Elwha River dam removal
Past, present, and future

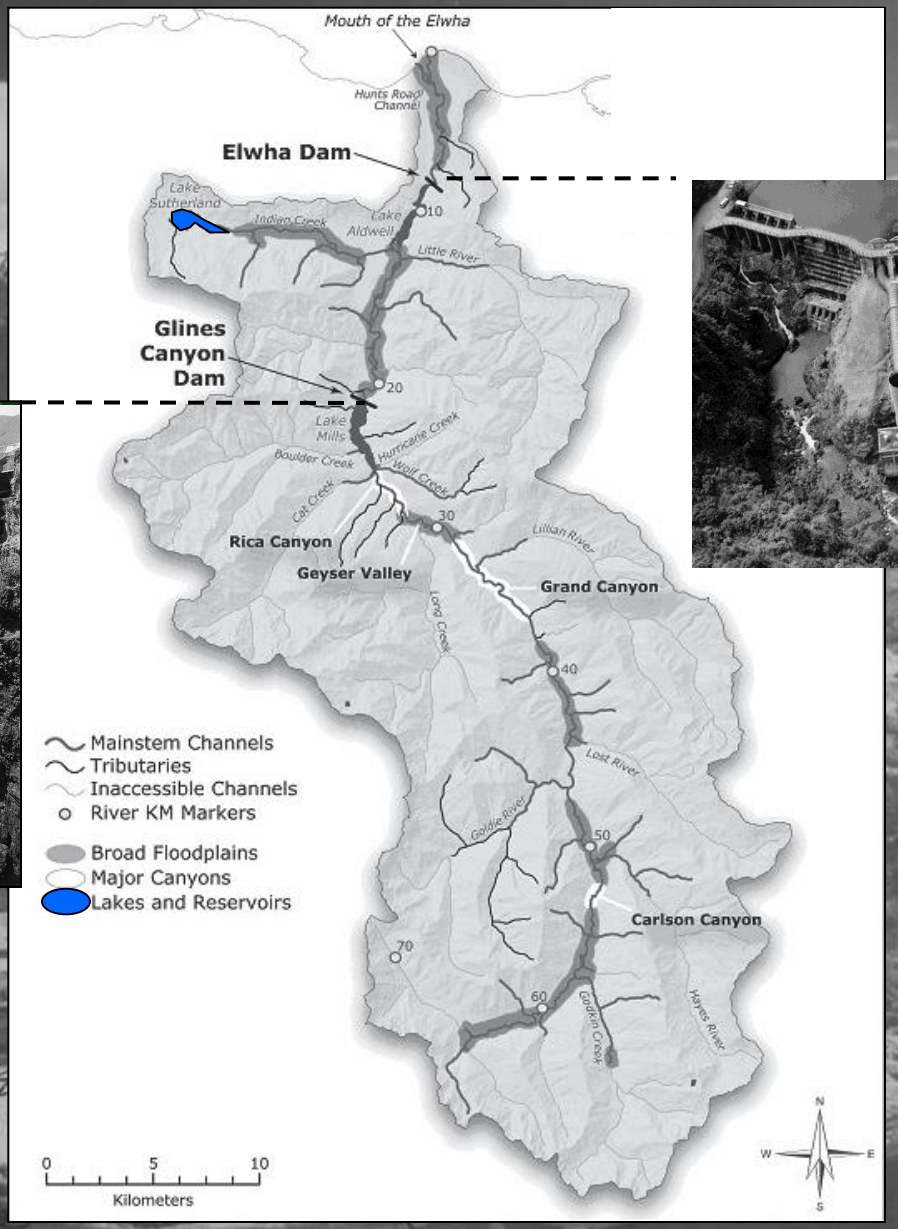
NOAA science advisory board presentation

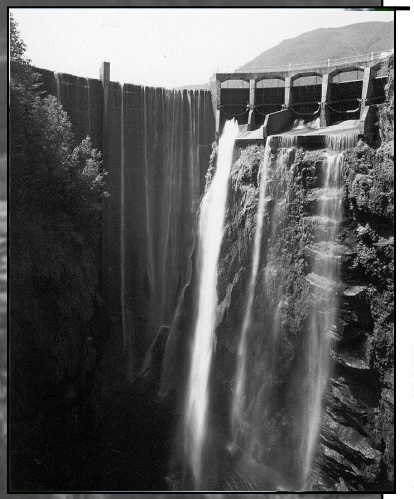
July 17, 2012

Outline

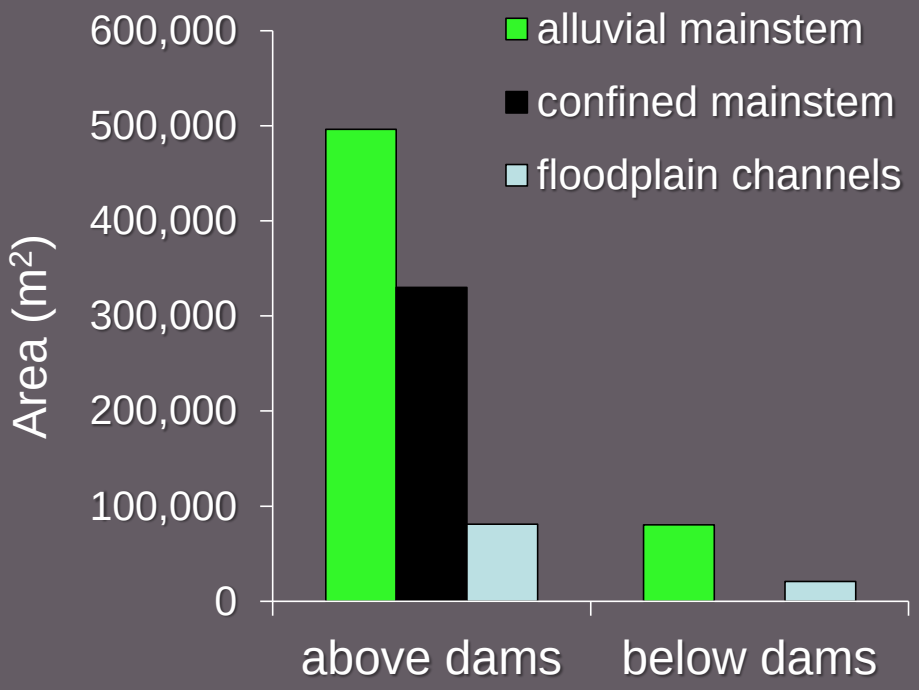
- Impacts of the Elwha River Dams
- The Elwha Ecosystem & Fisheries Restoration Act
- What has occurred with the Elwha dam removal
- How will salmon populations change with the removal of the Elwha River dams?
- Ongoing research

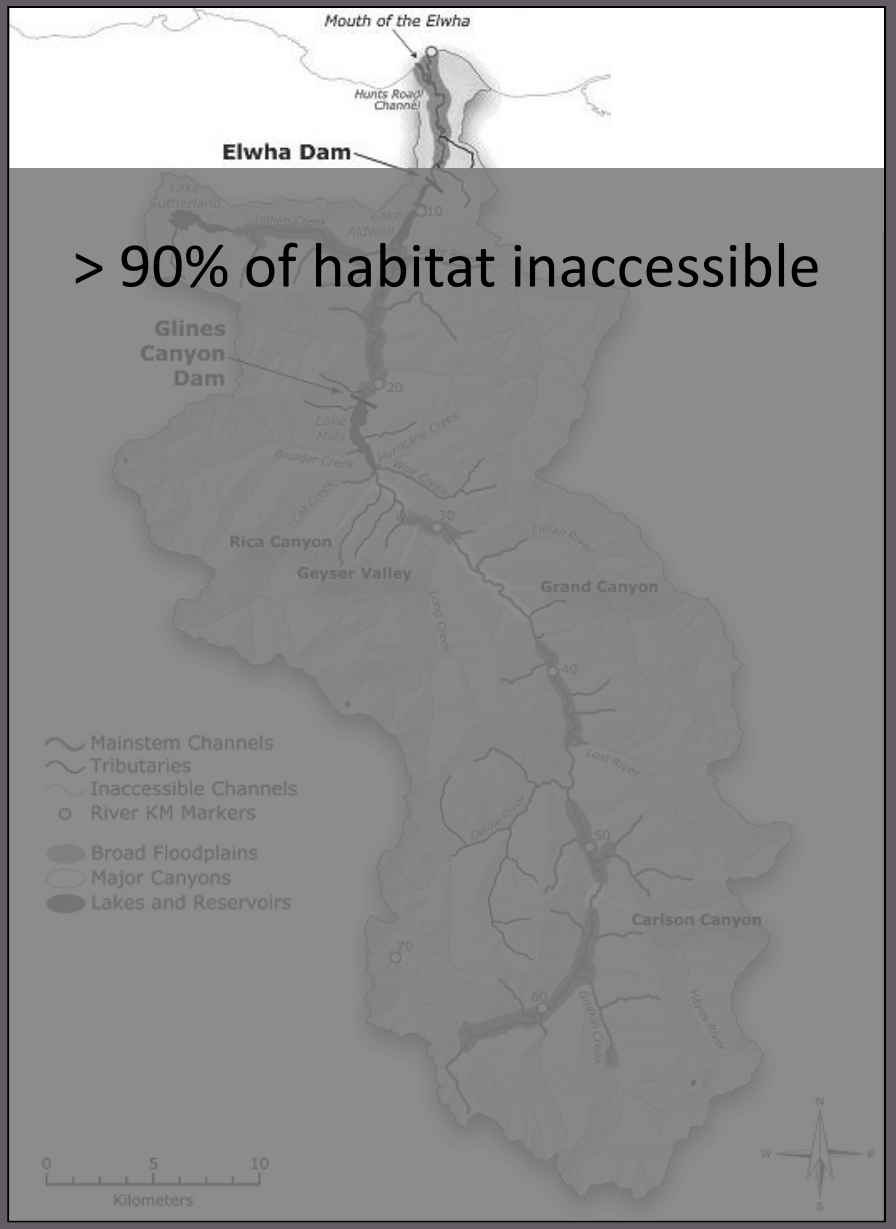
The Elwha River Basin





Impacts of the Dam – Fish Passage

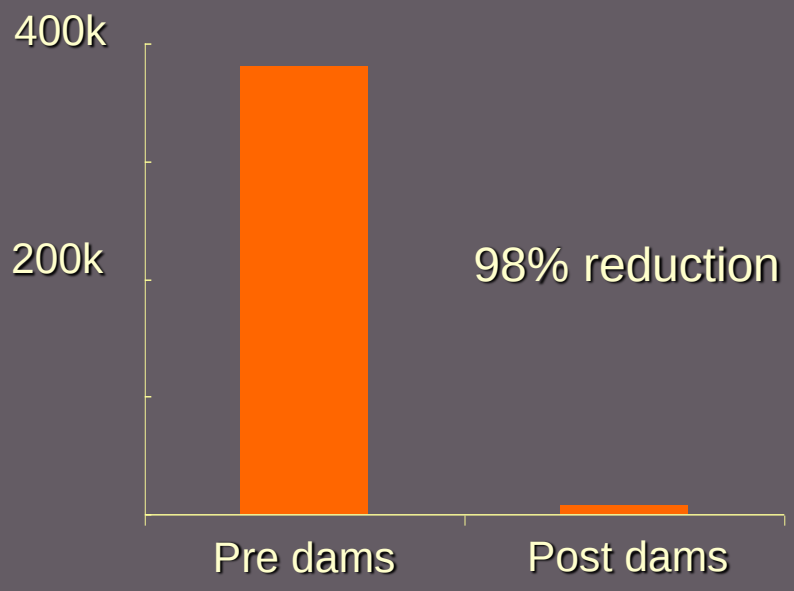




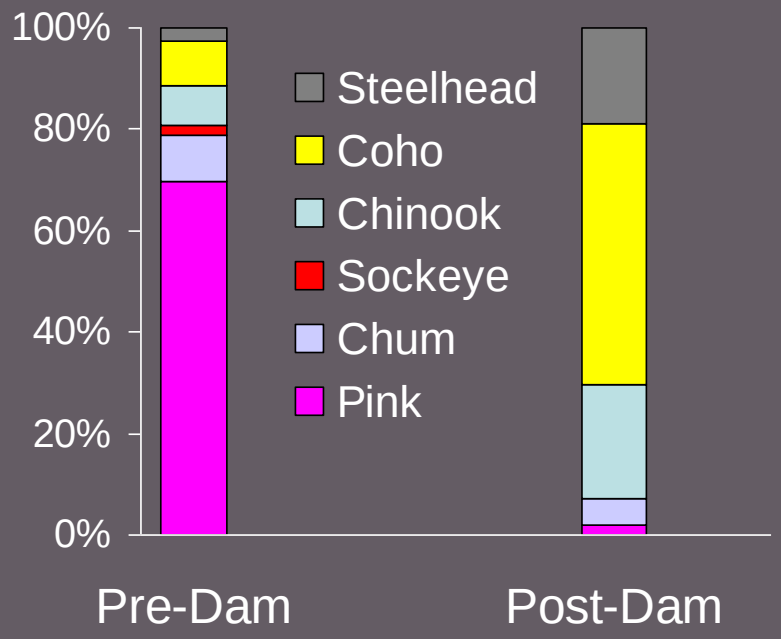
> 90% of habitat inaccessible

Impacts of the Dam – Salmon Populations

Total population decline



Shift in species composition



All native populations are very low in abundance

Elwha River Ecosystem & Fisheries Restoration Act

"…for the removal of the dams and full restoration of the Elwha River ecosystem and native anadromous fisheries."

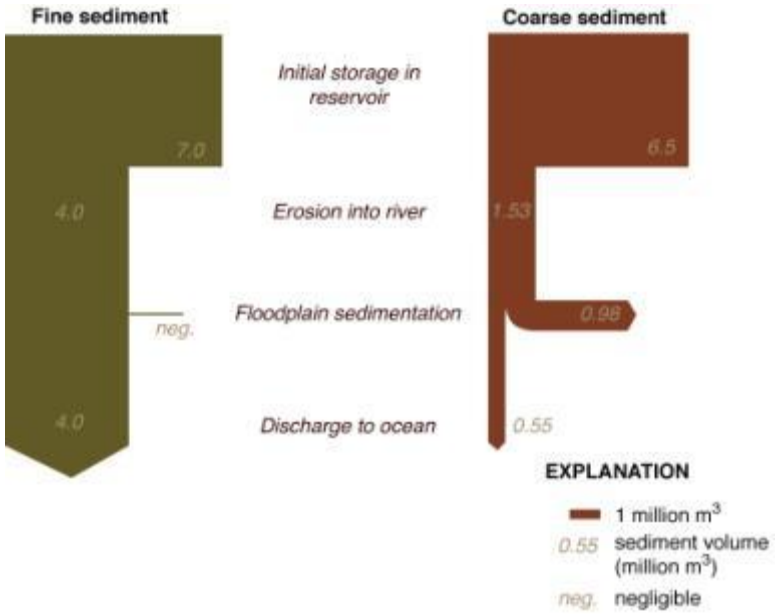
102nd Congress of the U.S.A.
January 3, 1992

September 2011

July 2012

What's Going to Happen To All the Sediment?

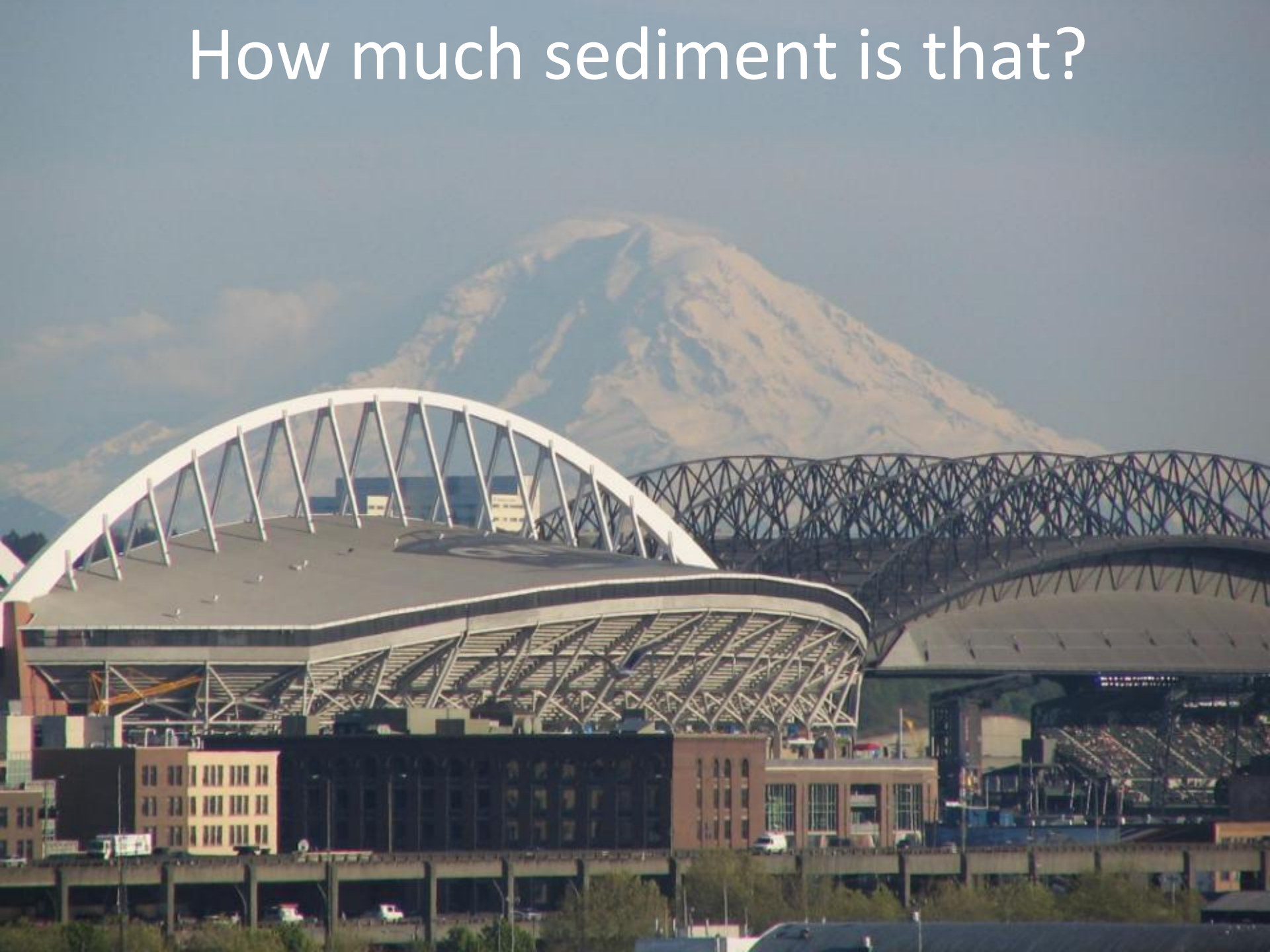
- ~19 million m^3 of sediment accumulated in reservoirs
  - > 50% fine sediments
  - < 30% coarse sediments
  - ¼ to ½ predicted to erode downstream
- Predictions



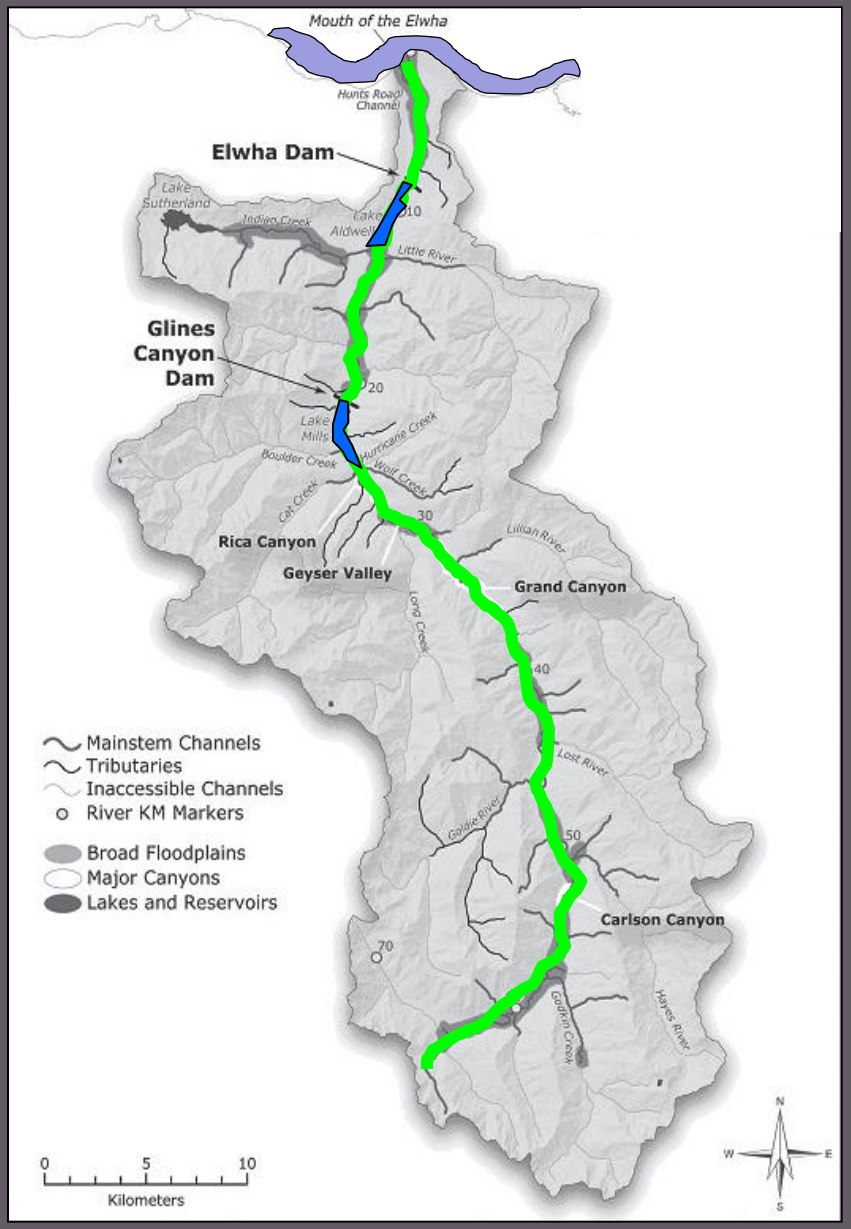
Gelfenbaum et al. 2011 USGS SIR 2011-5120

  - Short-term
    - suspended-sediment concentrations > 10,000 ppm
    - temporary deposits of fines in pools
  - Long-term
    - more dynamic & diverse floodplain habitats
    - bed aggradation (elevation) may increase 100-year flood stage by 1m

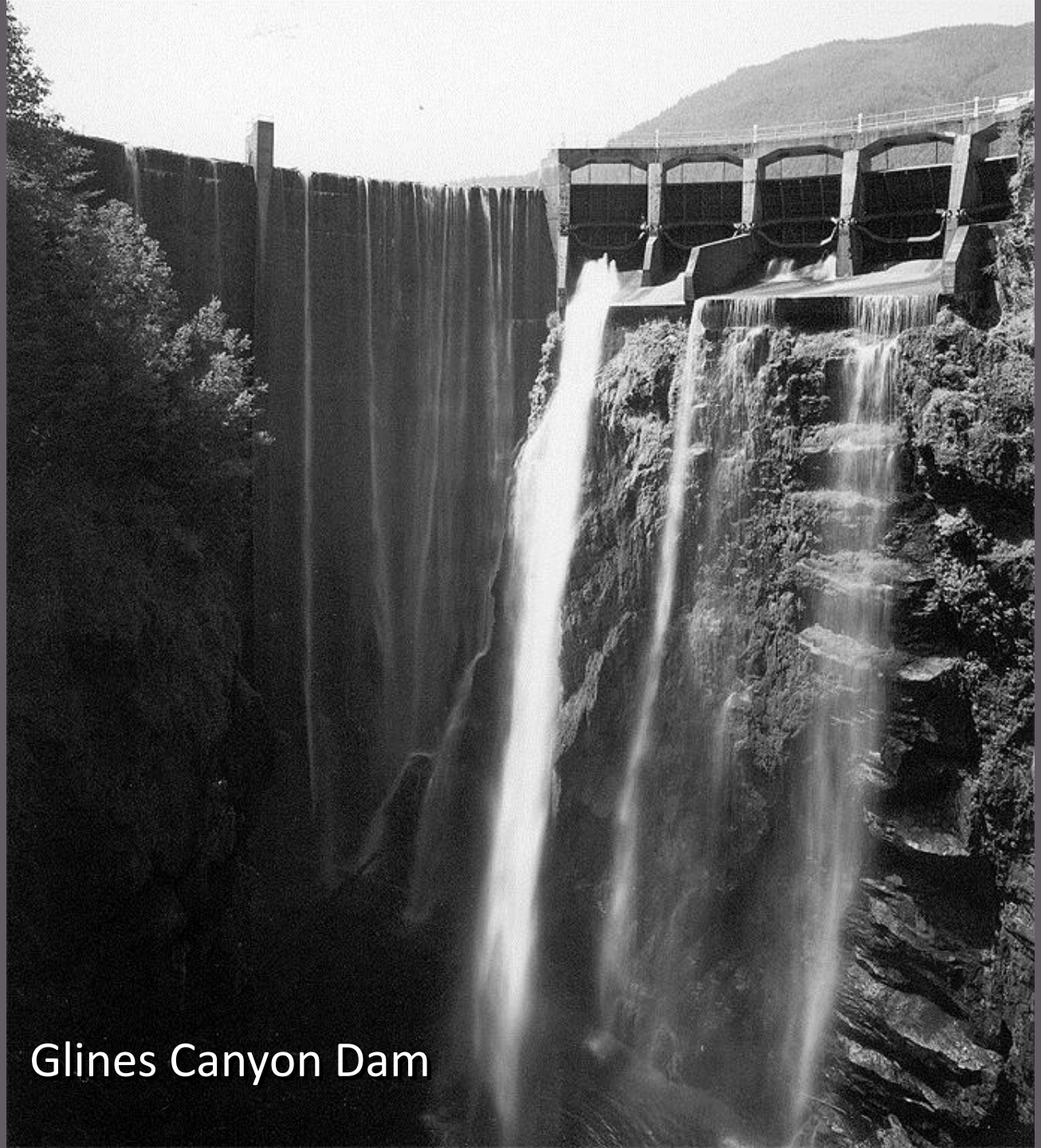
How much sediment is that?



What has occurred with the Elwha Dam removal?



- Former reservoirs
- Nearshore
- River ecosystem



Glines Canyon Dam

Glines Canyon Dam

Former Reservoir Surfaces


March 2012


March 2012


Photo by John Gussman, Doubleclick, Inc.
Boulder Creek

Slides courtesy Josh Chenoweth, NPS

Slides courtesy Josh Chenoweth, NPS

Elwha Dam


Elwha Dam


Feb 13 12 09:33:38
Elwha Dam


Elwha Dam


Jul 08 12 13:03:32
Elwha Dam

Former Reservoir Surfaces

Former Reservoir Surfaces

Former Reservior Surfaces

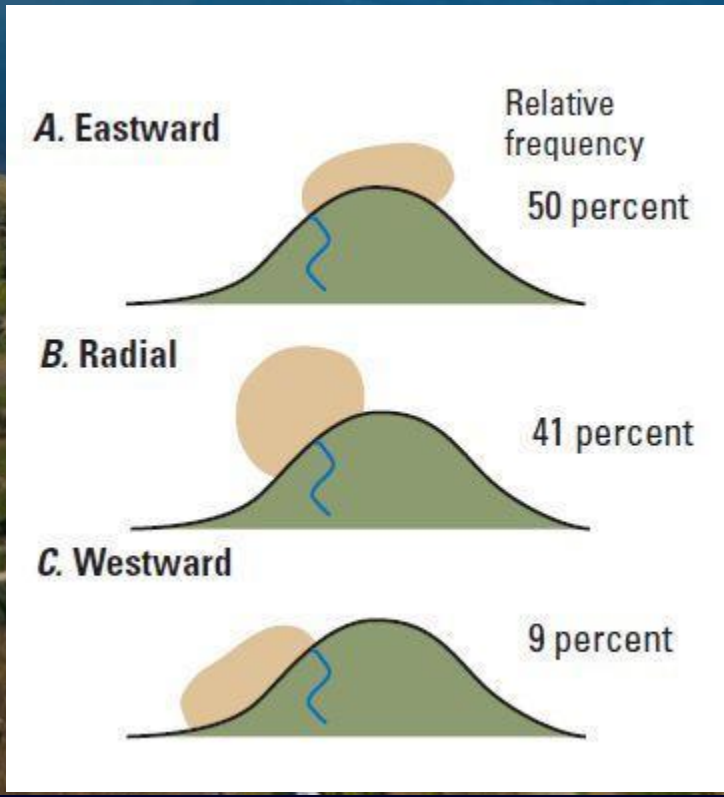
Revegetation Plan

- 7 year plan
- Plant 400,000 native plants
- Sow 5,000 pounds of locally harvested seed

USGS

Slides courtesy Josh Chenoweth

Photo: Matt Beirne, Lower Elwha Klallam Tribe



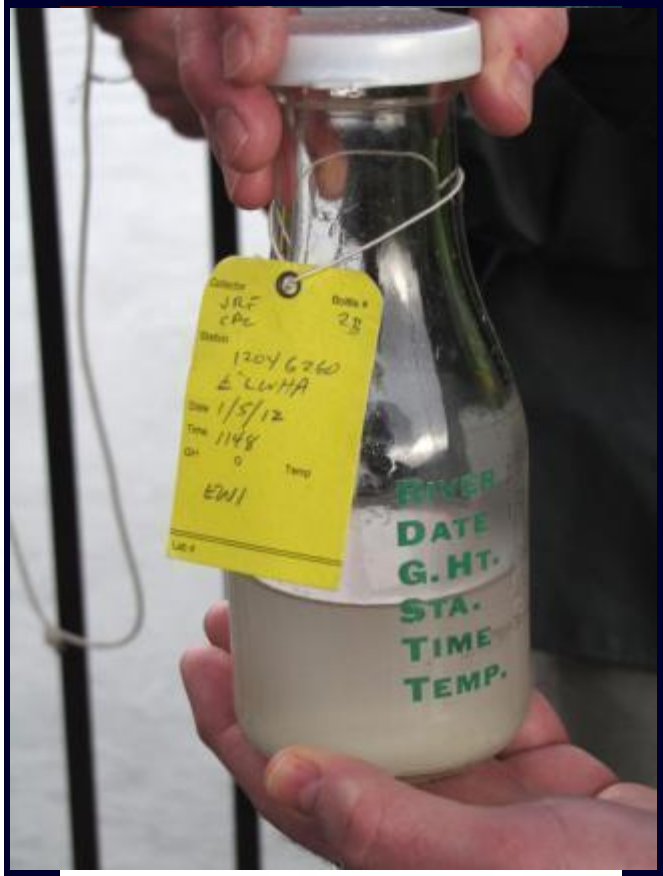
Warrick, J.A., and Stevens, A.W., 2011, A buoyant plume adjacent to a headland - observations of the Elwha River plume: Continental Shelf Research, v. 31, p. 85-97.

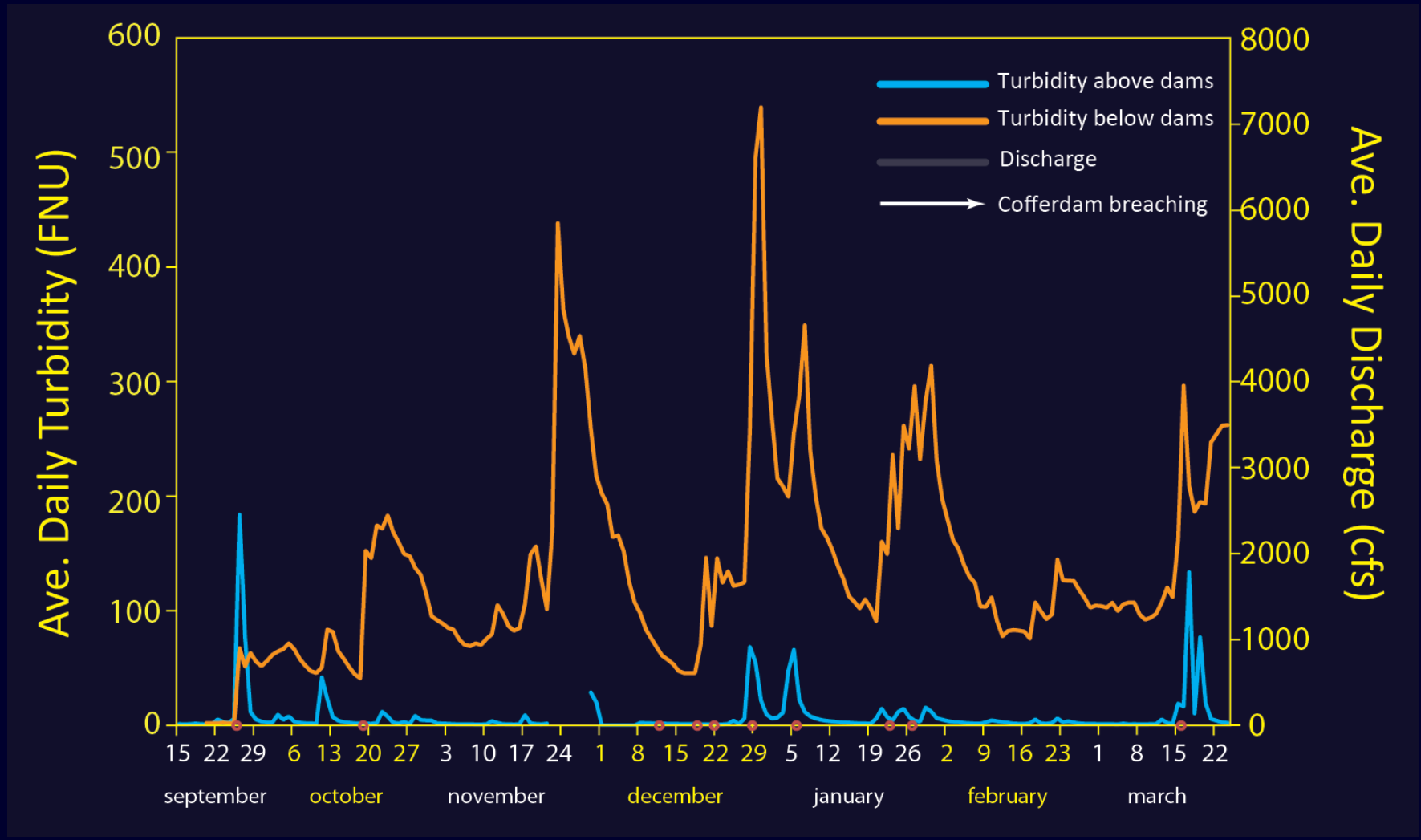
USGS


Roorda Aerial

Sediment Monitoring

- Continuous Mainstem – turbidity & suspended sediment @2 sites



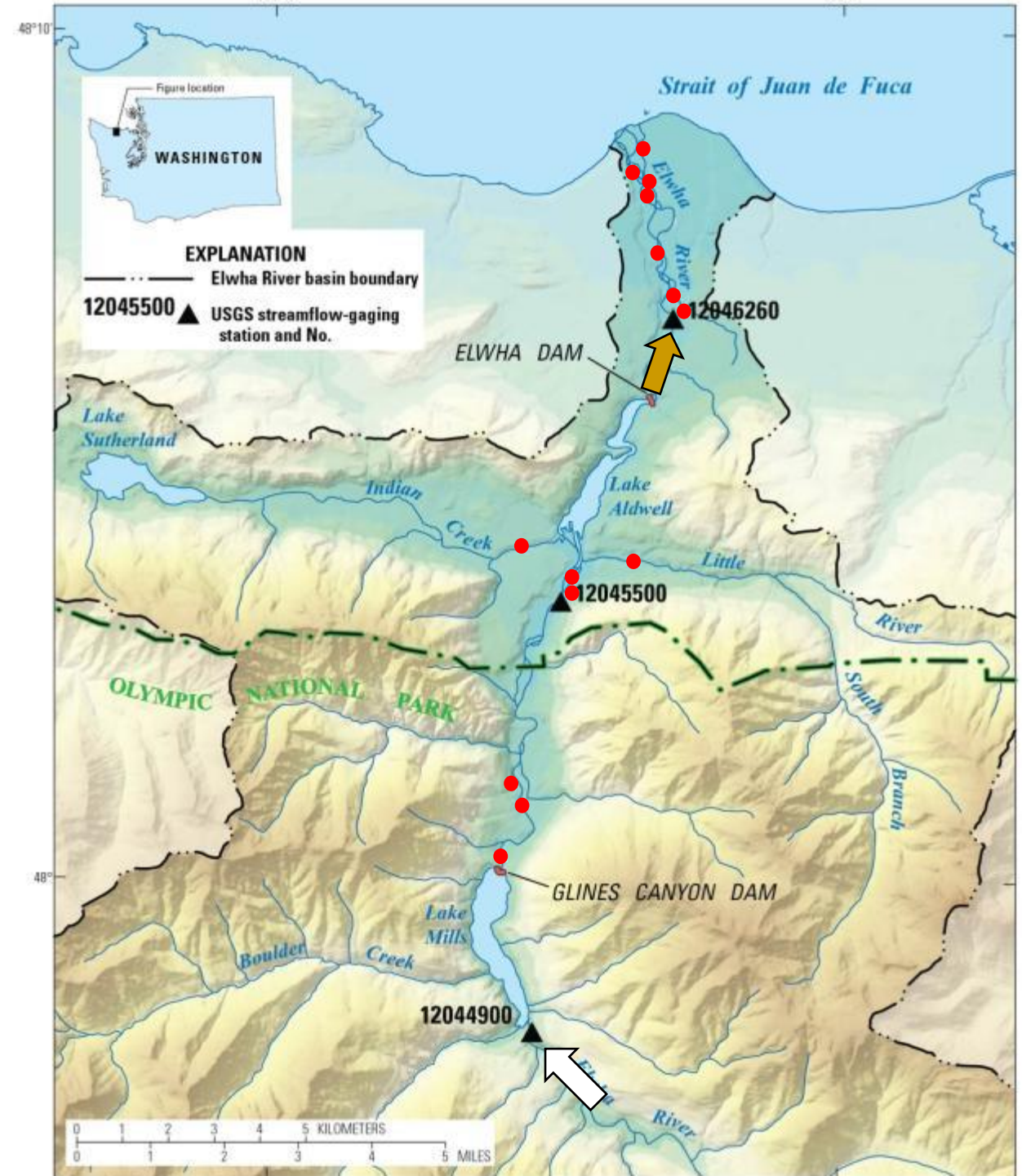


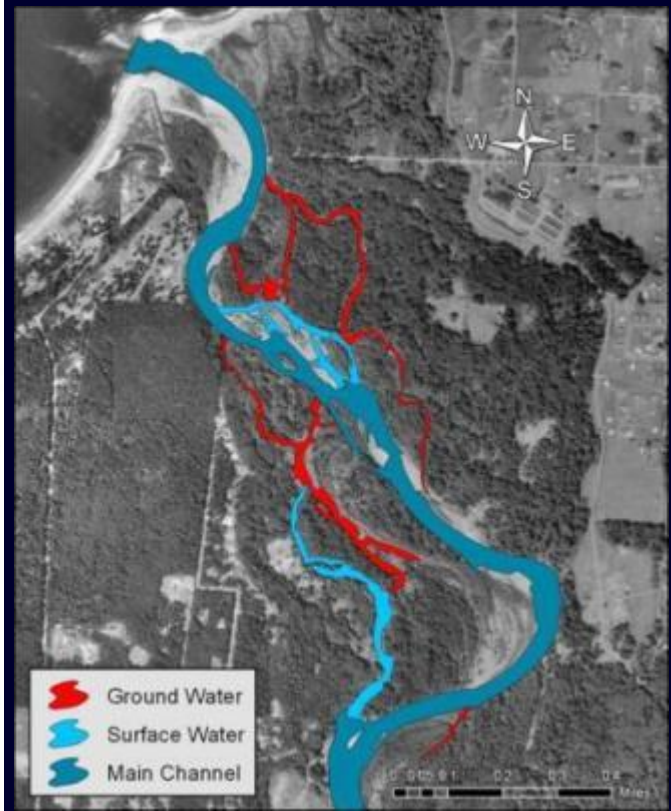
USGS

Provisional USGS data, subject to revision

Sediment Monitoring

- Daily turbidity measurements
- 14 sites
- Lower & Middle Elwha
- Mainstem, tributary, & floodplain channels





How will different habitats respond to turbidity?

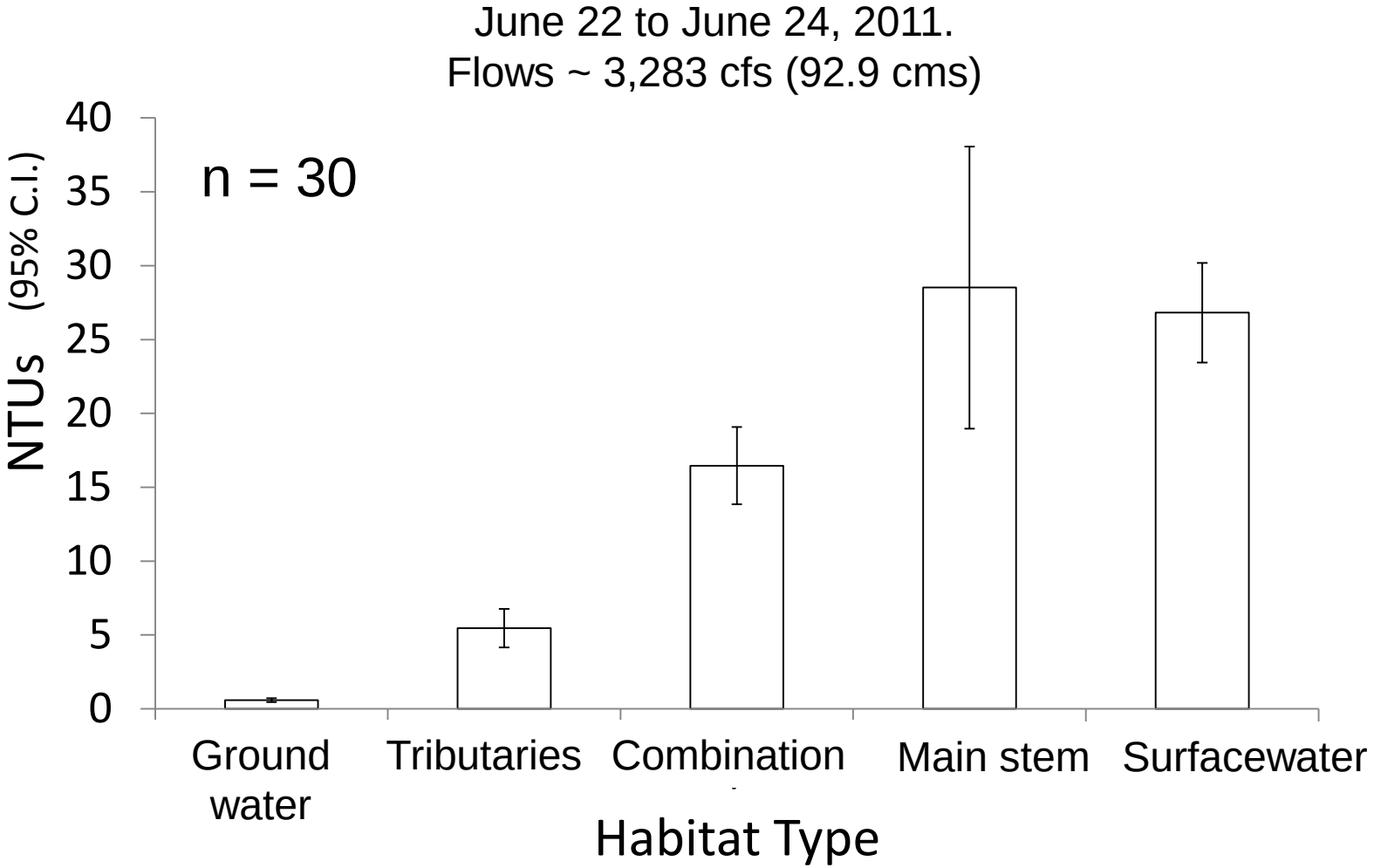


Photo: Lighthawk

Photo: John McMillan

Photo: John McMillan

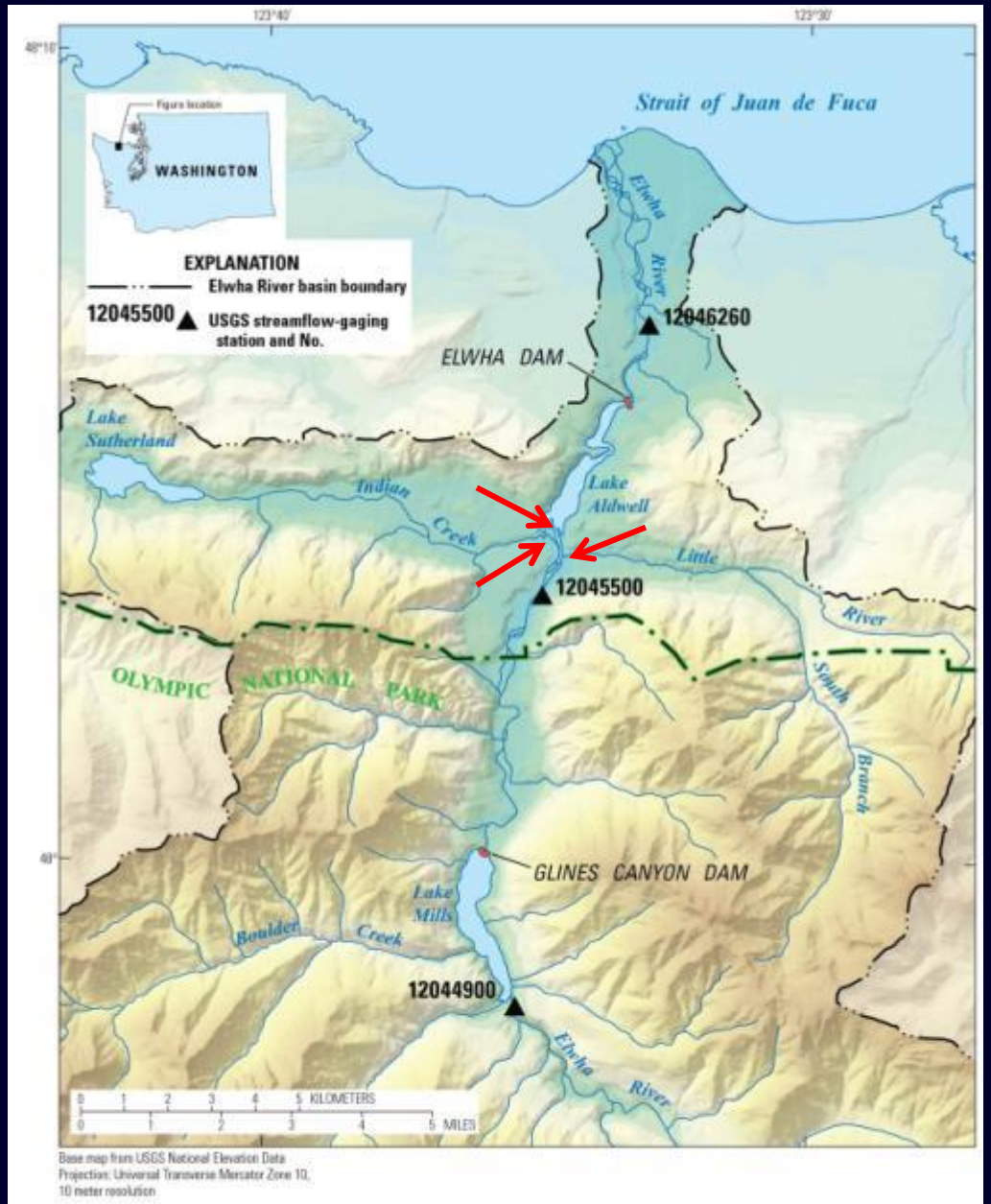
Jumpstarting recolonization - release of adult coho salmon

Photo courtesy of John McMillan

Jumpstarting Salmon Recolonization: Release of adult coho salmon

Release Location	Male Coho	Female Coho
Mainstem Elwha	260	223
Little River	102	70
Indian Creek	28	25

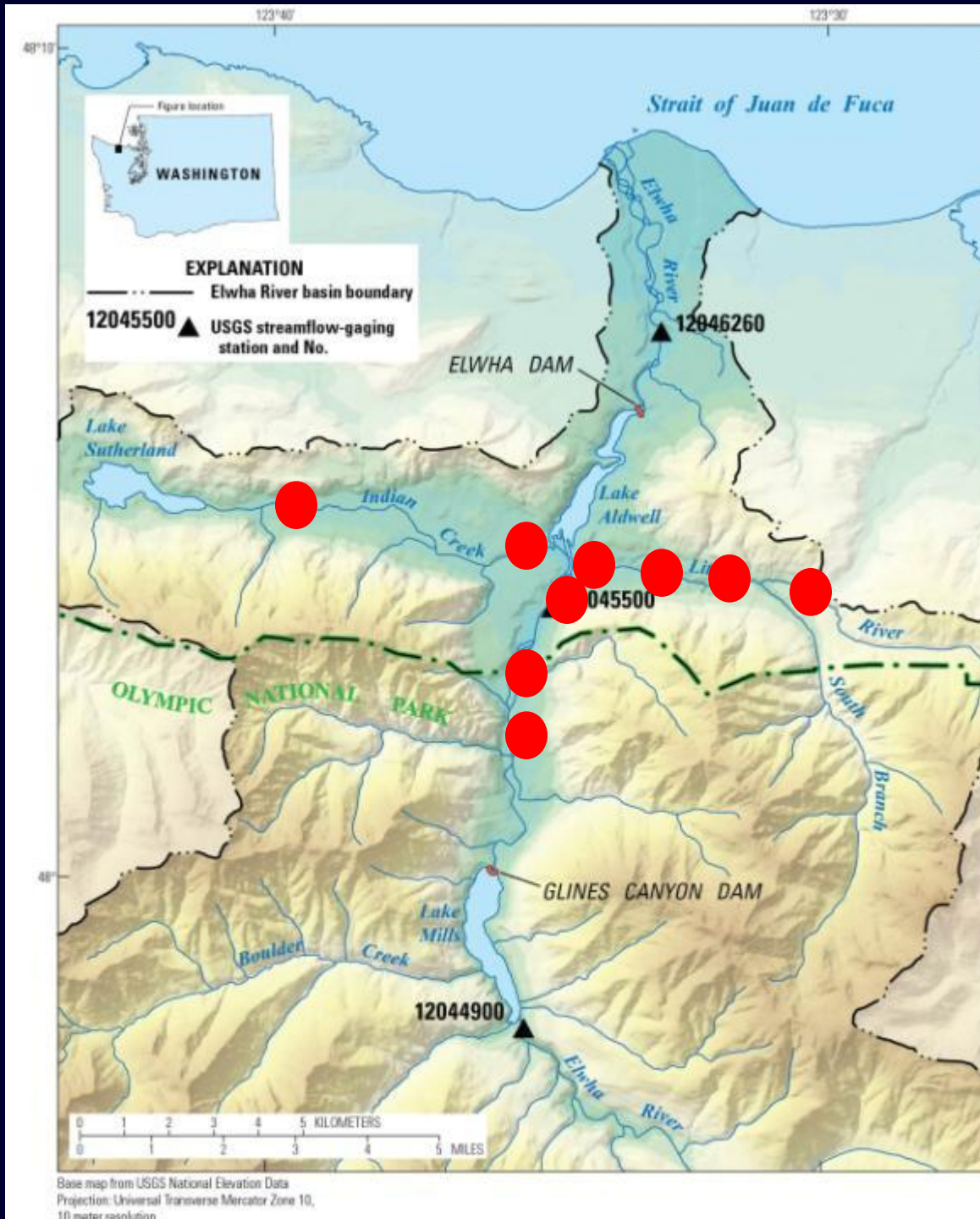
- 6 week release period
- 46 radiotagged
- Weekly redd surveys
- ~60% of tagged fish “fell back”



Jumpstarting Salmon Recolonization Release of Adult Coho salmon

Location	# Redds
Little River (T)	58
Indian Creek (T)	28
Elwha Campground (FC)	3
Madison Creek (T)	4
Pedersen property (FC)	2

Photo courtesy of John McMillan



Jumpstarting recolonization - release of adult steelhead

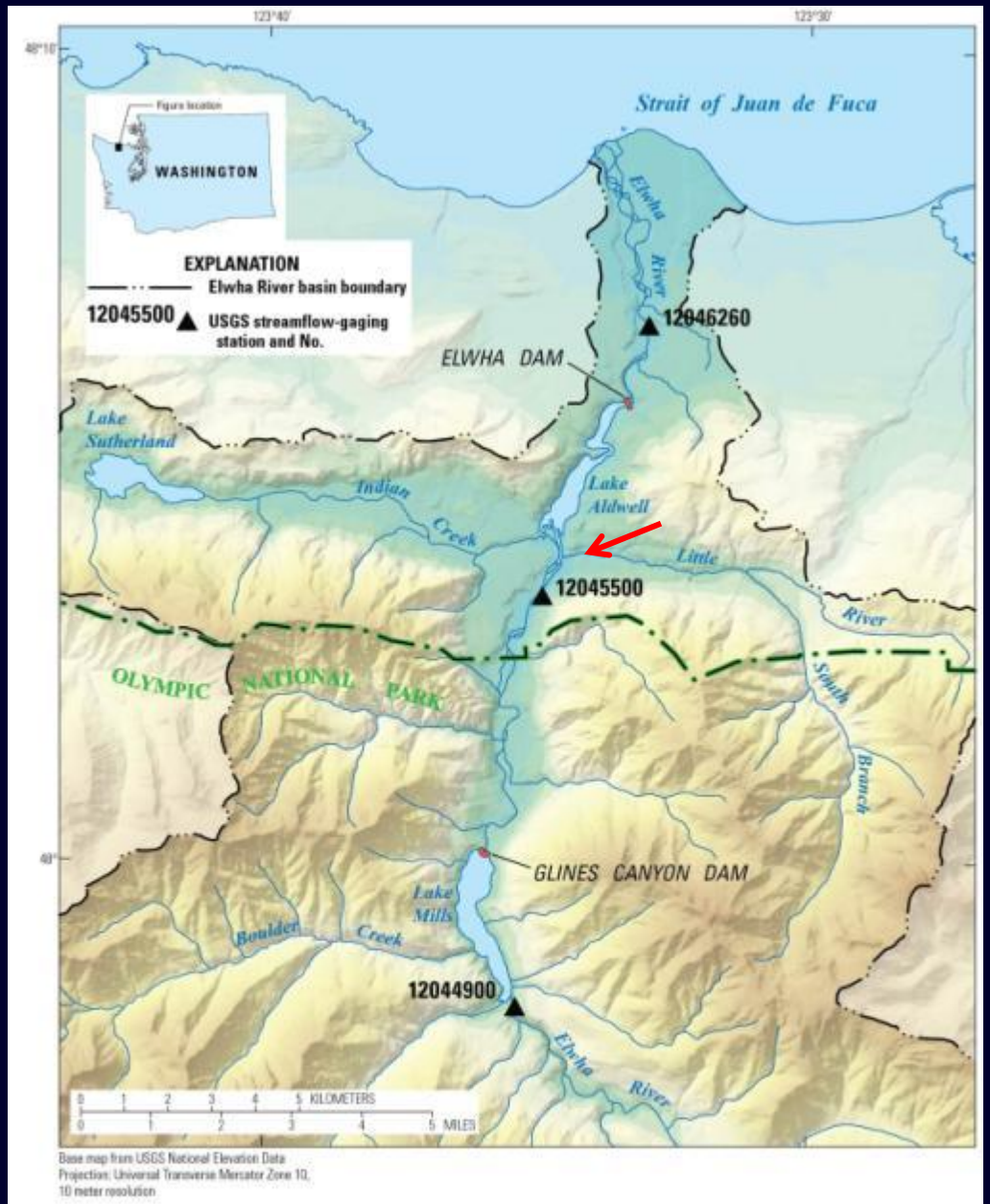
Photo courtesy of John McMillan

Jumpstarting Salmon Recolonization: Release of adult steelhead

Release Location	Male Stlhd	Female Stlhd	Rainbow trout
Little River	11	39	15

Photo courtesy of John McMillan

- 9 week release period
- 25 radiotagged
- Weekly redd surveys
- ~0% of tagged fish “fell back”



Coho salmon

- 58 redds in Little River

- More fish higher upstream

- Coho and steelhead both avoided spawning in canyon

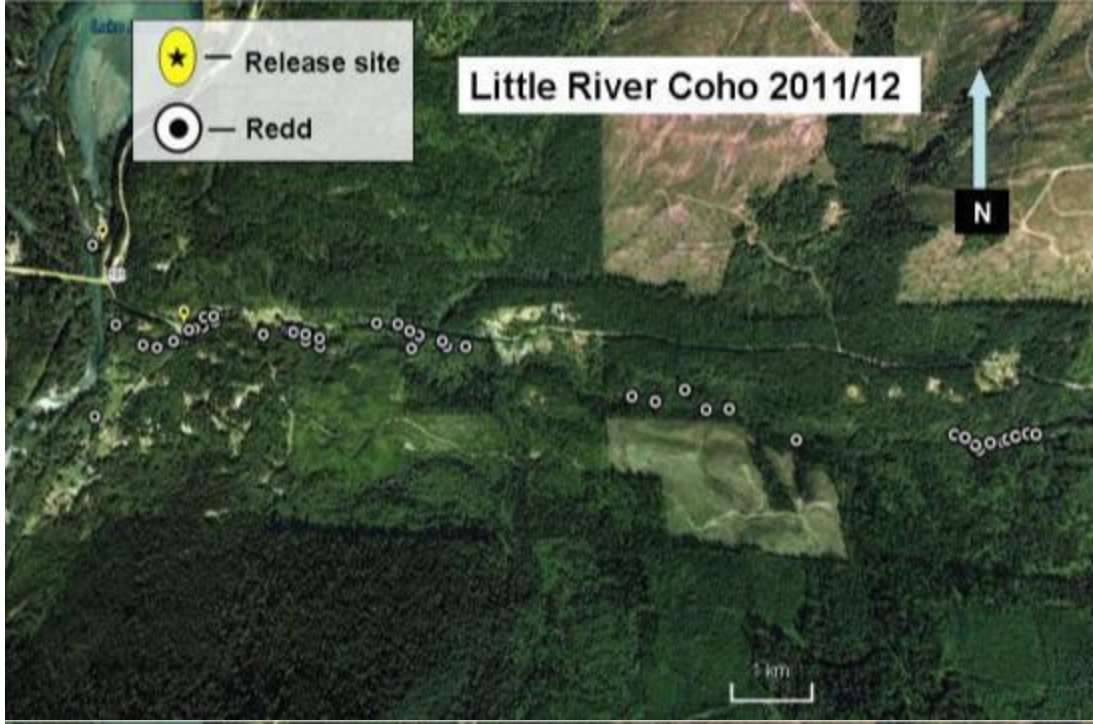
Steelhead

- 40 redds in Little River

- Often superimposed on coho redds

- Many fish at release site

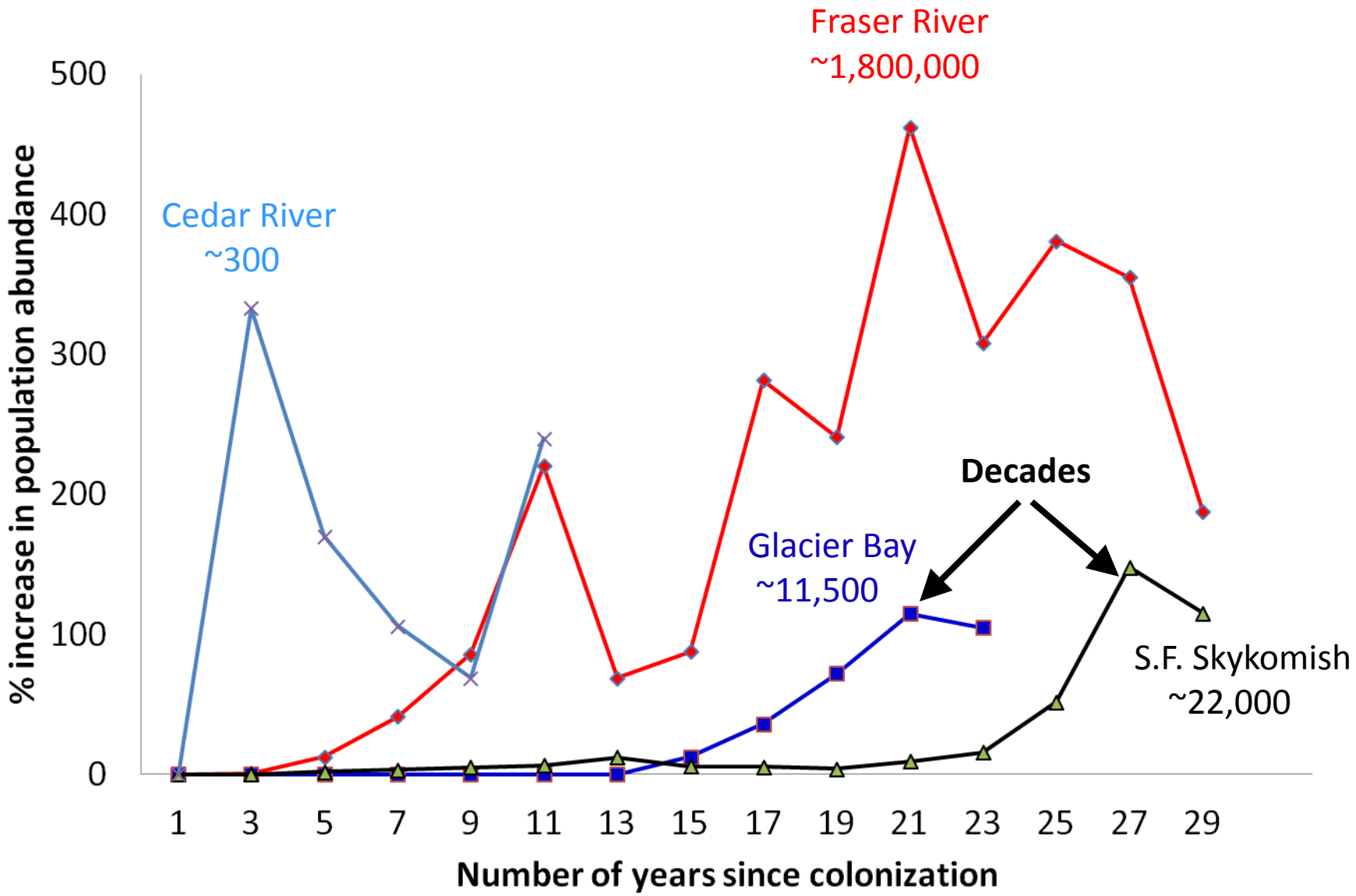
- Female steelhead x male rainbow trout spawnings



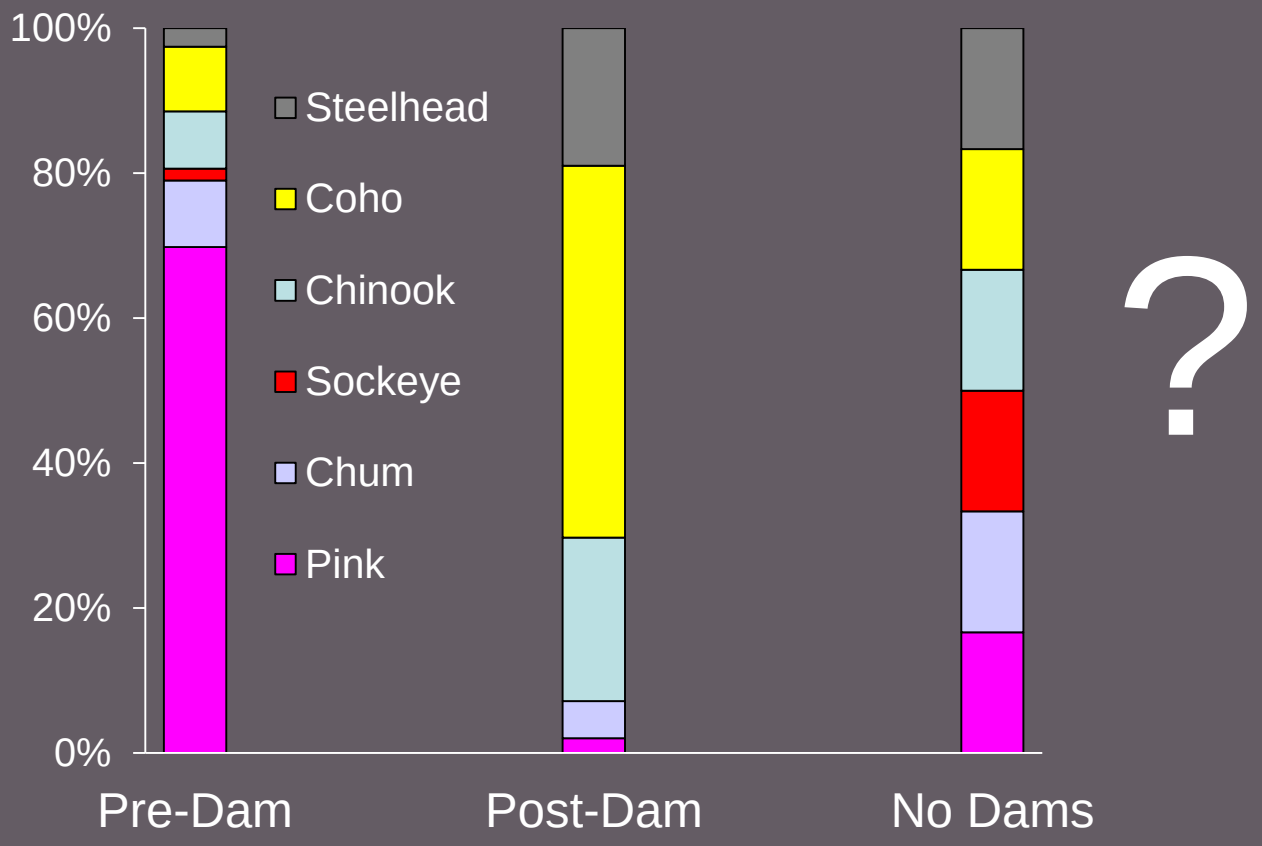
How will salmon populations change with the removal of the Elwha River dams?

- How long will it take salmon to colonize & establish spawning populations?
- What will be the species composition of salmonids?
- What habitats & locations will different salmon species colonize?
- How many more salmon will there be?

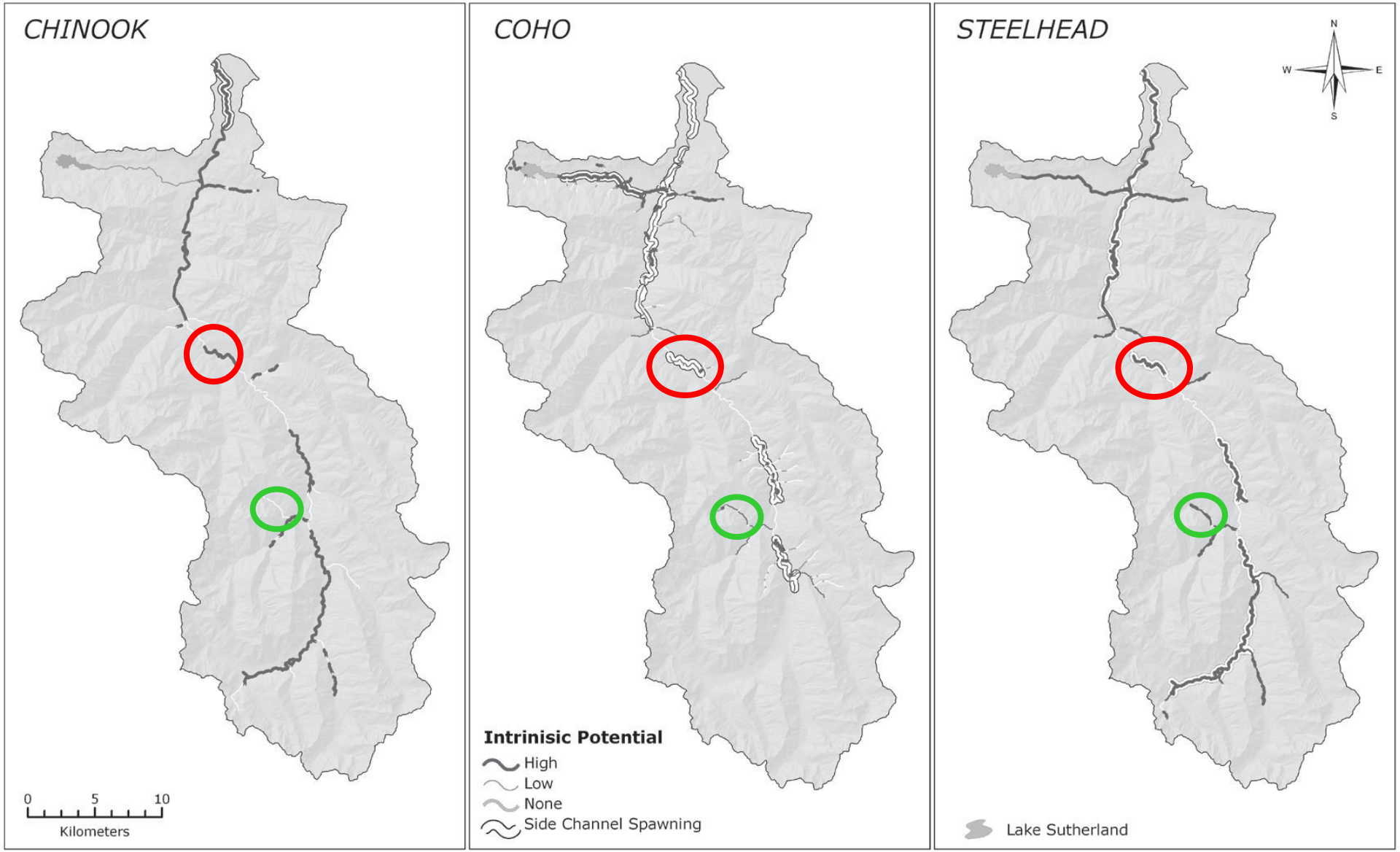
Salmon can successfully colonize newly available habitats



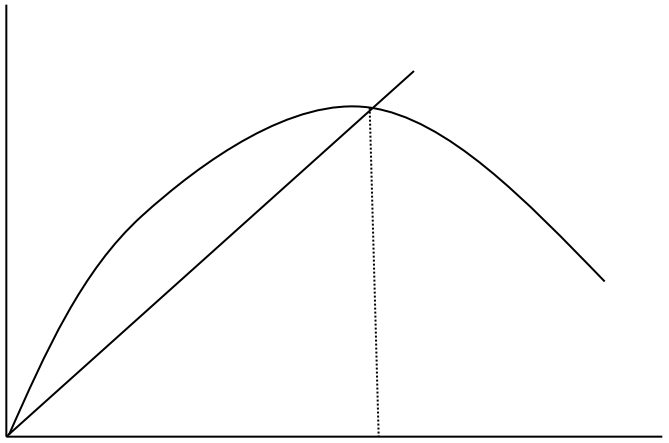
What will be the species composition of salmonids?



What habitats and locations will different salmon species colonize?



How many more salmon will there be?



$S_{rep} = Equilibrium Population Size$

Elwha Chinook Estimate	Equilibruim Population Size
Stream type	**4,589**
Ocean type	**10,099**

Parken C.K., McNicol R.E. & Irvine J.R. (2006) Habitat Based Methods to Estimate Escapement Goals for Chinook Salmon Stocks in British Columbia, 2004. Research Document 2006/083. Ottawa, ON: Canadian Science Advisory Secretariat, 74 pp.

How will salmon populations change with the removal of the Elwha River dams?

- All salmonids will utilize large alluvial valleys, while some such as steelhead and coho will utilize tributaries.

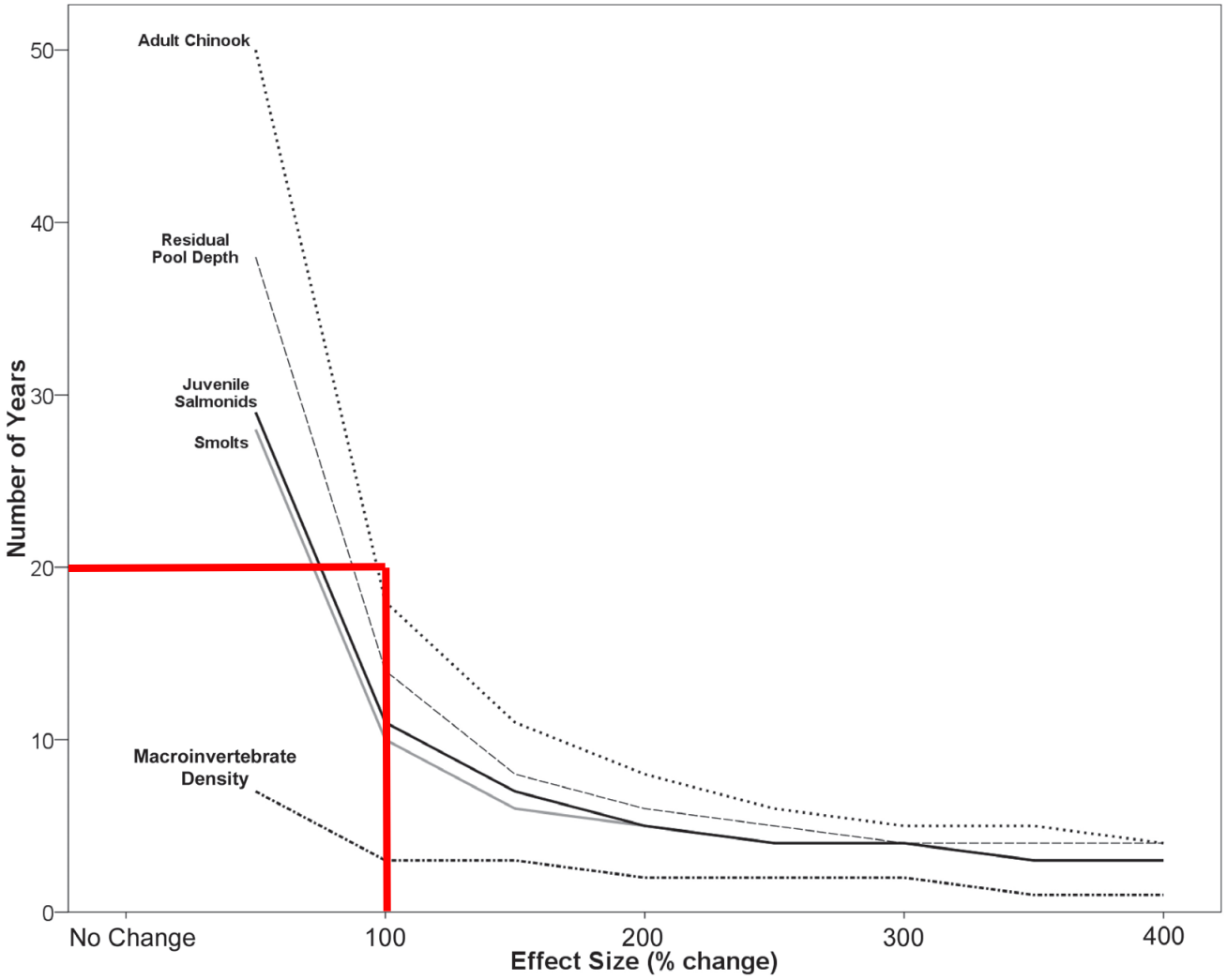
- Salmonid abundance can potentially increase 1 to 5 fold depending upon multiple factors.

- Salmonids will establish self sustaining populations in the middle & upper Elwha within decades.

Ongoing research

- Freshwater
  - Response by anadromous species
  - Genetic composition
  - Redistribution of non-anadromous species
  - Nutrients
  - Primary production
  - Large wood dynamics
  - Floodplain dynamics
  - Lower river vegetation
  - Groundwater
- Nearshore/Estuarine
  - Macrophytes (eelgrass and kelp)
  - Small invertebrates (e.g., amphipods)
  - Reef invertebrates (urchins, abalone)
  - Nearshore bathymetry
  - Currents
  - Shoreline topography
  - Nearshore fish and habitat
  - Sediment dispersal

Detecting a change in the Elwha River due to dam removal monitoring



McHenry and Pess 2008

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USGS science for a changing world

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Jennifer Bountry

Sea Grant

Ian MIller

Elwha Related Websites

General Info:

- www.elwhainfo.org
- www.nps.gov/olym/naturescience/elwha-ecosystem-restoration
- www.usgs.gov/elwha

Web Cams:

www.video-monitoring.com/construction/olympic/js.htm

Thanks!

Photo courtesy of John McMillan