoring Responses To Dam Removal

Project Objectives:

- *Improve migration*
- *Restore water temperature*
- *Restore channel processes, sediment routing*
- *Increase habitat diversity*

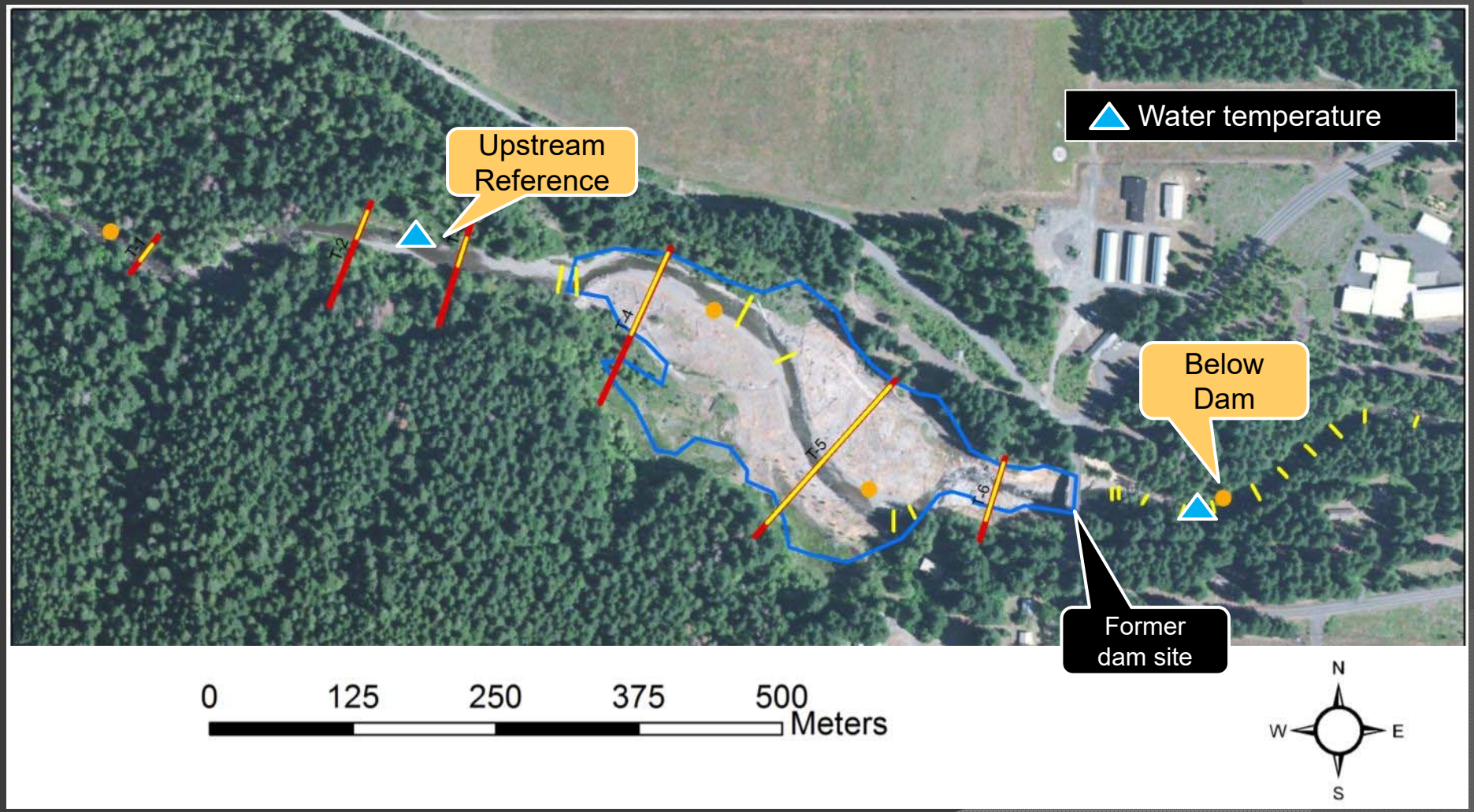
The larger goal of habitat restoration:

- *Increase steelhead viability*

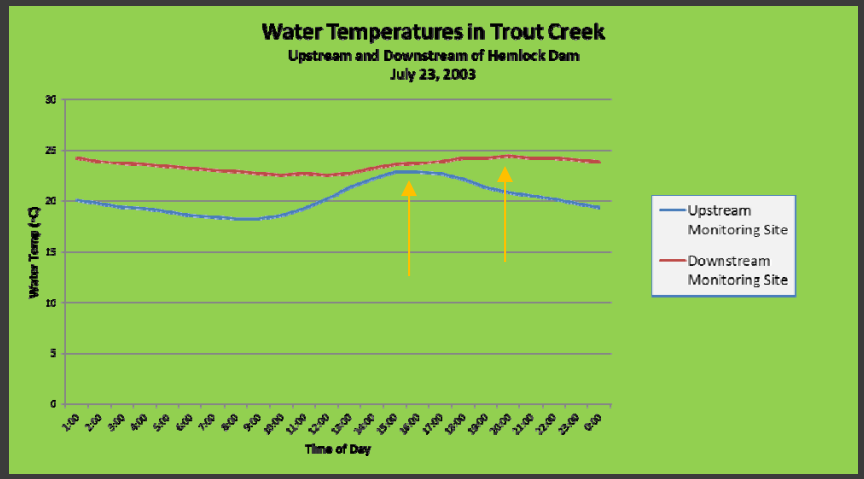
Monitoring Methods

- Photo points
- Topographic surveys
- Substrate surveys
- Water quality monitoring (up vs. downstream)
- Macroinvertebrates (USFS PNW Research)
- Adult and juvenile steelhead (USGS and WDFW)

Water Temperature Monitoring



Water Temperature Monitoring Results



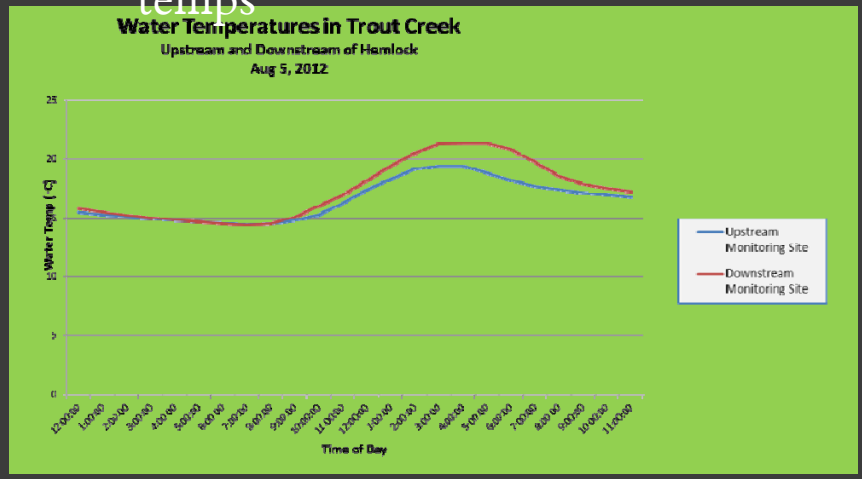
Before Dam Removal

Downstream:

- Higher average and peak temp
  Peak temp occurs in the evening
- Very little nighttime cooling

Downstream:

- Higher average and peak temp
- Peak temp more aligned with upstream
- Nighttime cooling, less time at high temps



After Dam Removal

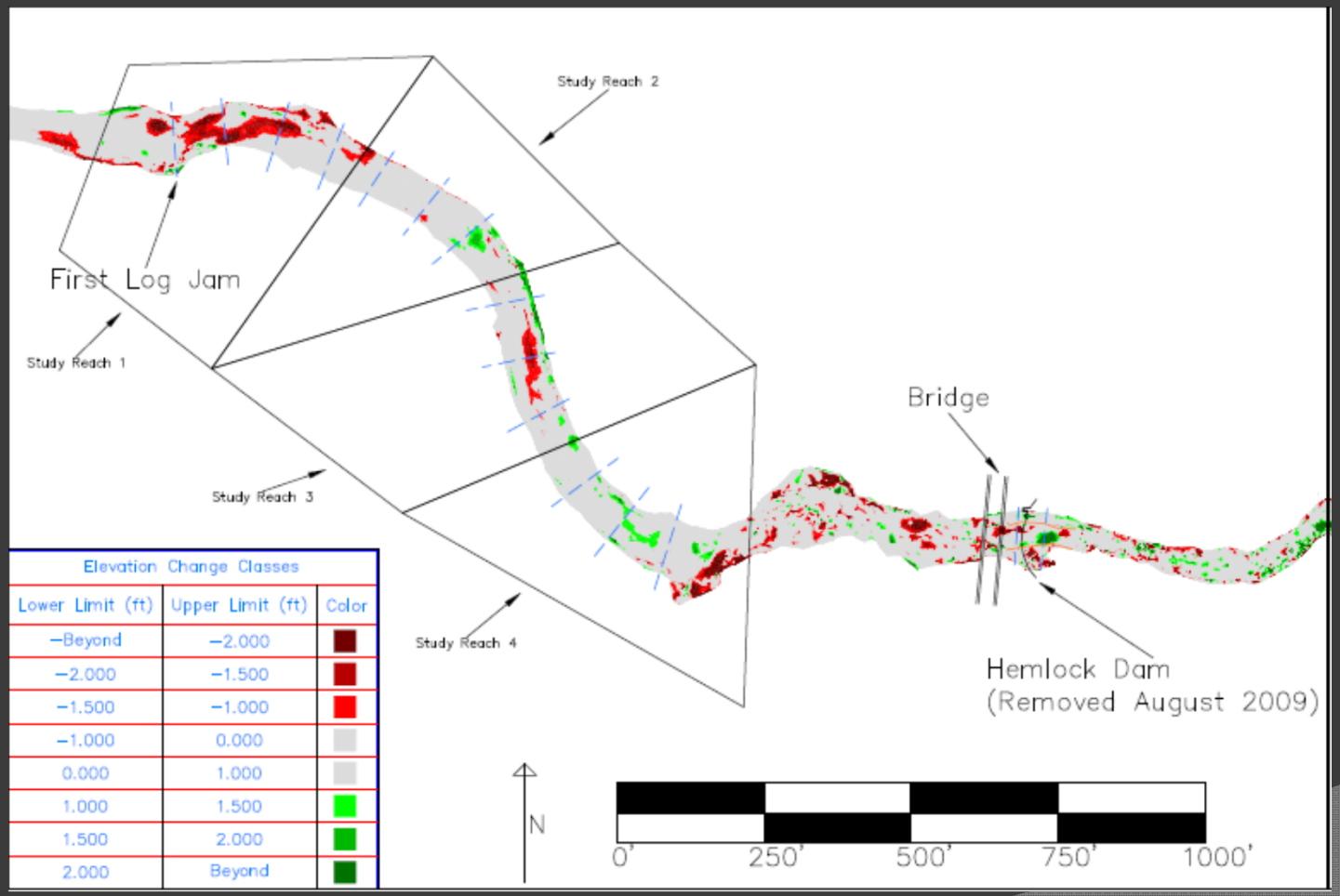
Fish Passage / Migration

Monitoring Results…

Before

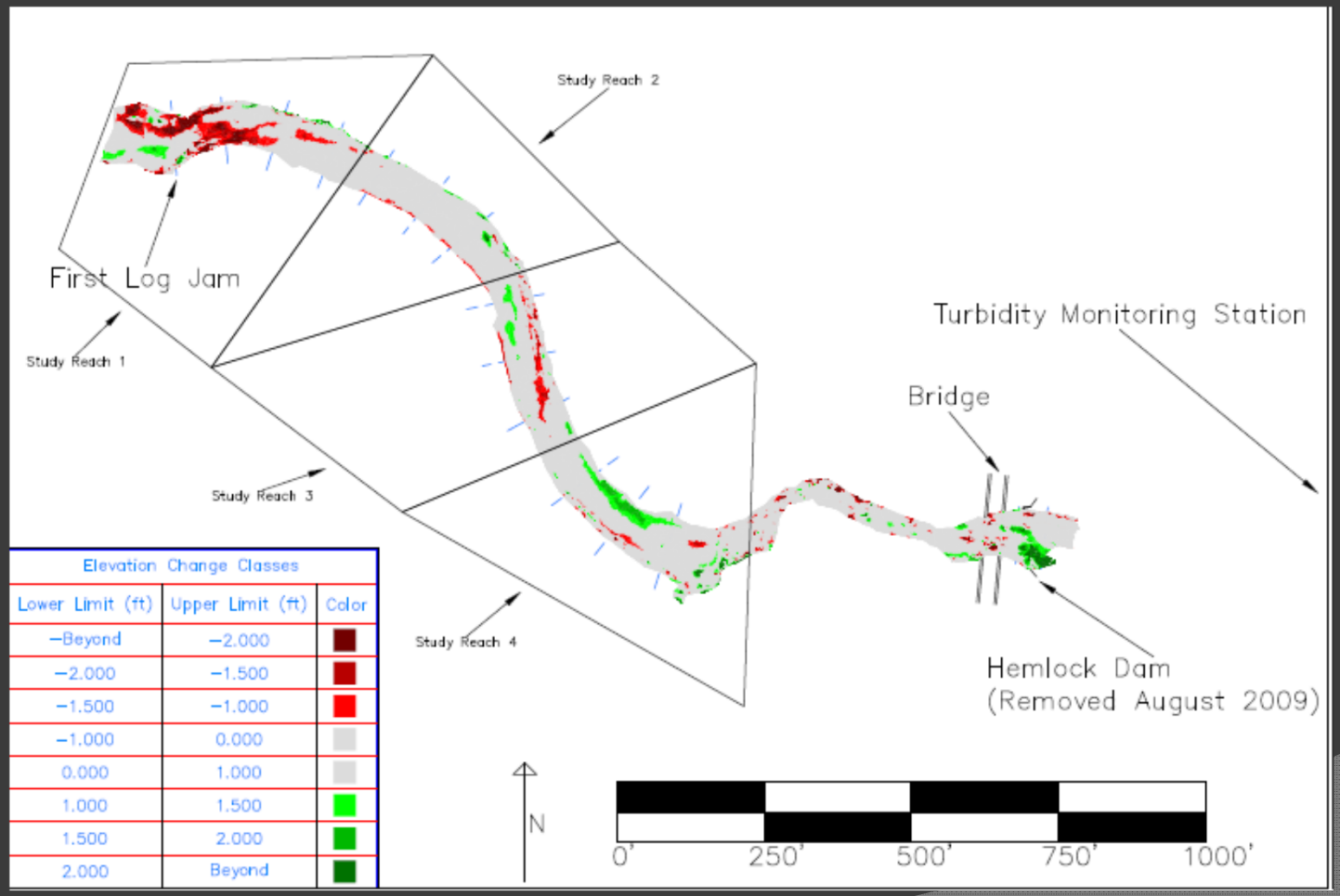
After

Channel change--erosion and deposition: 2009-2010 (year 1)



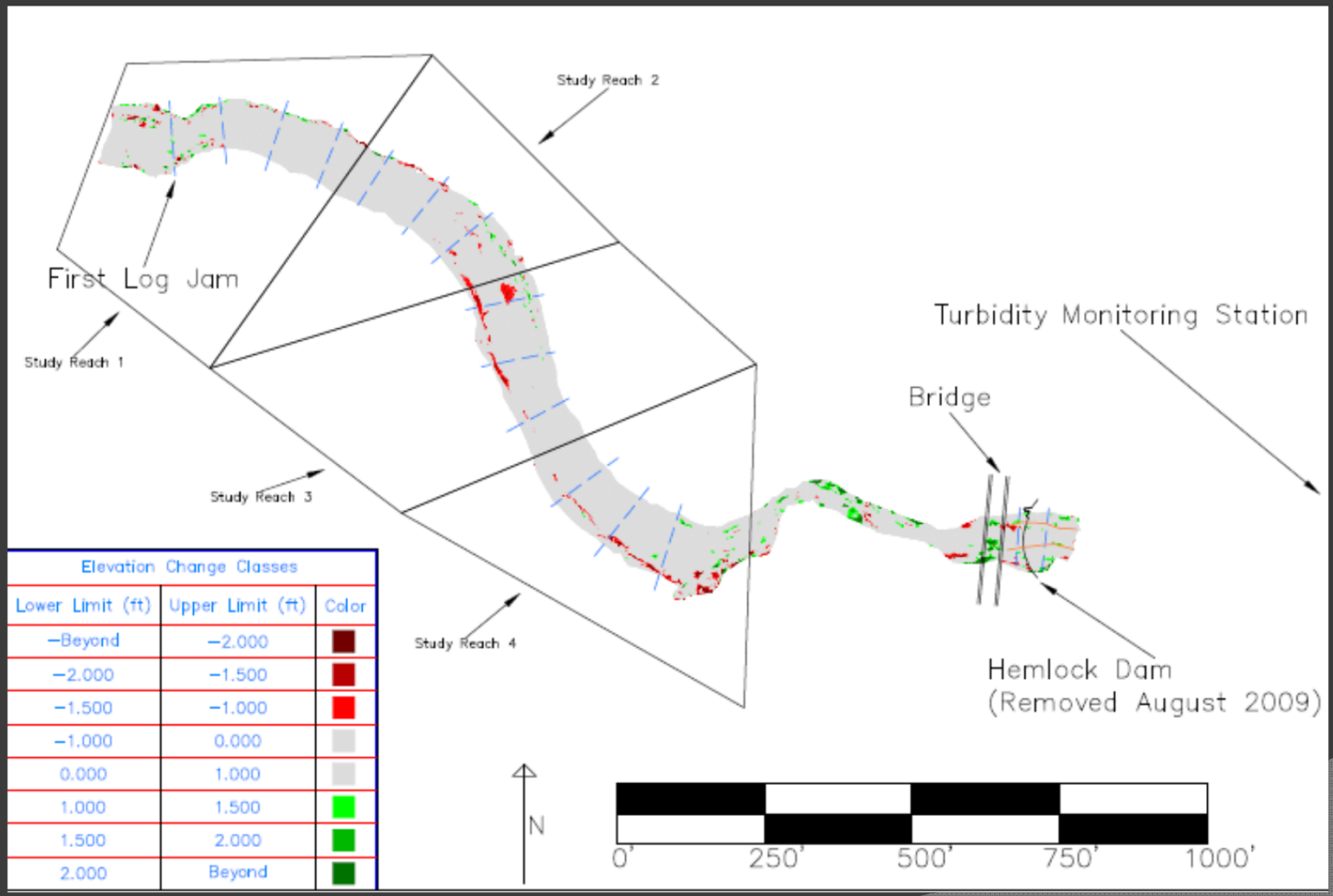
Elevation Change Classes		
Lower Limit (ft)	Upper Limit (ft)	Color
–Beyond	–2.000	
–2.000	–1.500	
–1.500	–1.000	
–1.000	0.000	
0.000	1.000	
1.000	1.500	
1.500	2.000	
2.000	Beyond	

2010-2011 (year 2)



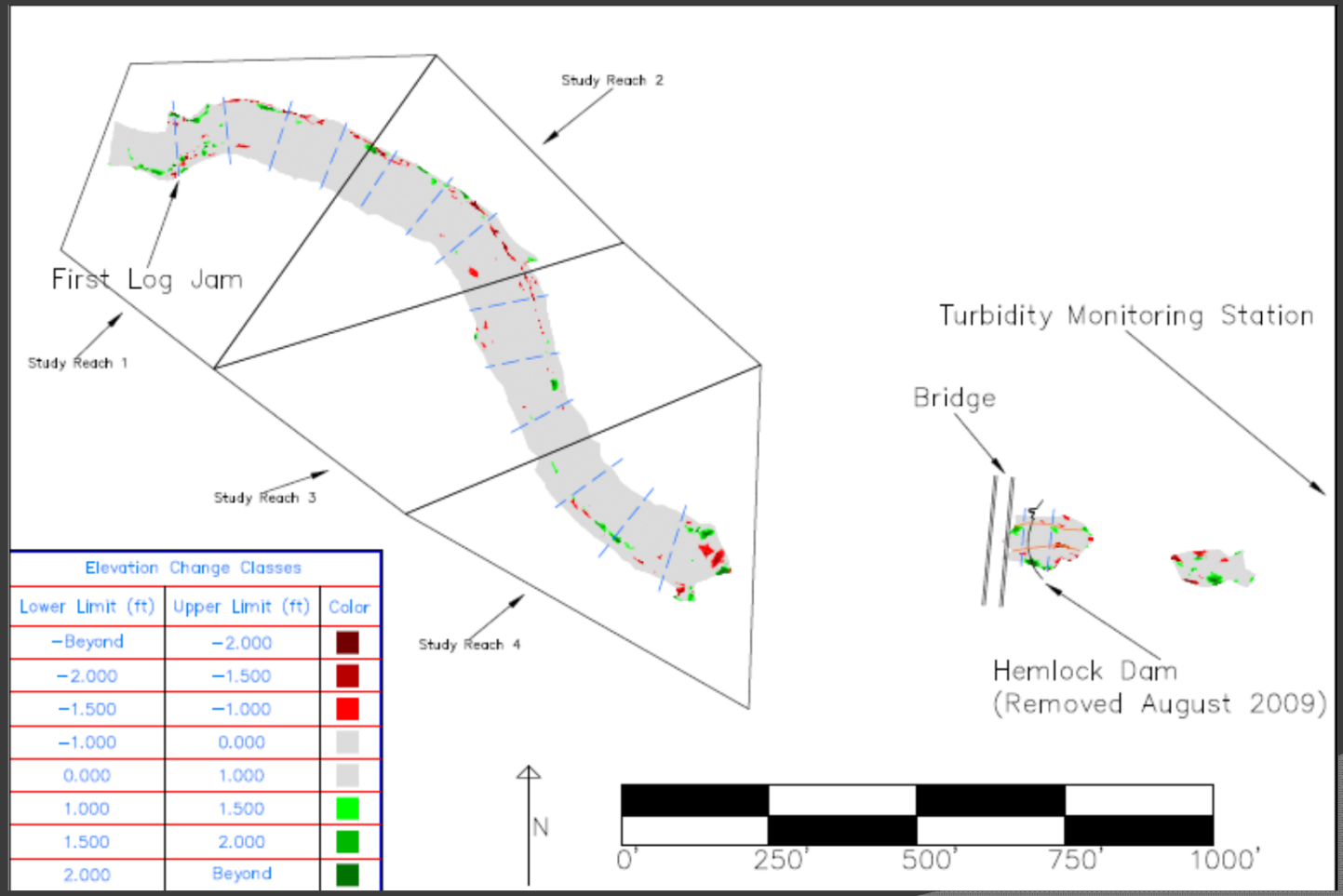
Elevation Change Classes		
Lower Limit (ft)	Upper Limit (ft)	Color
–Beyond	–2.000	
–2.000	–1.500	
–1.500	–1.000	
–1.000	0.000	
0.000	1.000	
1.000	1.500	
1.500	2.000	
2.000	Beyond	

2011-2012 (year 3)



Elevation Change Classes		
Lower Limit (ft)	Upper Limit (ft)	Color
–Beyond	–2.000	
–2.000	–1.500	
–1.500	–1.000	
–1.000	0.000	
0.000	1.000	
1.000	1.500	
1.500	2.000	
2.000	Beyond	

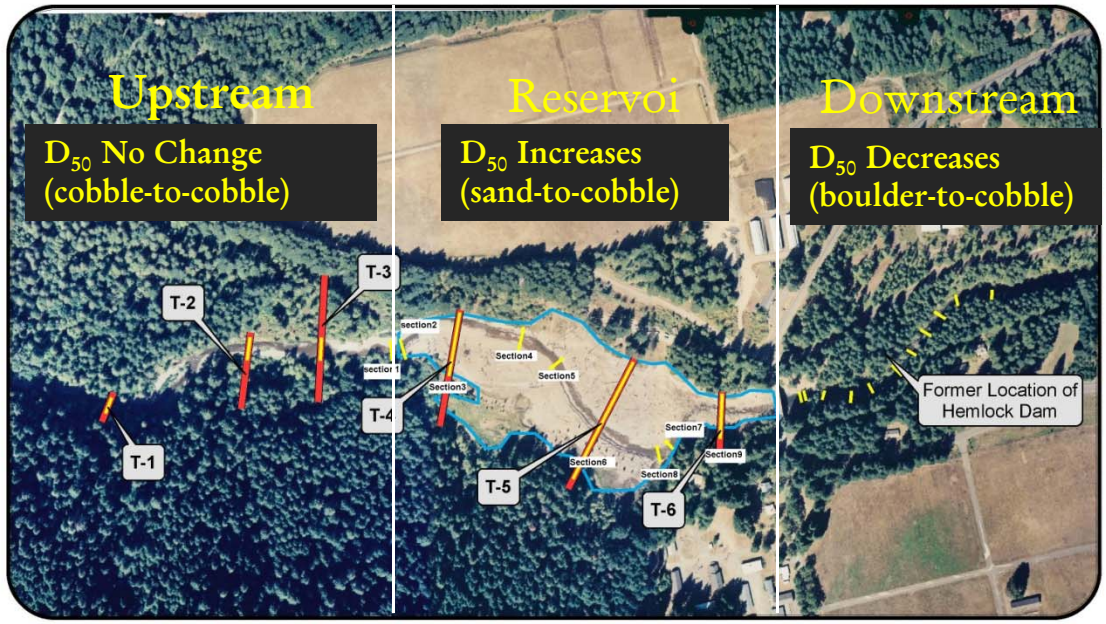
2012-2013 (year 4)



Elevation Change Classes		
Lower Limit (ft)	Upper Limit (ft)	Color
−Beyond	−2.000	
−2.000	−1.500	
−1.500	−1.000	
−1.000	0.000	
0.000	1.000	
1.000	1.500	
1.500	2.000	
2.000	Beyond	

Monitoring Results for Stream Substrate

Project Objective: Restore channel processes



Channel Substrate (D_{50})Change: Before-to-After Dam Removal

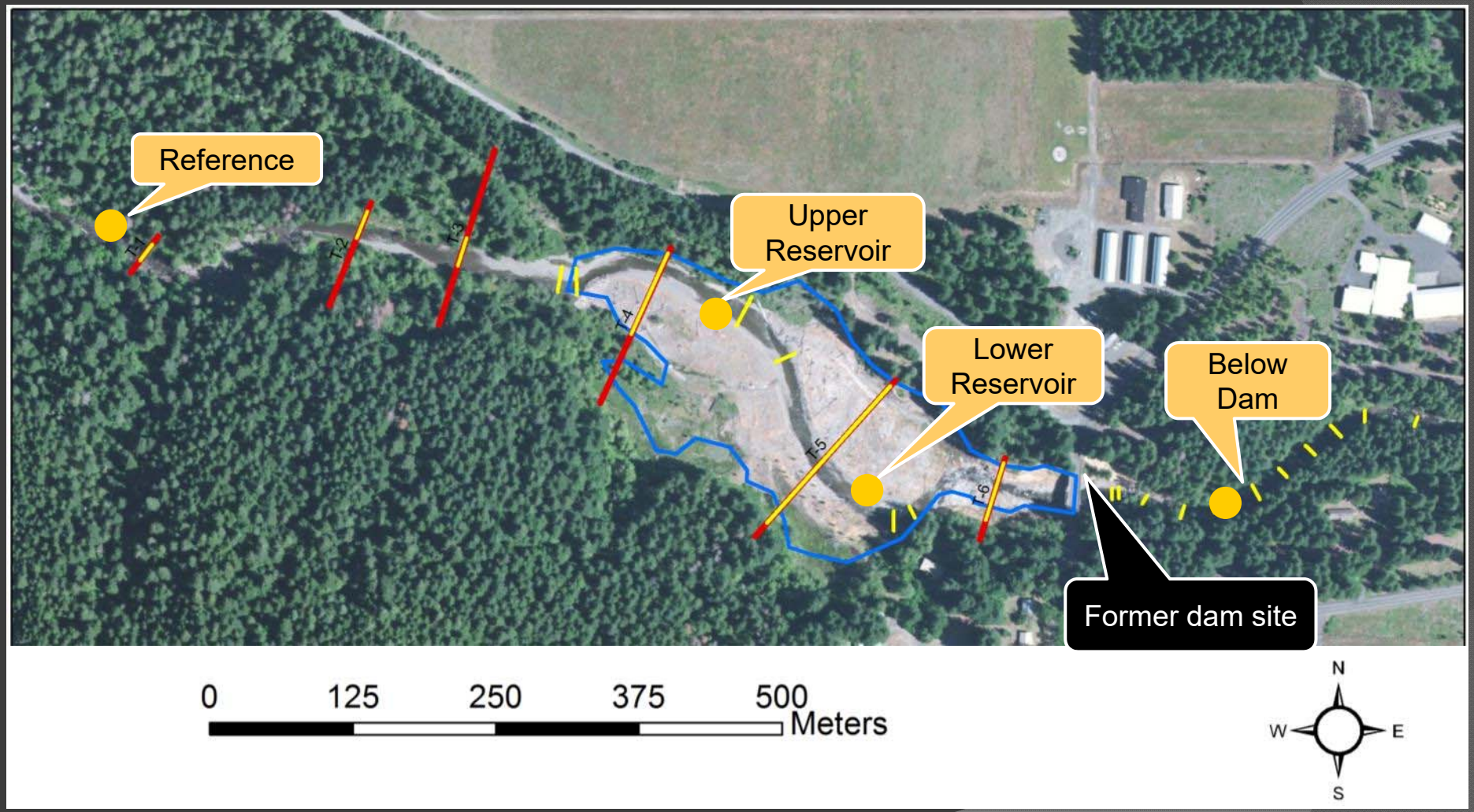
Monitoring Results--Habitat Improvement

Project Objective: Improve habitat complexity and diversity

Before

After

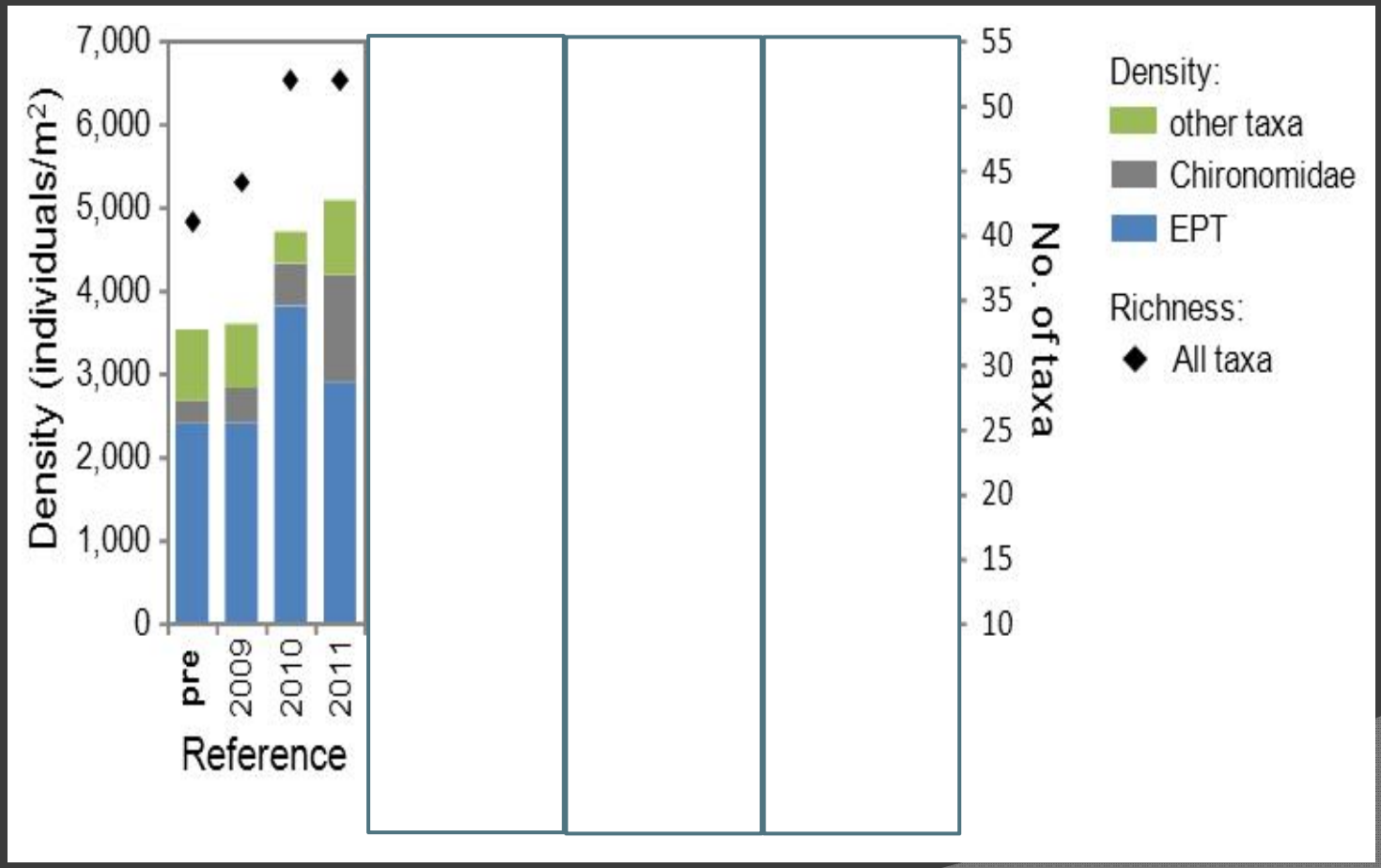
Macroinvertebrate Sampling Locations



Macroinvertebrate sampling site

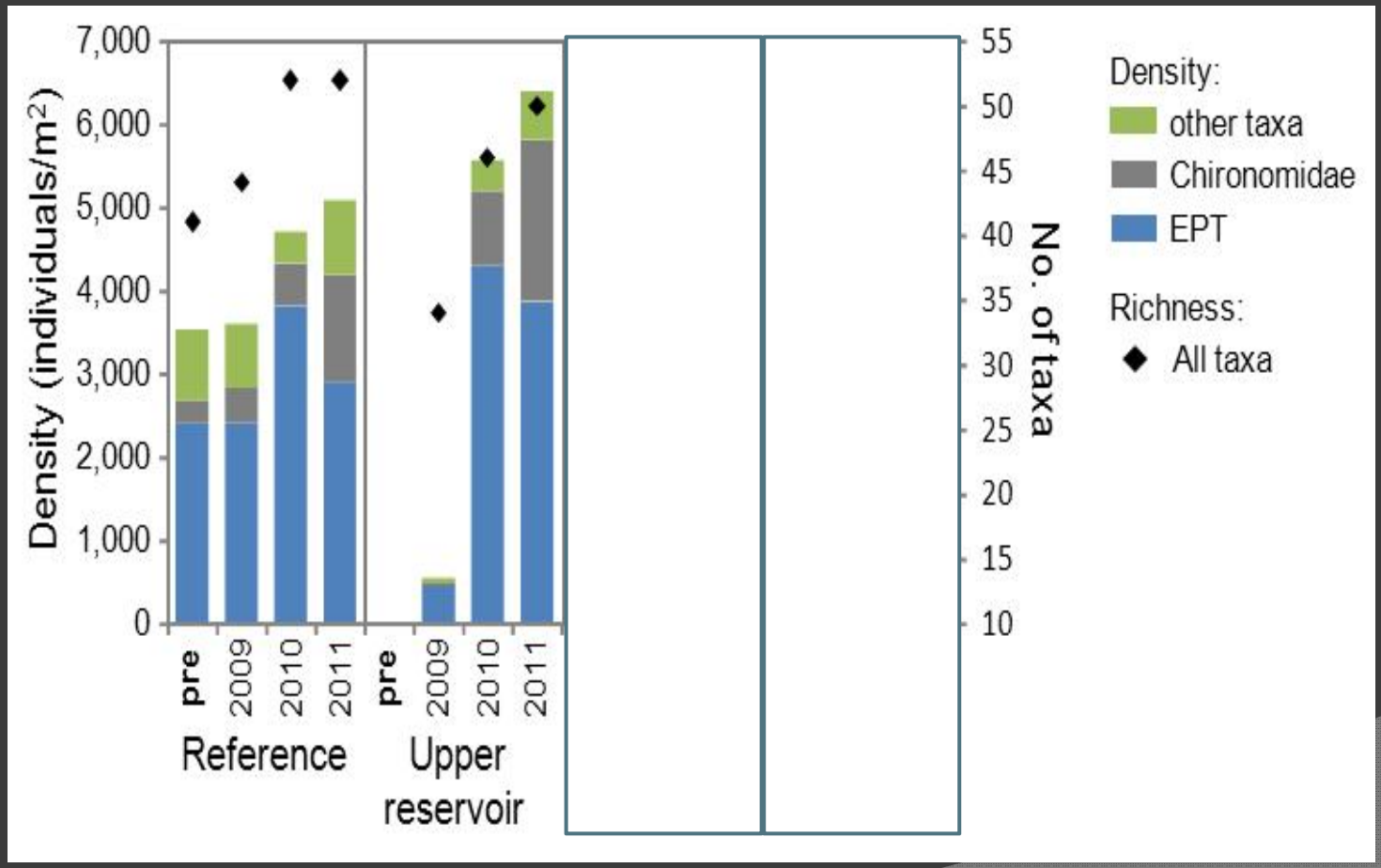
Monitoring Results--Macroinvertebrates

(Data from Shannon Claesson, PNW Research)



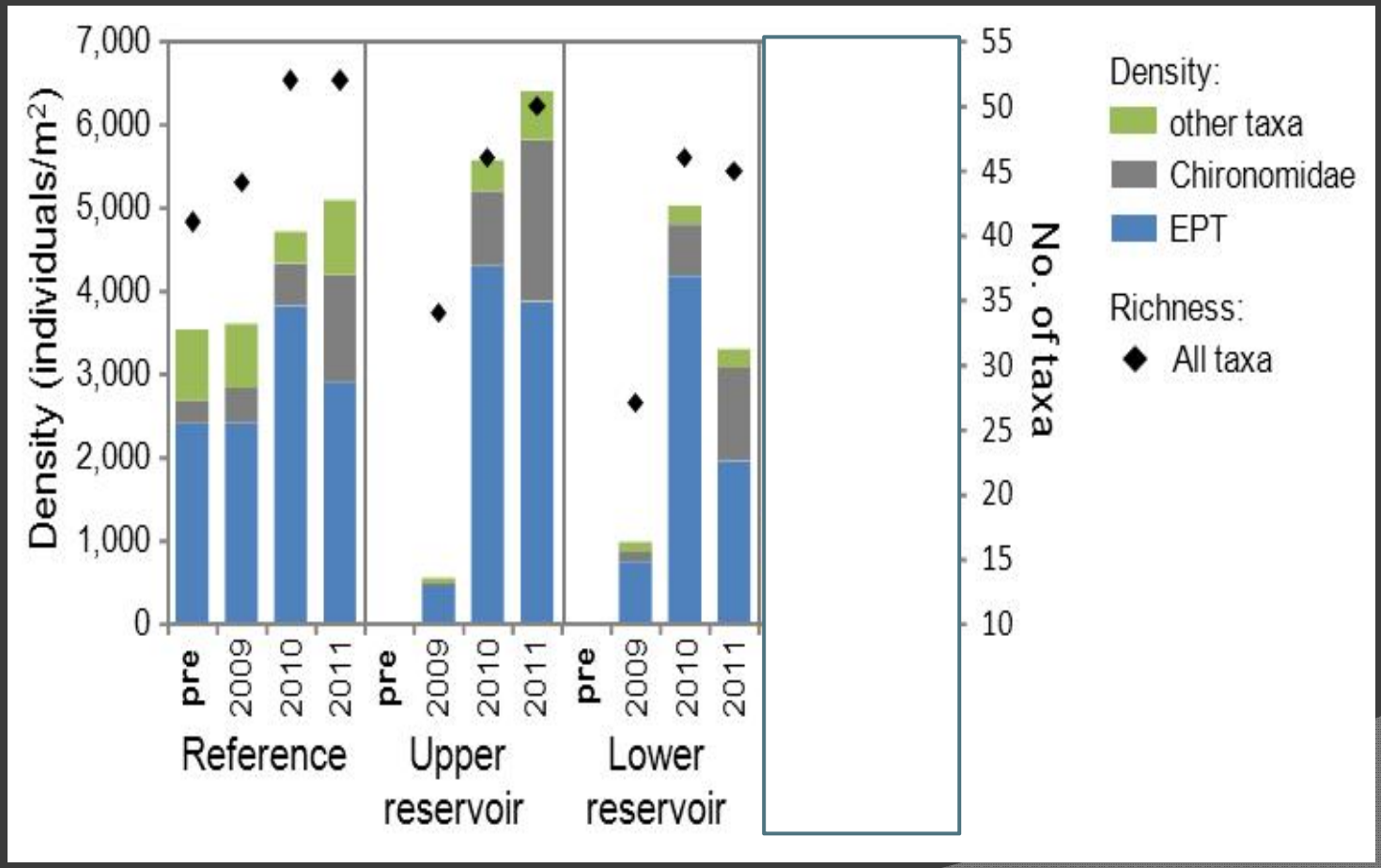
Monitoring Results--Macroinvertebrates

(Data from Shannon Claesson, PNW Research)



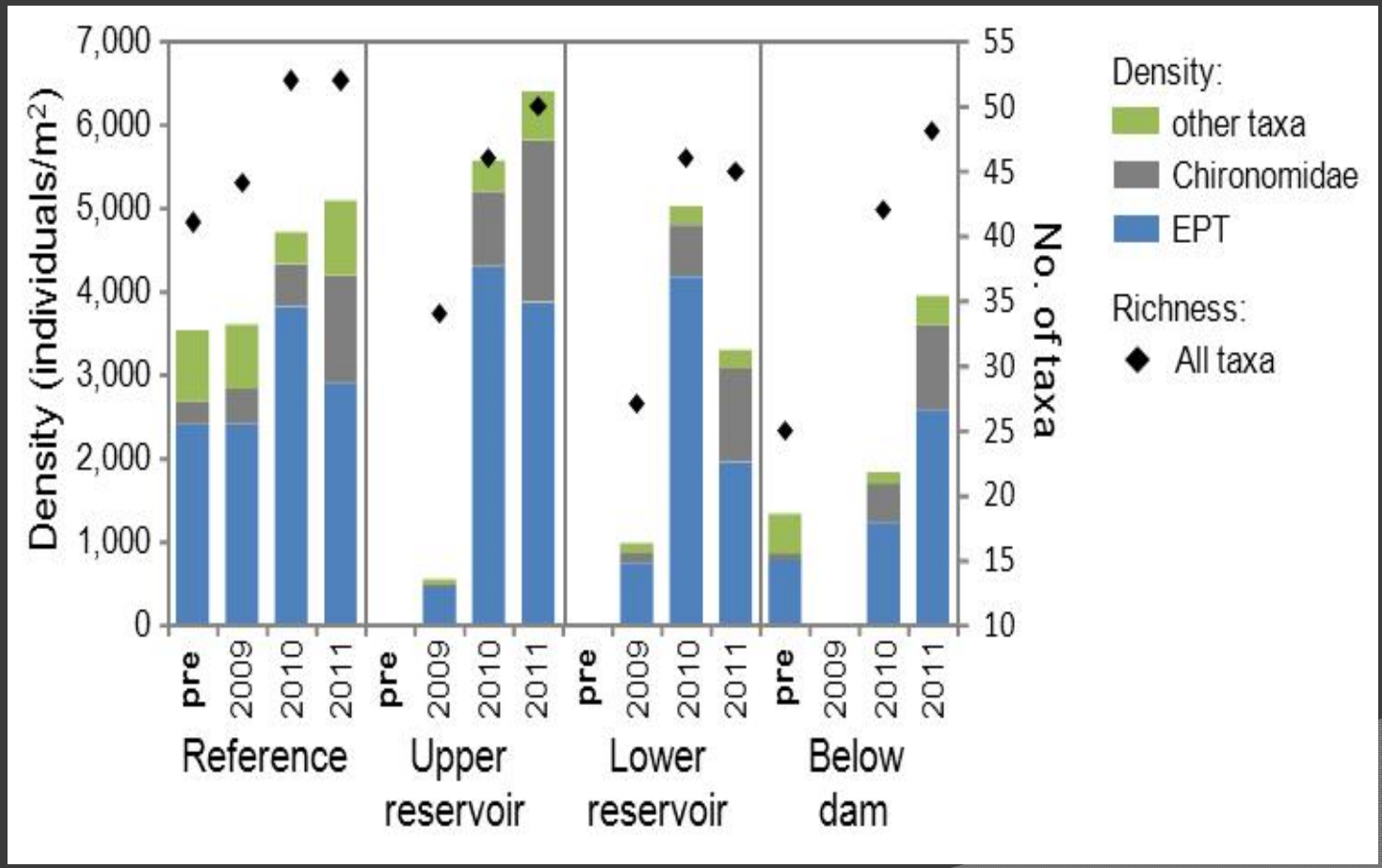
Monitoring Results--Macroinvertebrates

(Data from Shannon Claesson, PNW Research)



Monitoring Results--Macroinvertebrates

(Data from Shannon Claesson, PNW Research)



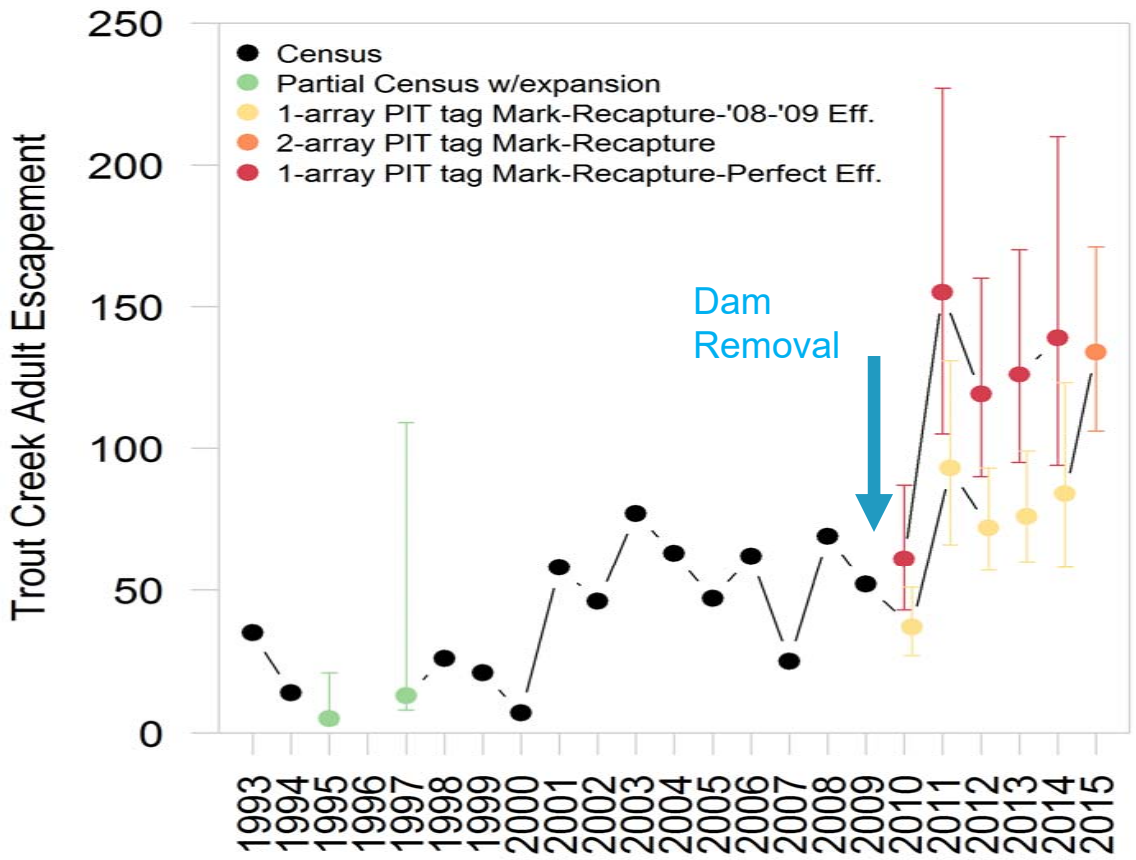
Adult steelhead monitoring—PIT Tag Arrays on Trout Creek

- Two arrays on Trout Creek:
  - within the reservoir reach
  - 5 miles upstream
- Increased precision of estimates
- Detection efficiencies for adult PIT-tagged steelhead have been in excess of 95% by the methods of Connolly et. al 2008.

(Slides and data from Ian Jezorek and Pat Connolly at USGS)

USGS

Adult Steelhead Escapement--Trout



(Slide and data from Thomas Buehrens at WDFW)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CONFEDERATED TRIBES AND BANDS
YAKAMA NATION
Mid-Columbia
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GROUP
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