Agenda Item E.9.a
Supplemental NMFS Presentation 1
April 2023

Klamath River Dam Removal

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Presentation Overview

- Klamath Basin context and description of hydroelectric dams
- Dam removal project summary and timeline
- Short term impacts and long term benefits to Klamath River salmon
- Future planning efforts

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Klamath Basin Context

- Unique habitat in the Upper Basin including spring dominated systems, marshes, and lakes
- Diverse stakeholders including Tribal, agricultural, public lands, municipal, and recreational uses
- Stressors – dams, water diversions, mining, logging, fishing, climate change
- Third largest salmon producer on the West Coast
  - Historically produced up to 1 million salmon
- Decline in fishery has had critical consequences to Tribal communities and ocean salmon fisheries

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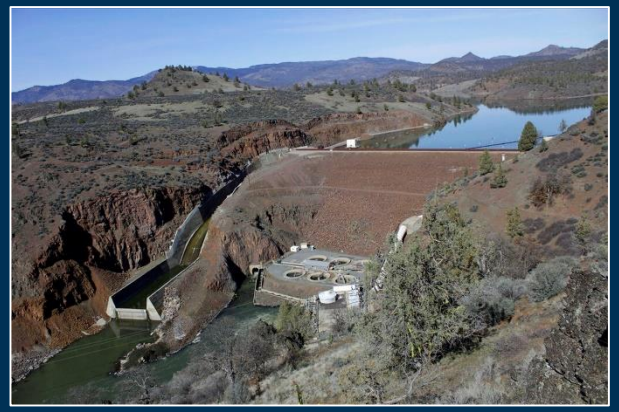
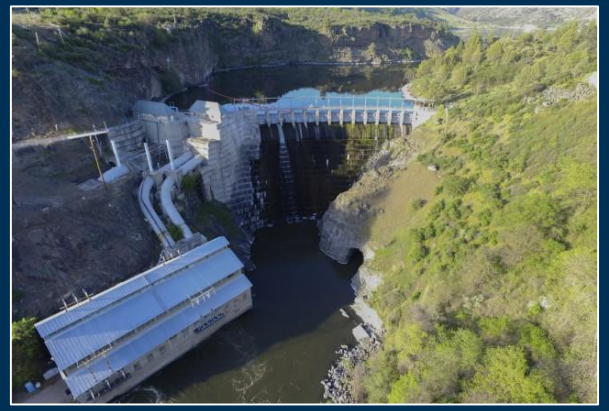
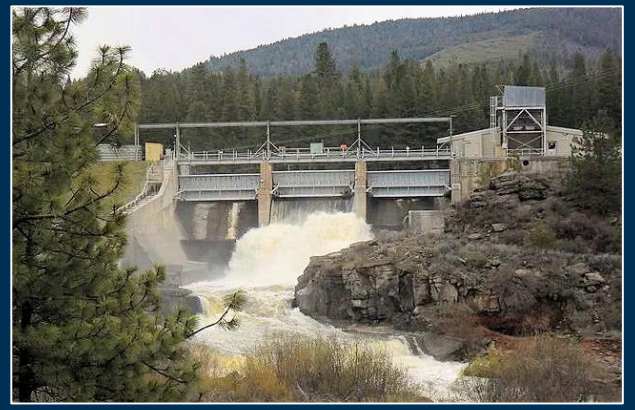
Four Hydroelectric Dams



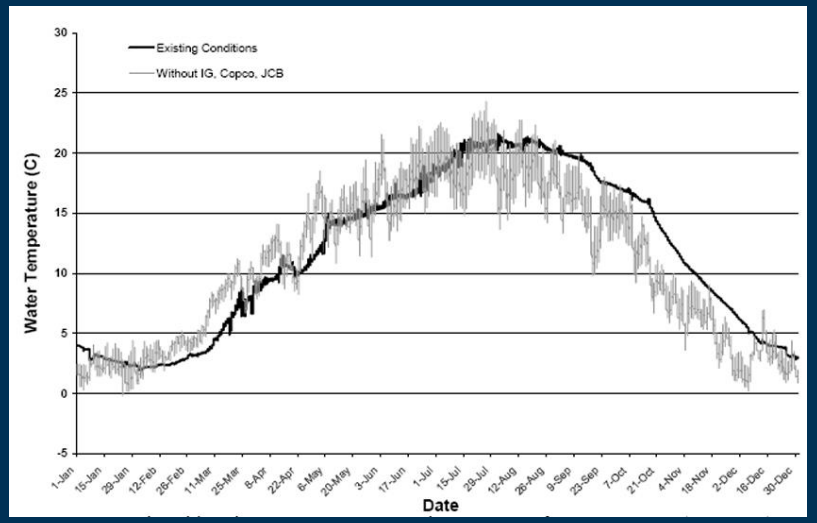




Iron Gate Dam Constructed in 1962 173 feet high RM 190	Copco 1 Dam Constructed in 1919 126 feet high RM 198	Copco 2 Dam Constructed in 1925 20 feet high RM 198	JC Boyle Dam Constructed in 1957 60 feet high RM 224 (in Oregon)

Impacts of Dams – Current Conditions

- No access to upper basin (400+ miles of anadromous habitat)
- Altered water temperature dynamic
- Blocks sediment transport
- Lost flow variability
- Increased disease (*C. shasta*)



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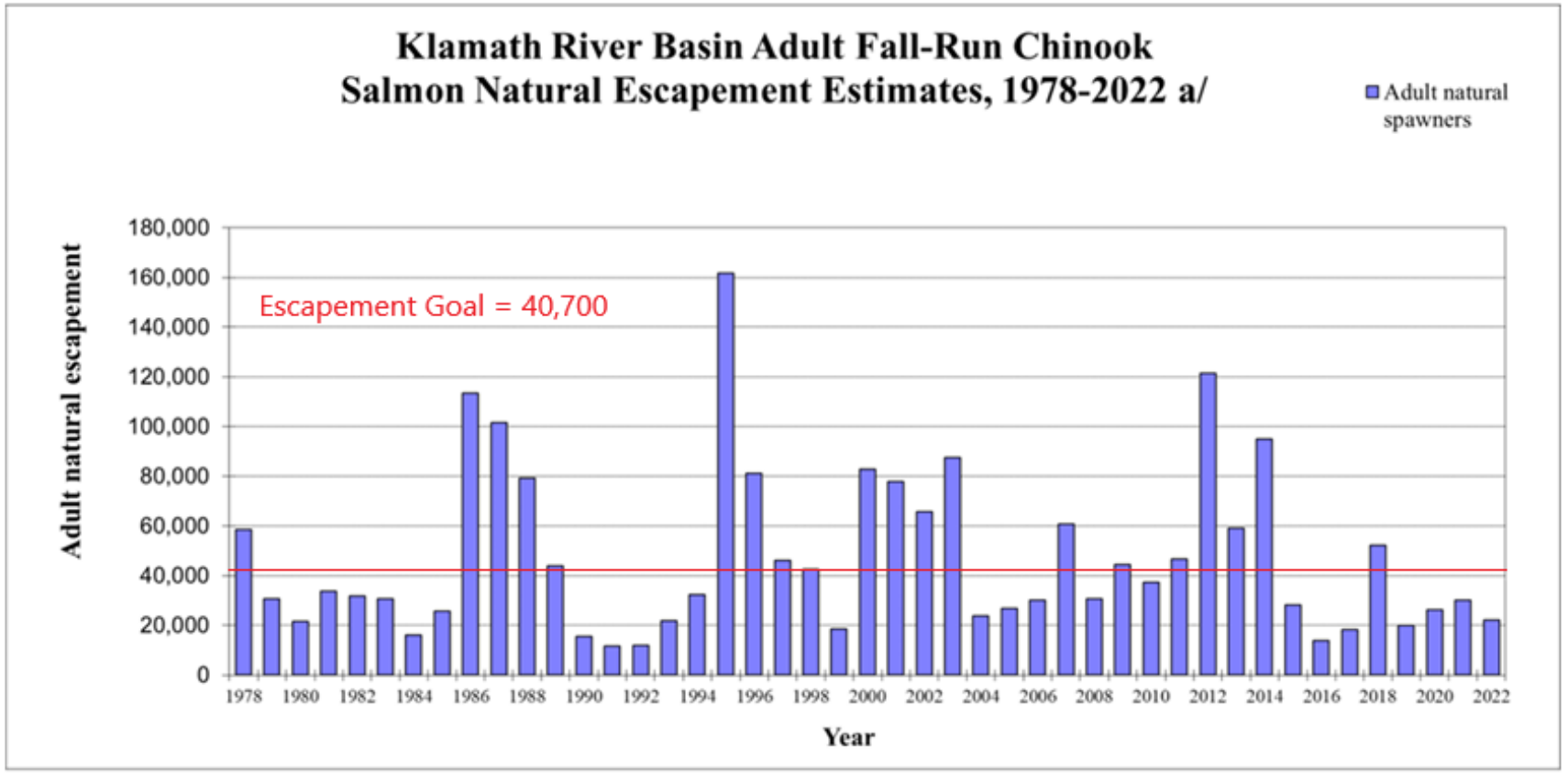
KRFC Salmon Abundance



CDFW 2023

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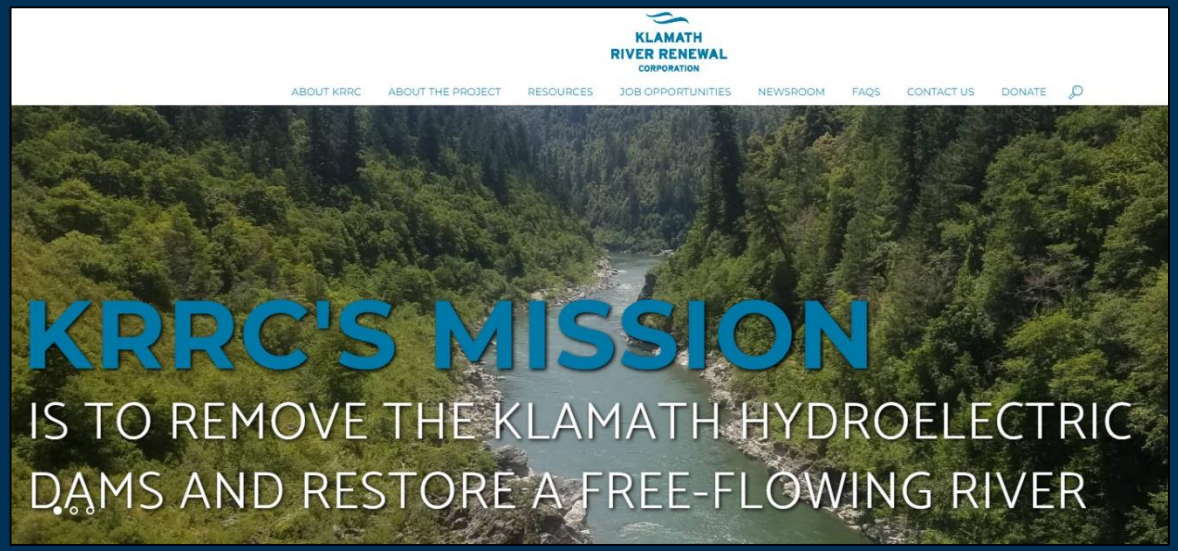
Dam Removal Strategy

- Klamath River Renewal Corporation (KRRC), an independent non profit organization, formed in 2016 under an amended Klamath Hydroelectric Settlement Agreement (KHSA)
- Signatories to KHSA (States, Tribes, Feds, PacifiCorp, irrigators, fishing interest groups, etc.) appointed KRRC to take possession of the dams and oversee the removal of four dams and restoration of reservoirs
- Funded ($500M) by PacifiCorp customer surcharges, California Prop 1 water bond funds, and contingency funds provided by the States
- https://klamathrenewal.org/



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Timeline for Dam Removal

- June 2021 – FERC License Transfer Ruling
- December 2021 – NMFS/USFWS Biological Opinions submitted to FERC
- August 2022 – FERC Issues Final EIS
- November 2022 – FERC License Surrender Order Issued
- March 2023 – FERC Notice to Proceed Issued
- July 2023 – Copco 2 Dam Removed
- January 2024 – Reservoir Drawdown Begins
  - Iron Gate Hatchery Closes, Fall Creek Opens
- Summer 2024 – Remaining 3 Dams Removed
- October 2024 – Volitional Fish Passage Complete
- 2024-2032 – Fall Creek Hatchery Operations, Reservoir Restoration, Reintroduction

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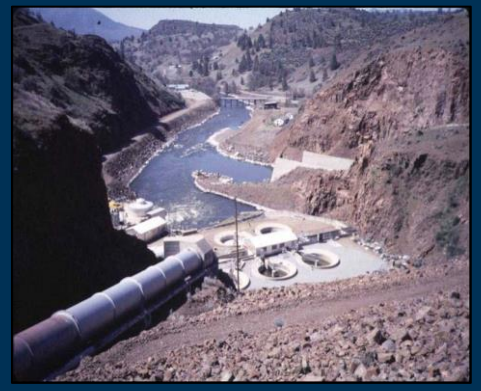
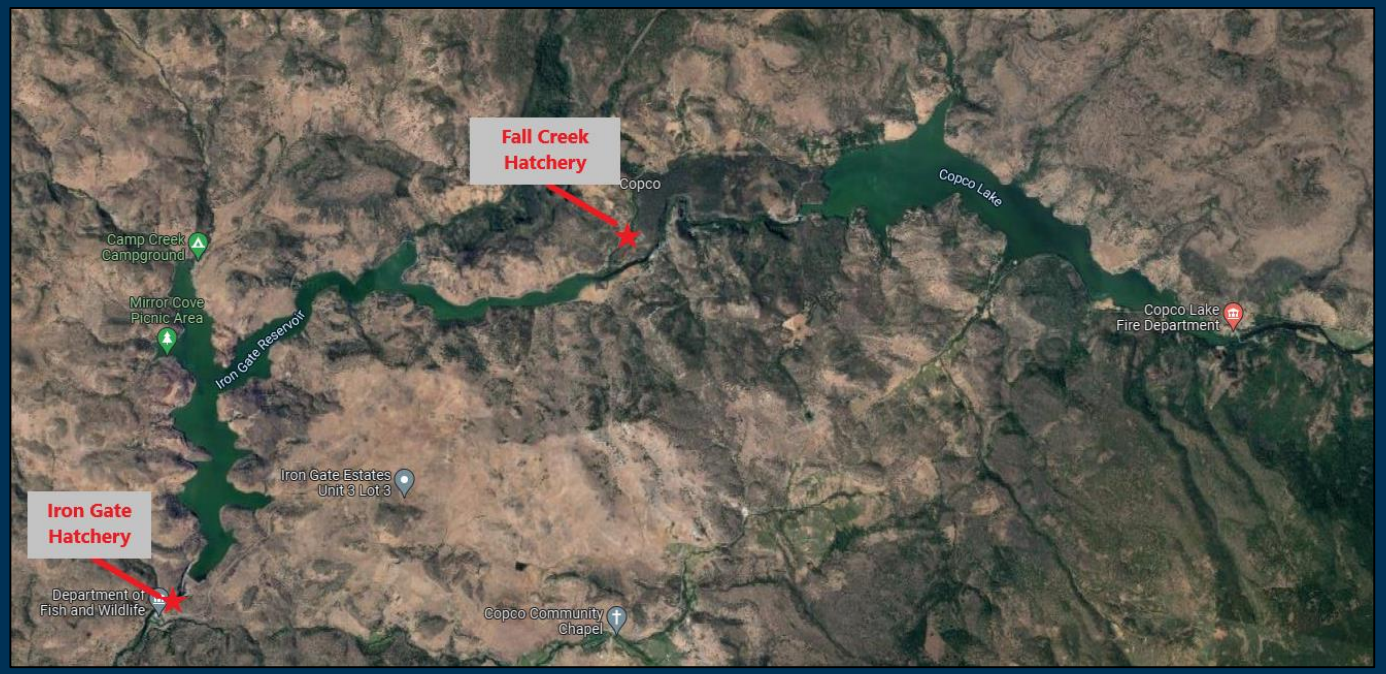
Hatchery Considerations

- The KHSA requires PacifiCorp to fund 8 years of hatchery operations post dam removal
- New hatchery plan contemplated by multiple agencies (CDFW lead) – led to Fall Creek Hatchery Plan
- Iron Gate Hatchery will be closed in the fall of 2023
- Fall Creek hatchery will be managed adaptively



Fall Creek Hatchery



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Fall Creek Hatchery Plan

Table 4. Comparison of Hatchery Mitigation Requirements and NMFS/CDFW Production Recommendation

Species / Life Stage	Current Production Goal (at IGH)	Production Goal Post-Dam Removal (at FCH)	Release Dates
Coho Yearlings	75,000	Minimum of 75,000	March 15 – May 1
Chinook Yearlings	900,000	Minimum of 250,000	Oct 15 – Nov 20
Chinook Smolts	5,100,000	Up to 3,000,000	April 1 – June 15
Steelhead	200,000	0	N/A

- Term is eight years
- Objective to tag 50% Chinook for fisheries management
- Adaptive Management
  - Rearing a portion of fish at Fall Creek opportunistically pre-dam removal for imprinting
  - Extensive monitoring
  - Broodstock collection

Dam Removal
Short Term Impacts
Long Term Benefits

Based on NMFS 2021, Biological Opinion-FERC Dam Removal

https://repository.library.noaa.gov/view/noaa/33979/noaa_33979_DS1.pdf

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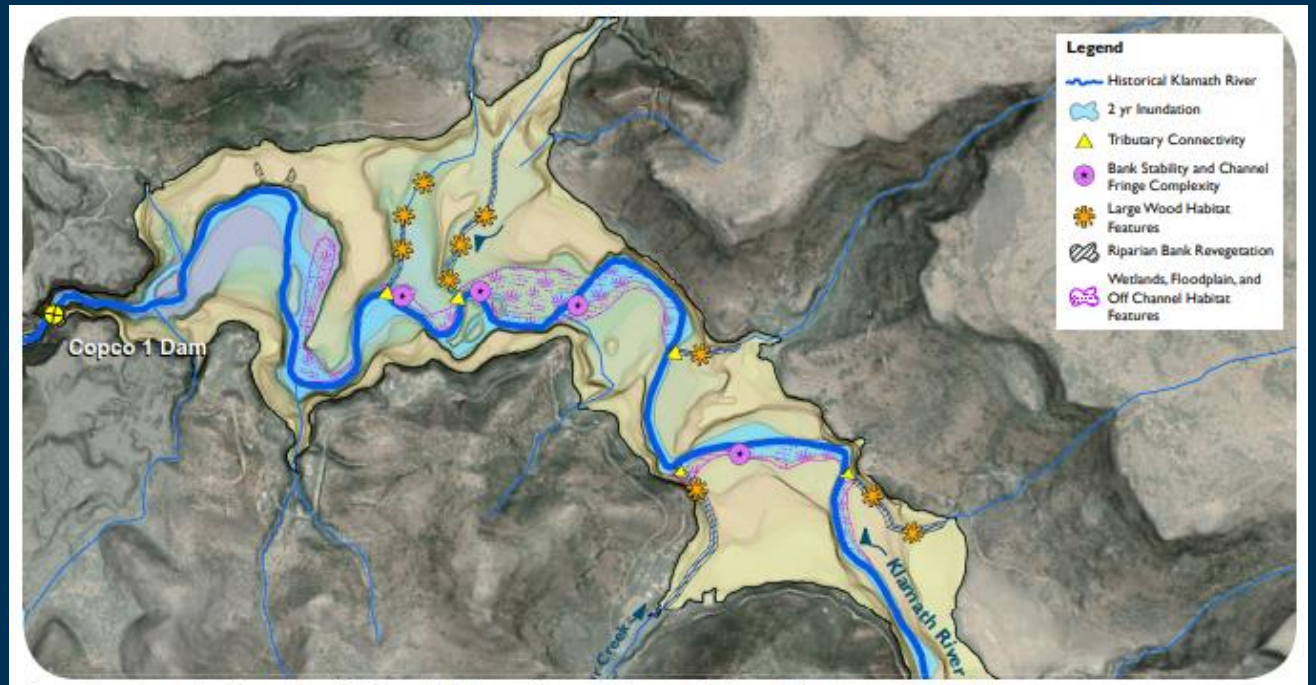
Dam Removal: Anticipated Impacts to ESA Listed Species

- Drawdown
  - Sediment mobilization
  - Redd suffocation
  - Rescue/Relocation
- Hatchery Operations
- Reservoir Restoration
  - Tributary connection



Comprehensive restoration actions for Copco No. 1 reservoir area. Yellow area is the existing reservoir footprint.

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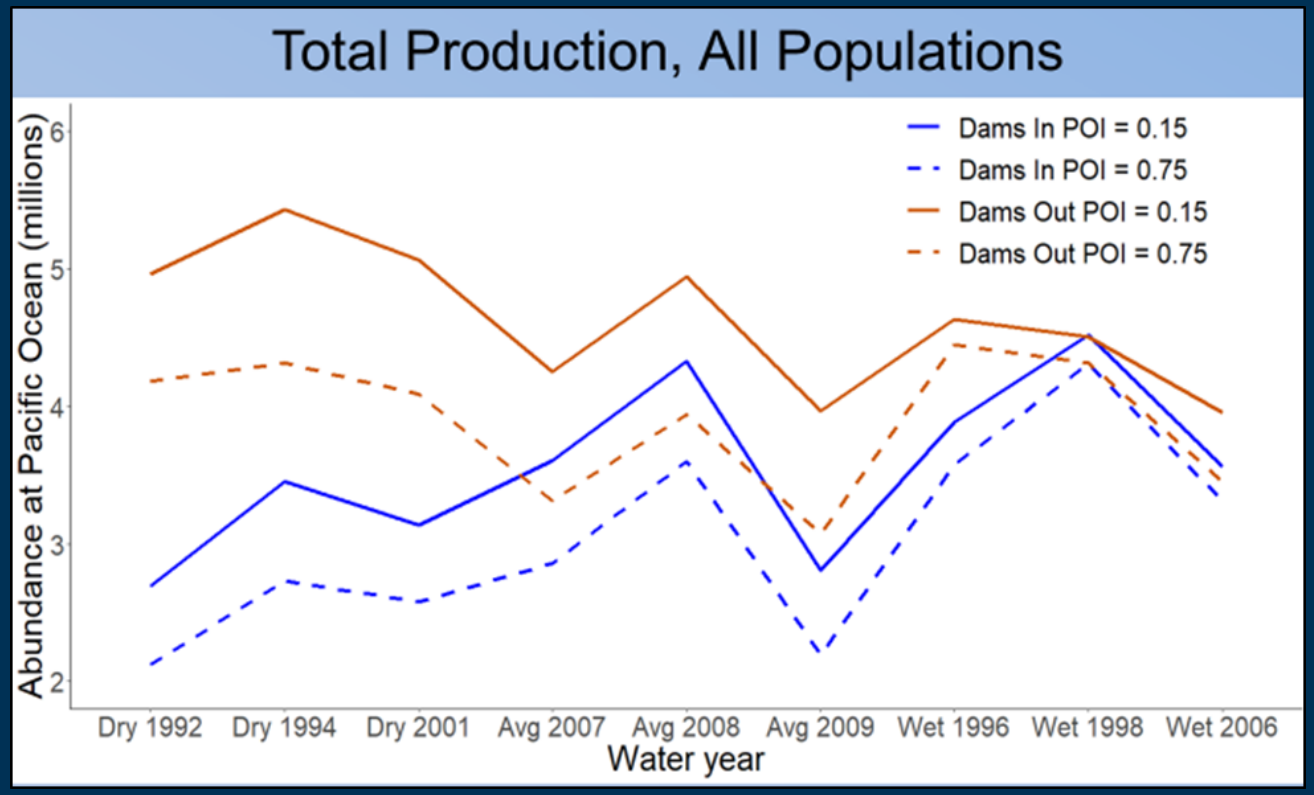

Compare High POI Dams In to Low POI Dams Out "… low POI scenario against a dams out, high POI dams in scenario is likely the most appropriate in the mid-term (USGS 2021). **Low POI production is expected to be roughly *200,000 to 3,000,000* fish greater than dams-in, high POI production** ."

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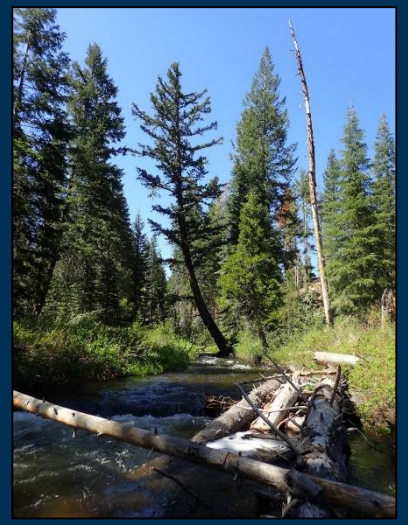
Post Dam Removal – Upstream Habitat

LONG TERM BENEFITS

- Key tributaries and cold water refugia for coho salmon
  - Scotch Creek, Camp Creek, Jenny Creek, Fall Creek, Shovel Creek, Spencer Creek
  - 76 miles of coho salmon habitat
- Key cold water tributaries in Upper Basin for fall and spring Chinook
  - Williamson River, Sprague River, Wood River
  - 300+ miles of Chinook salmon habitat

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Benefits of Dam Removal

- Increased flow variability
- Restoration of water temperature patterns
- Increased dissolved oxygen
- Reduced toxic blue-green algal blooms
- Increased large wood recruitment
- Increased sediment transport
- *Decreases in disease risks*

Chinook salmon abundance above IGD post dam removal

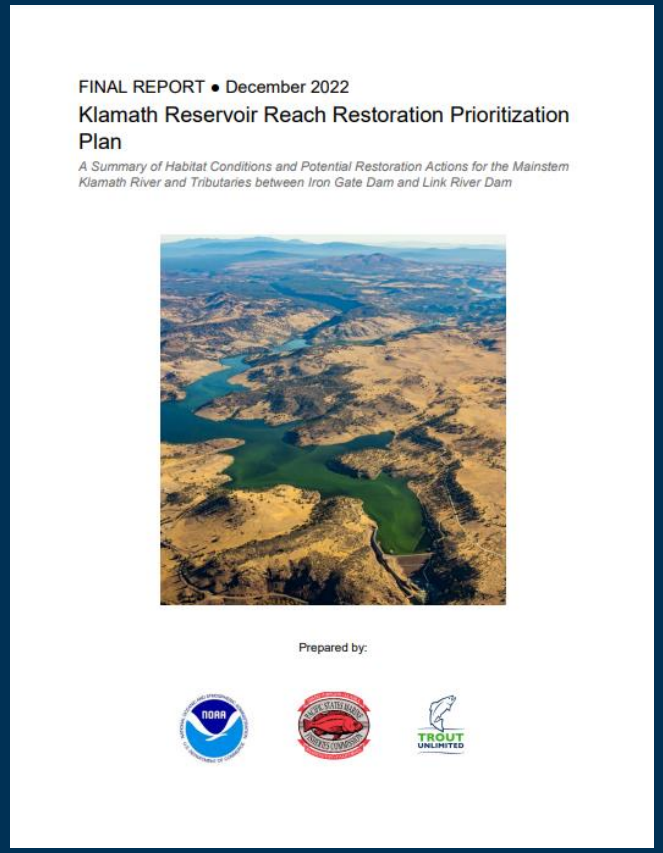
Publication	Key Findings
Huntington (2004)	used six methods to estimate a potential run capacity of adult Chinook salmon returning to areas above Iron Gate Dam that ranged from 9,180 to 32,040, with a mean or "best estimate" value of 21,245 fish
Oosterhout (2005)	abundance was maximized with removal of the four dams. Their estimate for total average spawner capacity upstream of IGD was 40,341 Chinook.
Huntington and Dunsmoor (2006)	estimated over 303 miles and 370 miles of spawning or rearing habitat for fall-run Chinook salmon and spring-run Chinook salmon, respectively.
Dunsmoor and Huntington (2006)	the removal of most or all of the mainstem Klamath Project dams would significantly improve conditions for migration and spawning of adult fall Chinook salmon. Dam removal would provide clear and at times dramatic thermal benefits to migratory salmonids now in, or reintroduced to, the Upper Klamath Basin
Hetrick et al. (2009)	Described benefits to dam removal for fish above and downstream of Iron Gate Dam, including that potential increases in food availability, in combination with changes in water temperatures that more closely resemble the historical pre-development thermal regime, are likely to increase the size of smolts at ocean entry, which has been shown to increase estuary/ocean survival

Chinook salmon abundance above IGD post dam removal

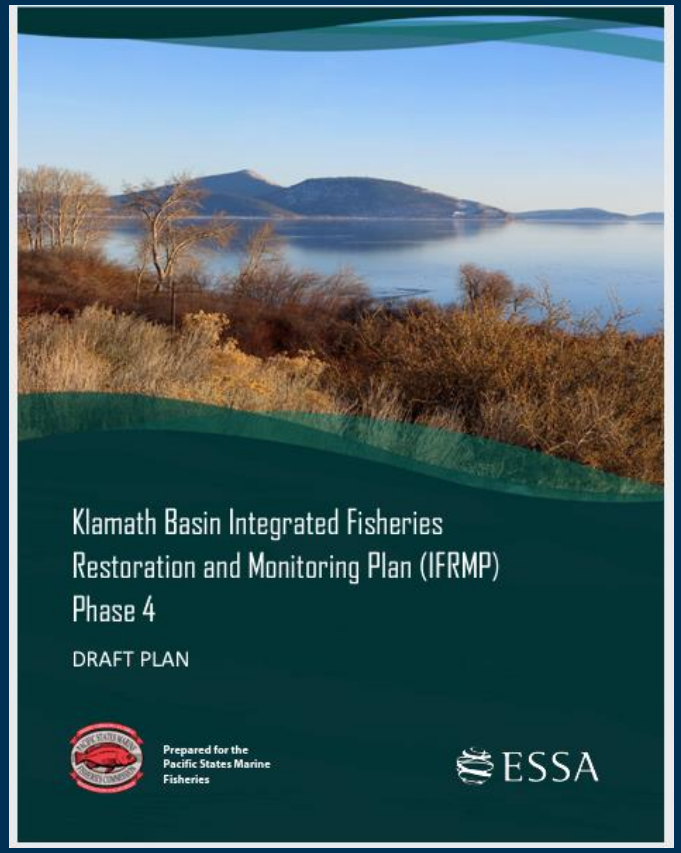
Publication	Key Findings
Goodman et al. (2011)	concluded that a substantial increase (on the order of 10,000 spawners) in Chinook salmon is possible in the reach between Iron Gate Dam and Keno Dam.
Hendrix (2011)	Median escapements and harvest were higher in the Dam Removal Alternative relative to the No Action Alternative
Lindley and Davis (2011)	Models predicted 3,660 (2420–5510) Chinook salmon spawners per year above IGD.
DOI and NMFS (2013)	“There is a high degree of certainty, based on available science (and the lack of contrary studies), that in the long term dam removal would expand usable habitat for Chinook salmon and would significantly increase their abundance as compared to leaving dams in place”.

PLANNING DOCUMENTS
Restoration

Klamath Reservoir Reach Restoration Prioritization Plan



Integrated Fisheries Restoration and Monitoring Plan (IFRMP)



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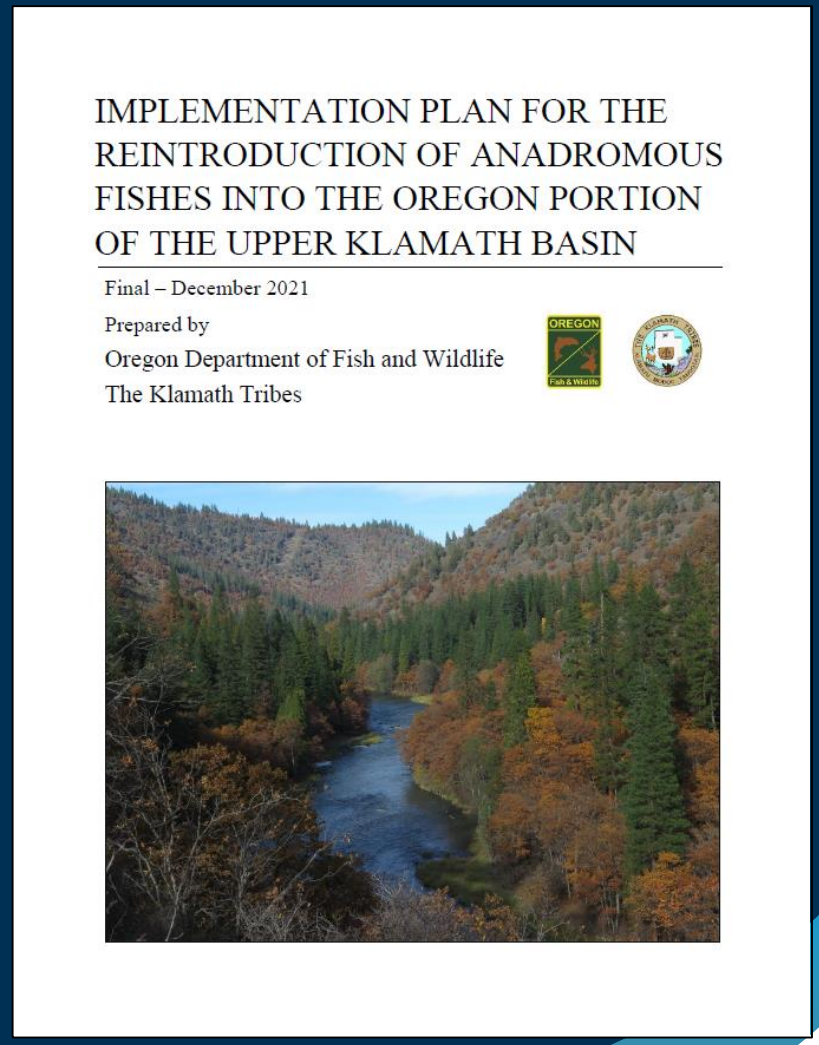
PLANNING DOCUMENTS
Repopulation

- Volitional Reintroduction – Coho salmon, Fall Chinook, Lamprey, Steelhead
- Active Reintroduction
  - Spring Chinook at ODFW Klamath Hatchery in Fort Klamath
- Reintroduction Plans (CDFW, ODFW/Klamath Tribes of Oregon)
- Upper Basin Spring Chinook experiments underway (NMFS, ODFW, CDFW, Cal Poly Humboldt, UC Davis, Klamath Tribes of Oregon)
  - Radio tags, acoustic tags, PIT tags
  - Survival through Upper Klamath Lake and Project reach


IMPLEMENTATION PLAN FOR THE REINTRODUCTION OF ANADROMOUS FISHES INTO THE OREGON PORTION OF THE UPPER KLAMATH BASIN

Final – December 2021

Prepared by

Oregon Department of Fish and Wildlife

The Klamath Tribes

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On the Horizon

- Reintroduction
- Keno Dam (Lake Ewauna and Unscreened Diversions)
- Upper Basin water quality
- Re-consultation with Reclamation for Water Operations (Fall 2024)

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References

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United States Department of the Interior and Department of Commerce National Marine Fisheries Service (DOI and NMFS). 2013. Klamath dam removal overview report for the Secretary of the Interior. Version 1.1, March 2013.