

Bull Trout Exhibit Growth Benefits and Life History Responses After Elwha River Dam Removal

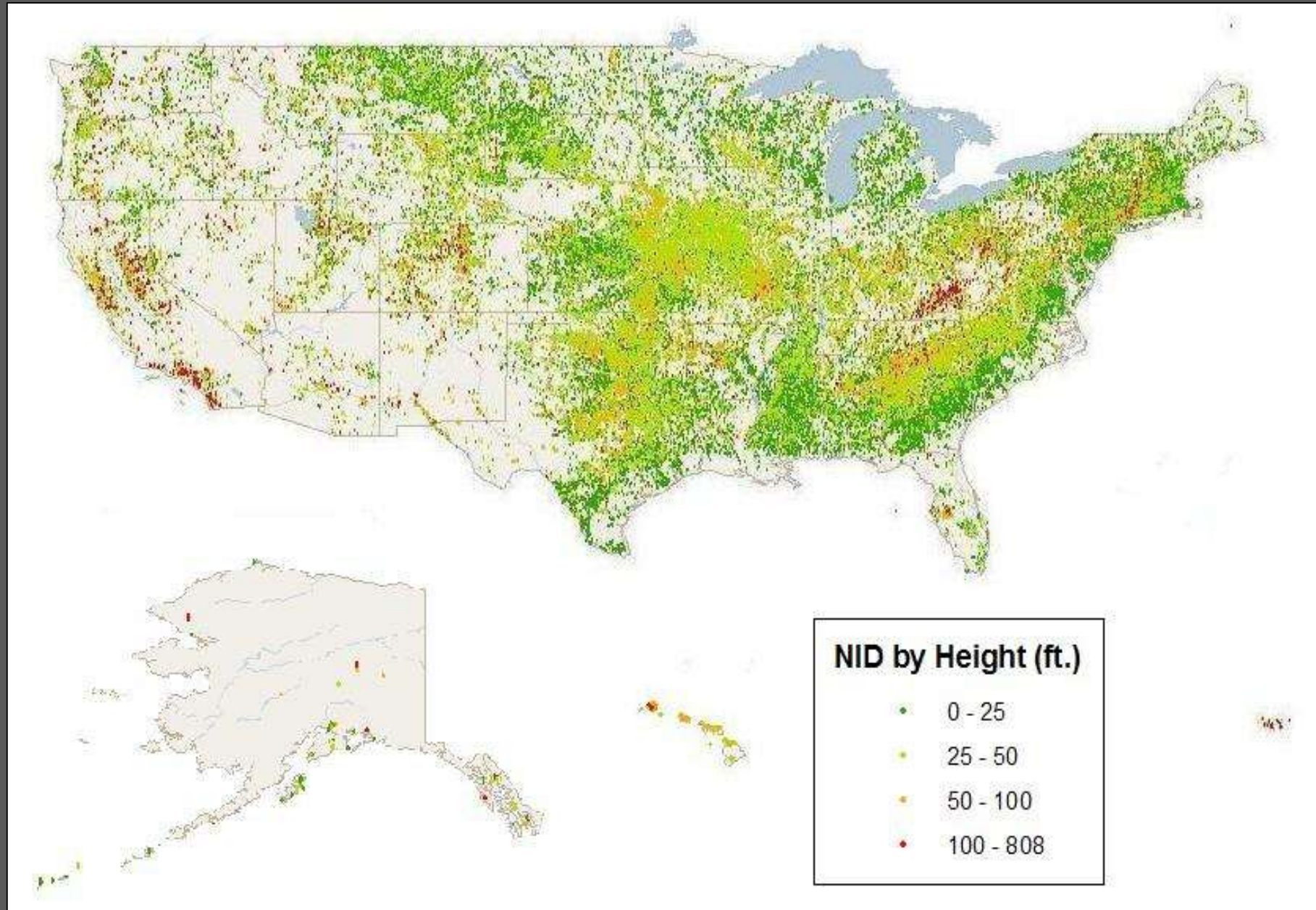


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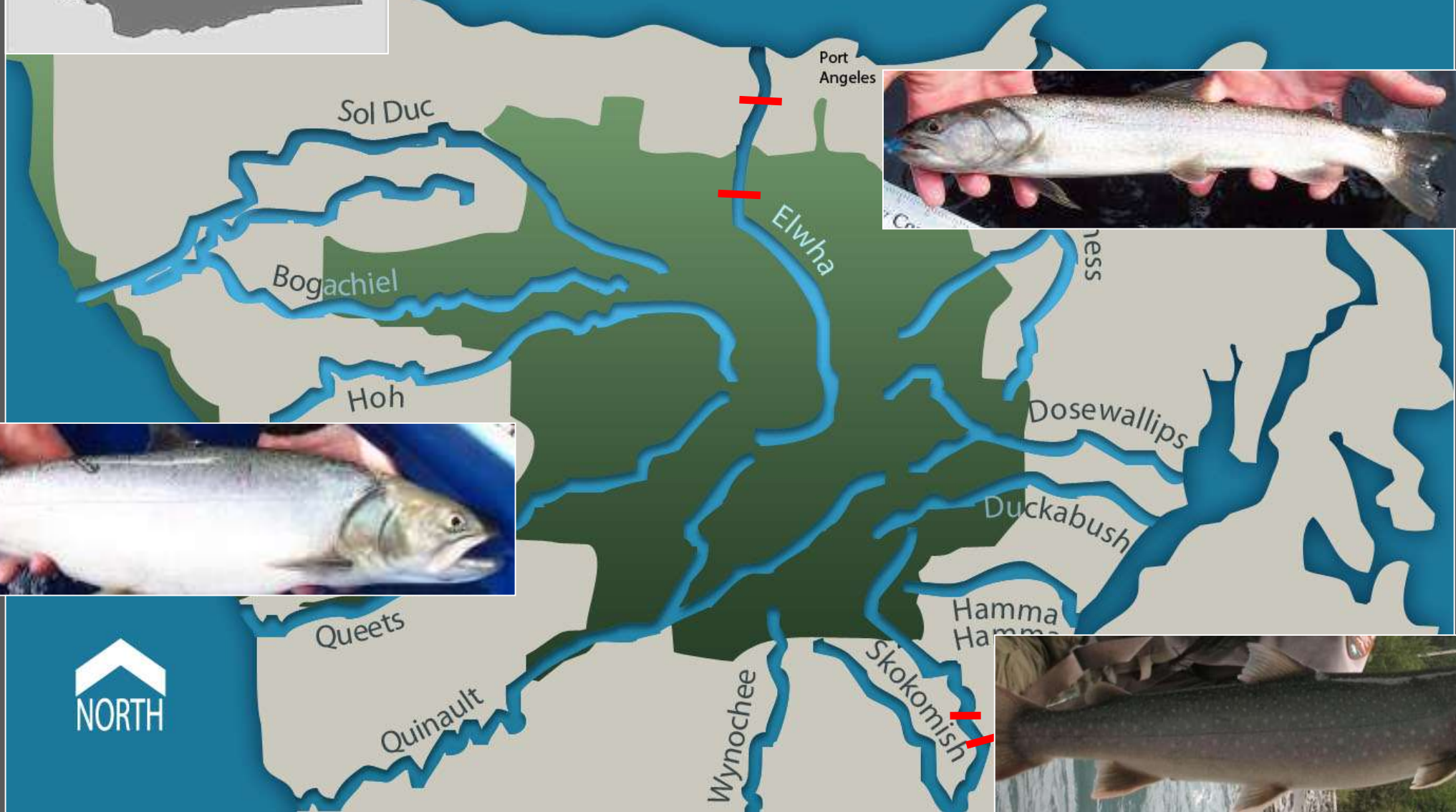
Presenter: Kathryn T. Sutton

>91,000 Dams in the U.S. = Intensive Demand on Waterways





Olympic Peninsula Rivers



Dams Blocked Access to 80 miles of Rivers & Creeks



Elwha Dam

- rkm 7.9
- Constructed 1913
- 120 ft. high
- Removed 2012



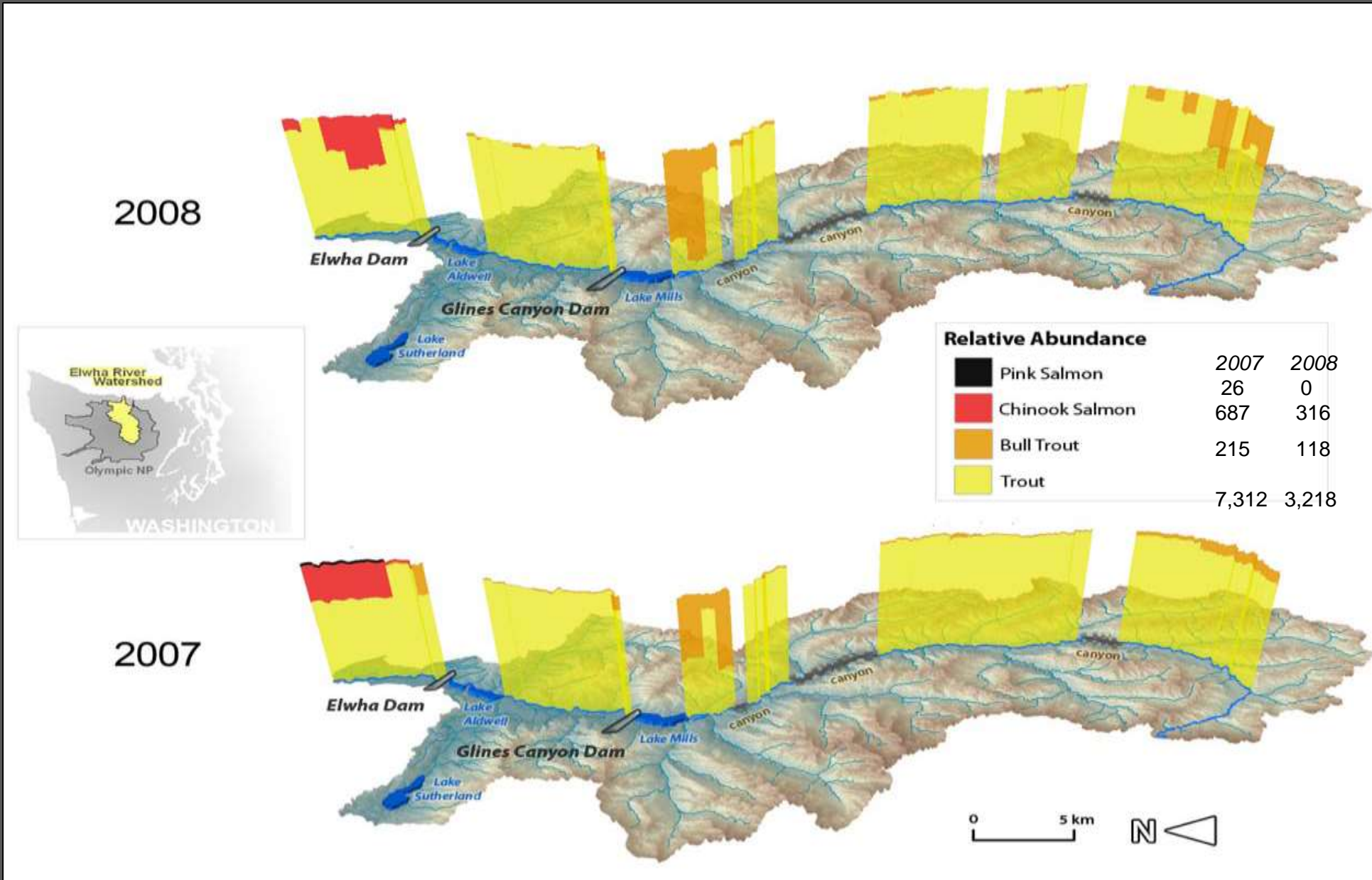
Glines Canyon Dam

- rkm 21.4
- Constructed 1927
- 235 ft. high
- Removed 2014

Elwha River Restoration: The Nation's Largest Dam Decommissioning



Before Dam Removal: Relative Abundance & Spatial Extent



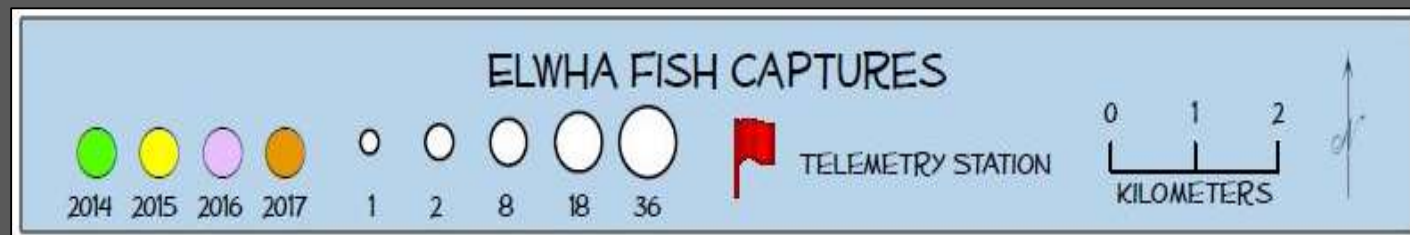
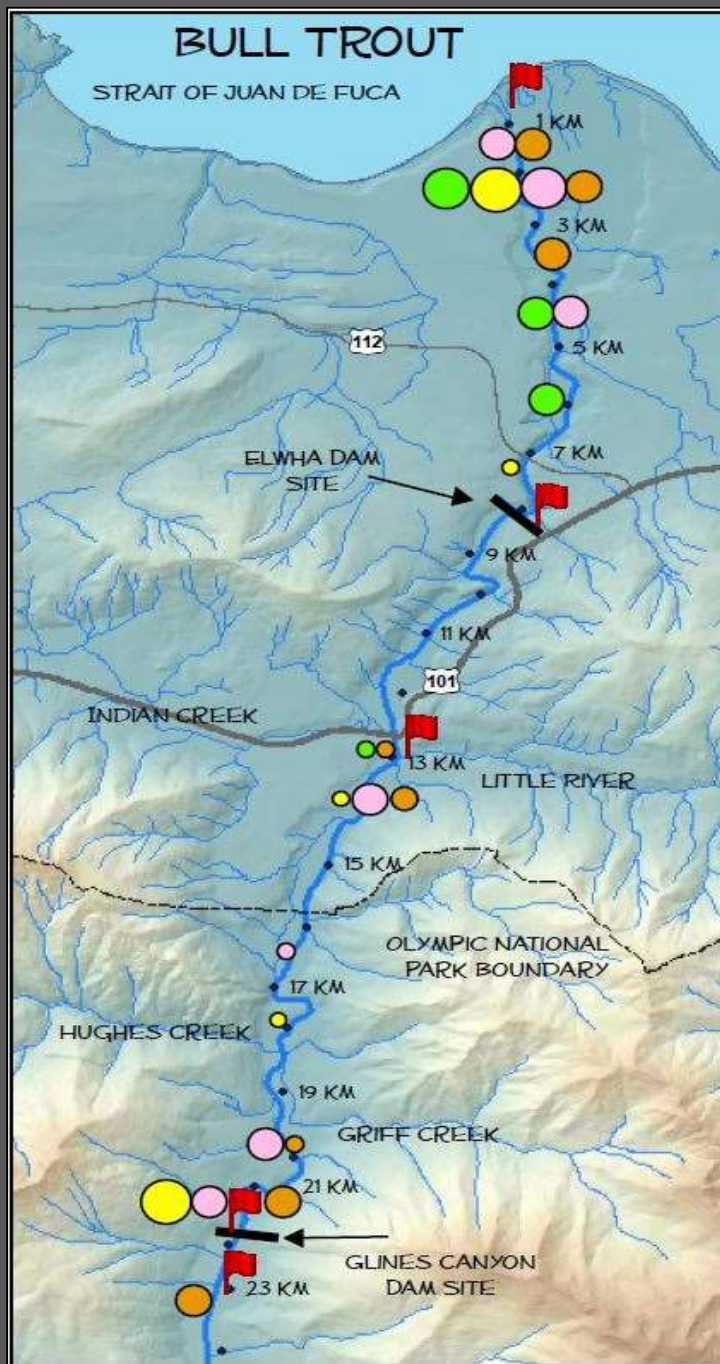
What is the response of bull trout to the nation's largest dam removal?

- Determine spatial and temporal movements throughout watershed, and upper extent after dam removal
- Assess body size before and after dam removal
- Describe diets of Elwha River bull trout after dam removal

Radio Telemetry: Methods and Approach

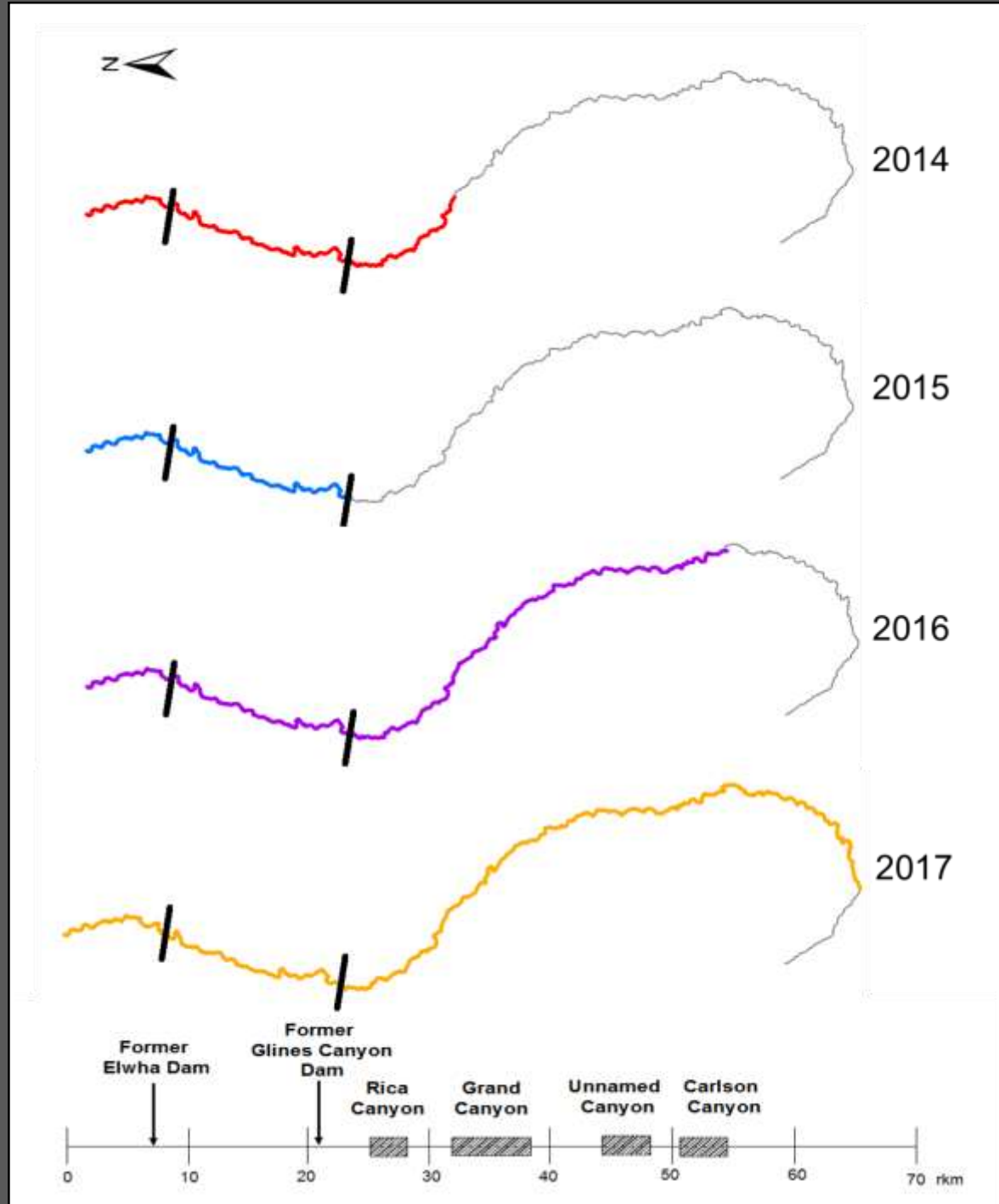
- Weekly capture via drift gill-net, 2014 - 2017
- Internally tagged bull trout
- Used transmitters that emitted coded bursts enabling unique identification of several hundred transmitters per frequency
- Tracked via strategically located fixed stations & weekly walking & monthly aerial surveys

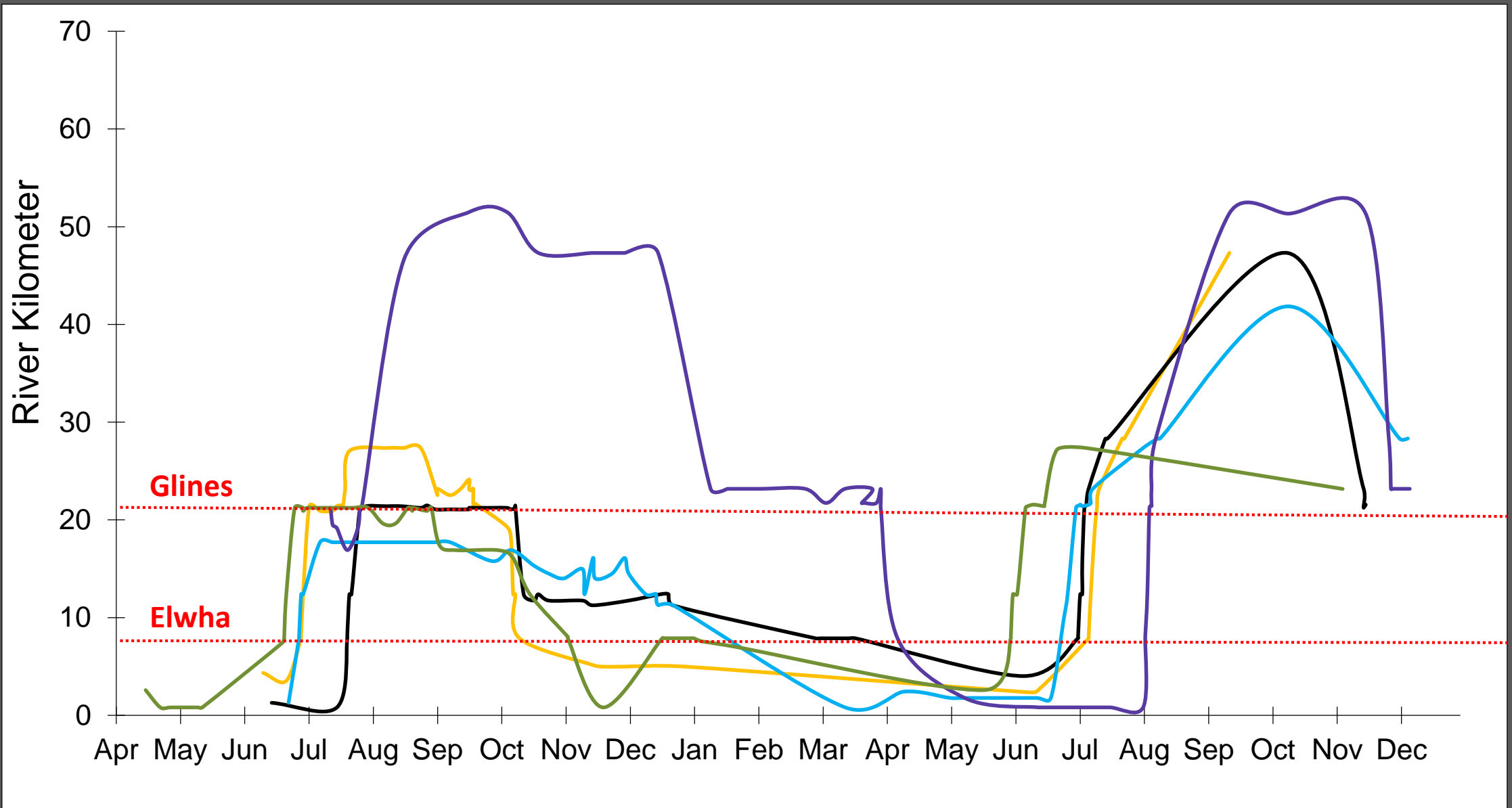




Year	N tagged	Tagging Location (rkm)	Tagging Period
2014	24	2-12	Apr 30- Jul 23
2015	46	1-21	Apr 15- Oct 28
2016	40	1-21	Mar30- Aug 23
2017	31	1-23	Apr 26- Sep7

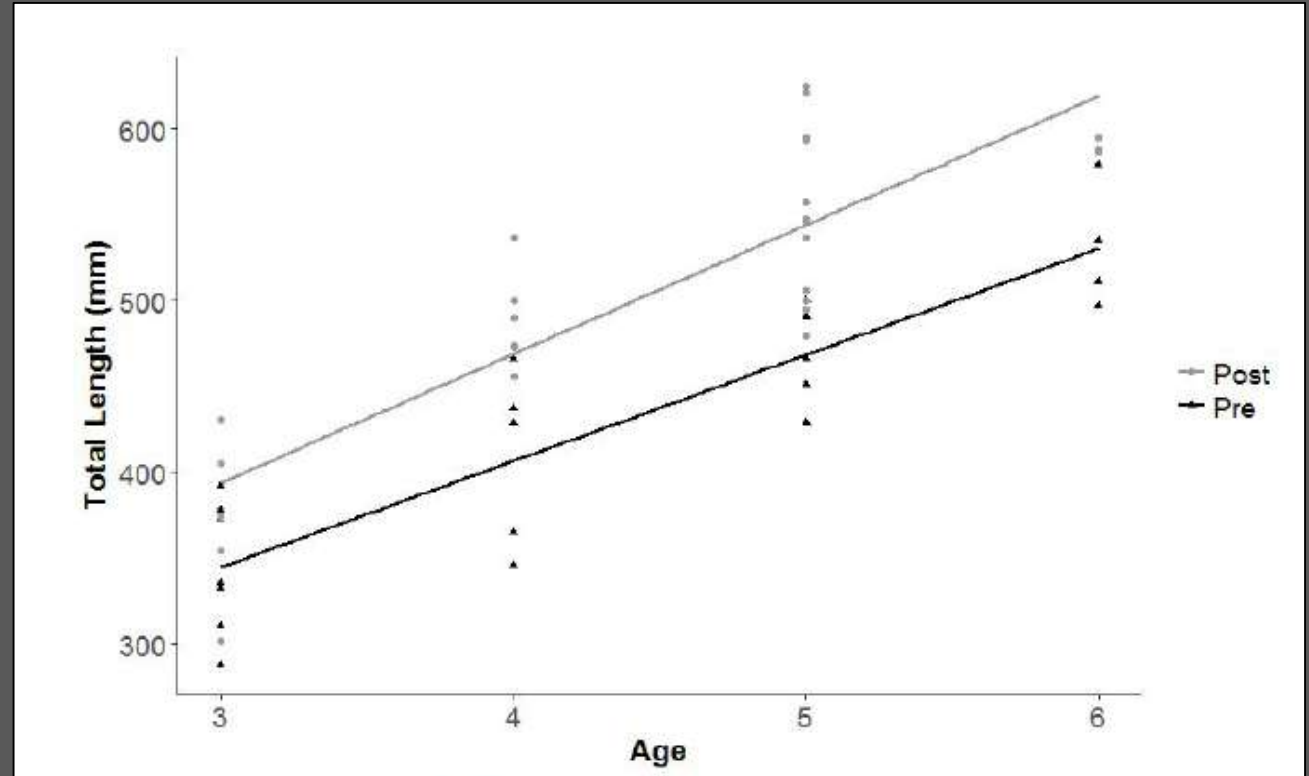
Progressive annual spatial expansion



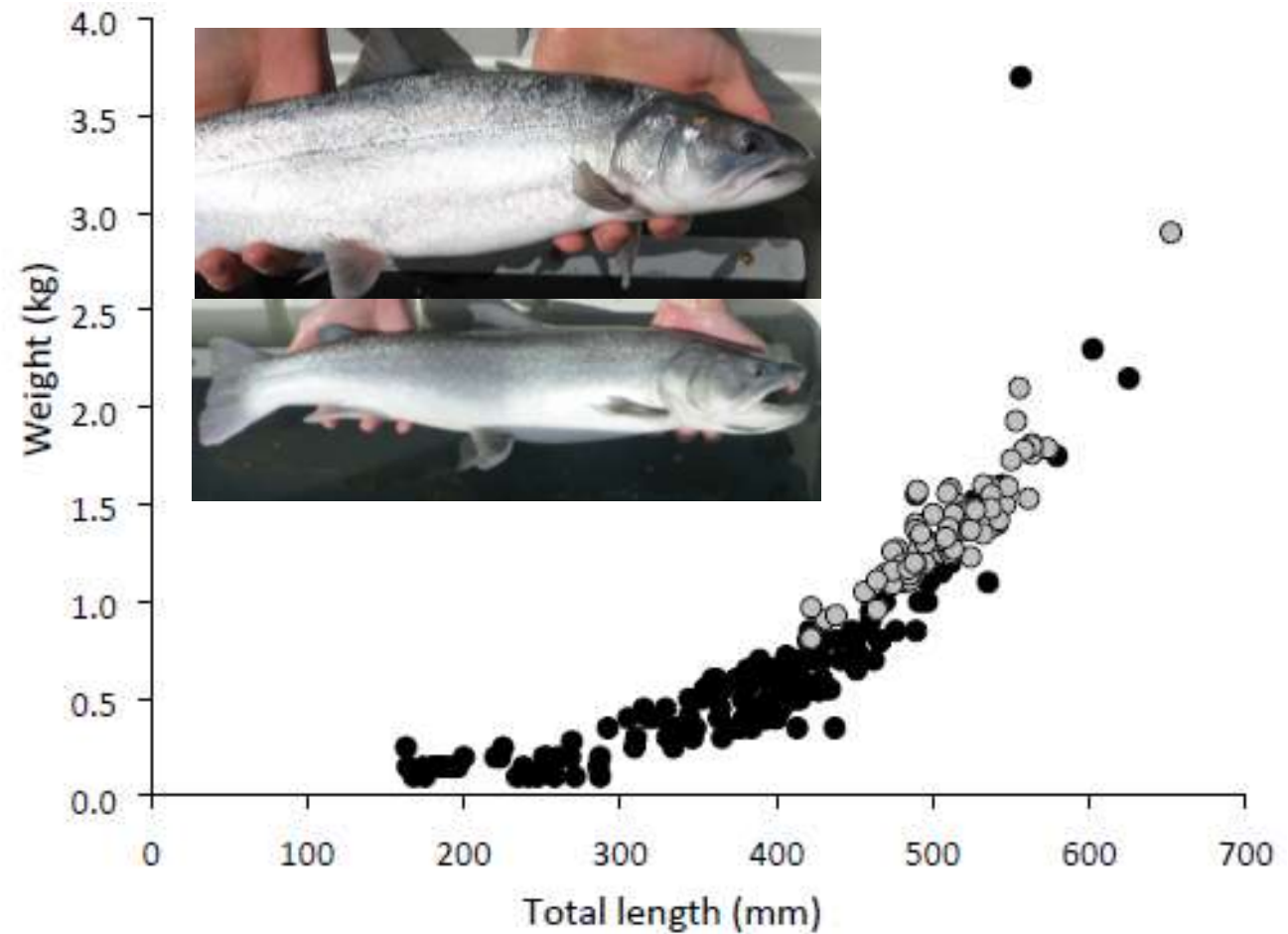
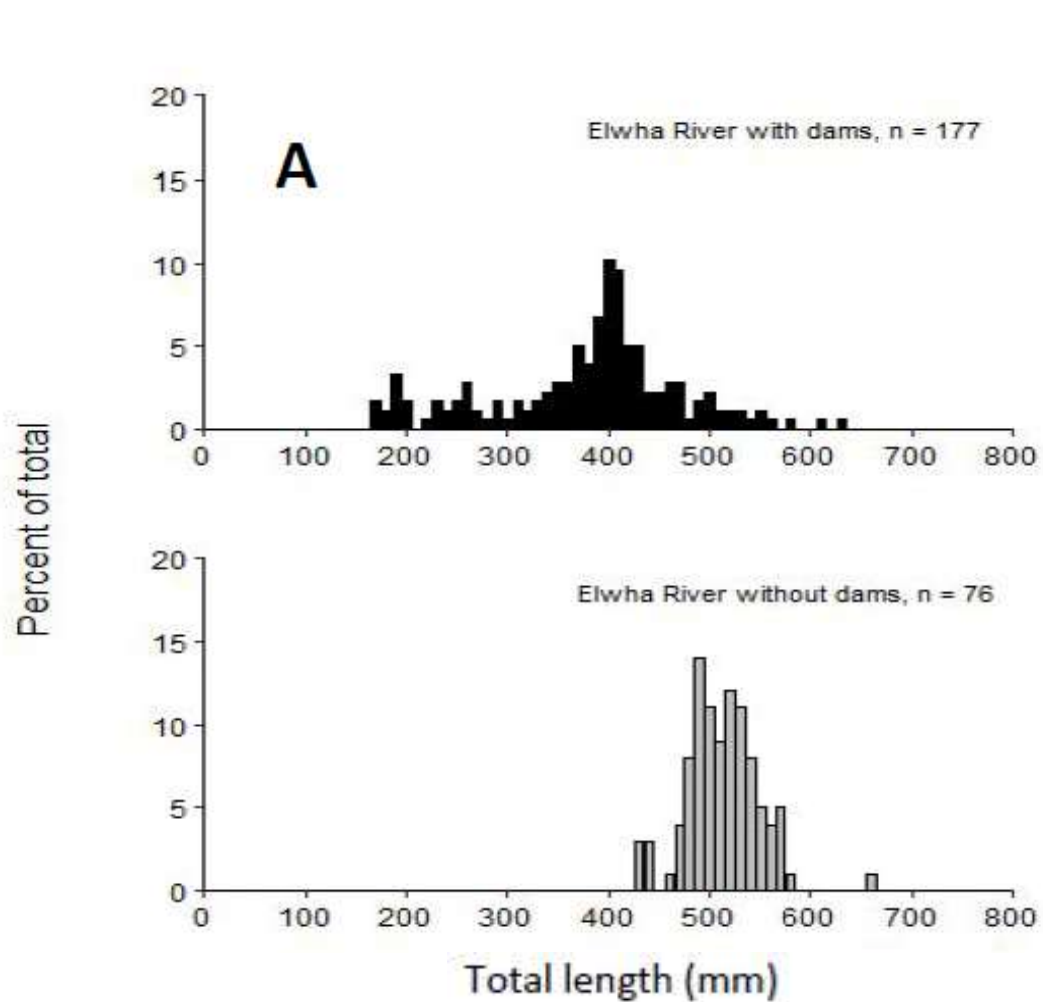


Length at age, pre- and post-dam removal

- Pre-dam removal
 - Angling
 - 2005, 2006, 2011
 - ME and UE
- Post-dam removal
 - Drift gill-netting
 - 2014-2017
 - LE and ME
- Aging from scales



Body Size, pre- and post-dam removal



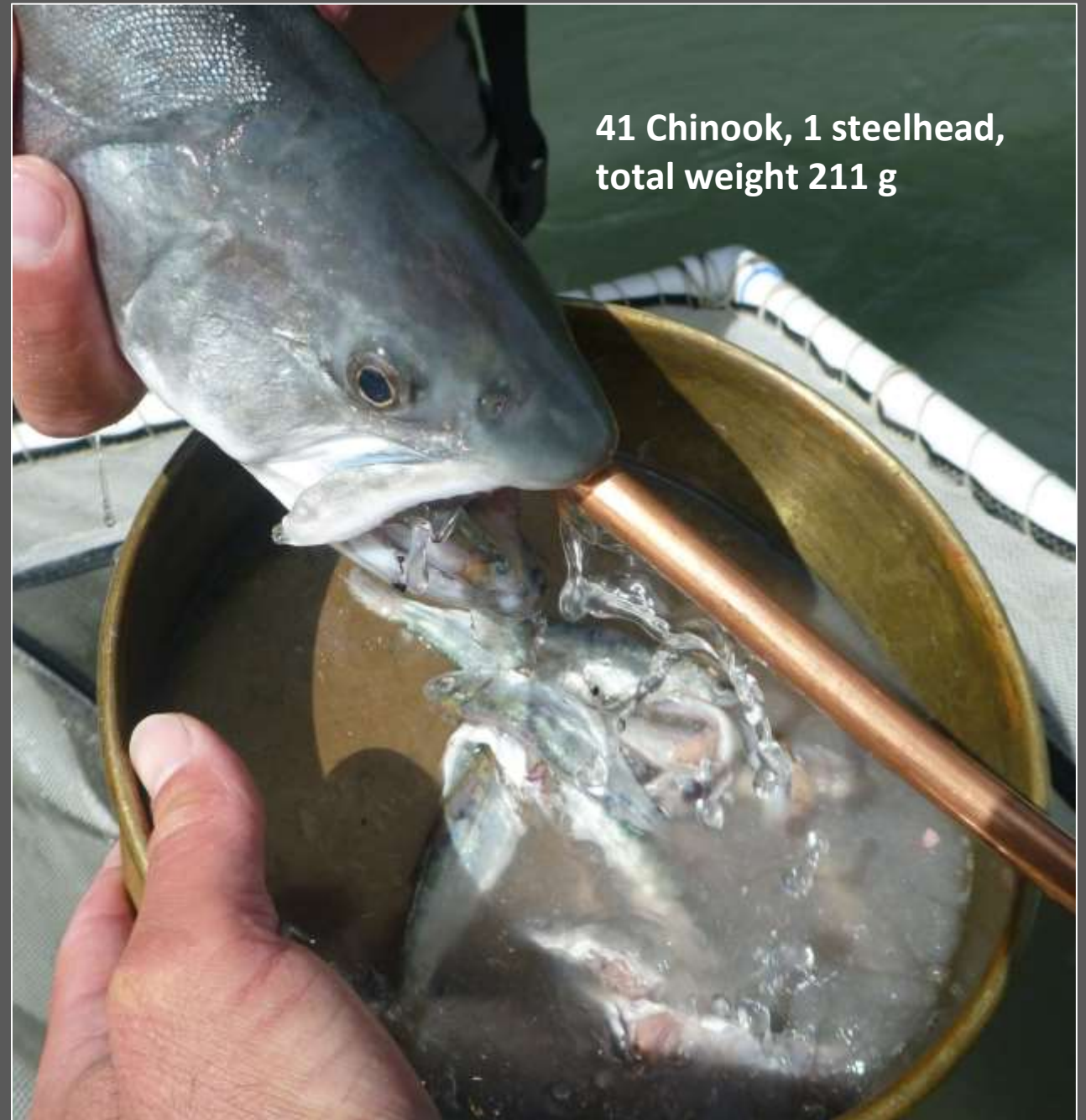
Diet Analysis

- Beach seining in Elwha estuary after dam removal ($n = 37$)
- Opportunistic sampling in river after dam removal ($n = 143$)
- Stomach contents ID'ed and separated into prey groups in the lab



Diet Analysis

- Diet primarily comprised of prey fish
 - (34% of all prey by number, >95% of stomach contents by weight in 71% of bull trout)
 - Pacific salmonids primary type consumed (87% of prey fish)
- Binge feeding observed
 - Hatchery releases of juvenile Chinook or coho salmon
- Limited occurrence of fish eggs and carcasses



Restoration Trajectory of Elwha Bull Trout

Pre-dam Removal

Low abundance and densities

Isolated in fragmented river system

Genetically isolated headwaters population

Adfluvial (w/ reservoirs) and fluvial (headwaters)

Smaller body size

Restoration Trajectory of Elwha Bull Trout

Pre-dam Removal	Expectations Post-dam Removal
Low abundance and densities	Increased abundance and densities
Isolated in fragmented river system	Spatial expansion throughout the river
Genetically isolated headwaters population	Greater genetic exchange
Adfluvial (w/ reservoirs) and fluvial (headwaters)	Increased anadromy
Smaller body size	Increased length at age

Conclusions



- Unique opportunity to assess response of bull trout to dam removal
- Connection of headwaters to the estuary
- Using resources now that were not available prior to dam removal
- Potential for increased size and fecundity, anadromy, abundance, and life history diversity
- Restoring connectivity may be key to recovery

Acknowledgements

NPS, OLYM

Kathy Beirne
Pat Crain
Anna Geffre
Roger Hoffman
Heidi Hugunin
Phil Kennedy
James Starr
Brian Winter

Keith Denton & Assoc.

Keith Denton

Photos:

NPS

Rebecca Paradis
John Chao

NOAA

George Pess
Todd Bennett
Steve Corbett
Kinsey Frick
Martin Liermann

Lower Elwha Klallam Tribe

Matt Beirne
Mel Elofson
Mike McHenry
Ray Moses
Rebecca Paradis
Sonny Samson
Wilson Wells

USFWS

Jeff Chan
Pat DeHaan
Dan Lantz
Tracy Leavy
Sedge Neil
Michaela Lowe
Jeffery Johnson
Michael Elam

USGS

Jeff Duda
Christian Torgersen
Ethan Welty
Trevor Eakes

