Elwha River dam removal, fish status update, and fishing moratorium

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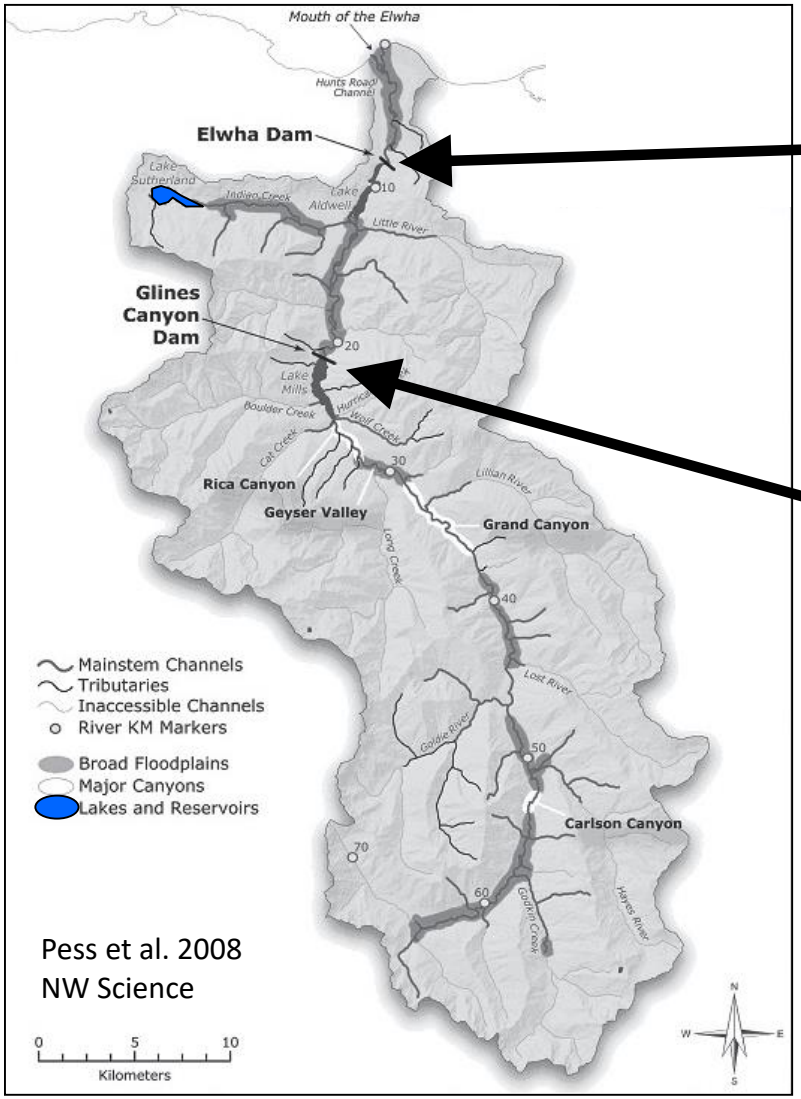
Washington Fish and Wildlife Commission
Port Angeles, WA
September 8 2017

Elwha update

1. **Fishing Moratorium**
2. **Dam removal and fish habitat conditions**
3. **How have the fish responded?**
4. **Future expectations**

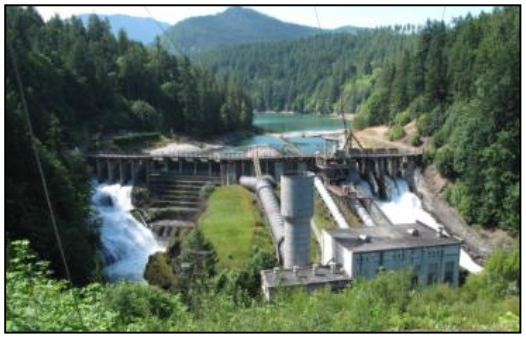
Elwha River



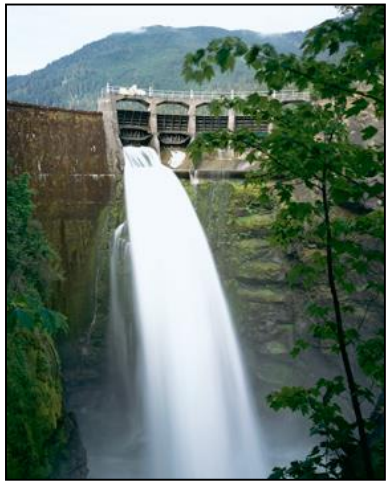
Pess et al. 2008
NW Science

833 km^2 watershed

Elwha Dam
- built 1913
- 32 m tall
- River km 8



Glines Canyon Dam
- Built 1927
- 64 m tall
- River km 21



115 km of habitat upstream of Elwha Dam site

Elwha Fishing Moratorium

Co-managers, Washington Department of Fish and Wildlife and the Lower Elwha Klallam Tribe agree with the National Park Service prohibiting fishing within Elwha River

Feb 2011: Fish and Wildlife Commission approved five-year fishing moratorium beginning March 1 2012

March 2017: WDFW, LEKT, and NPS agree to extend moratorium for two more years, through June 1 2019

Future fishing opportunities will depend on harvestable surplus to support both non-treaty and treaty fisheries.


Photo montage compiled by George Pess
Photos from NPS time lapse camera


May 12 14 08:32:59
Photo montage compiled by George Pess
Photos from NPS time lapse camera

Sediment release

- 21 million m^3 of sediment stored in former reservoirs
  - 16 million m^3 in Lake Mills (upstream of Glines)
  - 5 million m^3 in Lake Aldwell (upstream of Elwha)

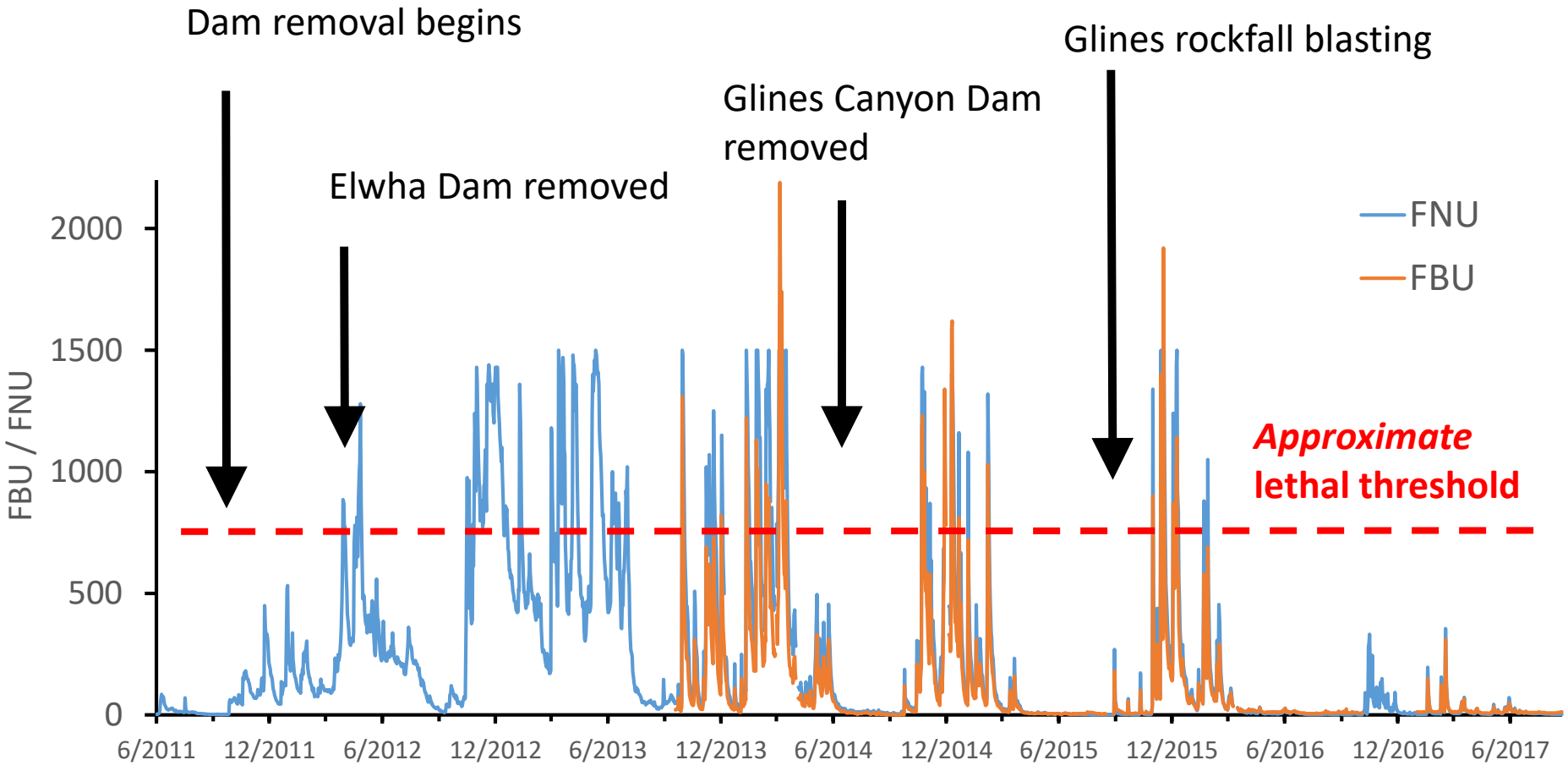
- Approximately two-thirds evacuated from former reservoirs
  - 90% delivered to coastal habitats
  - Pools filled, 1.0 – 1.5 m increase in river channel height downstream of dams during peak of sediment wave

- At this point, erosion from reservoirs mostly complete

- Greatest remaining impact to salmon habitat in floodplain channels, not mainstem

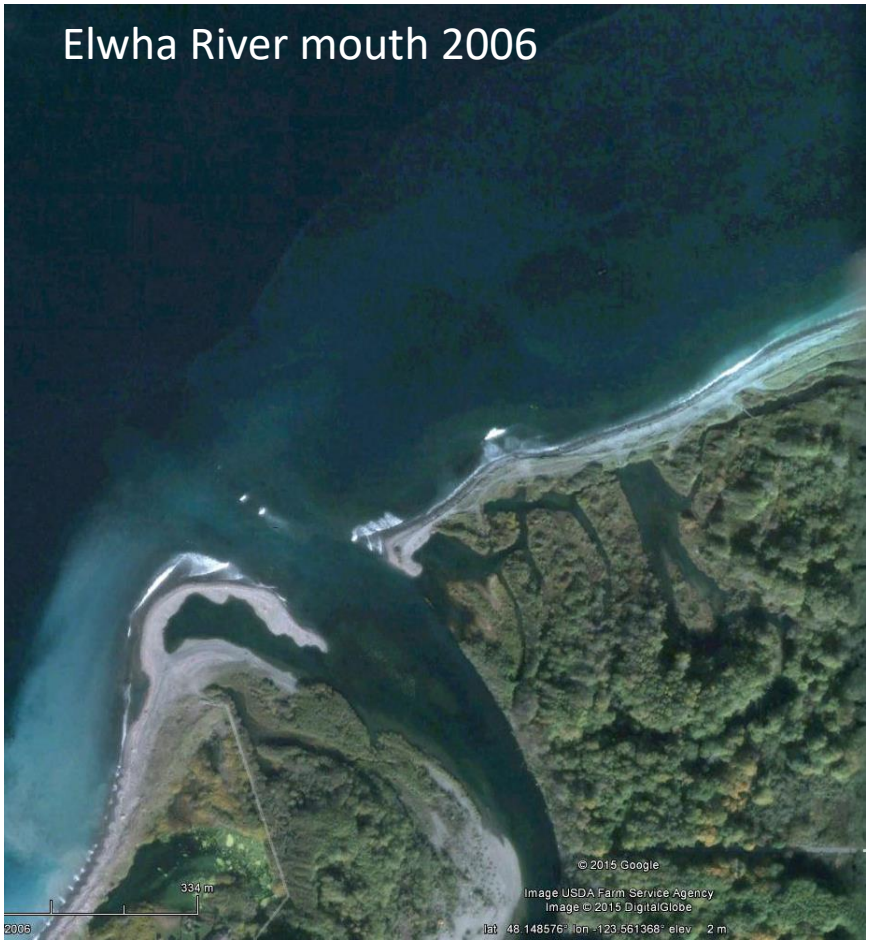
Lake Mills reservoir, Aug 28 2014
Andy Ritchie, NPS/USGS

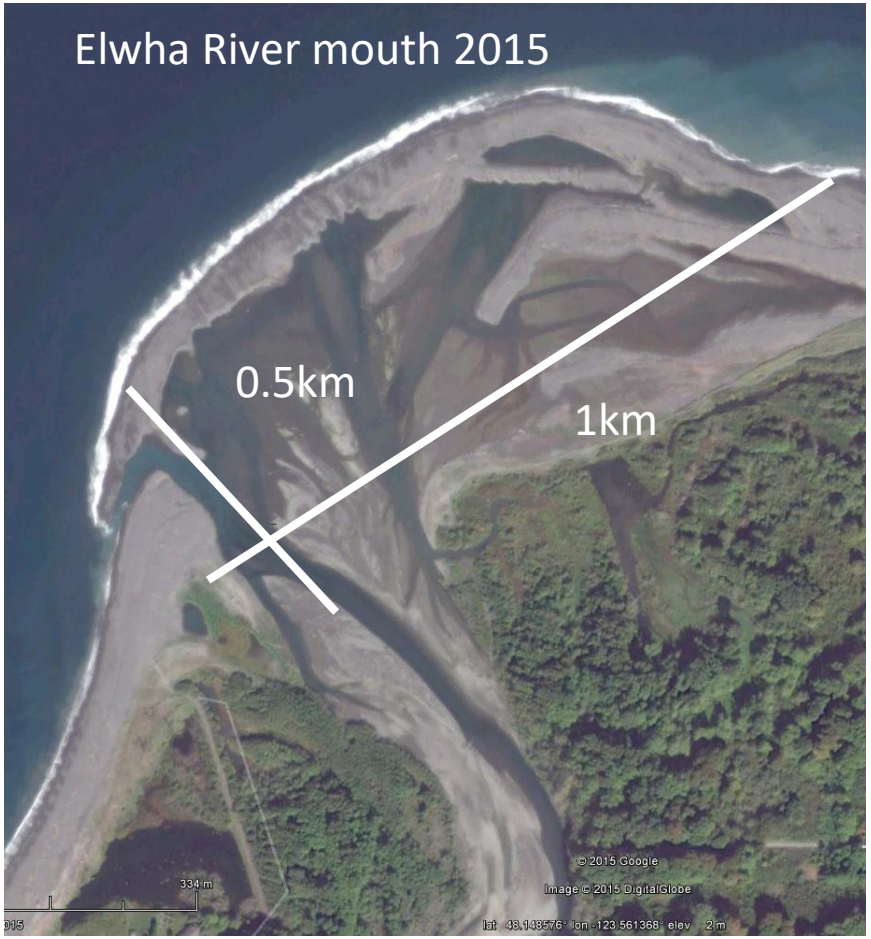
Turbidity



Data from USGS

Elwha River mouth, estuary & nearshore





Slide courtesy of George Pess, NOAA

How have the fish responded?

Coho salmon

Pink salmon

Chinook salmon

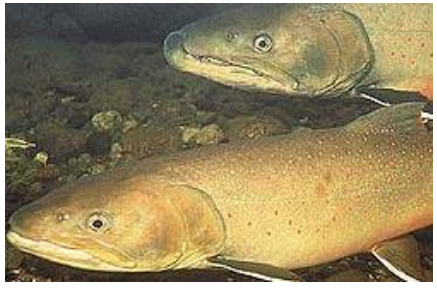
Steelhead

Chum salmon

Sockeye salmon

Eulachon

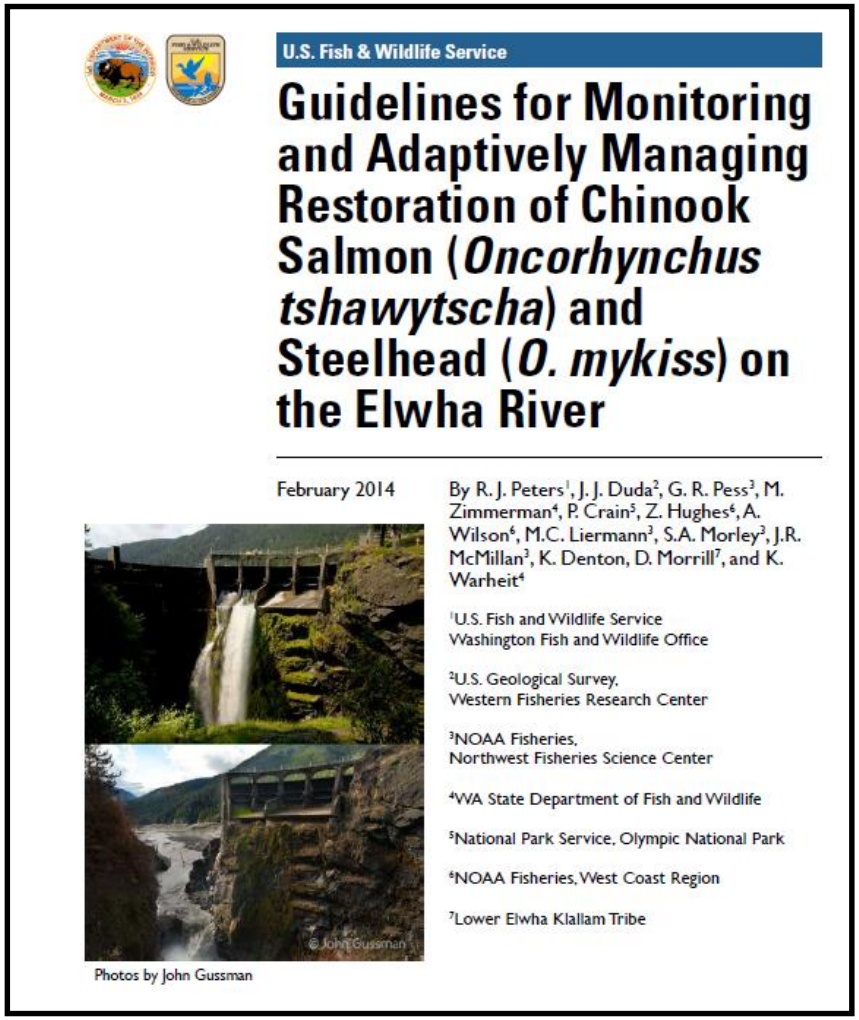
Bull trout



Pacific lamprey

Slide and photos courtesy of George Pess

Monitoring and Adaptive Management



U.S. Fish & Wildlife Service

Guidelines for Monitoring and Adaptively Managing Restoration of Chinook Salmon (*Oncorhynchus tshawytscha*) and Steelhead (*O. mykiss*) on the Elwha River

February 2014

By R. J. Peters[1], J. J. Duda[2], G. R. Pess[3], M. Zimmerman[4], P. Crain[5], Z. Hughes[6], A. Wilson[6], M.C. Liermann[3], S.A. Morley[3], J.R. McMillan[3], K. Denton, D. Morrill[7], and K. Warheit[4]

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Washington Fish and Wildlife Office

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Western Fisheries Research Center

[3]NOAA Fisheries,
Northwest Fisheries Science Center

[4]WA State Department of Fish and Wildlife

[5]National Park Service, Olympic National Park

[6]NOAA Fisheries, West Coast Region

[7]Lower Elwha Klallam Tribe

Photos by John Gussman

1. Preservation
Prevent extinction when river conditions at times are lethal to fish

2. Recolonization
Ensure continual access to habitat above former dam sites with some successful spawning

3. Local Adaptation
Promote evolution of traits advantageous for natural river, increase life history diversity

4. Viable Natural Population
Self-sustaining natural population productive enough to withstand harvest without hatchery supplementation

Triggers dictate movement between phases

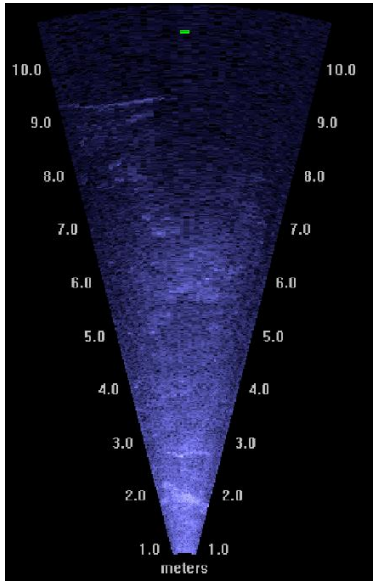
Species: Chinook Salmon
Oncorhynchus tshawytscha

		PHASE: Preservation	Recolonization	Local Adaptation	Viable Natural Population
	GOALS	Prevent extinction and preserve the existing genetic and life history diversity of native salmonid populations until fish passage is restored and water turbidity is determined to be non-lethal to fish in the river	Salmonids are continually accessing habitats above the old dam sites with some fish succesfully spawning and producing smolts	Maintain or increase life history diversity of natural-spawning populations through local adaptation to the Elwha River ecosystem until minimum levels of spawner abundance, productivity, and distribution are met	Ensure that self-sustaining and exploitable population levels continue once desired values for all VSP and habitat parameters have been met and hatchery programs are no longer needed for protection, recovery, or exploitation
Abundance	Natural spawners	950	>950 or <4,340	>4,340 or <10,000	>10,000
Weir, Sonar, foot and boat surveys, aerial surveys	Spawner escapement duration	4 yrs	4 yrs	4 yrs	4 yrs
Managing for pHOS	pNOS (natural-origin spawner)	•	0.95	1.0	1.0
Otoliths, CWT, Scale samples	pHOS (proportion hatchery-origin spawner)	•	0.05	0	0
Productivity	#Juvenile migrants/female	200	200	200	200
Weir, Sonar, Spawner Surveys, Smolt trap, otoliths, cwt, harvest	#Pre-fishing recruits/spawner (h+n)	>1.56	•	•	•
	#Spawners/spawner (h+n)	>1.0	•	•	•
	#Pre-fishing recruits/spawner (n)	•	>1.56	>1.56	>1.85
	#Spawners/spawner (n)	•	>1.0	>1.0	~1.0
	Productivity trend	4 yrs	4 yrs	4 yrs	4 yrs
Spatial Distribution	Extent	A portion of fish accessing above Elwha Dam	Above Elwha Dam: 43% of Intrinsic Potential	Above Glines Canyon Dam: 86% of Intrinsic Potential	100% of Intrinsic Potential
Spawner Surveys, Radio-telemetry, Snorkel Surveys	Barriers	No migration barriers exist below Elwha Dam	No 'artificial' migration barriers exist in Aldwell reach	No 'artificial' migration barriers exist in Mill's reach	No 'artificial' barriers exist within Intrinsic Potential
Diversity	Stream-type proportion	•	•	Positive trend	Stable > Preservation Phase
Sonar, otoliths, smolt trap	Entry timing variance	•	•	Positive trend	Stable > Preservation Phase

Abundance

How many adult salmon return to the Elwha River?

Estimate abundance using SONAR

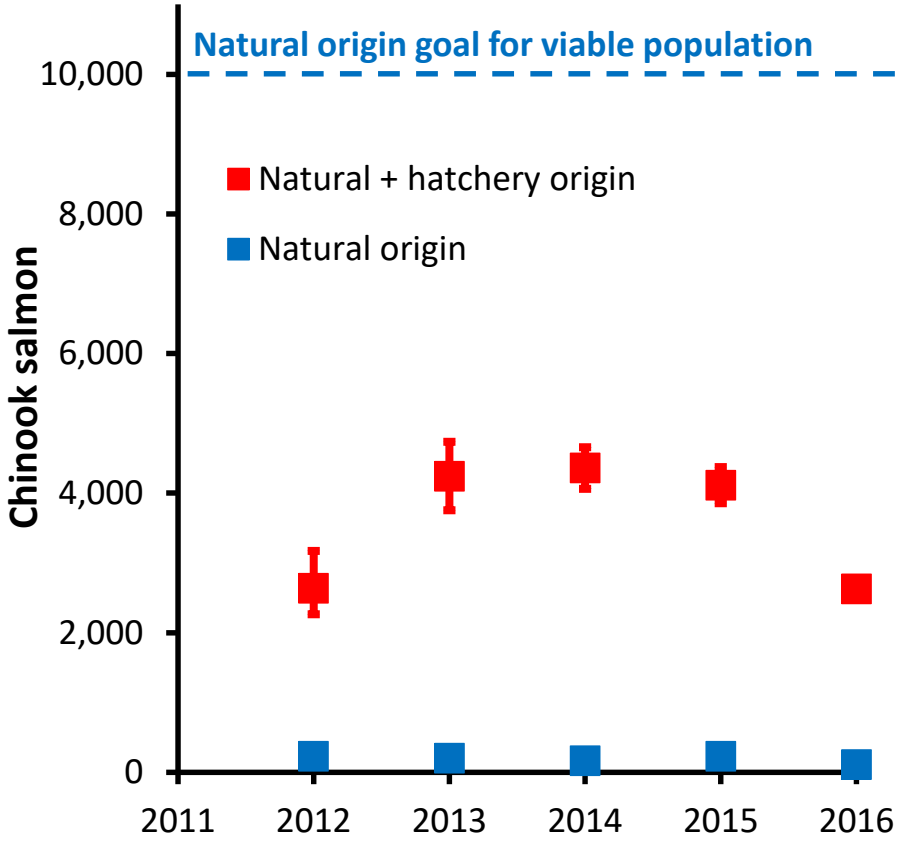


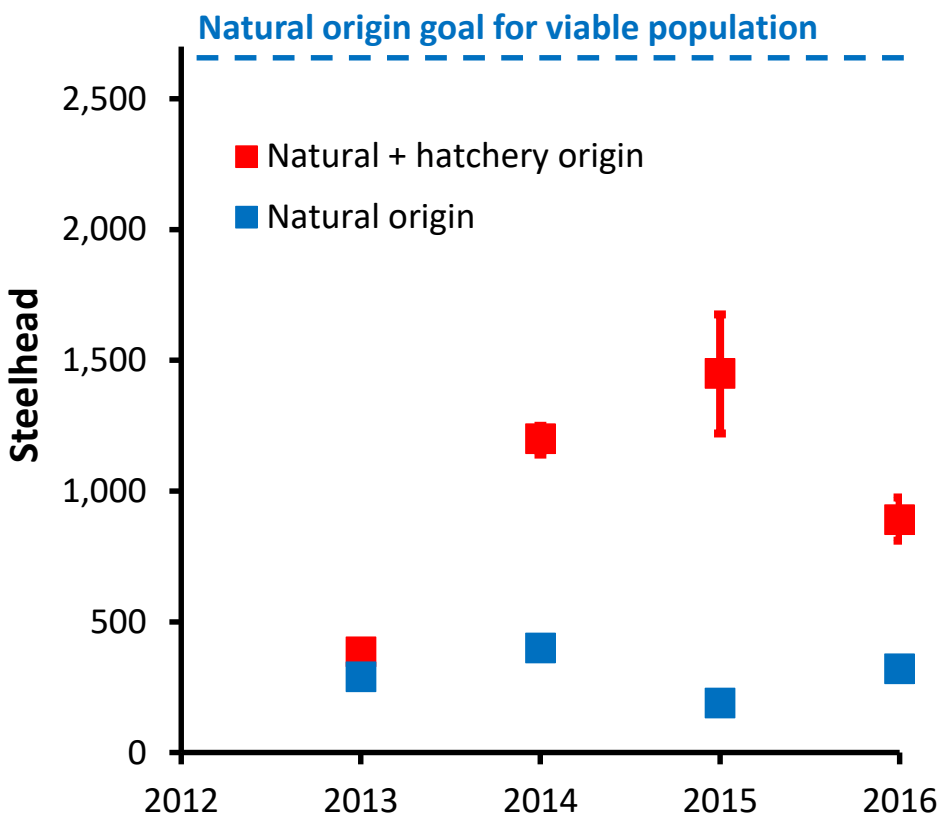
Evaluate hatchery marks

SONAR images: Keith Denton

Abundance

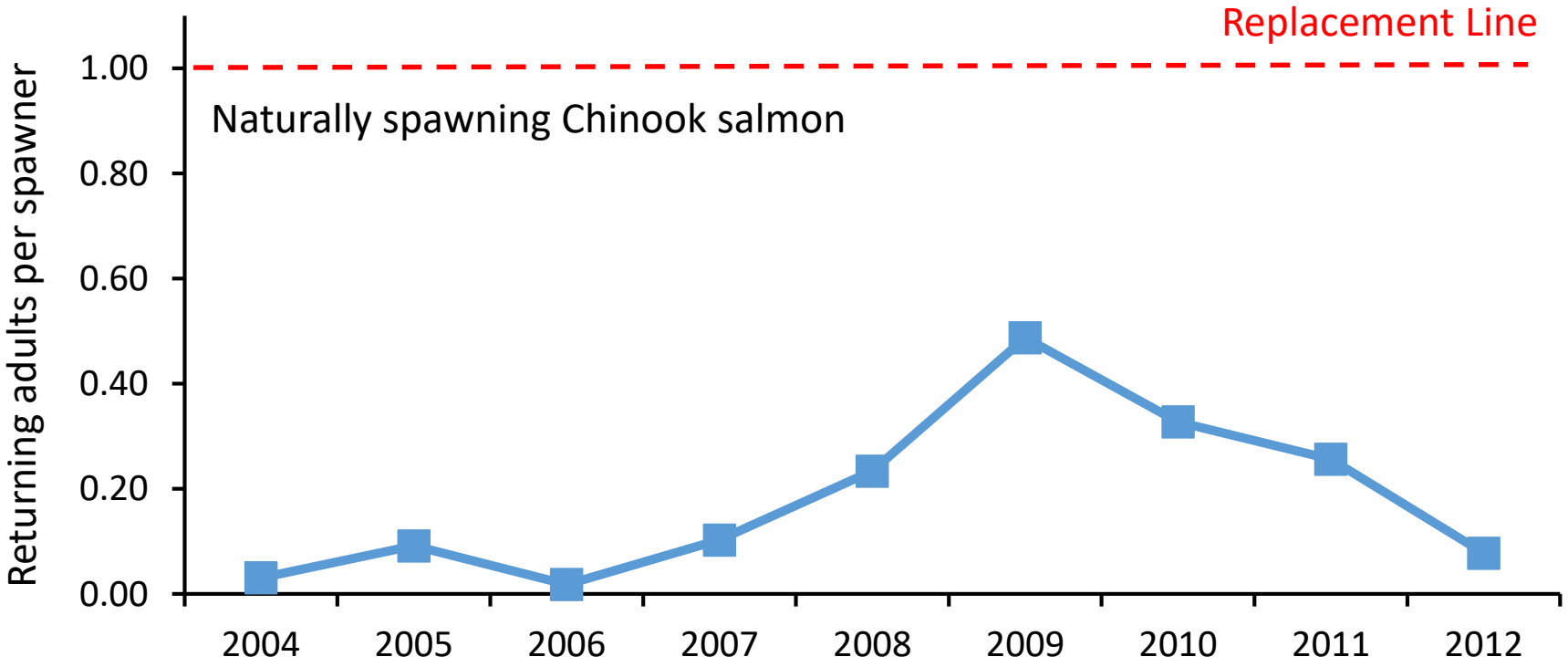
How many adult salmon return to the Elwha River?





Data sources:
Denton et al. 2017, Weinheimer et al. 2017

Productivity



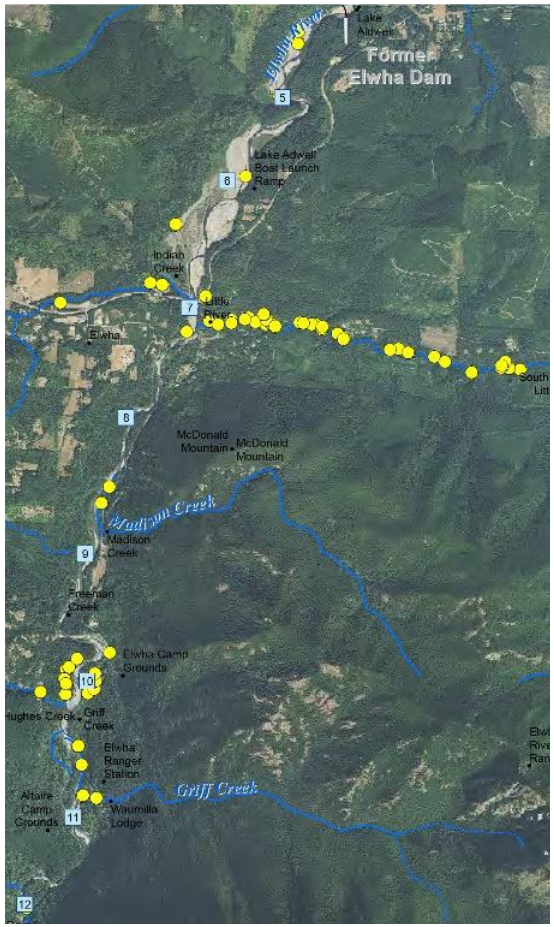
Data sources:
Denton et al. 2017
Weinheimer et al. 2017

Spatial structure

Steelhead spawning distribution 2016

Elwha Dam to mouth

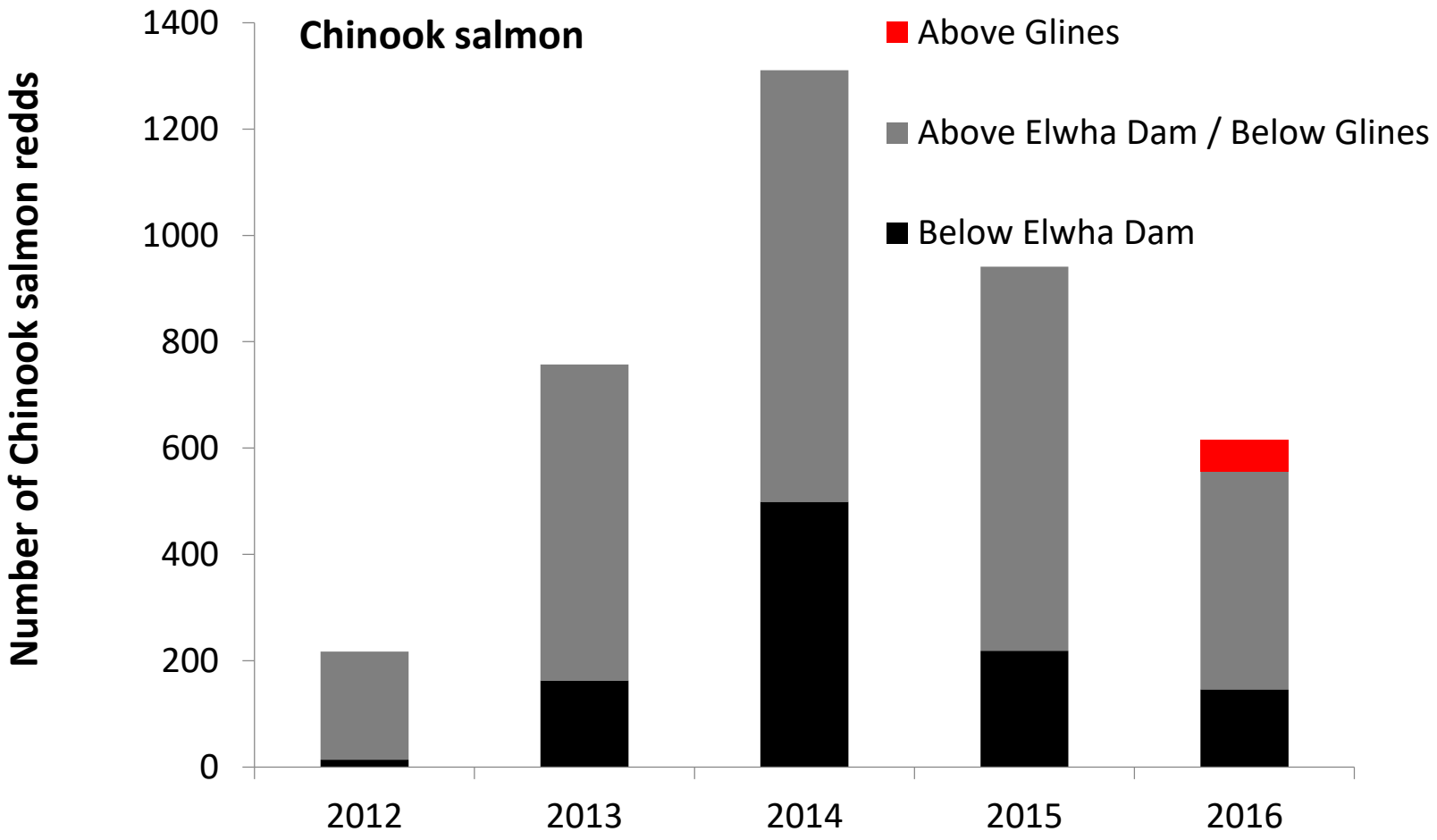
Glines Canyon to Elwha Dam



Upstream of Glines Canyon

Source: McMillan et al 2017

Spatial structure



Source: McHenry et al 2017

Diversity

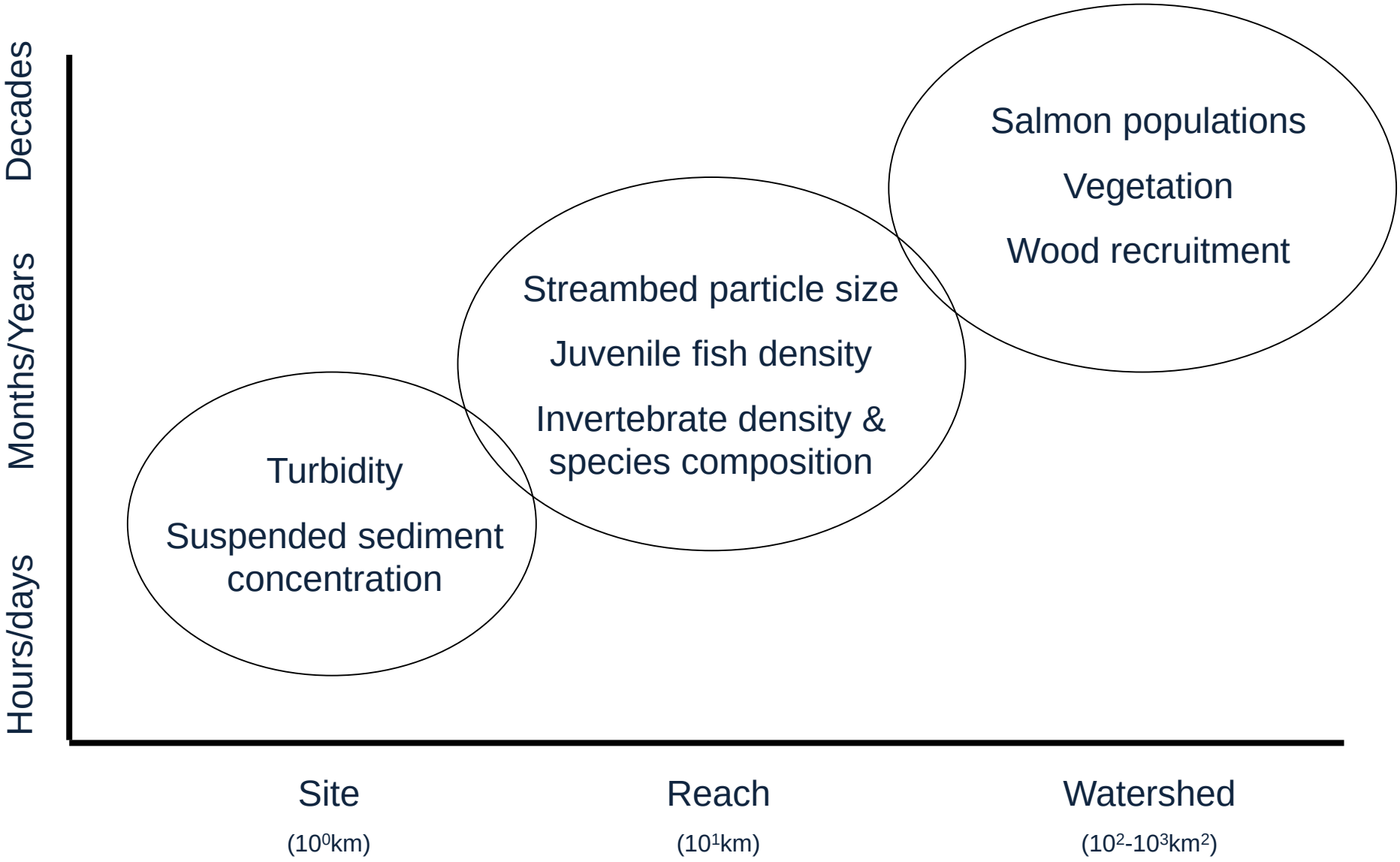
Length ~ 70mm

Length ~ 150mm

Slide courtesy of George Pess

Data from Liermann et al 2017 *Trans Amer Fish Soc*

How long will recovery take?



Outlook for the future

- **Encouraging signs:** fish accessing areas upstream of dams, massive physical disturbance tapering off
- Chinook, steelhead populations far short of long term recovery goals
- First step is to ensure colonists reach newly accessible spawning and rearing habitats
- Interagency collaborative monitoring effort intended to adaptively manage Elwha fish populations
- Unique opportunity for salmon recovery

Acknowledgements

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Questions?