Apr 4th, 1:45 PM - 2:00 PM

Planning, implementation, and monitoring Pacific salmonid recovery following the removal of two hydroelectric dams on Washington's Elwha River

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Salmonid Recovery Following the Removal of Two Hydroelectric Dams on Washington's Elwha River

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Dam photos courtesy of John Gussman

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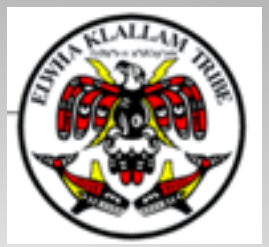

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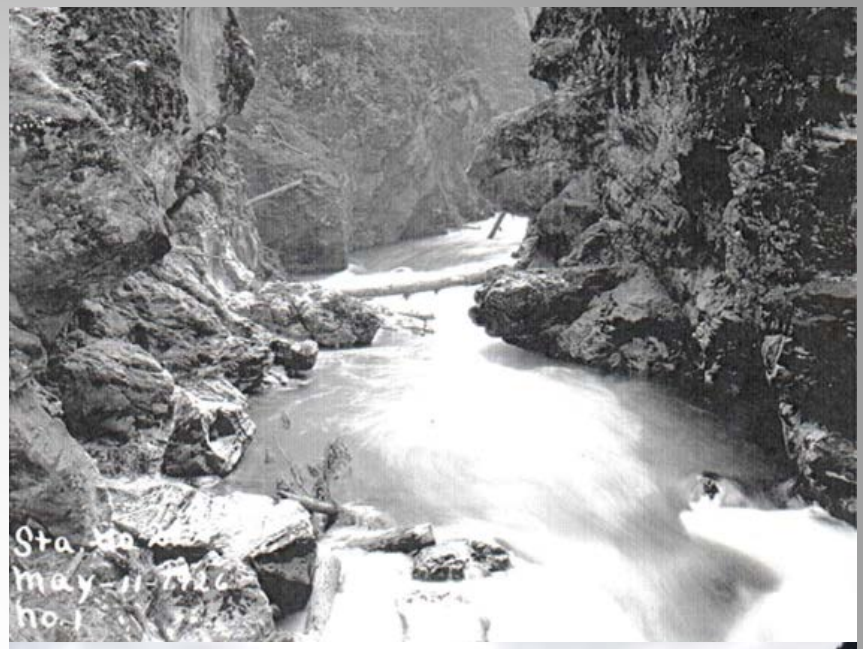
Hon. Norm Dicks, Hon. Al Swift, Hon. Bill Bradley, Chairworman Francis Charles, Robert Elofson, Dick Goin, Russ Busch, Bea Charles, Adele Smith and all tribal elders, NPS Superintendents (Laitner, Gustin, Creachbaum), Friends of the Earth, Seattle Audubon, Sierra Club, Berhhardt Construction

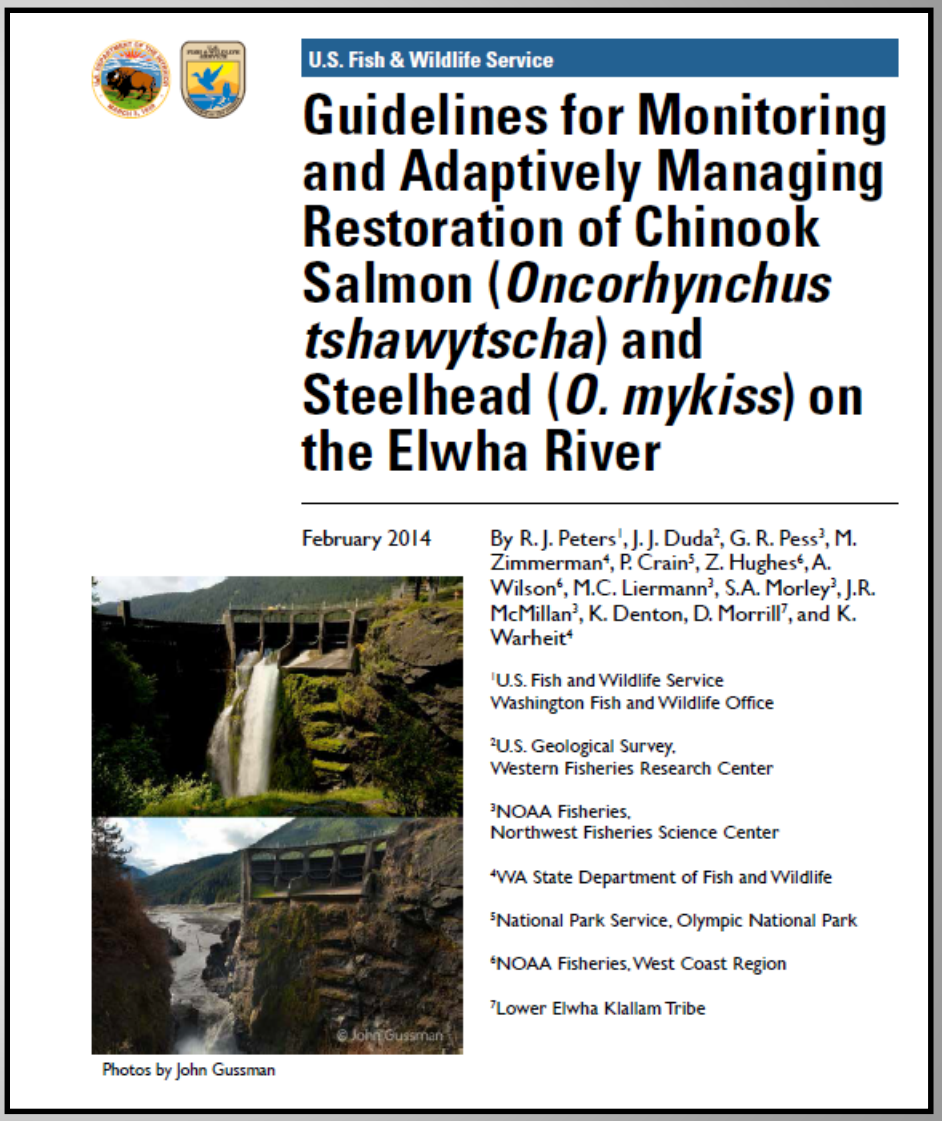
Outline

- Elwha River Phases
  - Pre-dam Phase
  - Dammed Phase
  - FERC Phase
  - Planning
  - Implementation phase
    - Develop monitoring & adaptive Management guidelines – approach
  - Post removal phase
    - Monitoring and adaptive management - results
- Summary



Elwha Adaptive Management Approach

- Define management activities
- Four phases of restoration
- Triggers and progressing through recovery
- Data standards
- Tools and Methods
- Influential variables



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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Photos by John Gussman

Available at:http://go.usa.gov/85XF

Four Restoration Phases

Preservation	Recolonization	Local Adaptation	Viable Natural Population
Conditions: Disturbed by sediment, potentially lethal to fish	**Conditions:** Passage restored	**Conditions:** Fish spawning at a rate that results in population growth	**Conditions:** Viable, exploitable population, no hatcheries
Goal: protect existing genetic and life history diversity, prevent extinction	**Goal:** fish accessing areas upstream of dams	**Goal:** maintain, increase population diversity	**Goal:** ensure viability and harvest

Triggers dictate movement between phases

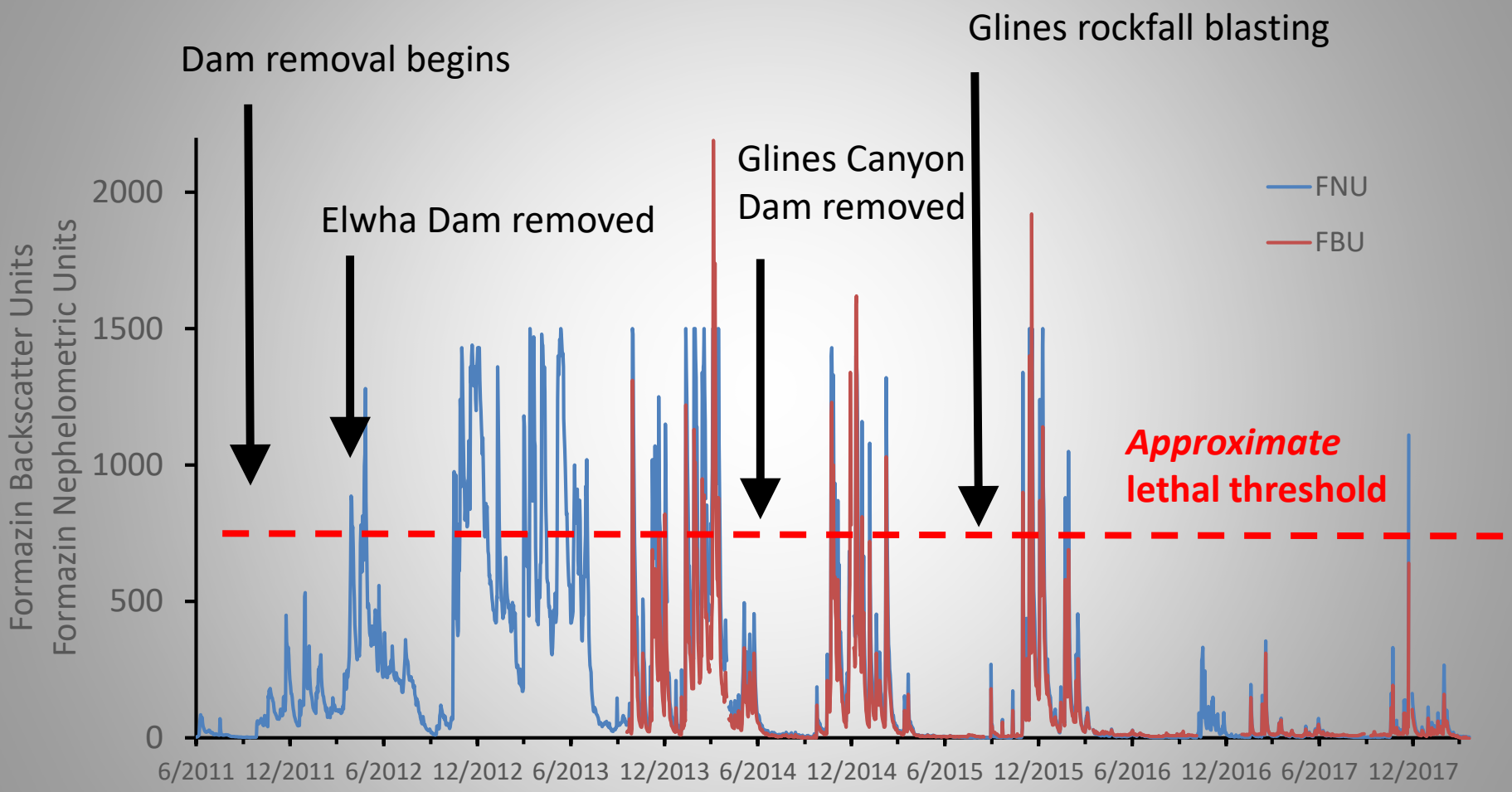
Species: Steelhead
Oncorhynchus mykiss

		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 (Weir, Sonar, foot and boat surveys, aerial surveys)	**Natural Spawners**	<196	>196 or <969	>969 or <2,619	>2,619
	Spawner Escapement duration	4 yrs	4 yrs	4 yrs	4 yrs
Managing for pHOS (Otoliths, CWT, Scale samples)	**pNOS** (natural-origin spawner)	*	0.90	1.0	1.0
	pHOS(proportion hatchery-origin spawner)	*	0.10	0	0
Productivity (Weir, Sonar, Spawner Surveys, Smolt trap, otoliths, cwt, harvest)	**#juvenile migrants/female**	75	75	75	75
	# Pre-fishing recruits/spawner (h+n)	>1.0	> 1.0	> 1.0	> 1.0
	#Spawners/spawner (h+n)	>1.0	> 1.0	> 1.0	> 1.0
	#Pre-fishing recruits/spawner (n)	*	*	*	*
	#Spawners/spawner (n)	*	>1.0	>1.0	~1.0
	Productivity trend	4 yrs	4 yrs	4 yrs	4 yrs
Spatial Distribution (Spawner Surveys, Radio-telemetry, Snorkel Surveys)	**Extent**	Above Elwha Dam; 9% intrinsic poetntial	Above Elwha Dam; 37% of Intrinsic Potential	Above Glines Canyon Dam; 74% of Intrinsic Potential	100% of Intrinsic Potential
	Barriers	No migration barriers exist below Elwha Dam	No 'artificial' migration barriers exist in Aldwell reach	No 'artificial' migration barriers exist in Mills reach	No 'artificial' barriers exist within Intrinsic Potential
Diversity (Sonar, spawner surveys)	**Entry timing variance**	n/a - data collection	0.5 days/yr	0.5 days/yr	0.5 days/yr
	Entry timing	Fish returning in February	Fish returning in January	Fish returning in December	No change from previous

Steelhead Monitoring Summary

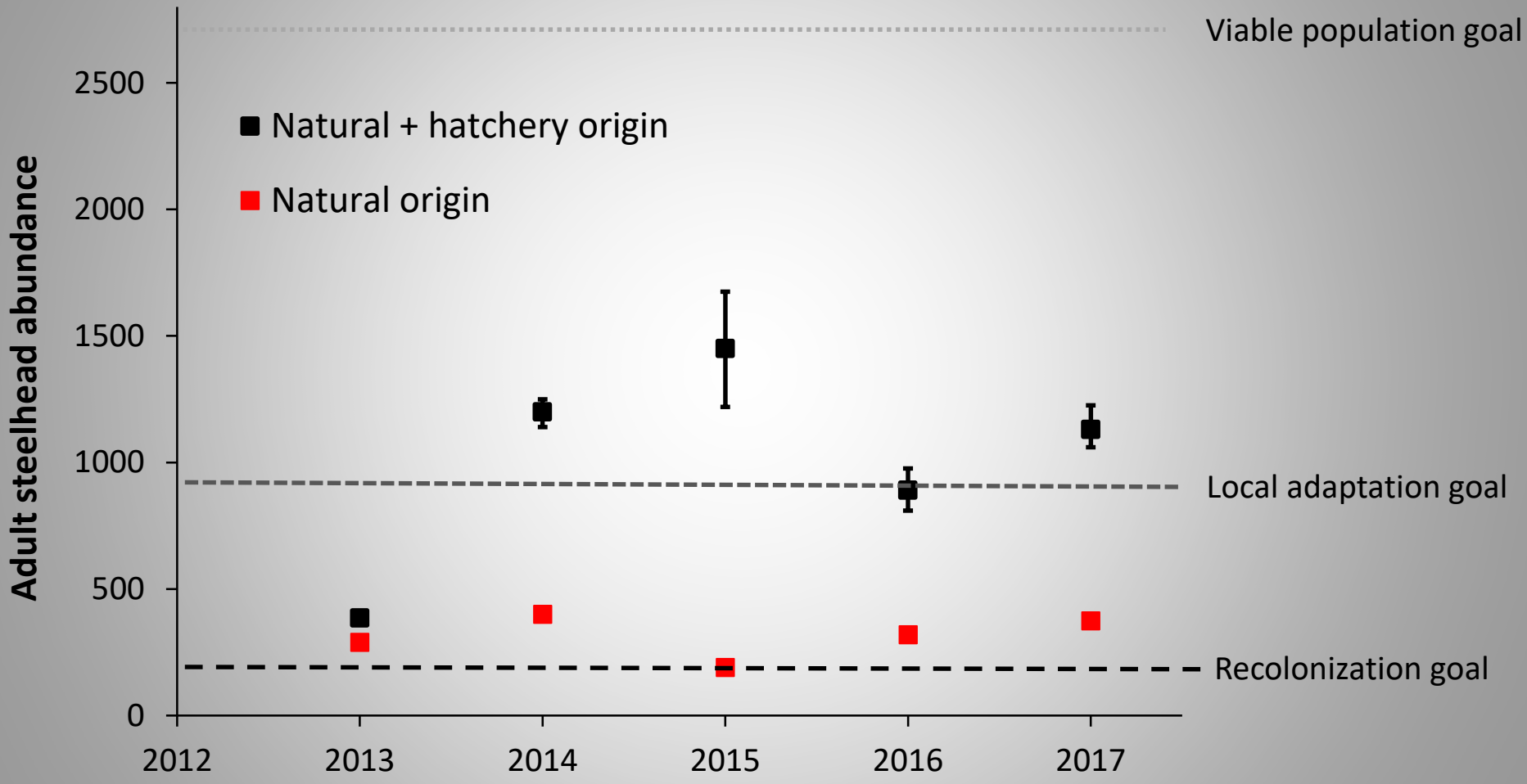
Performance Indicator	Preservation Triggers
Abundance	196 adults (H+N)
Spatial distribution	Upstream of Elwha Dam No artificial barriers downstream of Elwha
pHOS	No Trigger
Diversity	Adults returning in February
Productivity	75 juvenile migrants/female >1 spawner/spawner (H+N)

Turbidity



Data from USGS

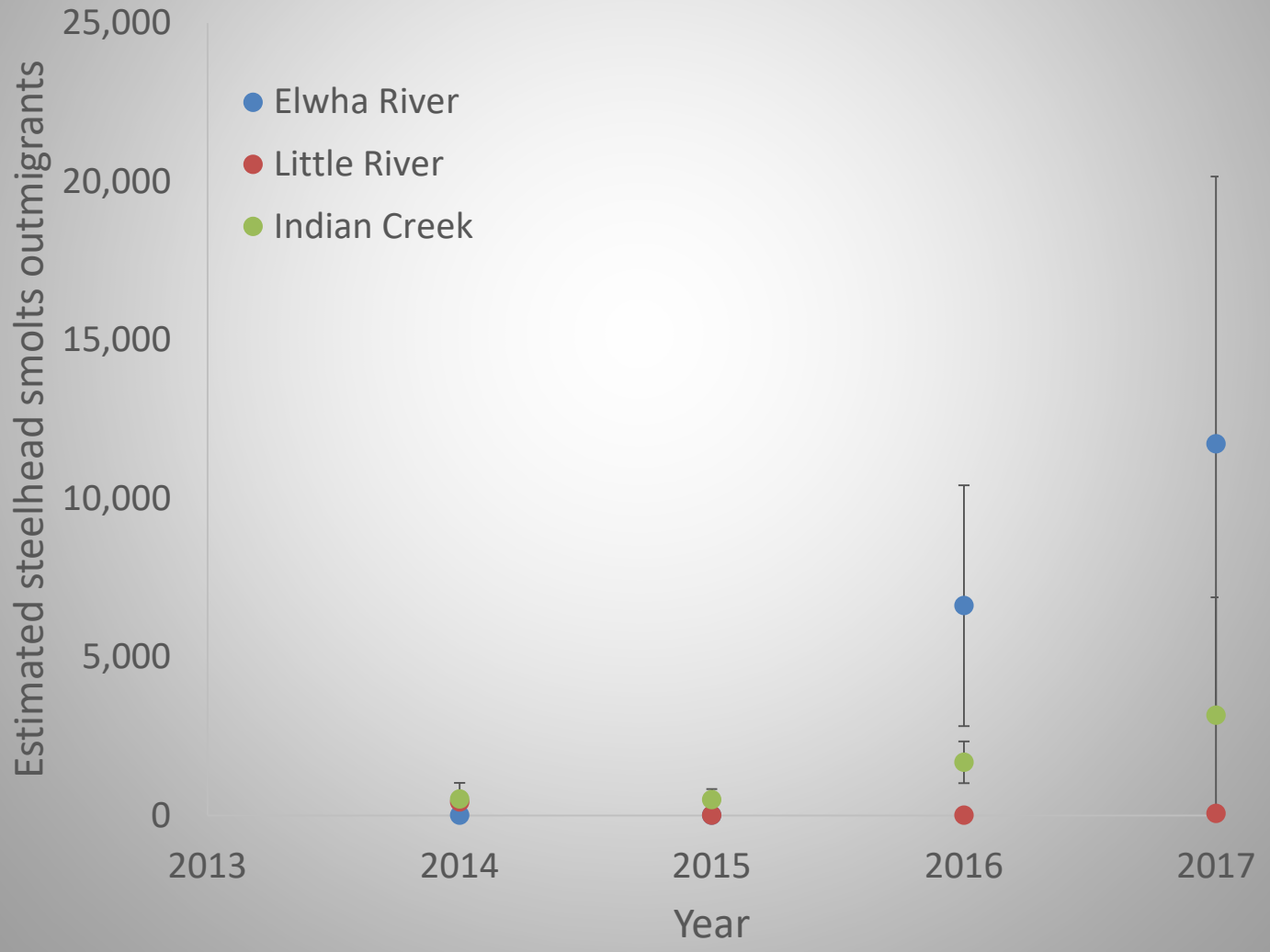
Steelhead SONAR abundance estimate



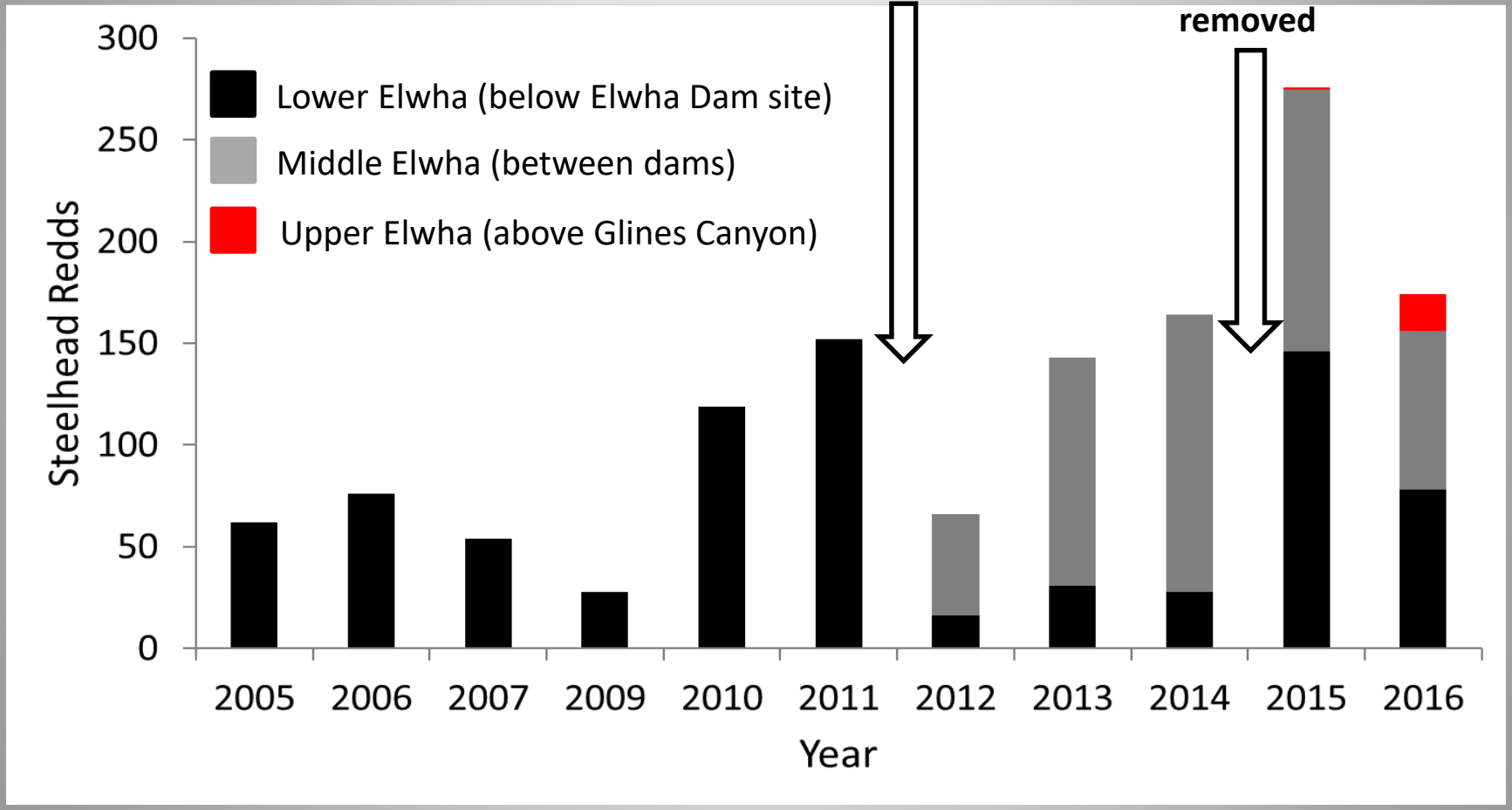
Information for hatchery and natural origin steelhead was taken during species composition collections. The intent of species composition was not designed to estimate such proportions but is more of an indicator.

Smolt Productivity

Elwha River, Indian Creek, & Little River Steelhead smolts



Spatial distribution



Steelhead Monitoring Summary

Performance Indicator	Preservation Triggers	Trigger Met?
Abundance	196 adults (H+N)	YES
Spatial distribution	Upstream of Elwha Dam	YES
	No artificial barriers downstream of Elwha	YES
pHOS	No Trigger	NA
Diversity	Adults returning in February	YES
Productivity	75 juvenile migrants/female	**NO**
	>1 spawner/spawner (H+N)	Final assessment 2020

Benefits of Collaboration: Salmonid Recovery

- Chinook and steelhead meeting most preservation 'triggers'
- Early detection of fish passage barrier – rock fall downstream of Glines Canyon Dam
- Salmonids and lamprey re-colonizing habitat
  - Bull trout connecting with isolated segments of population
- Coho salmon productivity >= than state average
- Bull trout displaying anadromy (Quinn et al. 2017)
- We can report much of what is occurring

Thank you

Questions?

Photo courtesy S. Brenkman, ONP