



NOAA
FISHERIES

Restoration
Center

Fish Passage on the Klamath River

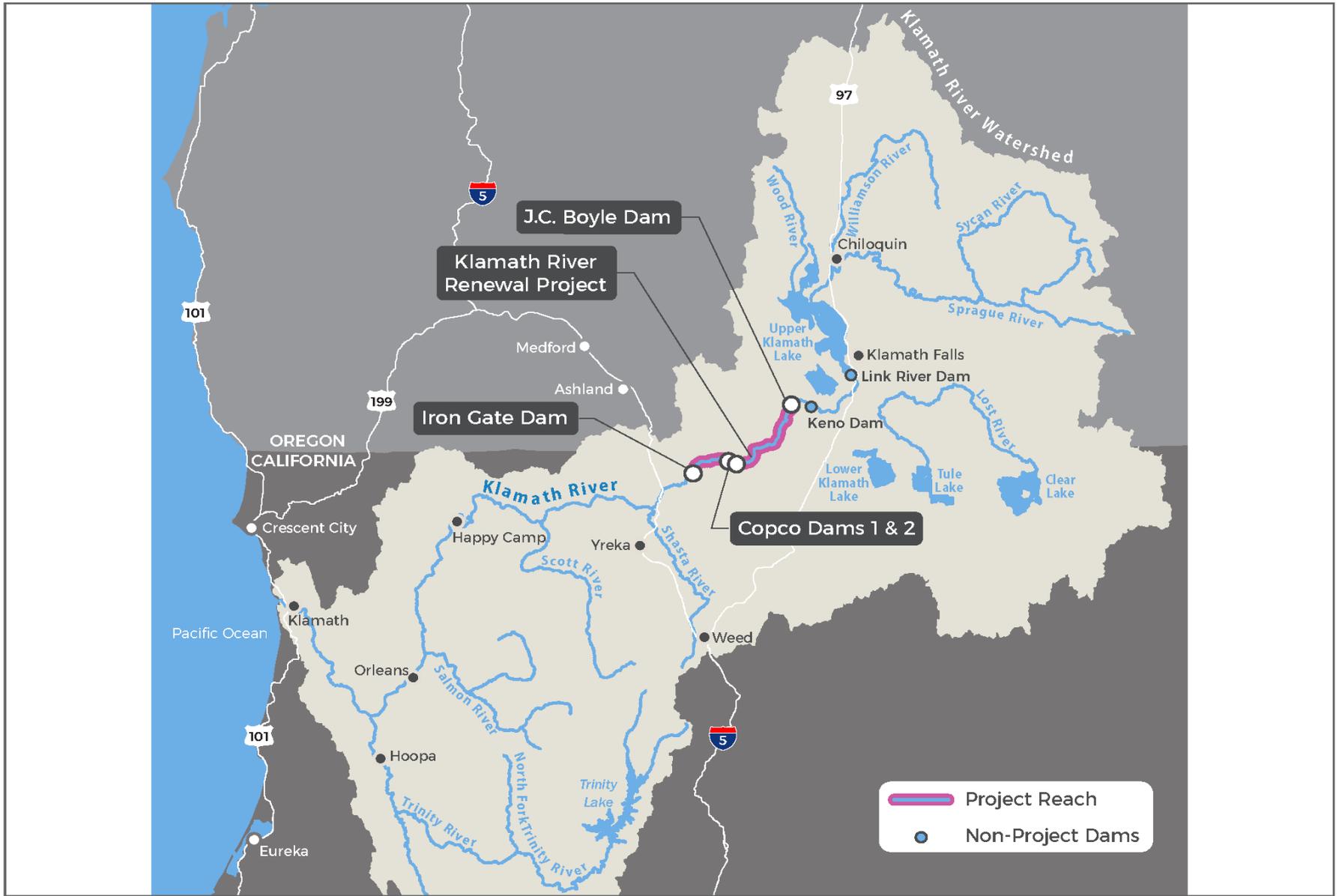
Bob Pagliuco, Dave White, Brian Cluer
Fish Passage Forum Meeting
Arcata, CA

March 28, 2018

Klamath Facts

- Historically,
 - Klamath 3rd largest salmon producer
 - Chinook, coho, steelhead, lamprey, trout, suckers
 - Important Tribal and commercial fisheries.
- Today
 - Coho and suckers listed
 - Spring run mostly gone
 - Fishery restrictions





Iron Gate Dam - 173 ft
high, built in 1962



Copco 1 and Copco 2 dams
- 126 and 20 ft high, built in
1918 and 1925



JC Boyle Dam - 60 ft high, built in 1957





Keno Dam, 24 ft high, built in 1967

No current plans for removal

Partial passage at fish ladder

2002 Fish Kill

- Over the past few decades citizens of the Klamath basin challenged one another in courtrooms to protect their families, communities, environment, and ways of life.
- Farmers vs fish and suckers vs salmon.....Water Wars
- The conflict escalated in 2001, when the federal government (BOR) cut water deliveries to farms to protect endangered coho salmon.
- The following year, The farmers received more water an estimated 35,000 - 70,000 adult salmon died in a catastrophic fish kill.

How Dam Removal Became Possible

- Klamath FERC Relicensing Process for a 50 yr license (Federal Nexus)
- Preliminary Fishway Prescriptions filed on March 24, 2006
- Prescription included volitional passage able to reintroduce multiple species of concern to currently viable habitat blocked by Project:
 - ESA listed coho and suckers
 - Declining Chinook-- west coast fishery closure
 - Steelhead and migratory lamprey
 - Resident lamprey and trout
- PacifiCorps pushed back, trial type hearing, judge ordered in favor of passage.
- Passage was not cost effective for PacifiCorp leading to dam removal

Once Dam Removal became an Option....

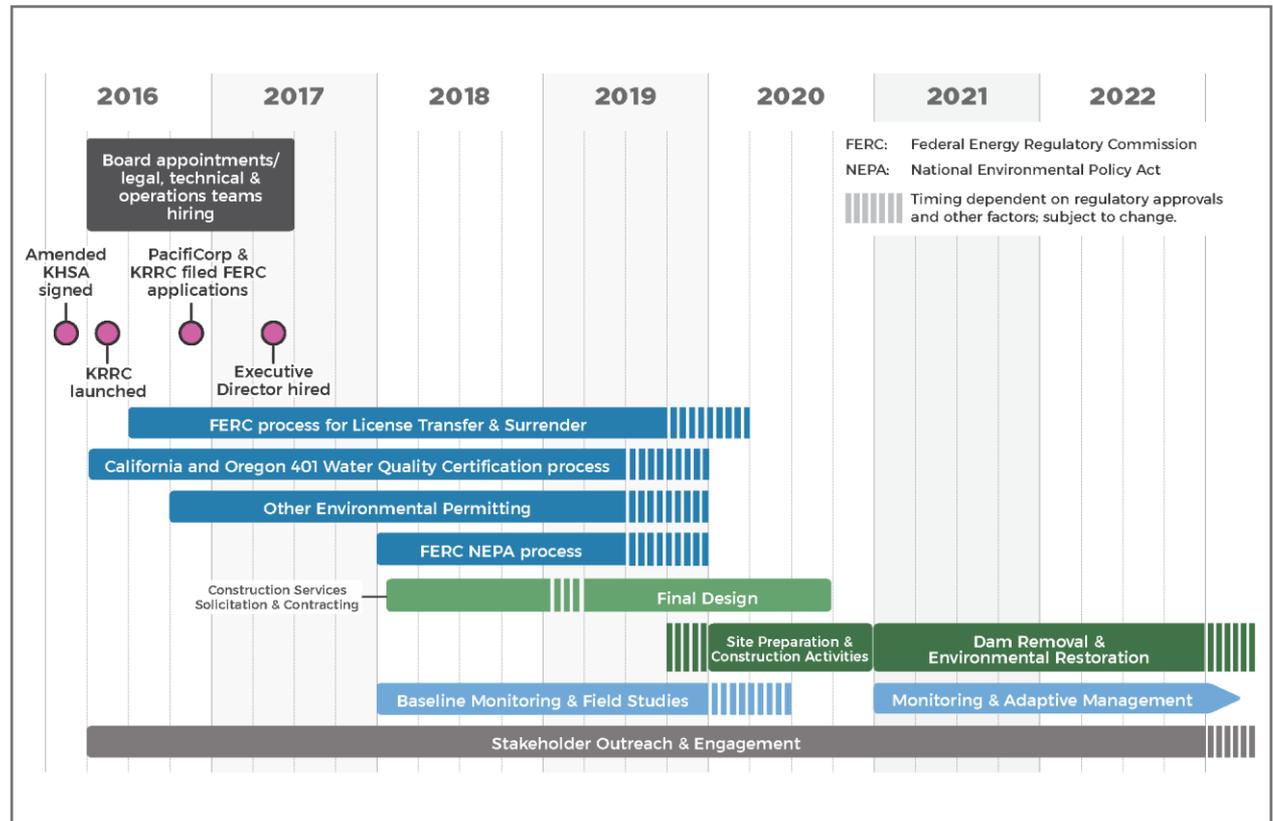
- 45 Parties representing Federal agencies, California and Oregon, three Indian tribes, two counties, irrigators, and conservation and fishing groups came together to develop agreements on water security, dam removal and restoration in the Klamath Basin.
- The Klamath Basin Restoration Agreement (KBRA) and the Klamath Basin Hydro Settlement Agreement (KHSA) were signed on February 18, 2010
- They provide a comprehensive solution for water, fishery, and power issues in the Klamath basin
- PacifiCorp Rate Payer Contribution - \$200 million (\$184 million Oregon consumers and \$16 million from customers in California)
- State of CA Contribution - \$250 million from Proposition 1

Klamath Agreements

- [2010 KHSA](#) –The KHSA details the removal of four PacifiCorp hydroelectric dams: Iron Gate, Copco No. 1, Copco No. 2, and J.C. Boyle. The 2010 agreement was linked to the KBRA, an agreement to guide restoration and resolve resource conflicts in the Klamath Basin
- [2010 KBRA](#) –The KBRA was designed to balance water use between environment and agriculture, fund fisheries restoration, improve irrigation infrastructure, and provide economic development programs for local communities. It also provided funding for the UKBCA. The KBRA expired in 2015 due to inaction in the U.S. Congress.
- [2014 UKBCA](#) – The Upper Klamath Basin Comprehensive Agreement was designed to resolve competing water claims in the Upper Basin, by balancing environmental flows and certainty for irrigated agriculture. It provided for habitat restoration programs as a mechanism for landowners to receive permits under the Endangered Species Act and created economic development opportunities for the Klamath Tribes. The agreement is no longer active due to lack of funding, a result of the KBRA's expiration.
- [2016 KPFA](#) – The Klamath Power and Facilities Agreement Distinct addresses the continued operations of other PacifiCorp facilities that will be transferred to Bureau of Reclamation. The agreement also commits parties to protect Klamath Basin irrigators from financial and regulatory burdens associated with fish returning to the Upper Klamath Basin and also commits parties to continue efforts to resolve water disputes.
- [2016 Amended KHSA](#) – After the KBRA expired, parties signed an amended KHSA in April 2016. This new agreement provides for decommissioning the hydroelectric dams through the traditional Federal Energy Regulatory Commission (FERC) approval process.

Klamath River Renewal Corporation (KRRC)

- Under the amended KHSA, the KRRC will take title to the dams and undertake the actual project design and removal activities
- The Governors of California and Oregon, the Karuk and Yurok Tribes, and conservation and fishing groups that signed the amended Agreement and appointed the KRRC's Board of Directors.



www.klamathrenewal.org

Anticipated Project Timeline
Klamath River Renewal Project

Valuable Fisheries That Would Benefit



Coho – Listed ESA threatened in 1997.



Chinook -

- **Spring run was once dominant above UKL, now remnant**
- **Fall Run is now predominant commercial/tribal/sport run. Low numbers in 2006 lead to fishery restrictions.**



Lamprey – Important to Tribes.



Steelhead – Important sport fish, trout above Iron Gate could revert to anadromy if passage provided.



Redband Trout – Important sport fish, listed sensitive species in Oregon.

Passage Value Gained

<u>Species</u>	<u>RM Habitat Gained</u>	<u>Number of Important Tributaries</u>
Coho Salmon	58	7
Chinook	420	49
Steelhead	420	49
Pacific lamprey	>516	>9
Redband trout	420 miles of habitat connectivity	49

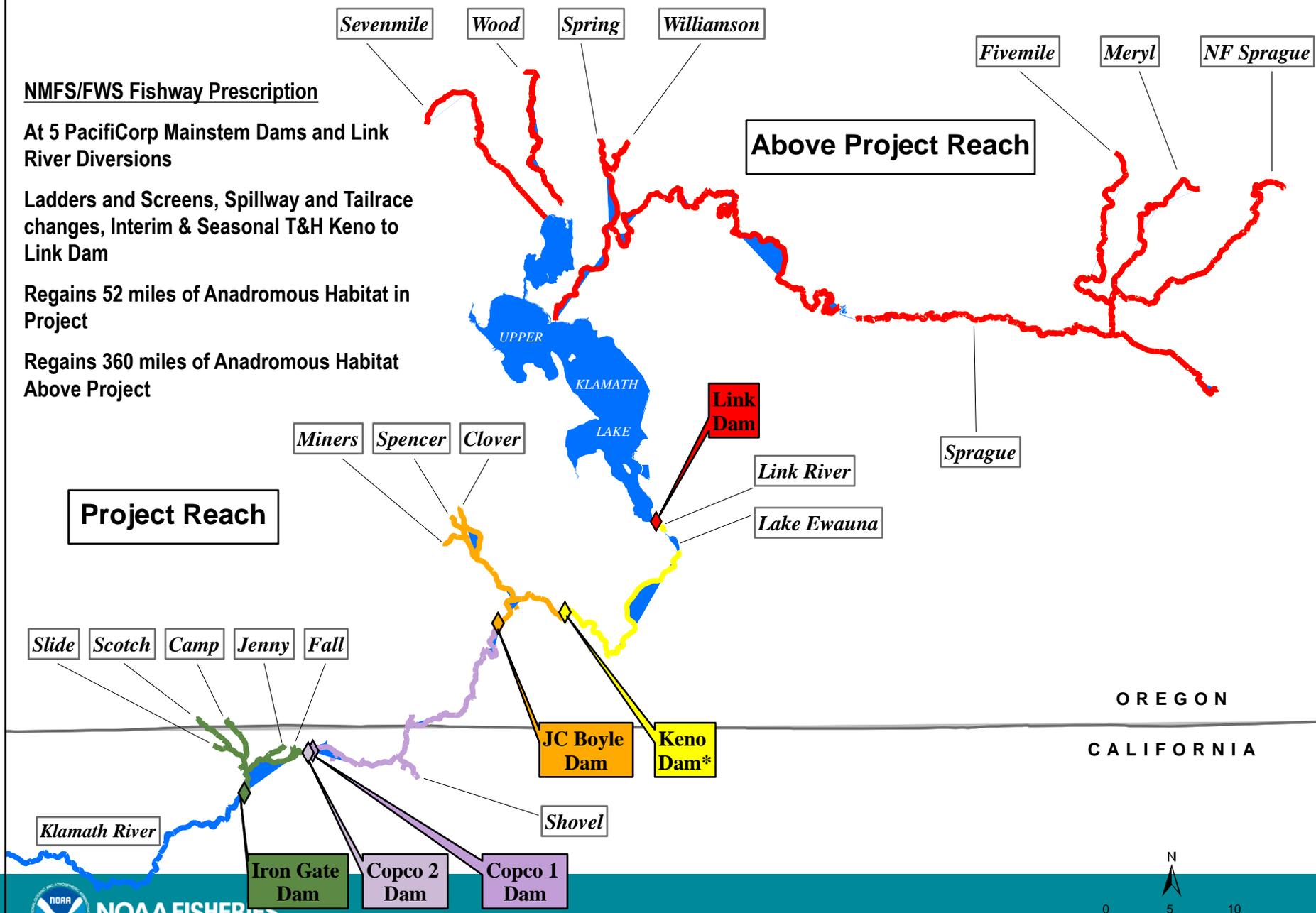
NMFS/FWS Fishway Prescription

At 5 PacifiCorp Mainstem Dams and Link River Diversions

Ladders and Screens, Spillway and Tailrace changes, Interim & Seasonal T&H Keno to Link Dam

Regains 52 miles of Anadromous Habitat in Project

Regains 360 miles of Anadromous Habitat Above Project



*Keno Dam currently supports fish passage

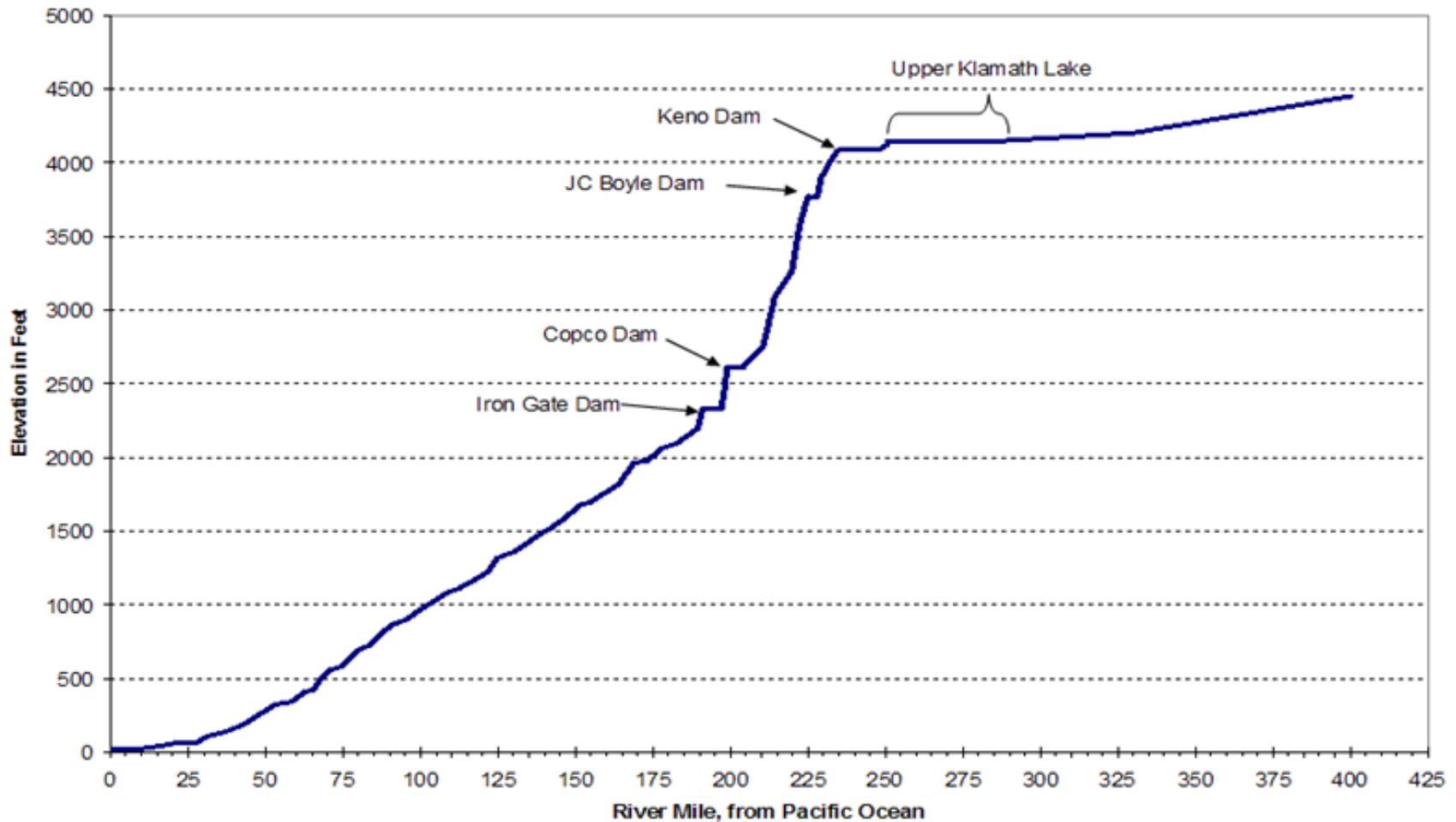
Socio-Economic Benefits of Dam Removal

- **Dam removal would produce substantial, positive effects on recreational, commercial, and tribal fisheries harvest quotas**
- **Commercial fishing** –Troll harvest of Klamath Chinook salmon is expected to increase by an average 43 percent with dam removal and an estimated annual net revenue increase of \$7.296 million (2012 dollars) or a total of \$134.5 million for the 50-year period of analysis.
- **In-river sport fishing** –In-river recreational harvest of Klamath Chinook salmon is expected to increase by 8 percent resulting average annual net economic value would increase \$126,000 per year (2012 dollars).
- **Ocean sport fishing** - The ocean recreational harvest of Klamath Chinook salmon is expected to increase by 43 percent and result in increased annual net economic value of \$2.865 million (2012 dollars).
- **Dam removal activities would generate \$7 million in associated jobs and earnings**
- **Dam removal would produce positive effects on traditional tribal ceremonial and fishing practices above and below Iron Gate Dam**

Fishery Benefits of Dam Removal

- **Klamath dams block access to over 400 miles of habitat for federally-listed coho salmon, commercially important Chinook salmon, steelhead, and culturally-important lampreys**
- **Dam removal will restore the maximum spawning and rearing habitat for salmon and lampreys**
- **Dam removal will restore maximum habitat and habitat connectivity for resident trout**
- **Dam removal will improve water temperature, water quality, and dissolved oxygen conditions for salmon in the Klamath River**
- **Thermal refugia under reservoirs will be restored**
- **Aquatic insect food supply for salmon and trout will increase**
- **Spawning gravel for salmon and trout will increase**
- **Crowding, delay, or injury of migrating fish at dams will be eliminated**
- **Fish disease downstream of Iron Gate Dam will likely be reduced**
- **Entrainment or impingement of federally-listed coho and suckers will be eliminated**

A River Up-Side-Down



Sediment Facts

- Because of Klamath Basin geology, little sediment has accumulated behind the dams compared to other systems
- 97% of the sediment is fine grained sand, silt or clay and the majority is algae
- Steep, bedrock canyons below dams assure sediment will move quickly
- No contaminants of consequence in any sample
- Deposition of any coarse sediment with potential to increase flood elevations highly unlikely
- Only 20% (4 million cubic yards) of sediment accumulated behind the dams will mobilize
- Majority of sediment transported out in a few weeks
- No demonstrated benefit to sequencing dam removal
- Conservative estimates suggest simultaneous removal of four dams will generate lethal concentrations of sediment for fish the first winter for a few weeks



Elwha Dams

Washington

Kootenai River

Montana

Condit Dam

Milltown Dam

Stearns Dam

Oregon

Idaho

Rogue Dams

Snake River



Klamath Dams

Utah

Nevada

San Clemente Dam

California

What We Have Learned from Other Dam Removals

- Control of invasive/noxious weeds is critical to short-term and long-term success of vegetation
- Revegetation with native plants, preferably larger sizes to reduce browse
- Irrigation or water source is critical for active revegetation plans
- Maximize initial, natural evacuation of sediment, stabilize remaining sediment
- Minimize hazards in reservoir and downstream

Restoring the Reservoir Footprint

RECLAMATION *Managing Water in the West*

Technical Report No. SRH-2011-19

Reservoir Area Management Plan for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration

Klamath River, Oregon and California
Mid-Pacific Region



U.S. Department of the Interior
Bureau of Reclamation

June 2011

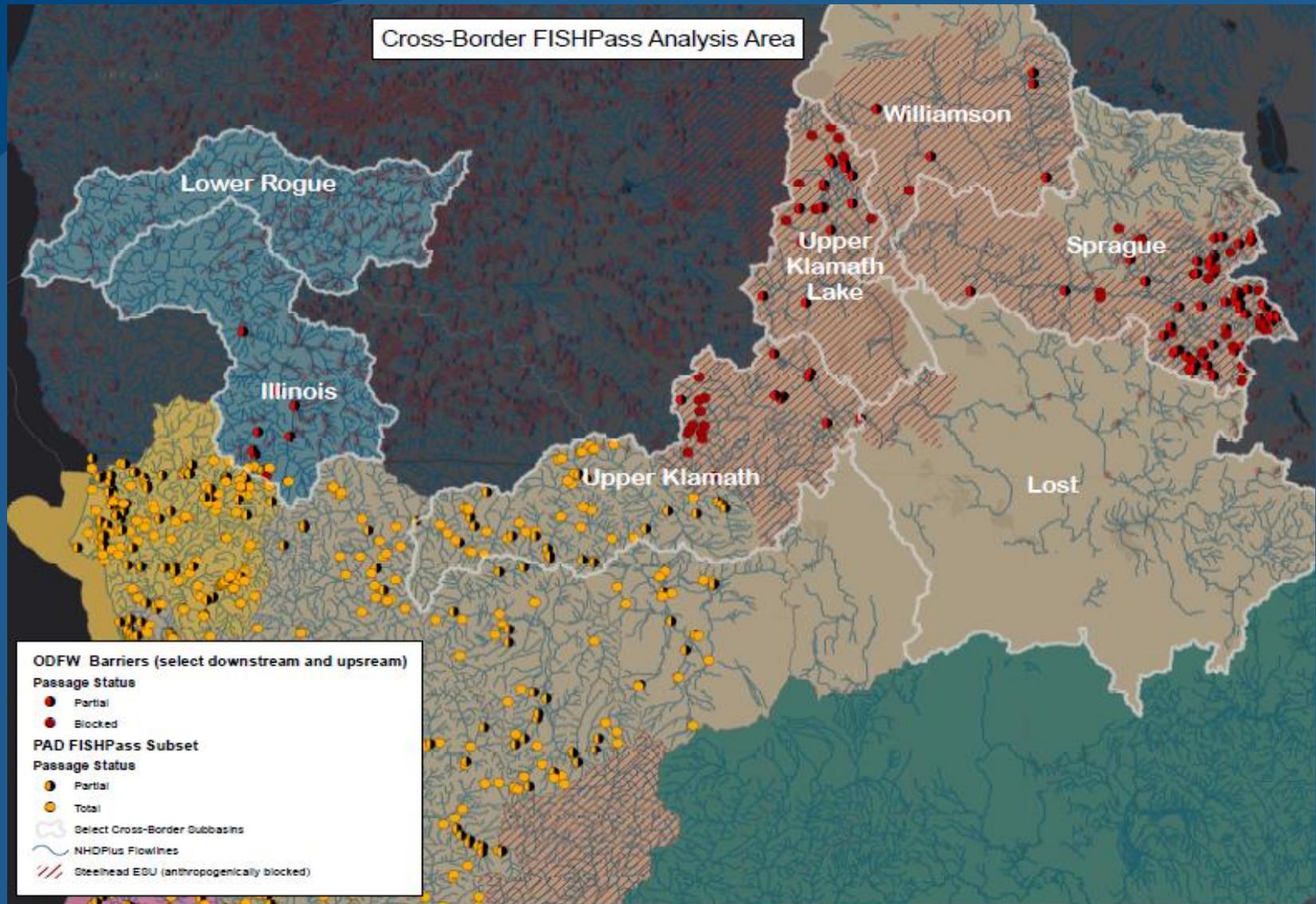
Period	Goal	Objective	Potential Project
<i>Pre-construction period:</i>	Control invasive weeds, and eliminate the invasive seed bank.	Reduce and minimize the local sources of invasive weeds.	A weed management program implemented under KBRA and with County involvement
<i>Construction period: (0 to 1 year)</i>	Natural erosion of reservoir deposits, transport via the river, dispersal in the ocean.	Maximize erosion of reservoir deposits during drawdown	Allow erosion of deposit during reservoir drawdown. Do not stabilize reservoir deposit.
<i>Short-term: (1-5 years after dam removal.)</i>	Limit windblown dust and surface erosion from reservoirs. .	Less than 25% of the reservoir areas will be exposed to erosion.	Active planting of native grasses and other species.*
	Establish native vegetation.*	75% of the reservoir areas will have native vegetation cover.	Active planting of native grasses and other plant species.*
	Control invasive weeds on exposed areas.	Maintain vegetative cover at less than 5% for weed species.	Apply herbicides the first year following dam removal. Monitoring and management of weeds in subsequent years.
	Produce habitat along riparian edges for salmonid smolts.	Establish a Minimum of 400 live shrub or tree species per acre within riparian-bank areas.	Active planting of native shrub and tree species within riparian-bank areas.*
<i>Mid-term: (5-10 years).</i>	Fish habitat within reservoir reaches similar to reaches found u/s or d/s.	Spawning and rearing habitat performing within 25% of similar u/s or d/s habitats.	Passive rehabilitation of riffles and pools. Natural resupply of gravel to reservoir reaches.
<i>Long-term: (10-50 years.)</i>	Establish sustainable riparian and fish habitat	No significant maintenance required to sustain fish habitat	Monitor vegetation growth along riparian corridor. Limit encroachment into riparian corridor.

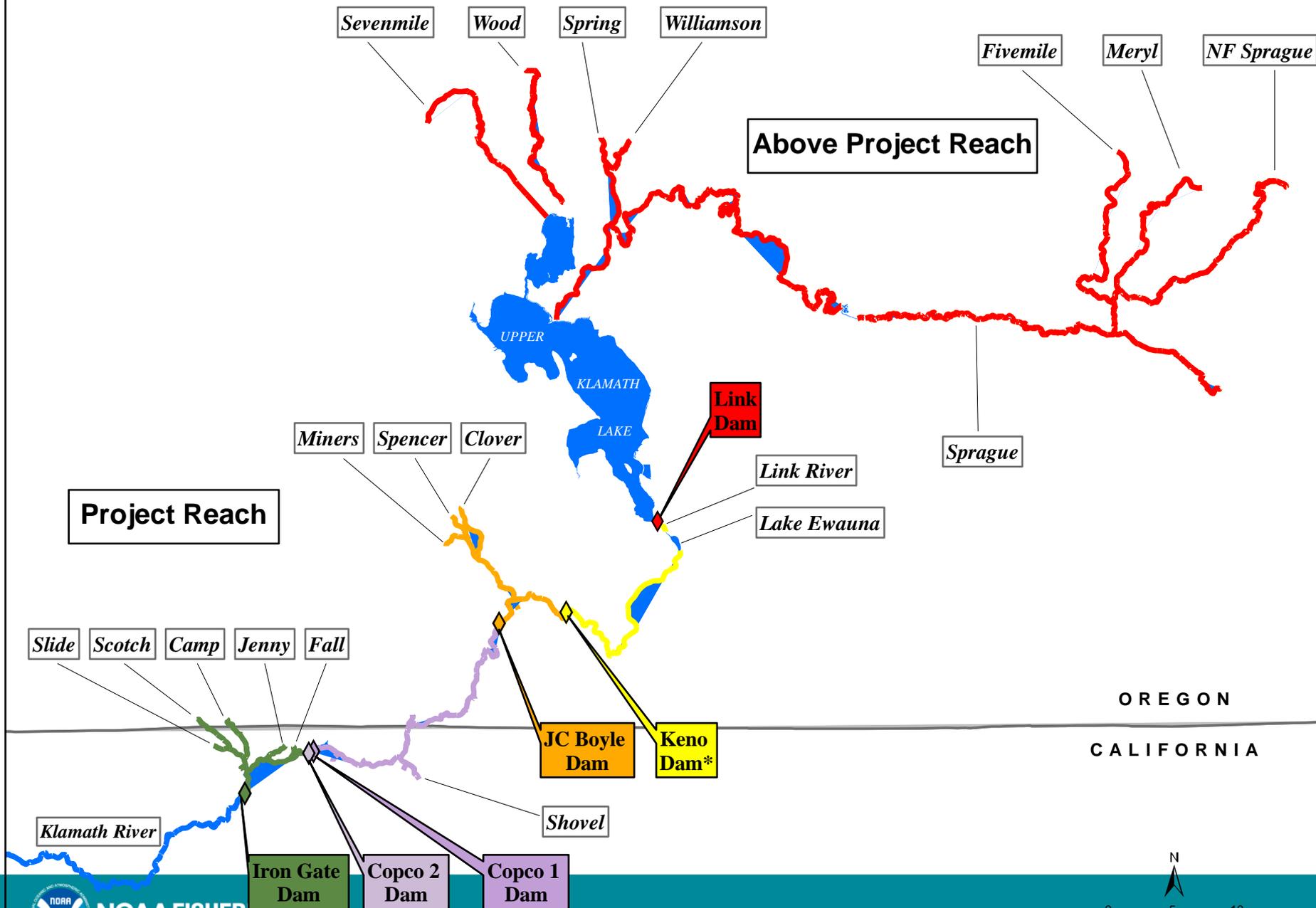
* Native and genetically appropriate planting materials from local sources to be used if feasible.

Upper Basin Restoration

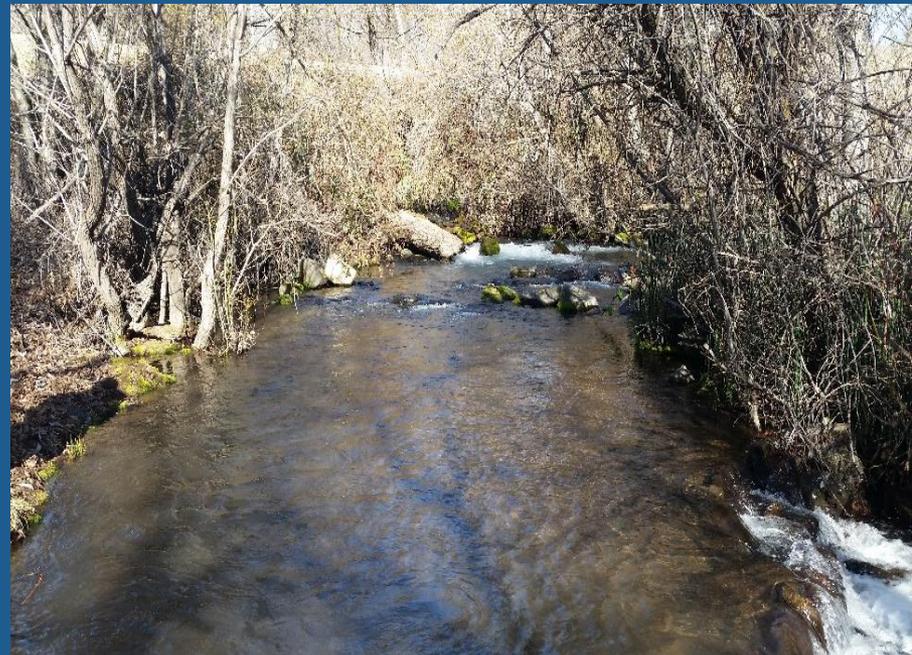
- Working with ODFW and others to address upper basin issues
- 29 Screening Projects identified
- 40 Fish Passage Projects identified
- Focus on Fall Creek, Jenny Creek, Shovel Creek and Spencer Creek for coho
- Focus on Wood, Williamson and Sprague Rivers for Spring Chinook

Additional Passage Opportunities





Upper Basin Restoration



Fall Creek



Upper Basin Restoration



Shovel Creek



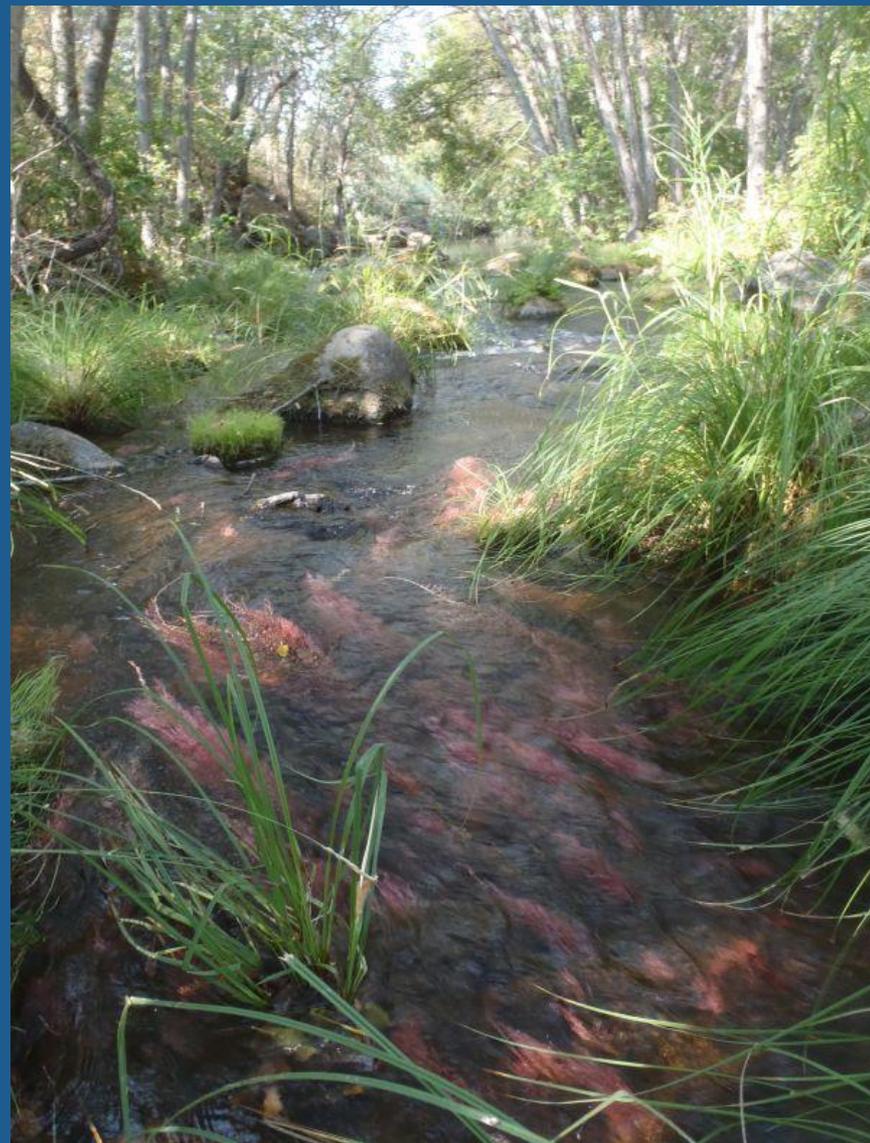
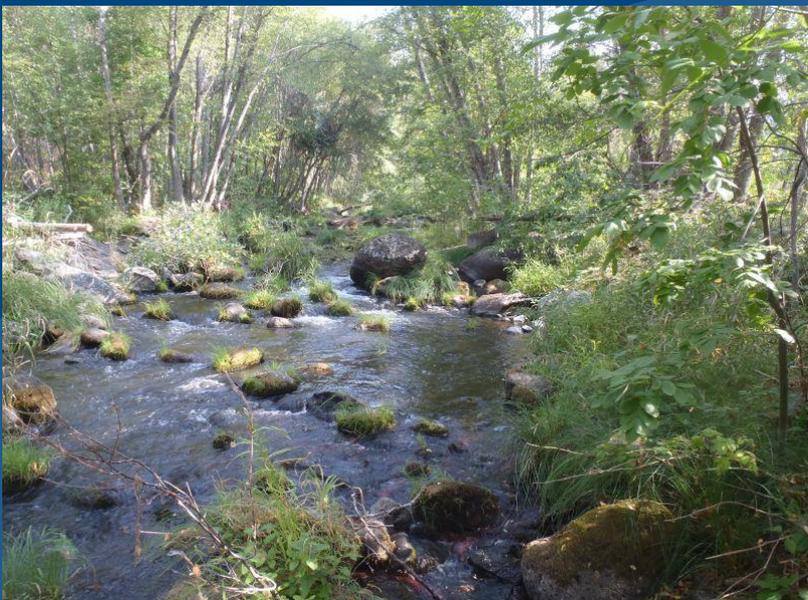
Upper Basin Restoration



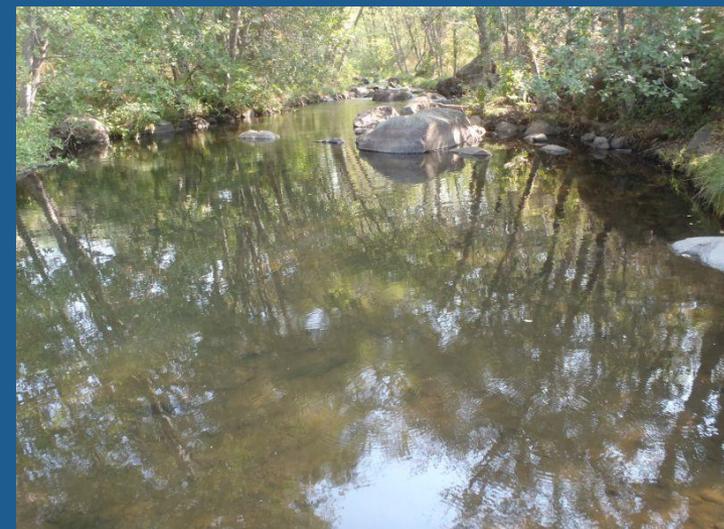
Spencer
Creek



Upper Basin Restoration



Jenny
Creek



Upper Basin Restoration

Wood River, Sprague River, Williamson River



Upper Basin Restoration Challenges



- Lack of Funding
- Lack of Prioritization
- Water quality in Lake Ewauna and Upper Klamath Lake
- Keno and Link River Fish Passage
- ODFW Spring Chinook Reintroduction

Questions?

