

Klamath Dam Removal – Meeting the Moment and Planning for the Future



A Concurrent Session at the 41st Annual Salmonid Restoration Conference
Santa Rosa, California, March 26-29, 2024

Session Coordinator: Bob Pagliuco, Marine Habitat Resource Specialist,
NOAA Fisheries Restoration Center



The Klamath River Basin once supported the third most productive salmon runs on the contiguous U.S. Pacific Coast, and is home to runs of spring- and fall run Chinook salmon, Coho salmon, and steelhead, in addition to populations of Pacific lamprey, eulachon, green sturgeon, and resident native fishes such as bull trout, redband trout, and several species of suckers. The Klamath Basin is home to several tribes, including the Yurok, Hoopa, Karuk, Quartz Valley, Shasta Indian Nation, Modoc Nation, and Klamath Tribes, who are inextricably tied to this land for harvesting plants, terrestrial animals, and fish for sustenance and cultural practices. The degradation of habitat and decline of these culturally important species have significantly altered the tribes' major food sources, cultural practices, and way of life.

The Klamath River dam removal project is the largest dam removal project in the country and will remove four mainstem dams. This monumental project will provide over 420 miles of reconnected habitat, improved water quality conditions, a reduction in blooms of toxic blue-green algae and disease and is expected to increase commercial and sport fisheries while producing positive effects on traditional tribal ceremonial and fishing practices.

This session will highlight the current state of dam removal, science and monitoring, future restoration needs, and what lies ahead following implementation of the largest river restoration project in the country.

Presentations



- **Klamath Dam Removal—Deconstruction Update**
Mark Bransom, CEO, *Klamath Renewal Corporation*Slide 4
- **Klamath Dam Removal—Restoration Update**
Dave Coffman, PG., *Northern California and Southern Oregon RES*.....Slide 68
- **A Release Study Assessing the Survival of Juvenile Spring-Run Chinook Salmon in the Upper Klamath River Basin to Inform Reintroduction**
Rachelle Tallman, Ph.D. Candidate, *University of California, Davis*Slide 105
- **The Klamath Basin Fisheries Collaborative: Science and Collaboration across a Newly Connected Basin**
Summer Burdick, *United States Geological Society*, and Betsy Stapleton, Scott River Watershed Council.....Slide 128
- **Evaluating the Effectiveness of Dam Removal on the Klamath River Using SONAR and Radio Telemetry**
Damon Goodman, *California Trout*.....Slide 147
- **Klamath Dam Removal and The Future of Dam Removal in California: 4 Down, 150 to Go**
Ann Willis, *American Rivers*.....Slide 163



SRF 41st Conference

SRF Klamath Dam Removal Session

Drawdown Phase Update – Mark Bransom

March 28, 2024

Presentation Outline

- **General Project Overview**
- **Pre-Drawdown Construction Overview**
- **Initial Drawdown Phase**
- **Drawdown Construction Activities Status**

General Project Overview



Copco No. 1 | CA



Copco No. 2 | CA



JC Boyle | OR



Iron Gate | CA

Regulatory: 70 + Approvals/Agreements

FEDERAL

15+

FERC, USACE,
USFWS,
NMFS, NEPA
(3), NPS, BLM,
EPA

STATE

30+

401s, DSOD, S106,
NPDES, DSL,
Clean Fill, Haz
Waste, Coastal
Comm, Fire, Dust,
Air Quality, WQ
Plans

COUNTY

25+

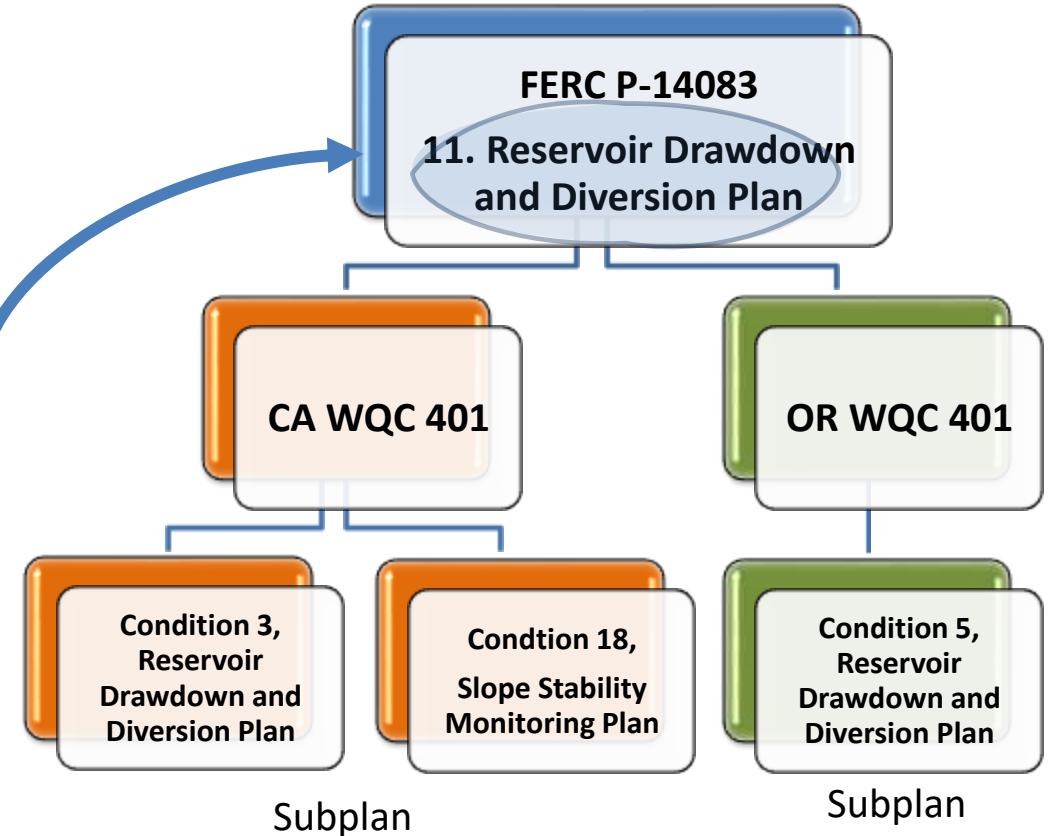
MOU's, Drilling,
Haz Waste,
Signs, Septic,
Encroachments,
Demo, Bridges,
Wells, Waterlines

54 Management Plans

Sources: CWA 401s, FEIR, FEIS, MOUs

16 FERC “Parent Plans”

1. Aquatic Resources Management Plan
2. Construction Management Plan
3. Erosion and Sediment Control Plan
4. Hatchery Management and Operations Plan
5. Health and Safety Plan
6. Historic Properties Management Plan
7. Interim Hydropower Operations Plan
8. Recreation Facilities Plan (CA)
9. Remaining Facilities Plan (OR)
10. Reservoir Area Management Plan
11. Reservoir Drawdown and Diversion Plan
12. Sediment Deposit Remediation Plan
13. Terrestrial and Wildlife Management Plan
14. Waste Disposal and Hazardous Materials Plan
15. Water Quality Monitoring and Reporting Plan
16. Water Supply Management Plan



27 subplans (CA) 11 subplans (OR)

Compliance Management

- **Master compliance database for 7, 30, and 90-day outlook**
- **Over 1200 actions for tracking, assigning and reporting**
- **Field-based driven, with Compliance Management Team to manage upsets**

Dam Removal Project Timeline

	2022	2023 Pre- Drawdown	2024 Drawdown	2025	2026	2027	2028	2029	2030
Regulatory Approval Acquisition	█								
Pre-Drawdown Year Activities		█							
Drawdown Year Activities			█						
Post-Drawdown Year Activities				█					
Final License Surrender Order									█

Pre-Drawdown Year:

- Dam/tunnel modifications
- Road/Bridge improvements
- CoY Waterline Replacement
- Fall Crk Hatchery Construction
- Water Quality/Quantity Monitoring
- Copco No. 2 Dam Removal

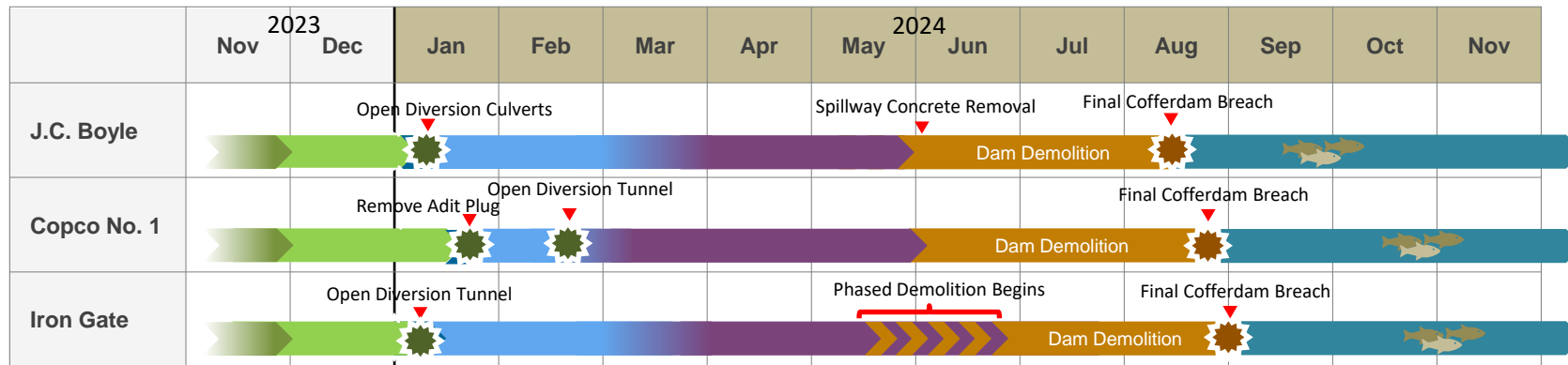
Drawdown Year:

- Dam and infrastructure removal
- Initial reservoir restoration

Post-Drawdown Years:

- Site Restoration
- Monitoring/Adaptive Management

Stages of Reservoir Drawdown



1. Operational Drawdown:

Lowering reservoir to its minimum operating level

2. Initial Drawdown:

Reservoir water evacuation below the Operational Drawdown limits

3. Reservoir Refilling and Releasing Period:

Inflows exceed outflow capacity periodically, causing reservoir levels to rise and fall

4. Dam Demolition:

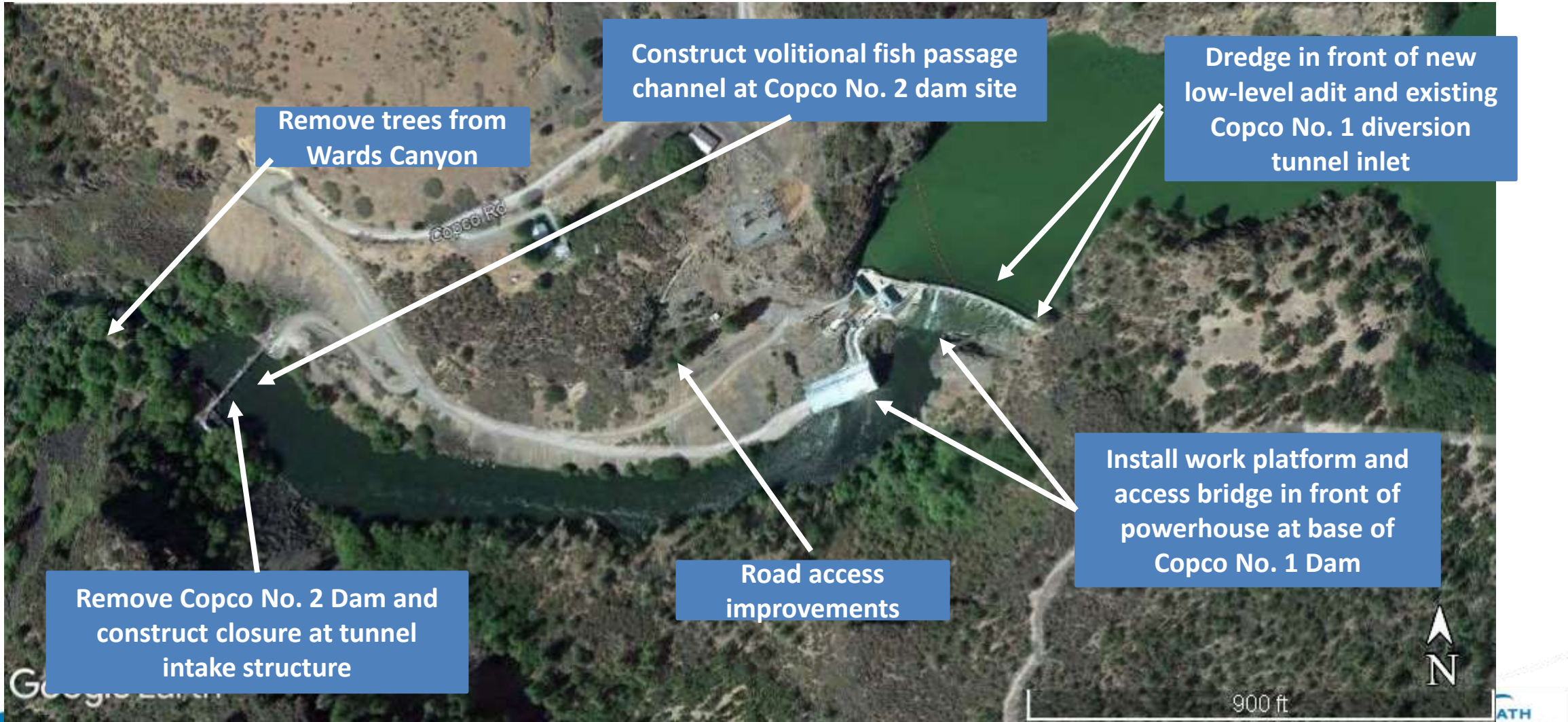
Reservoir water elevation remains at the top of the historic cofferdam while dam concrete and embankments are removed

5. Klamath River Reconnection:

Breaching of the historic cofferdam, allowing the river to permanently flow in a riverine condition

Pre-Drawdown Construction Overview

Pre-Drawdown – Copco Complex



Copco No. 1 – Progress Photos



Dredging and debris barges moored at Copco 1 Dam while dredging in front of the new low-level adit. Debris, including rock and timbers, can be seen in the debris barge.

17 September 2023



Offloading debris barge in dredging disposal area.
30 August 2023

Copco No. 1 – Progress Photos



Face of the plug round
after the last blast in the
Copco 1 adit.

26 September 2023

Copco No. 1 – Progress Photos



First section of steel extension pipe set in place at the Copco 1 low-level adit.

10 October 2023

Copco No. 1 – Progress Photos



General view of Copco 1 dam and powerhouse with progress on grouted riprap placement over the steel extension pipe.

8 November 2023

Copco No. 2 – Removal



Copco 2 dam site before
demolition.

13 June 2023

Copco No. 2 – Removal



Completed Copco 2 dam site.

23 January 2024

Copco No. 2 - Removal



Copco No. 2 Powerhouse – Progress Photos



Copco 2 steel penstock thrust blocks have been removed. Lower thrust block backfilled.

1 November 2023

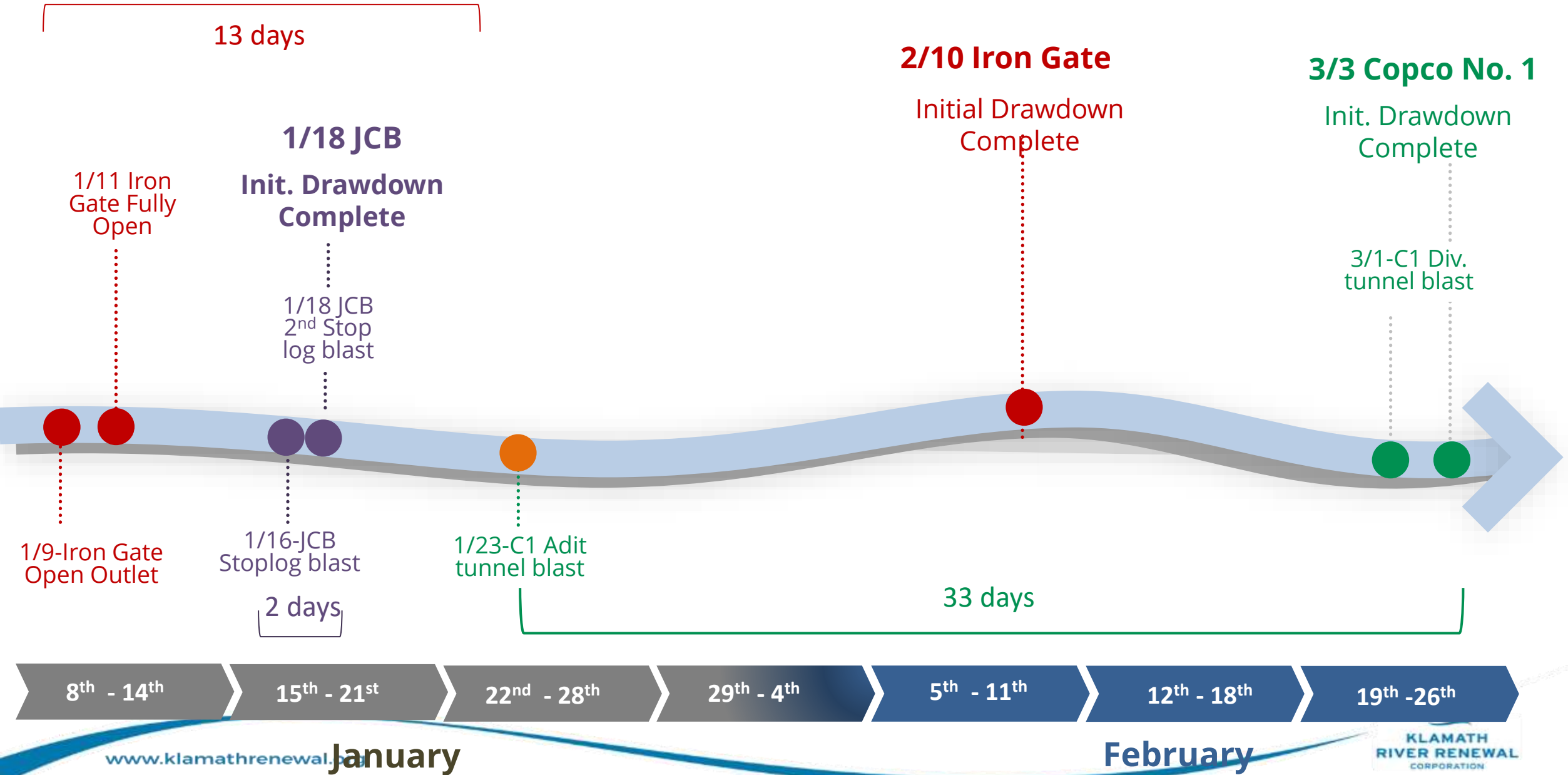


Copco 2 tailrace backfilled with rip rap

11 November 2023

Initial Drawdown Phase

Lower Klamath Project Initial Drawdown Schedule



JC Boyle – Drawdown Photos



Reservoir drawdown initiated after blasting the first diversion culvert.

16 January 2024

JC Boyle – Drawdown Photos



JC Boyle reservoir drawdown complete. Historic cofferdam located in the center of the image. 1200 cfs flushing flow in progress.

24 January 2024

Copco No.1 Initiation



Copco No. 1 – Drawdown Progress Photos



View of Copco No. 1
Powerhouse and river
channel after adit plug
blasted

23 January 2024

Copco No. 1 – Drawdown Progress Photos



View of Copco No. 1 Dam and reservoir after drawdown.

31 January 2024

Copco No. 1 – Drawdown Progress Photos



View of Copco Reservoir
after drawdown.

31 January 2024

Copco No. 1 – Drawdown Progress Photos



View of Copco No. 1 Dam and reservoir after drawdown.

31 January 2024

Copco No. 1 – Drawdown Photos



Looking downstream
towards Copco Dam
and Copco Cove.

15 March 2024

Copco No. 1 – Drawdown Photos



Klamath River
looking upstream
from Copco 1 Dam

15 March 2024

Iron Gate – Drawdown Photos



View of Iron Gate dam and reservoir before drawdown.

20 December 2023

Iron Gate Dam – Drawdown Progress Photos



Klamath River at Low Level
Outlet tunnel

5 February 2024

Iron Gate – Drawdown Photos



Iron Gate project site including dam (upper right), haul road (center), and waste disposal area (upper left). Note high water level due to ESA geomorphic releases.

15 March 2024

Iron Gate – Drawdown Photos



Klamath River at Scotch-Camp Confluence. Klamath River on the right. Note high water level due to ESA geomorphic releases.

15 March 2024

Iron Gate – Drawdown Photos



Jenny Creek tributary
looking downstream
towards the Klamath.

15 March 2024

Iron Gate – Drawdown Photos



Klamath River from Jenny Creek (left side) looking upstream towards Copco Village.

15 March 2024

Iron Gate – Drawdown Photos



Klamath River
downstream of
Jenny Creek.

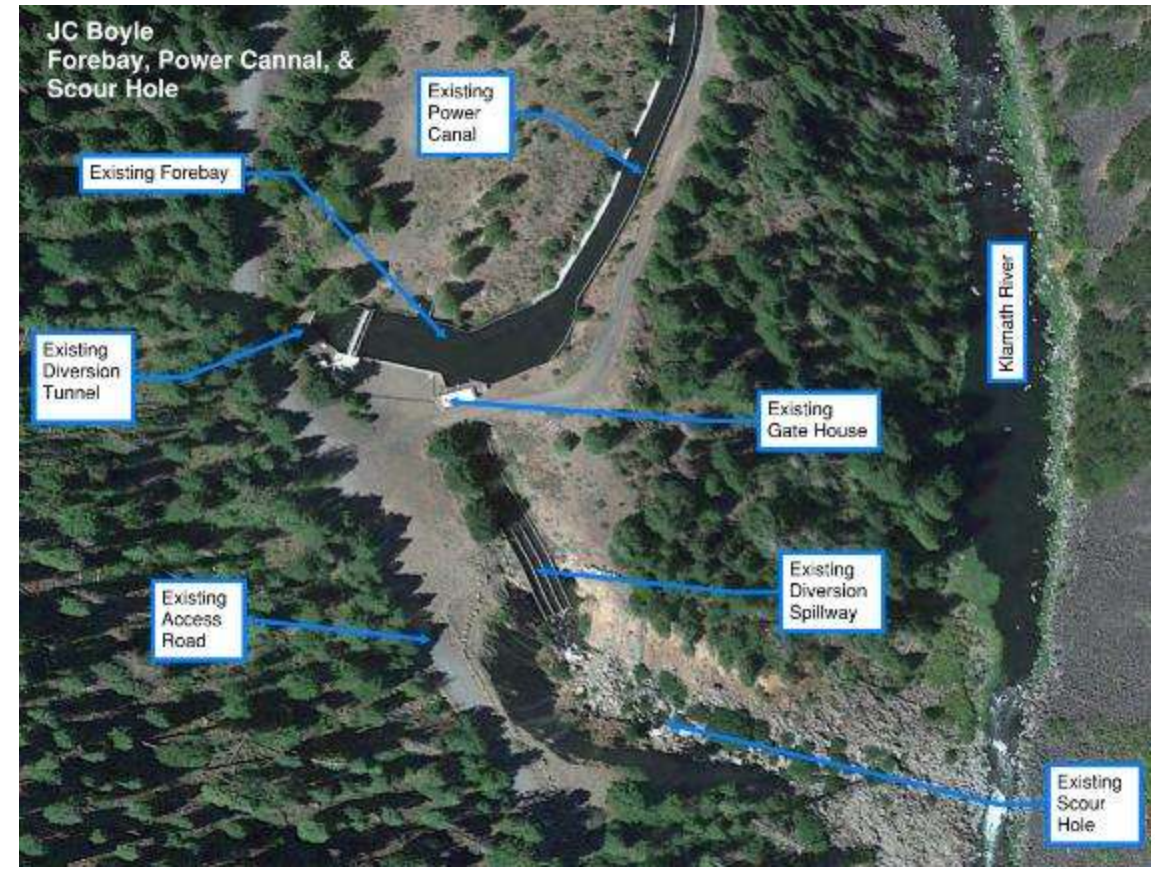
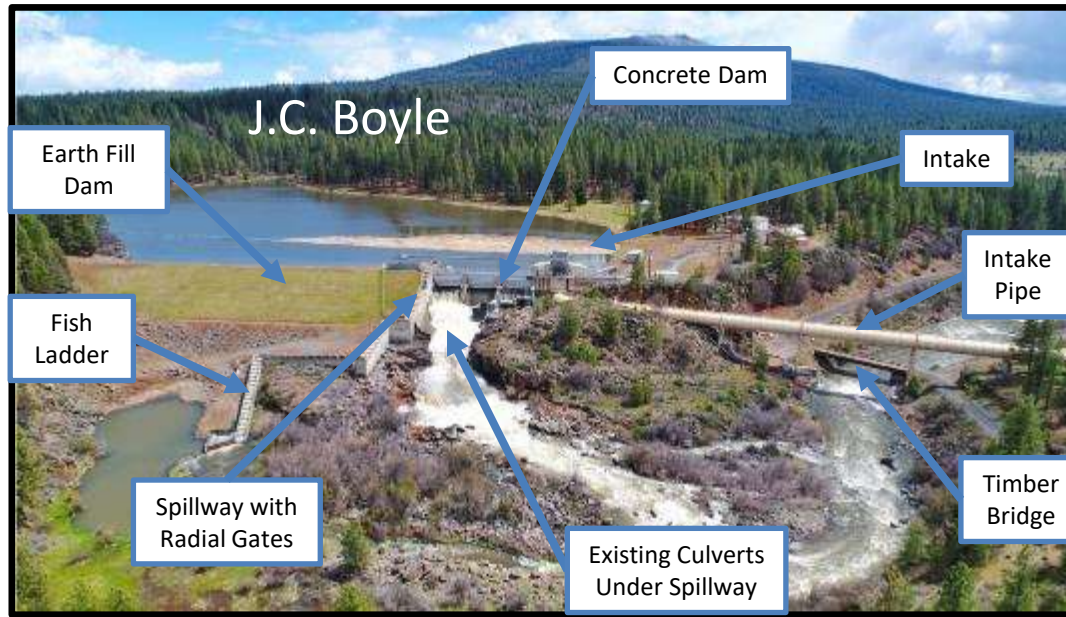
15 March 2024

Drawdown Construction Activities

2024 JC BOYLE FACILITIES REMOVAL

Other aspects of the JC Boyle facility removal include:

- Demolition of a 2-mile-long concrete power canal
- Fill of a large scour hole 2 miles downstream from the dam
- Removal of penstocks, powerhouse and ancillary buildings



JC Boyle – Construction Photos



JC Boyle reservoir sediment removal behind original cofferdam.

22 February 2024

JC Boyle – Construction Photos



JC Boyle Dam fish screen / intake building demolition.

13 February 2024

JC Boyle – Construction Photos



Interior electrical demolition in the JC Boyle powerhouse.

22 February 2024

JC Boyle – Construction Photos



JC Boyle substation equipment removal.

27 February 2024

JC Boyle – Construction Photos



JC Boyle headgate structure
demolition.

17 March 2024

JC Boyle – Construction Photos



JC Boyle power canal outer wall demolished and prepared for use as a haul road to the scour hole.

17 March 2024

JC Boyle – Construction Photos



JC Boyle forebay buildings demolished.

17 March 2024

JC Boyle – Construction Photos



JC Boyle powerhouse warehouse demolition complete.

17 March 2024

2024 – COPCO NO. 1 FACILITIES REMOVAL

- Concurrent with dam removal, existing structures at the Copco 1 facility will be decommissioned and removed.
- Facilities include the existing hydro-power generation equipment, the powerhouse structure itself, and several other buildings in the vicinity of the dam.



Copco No. 1 – Construction Photos



Overview of Copco 1 and 2 sites and the Klamath River between Copco 1 and 2.

15 March 2024

Copco No. 1 – Construction Photos



Tractionline winched excavator removing diversion tunnel gate operator concrete piers at Copco 1.

6 February 2024

Copco No. 1 – Construction Photos



Copco 1 penstock removal in progress in preparation for U500 road.

21 February 2024

Copco No. 1 – Construction Photos



Placing fill for U500 road at Copco 1.

27 February 2024

Copco No. 1 – Construction Photos



Demolishing the
Copco 1 intake
gatehouses.

1 March 2024

Copco No. 1 – Construction Photos



Mechanical and electrical demo in progress at Copco 1 powerhouse.

22 February 2024

Copco No. 1 – Construction Photos



Copco 1 diversion tunnel plug loaded and tied in.

1 March 2024

Copco No. 1 – Construction Photos



Copco 1 diversion tunnel after
blasting the plug.

1 March 2024

Test Blast at Copco No. 1



IRONGATE DAM RESERVOIR DRAWDOWN & REMOVAL

- Drawdown of Irongate Reservoir is using the existing low level outlet diversion tunnel.
- Beginning in approximately May/June of 2024, large trucks and excavation equipment will remove the dam embankment from the top down
- Approximately 1 million cubic yards will be excavated in total
- The existing spillway will be filled in with earthen materials
- The powerhouse equipment will be removed and the powerhouse demolished
- Once the dam and facilities are removed, a new river channel will be built in the dam footprint. This channel grading is expected to be completed by October 2024



Iron Gate – Construction Photos



First time cleaning the newly-exposed diversion tunnel intake structure trash racks at Iron Gate.

8 February 2024

Iron Gate – Construction Photos



Exposed diversion tunnel intake structure trash racks at Iron Gate.

12 March 2024

Iron Gate – Construction Photos



Iron Gate Powerhouse
demolition.

15 March 2024

Iron Gate – Construction Photos



Removal of Iron Gate power generation equipment.

20 March 2024

Fall Creek Hatchery - Complete



Fall Creek Hatchery progress.

Hatchery construction is complete, and the facility has been turned over to CDFW. Contractor has demobilized from site. Only minor punch list items remaining.

5 March 2024



Thank you

Restoration Elements of the Klamath River Renewal Project

*41st Annual Salmonid Restoration Federation Conference
March 27, 2024*



Dave Coffman, PG

Director, Northern California, and Southern Oregon

RES' Role on the Project

- Restoration Designer & Contractor
- Supporting regulatory approvals process
- Implementation of biological resource protection measures
- Long-term monitoring and maintenance to meet performance criteria
- Performance Guarantee



Restoration Goals



Free Flowing River

- Fish Passage

Stabilization of Remaining Sediments

- Supplemental Sediment Evacuation and Sediment Stabilization through Revegetation



Habitat Enhancement

- Large Wood Placement, Habitat Complexity Along Tributary Channels

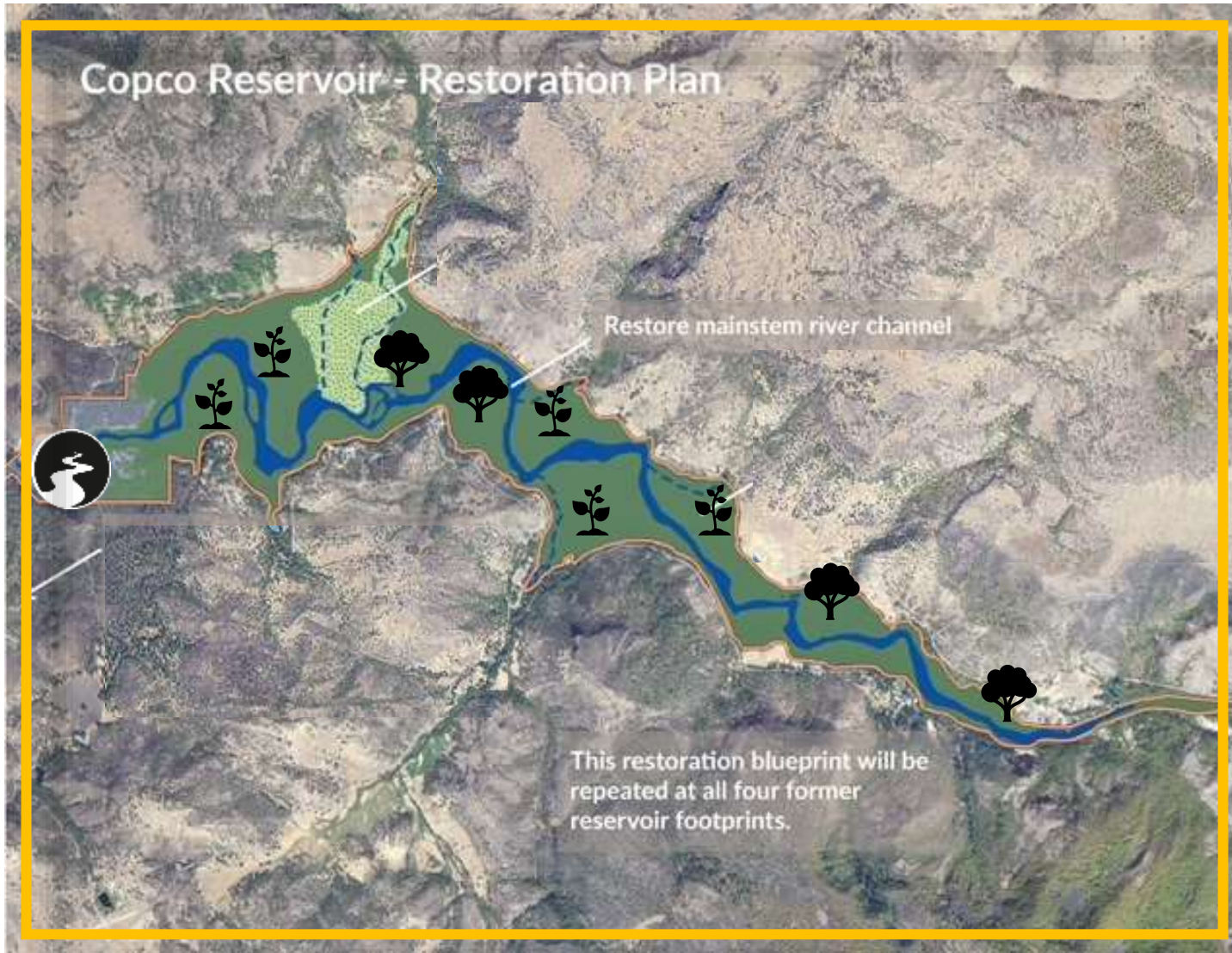
Restoring the Reservoir Footprint Framework: Copco Example







Copco Reservoir - Current Reservoir Footprint

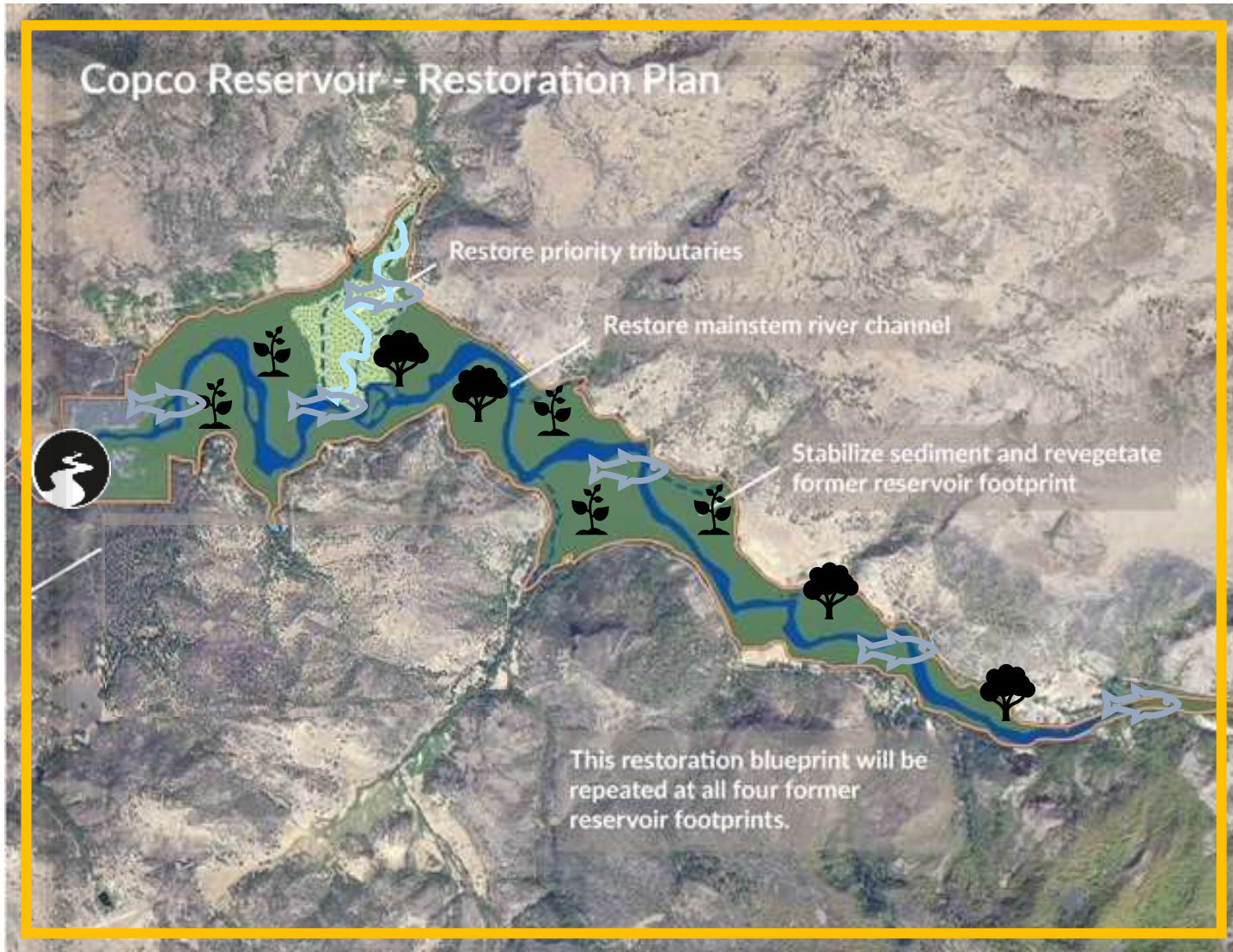
-  Draining reservoir restores Klamath River channel
-  Sediment evacuation







Restoring the Reservoir Footprint Framework: Copco Example



-  Draining reservoir restores Klamath River channel
-  Sediment evacuation
-  Revegetate former reservoir footprint
-  Dam removal contractor removes dam and footprint in channel restored

Restoring the Reservoir Footprint Framework: Copco Example



-  Draining reservoir restores Klamath River channel
-  Sediment evacuation
-  Revegetate former reservoir footprint
-  Dam removal contractor removes dam and footprint in channel restored
-  Restore priority tributaries
-  Monitor and ensure fish passable channels

Klamath River – Former Copco Lake



Klamath River – Former Copco Lake



Klamath River – Former Copco Lake



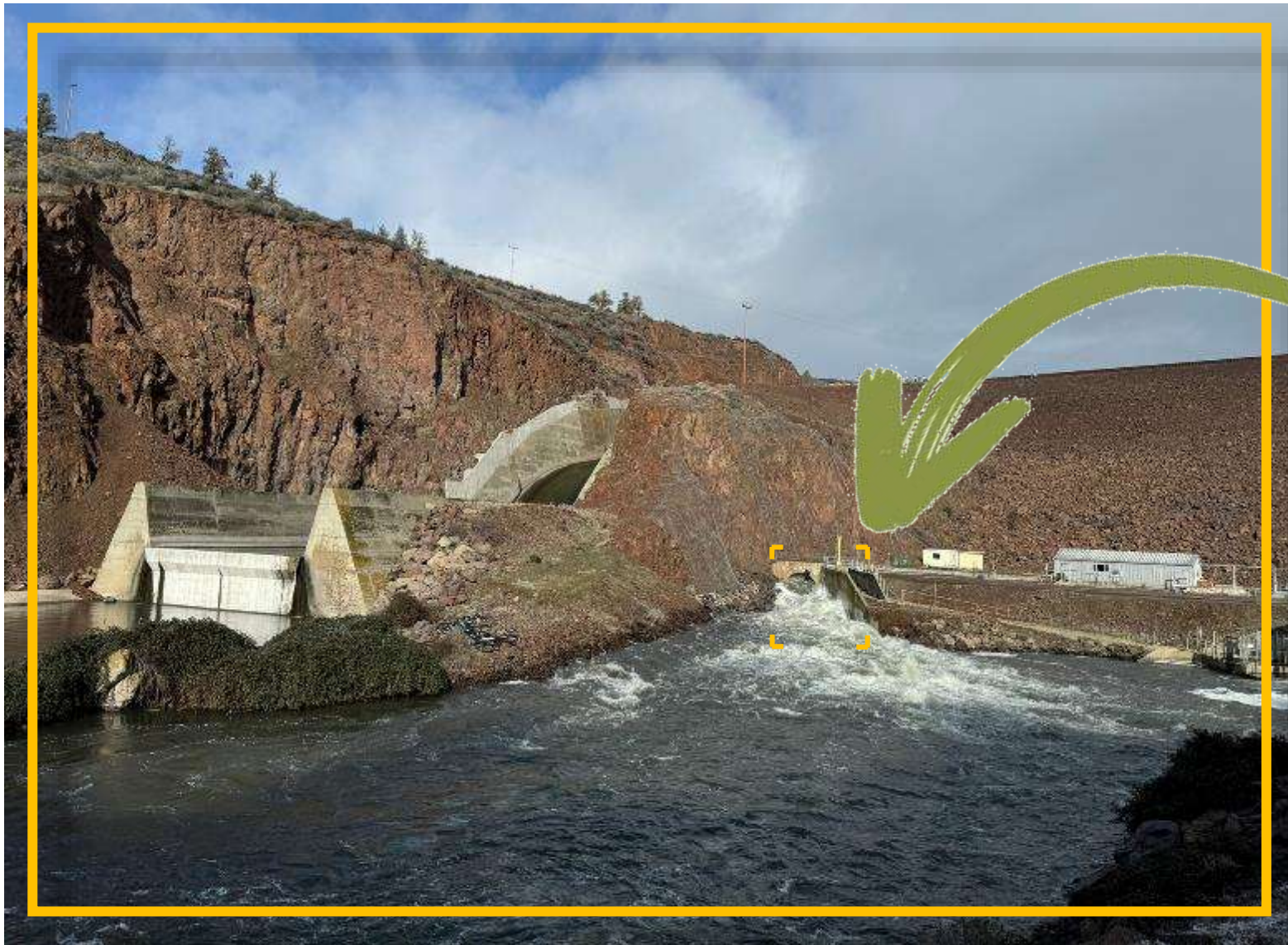
Klamath River – Former Copco Lake



An aerial photograph of the Iron Gate Dam, a large concrete structure with a massive reservoir behind it. The dam features a spillway on the left side where water is cascading. In the foreground, there are several circular structures, likely part of a water treatment or power generation facility, and a road. The surrounding landscape is arid with sparse vegetation and distant mountains under a clear sky.

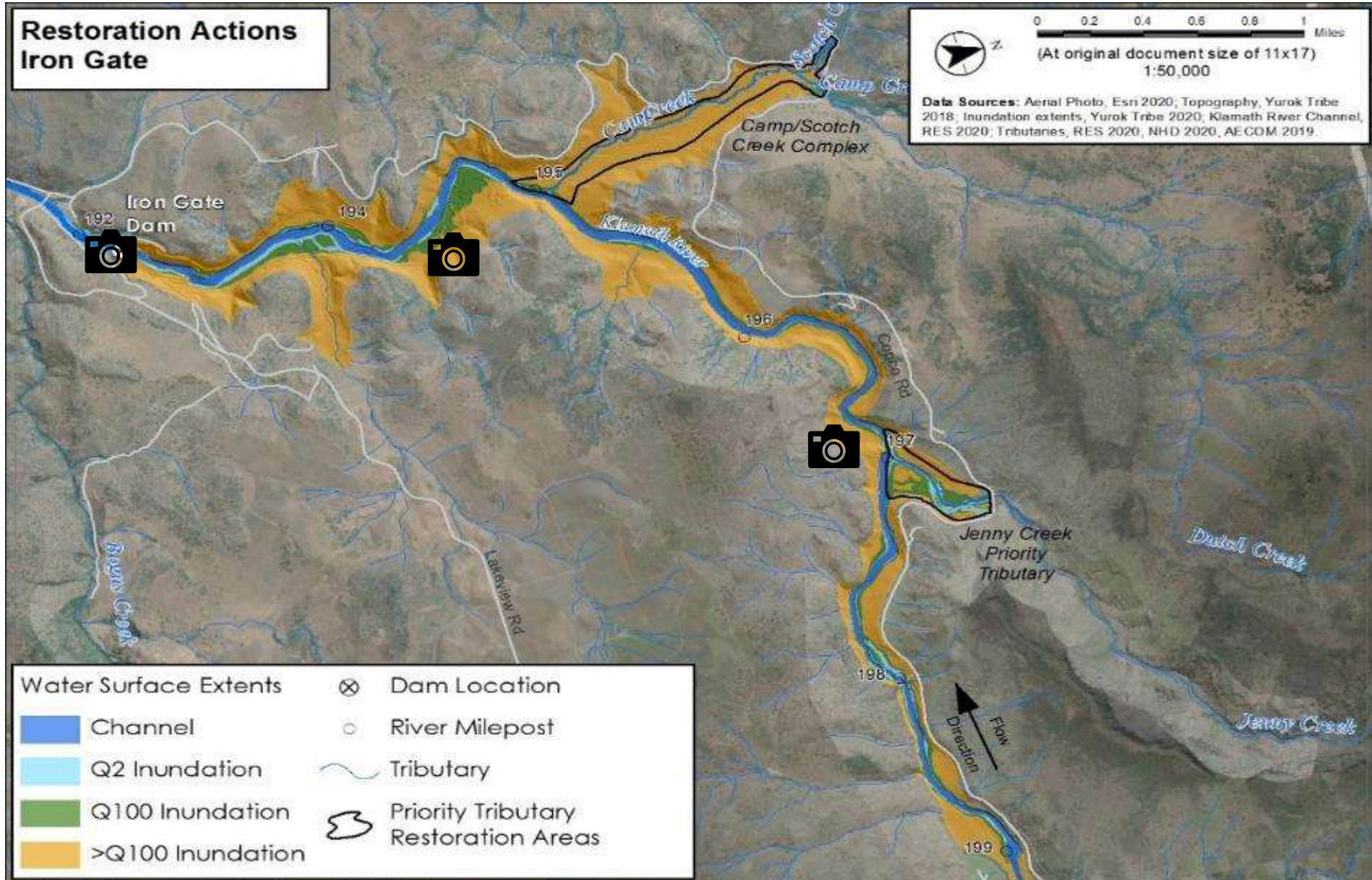
Iron Gate Dam

Iron Gate Drawdown





Iron Gate Reservoir Restoration Areas



Iron Gate



Iron Gate



Iron Gate



Iron Gate



Iron Gate – Jenny Creek



Iron Gate – Jenny Creek





Iron Gate Reservoir Restoration Areas

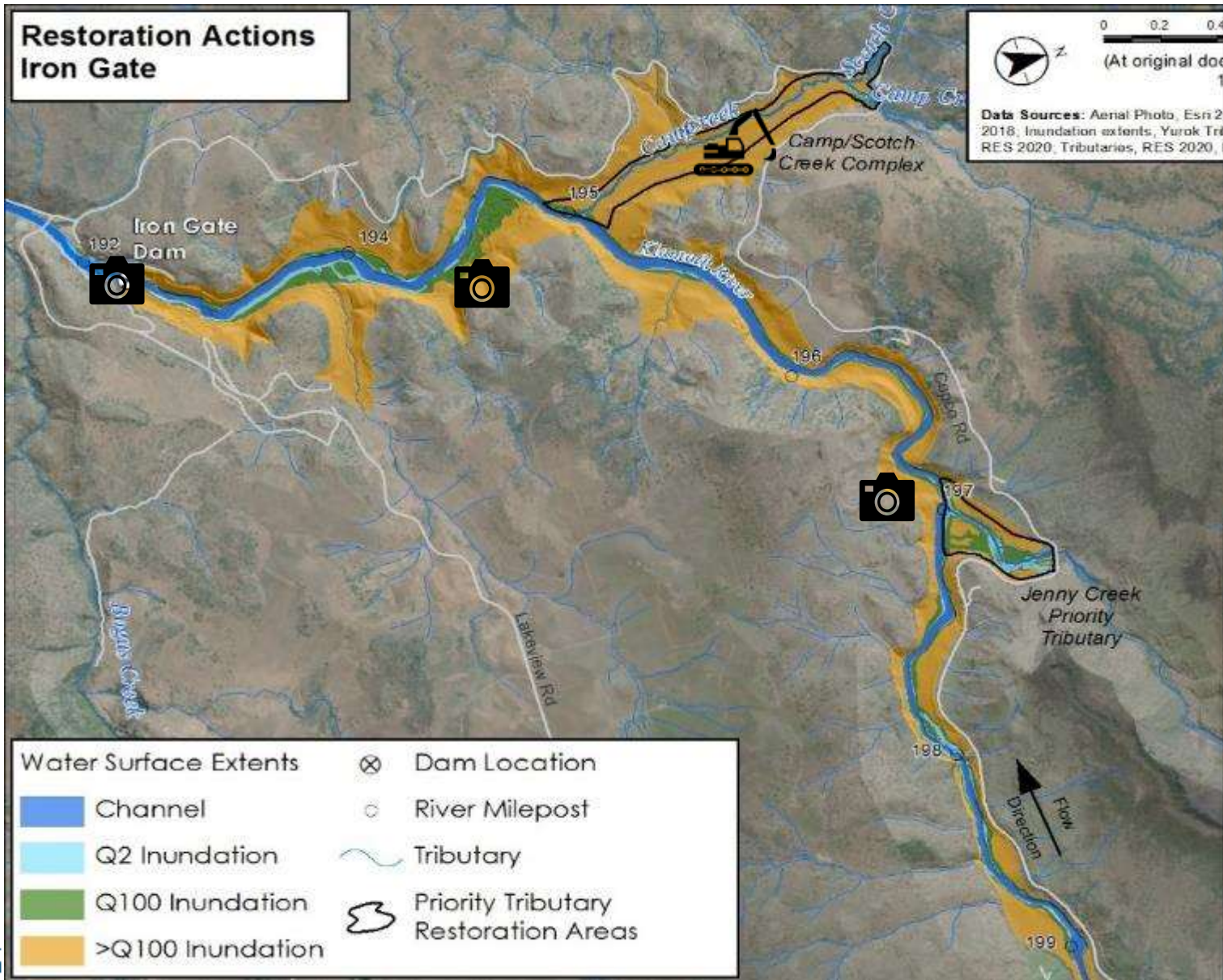
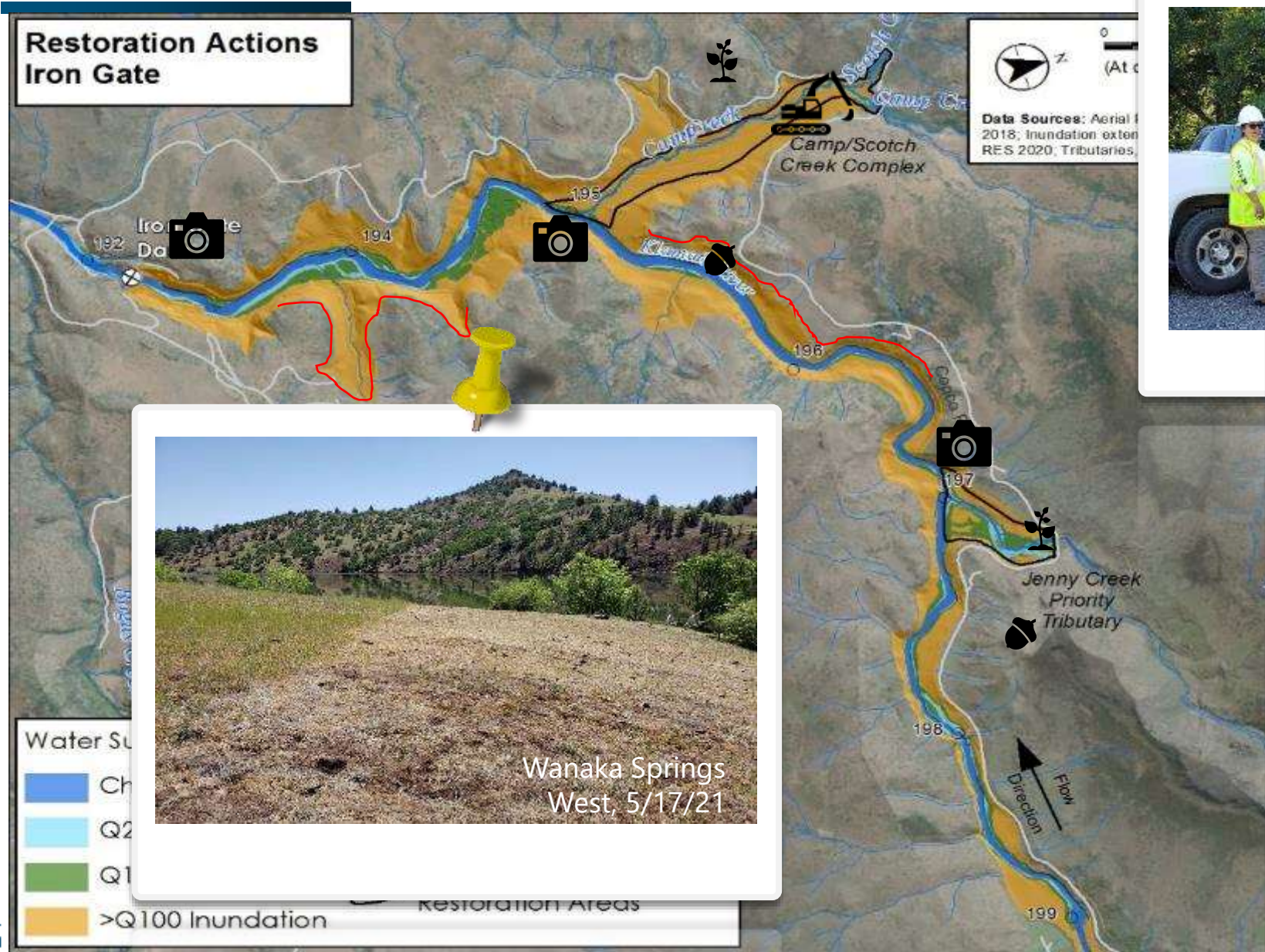


Photo: Dan Dilulio



Photo: Bob Pagliuco, NMFS

Iron Gate Reservoir Restoration Areas



Iron Gate Reservoir Restoration Areas



Iron Gate Reservoir Restoration Areas





Iron Gate Reservoir Restoration Areas





Iron Gate Reservoir Restoration Areas



August 2023



Iron Gate Reservoir Restoration Areas



February 26, 2024



Iron Gate Reservoir Restoration Areas



March 15, 2024



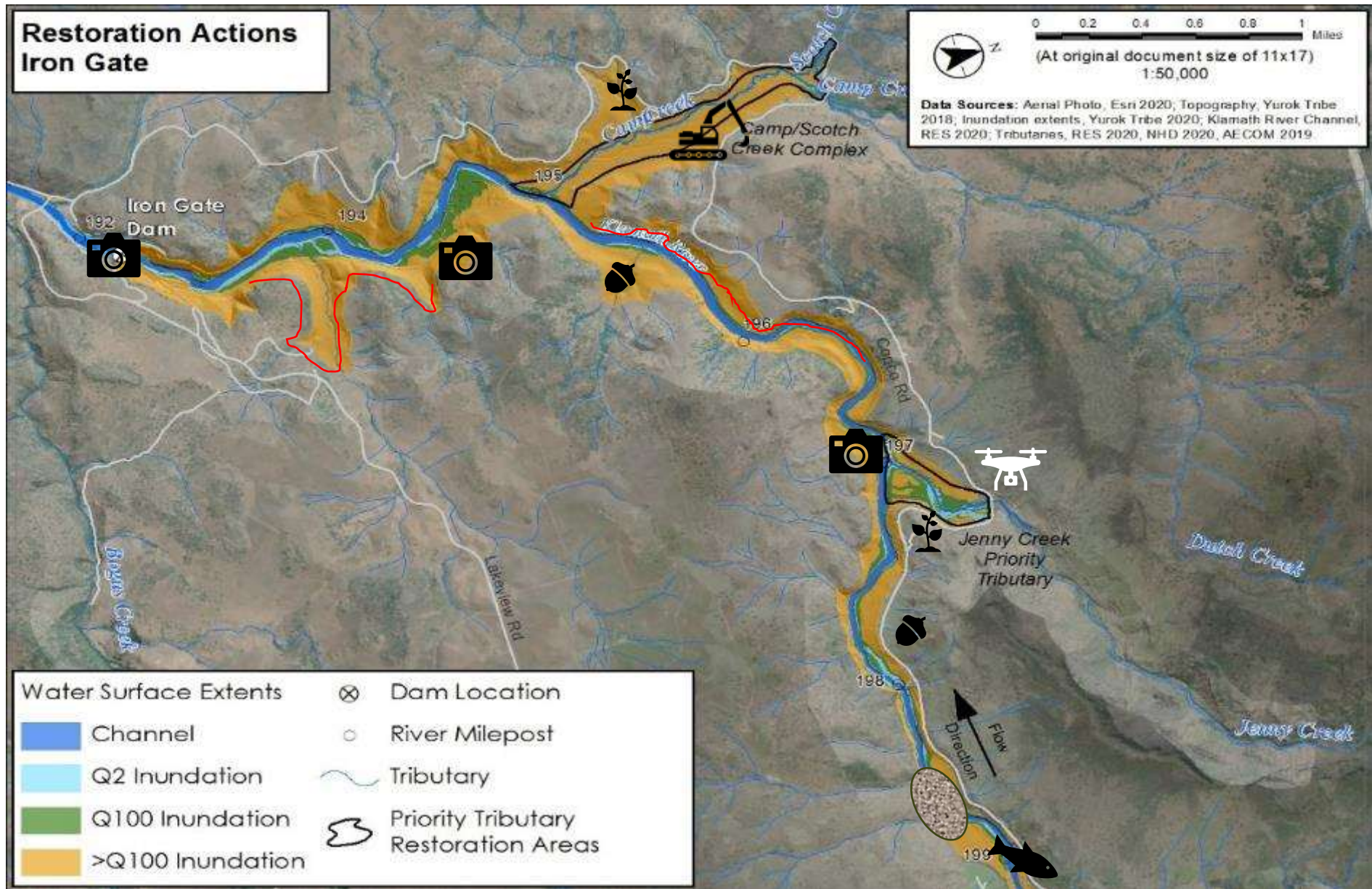
Iron Gate Reservoir Restoration Areas



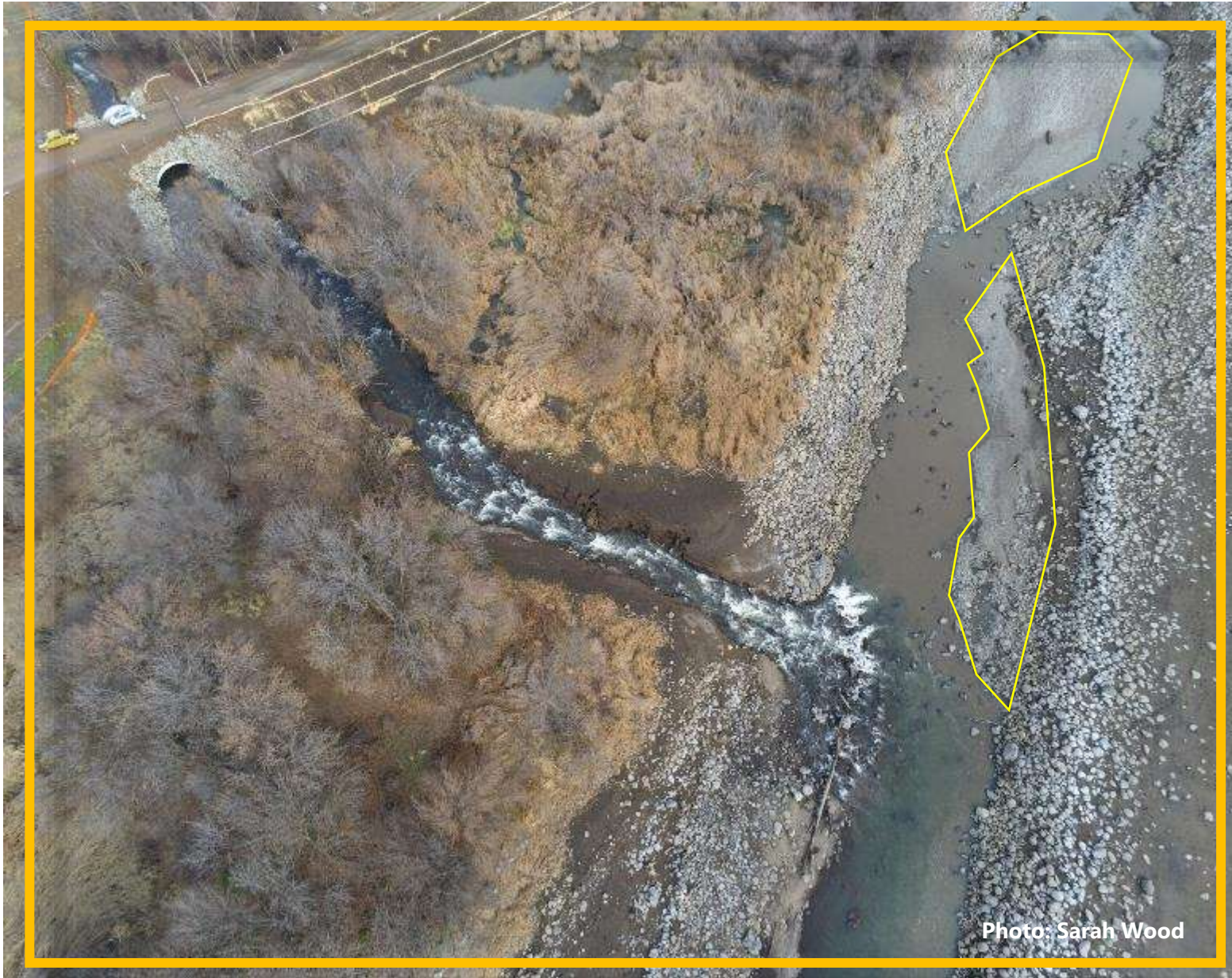
March 7, 2024



Iron Gate Reservoir Restoration Areas



Fall Creek and Klamath River

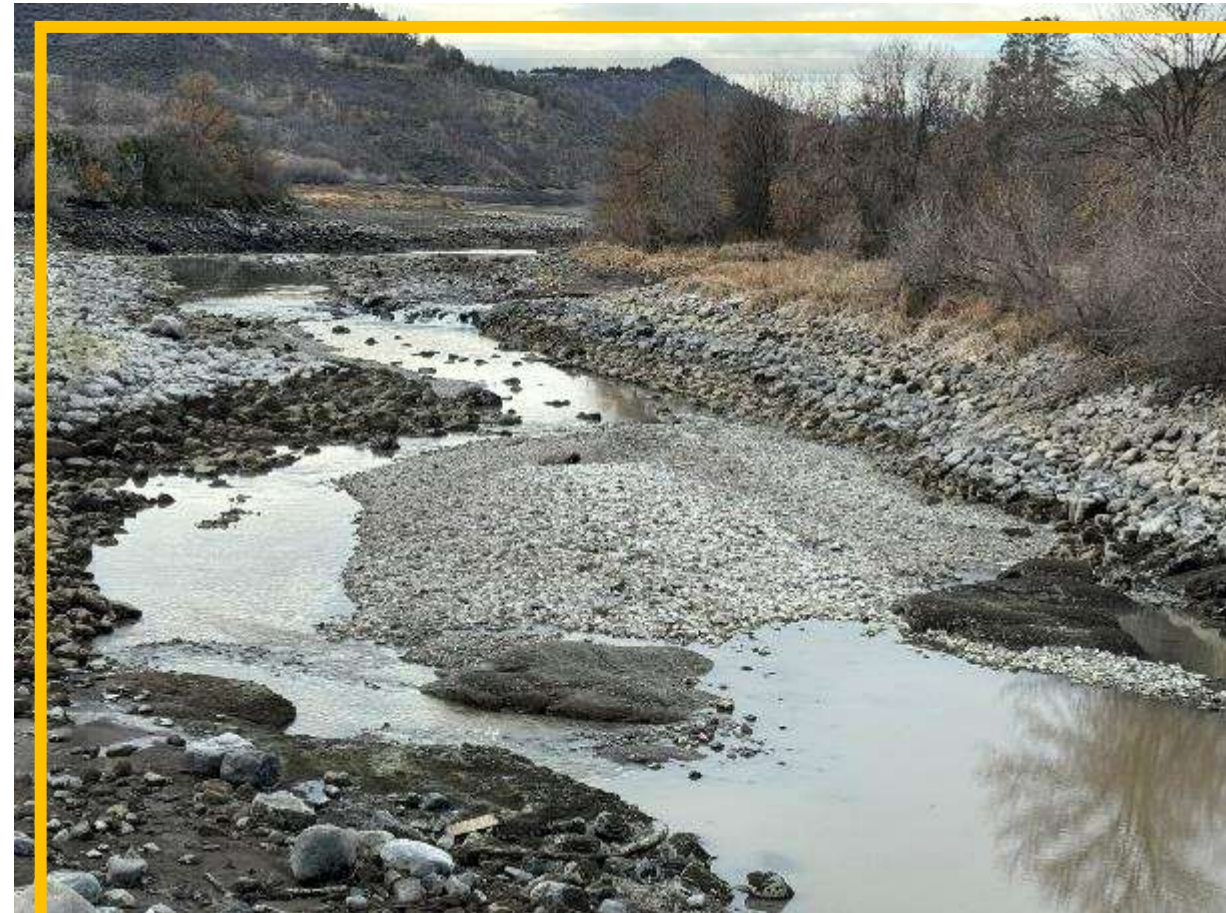


Fall Creek and Klamath River

January 23,
2024

**Klamath
River above
Fall Creek**

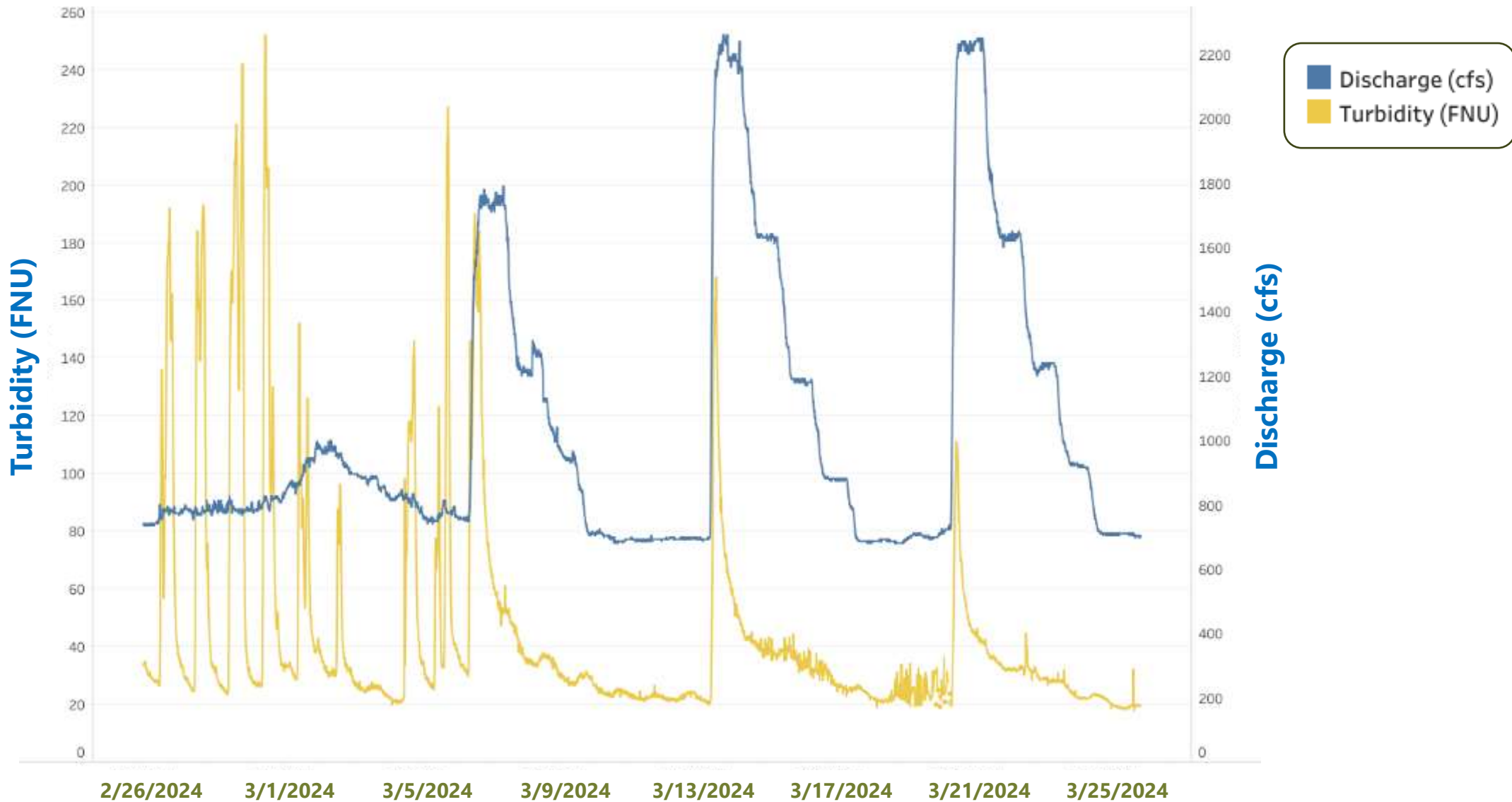
**January 22,
2024**





Water Quality Monitoring

Klamath River below J.C. Boyle Powerplant (USGS 11501700) – Turbidity and Discharge





Water Quality Monitoring

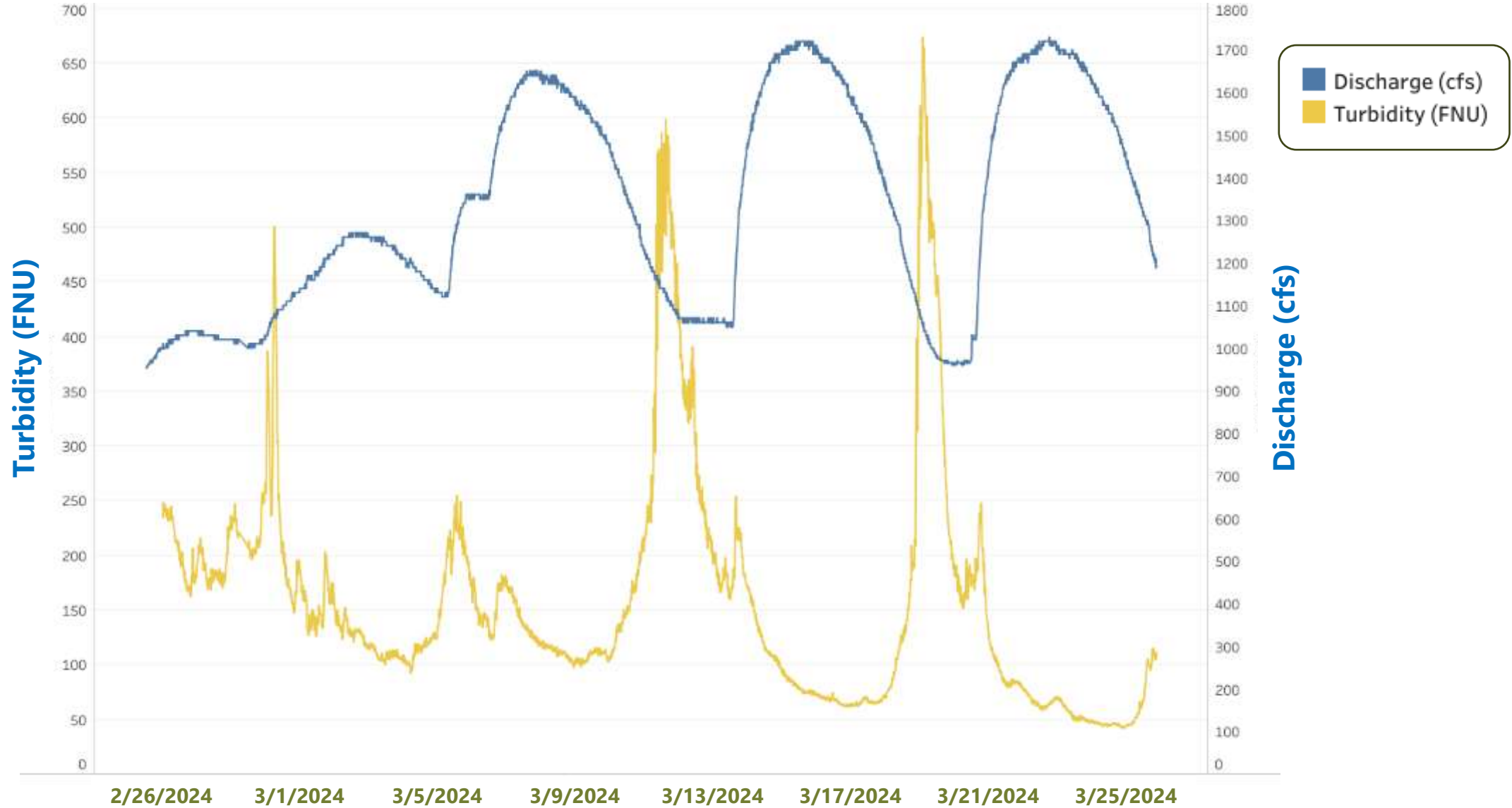
Klamath River ab Fall Creek near Copco – Daggett Bridge (USG 11511990) – Turbidity and Gage Height





Water Quality Monitoring

Klamath River below Iron Gate (USGS 11516530) – Turbidity and Discharge







Thank you!



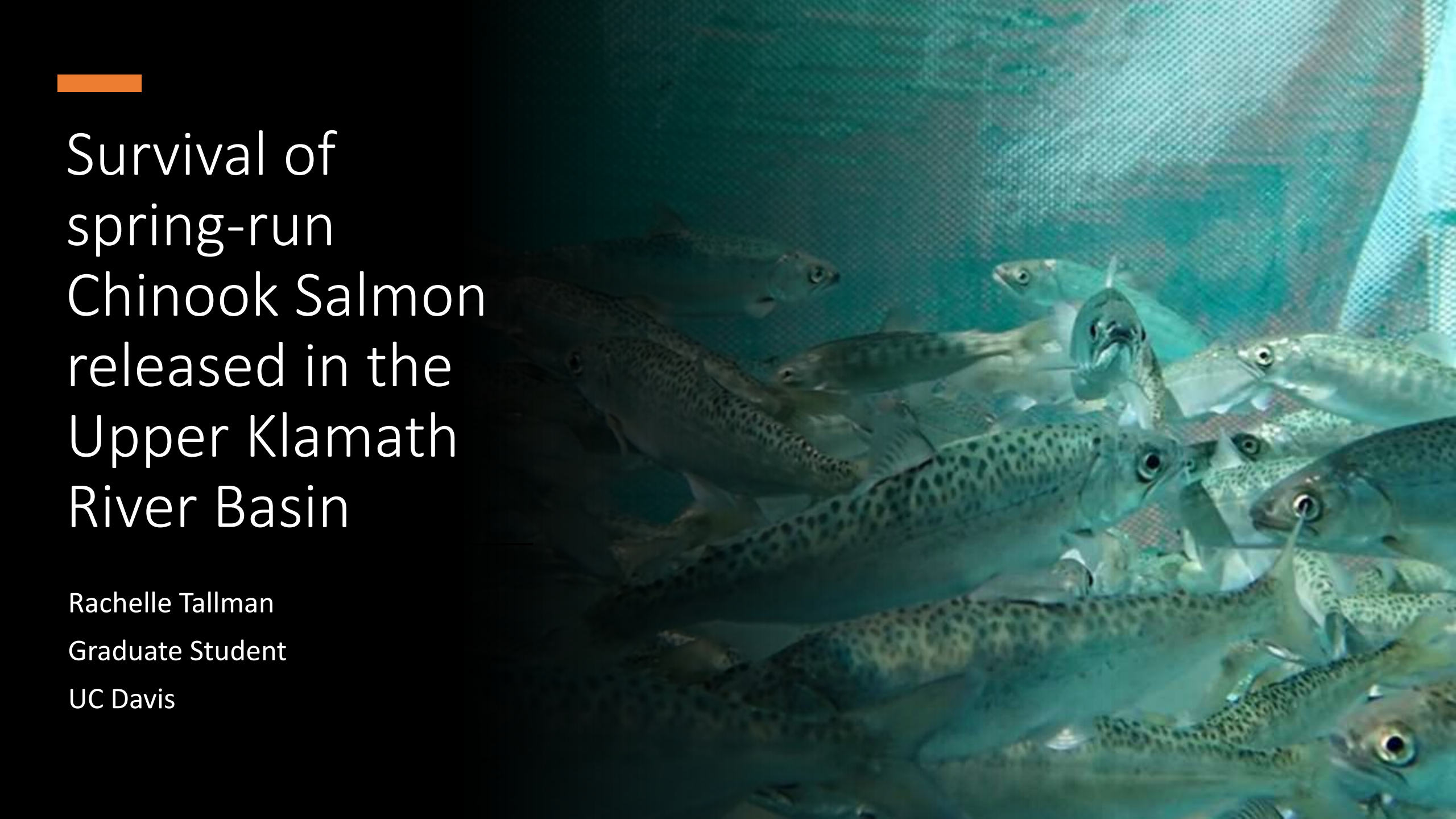
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Questions

Dave Coffman

Klamath Restoration
Program Manager
dcoffman@res.us

res.us/klamath 

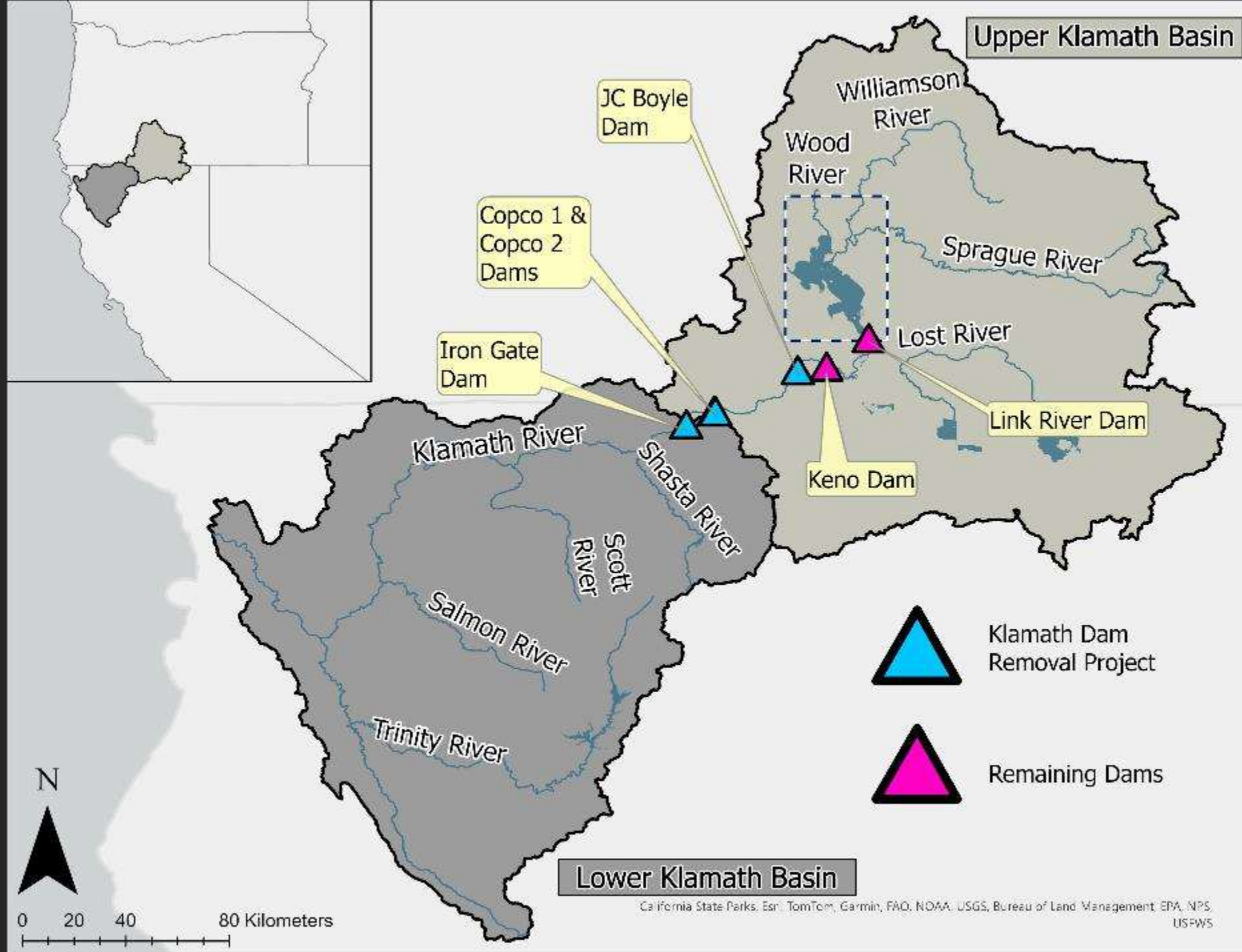
A photograph showing a large number of Chinook salmon swimming in a blue mesh net. The fish are densely packed, and their silvery scales and dark spots are visible. A person's hand is seen at the top right corner, holding the edge of the net. The background is a solid teal color.

Survival of
spring-run
Chinook Salmon
released in the
Upper Klamath
River Basin

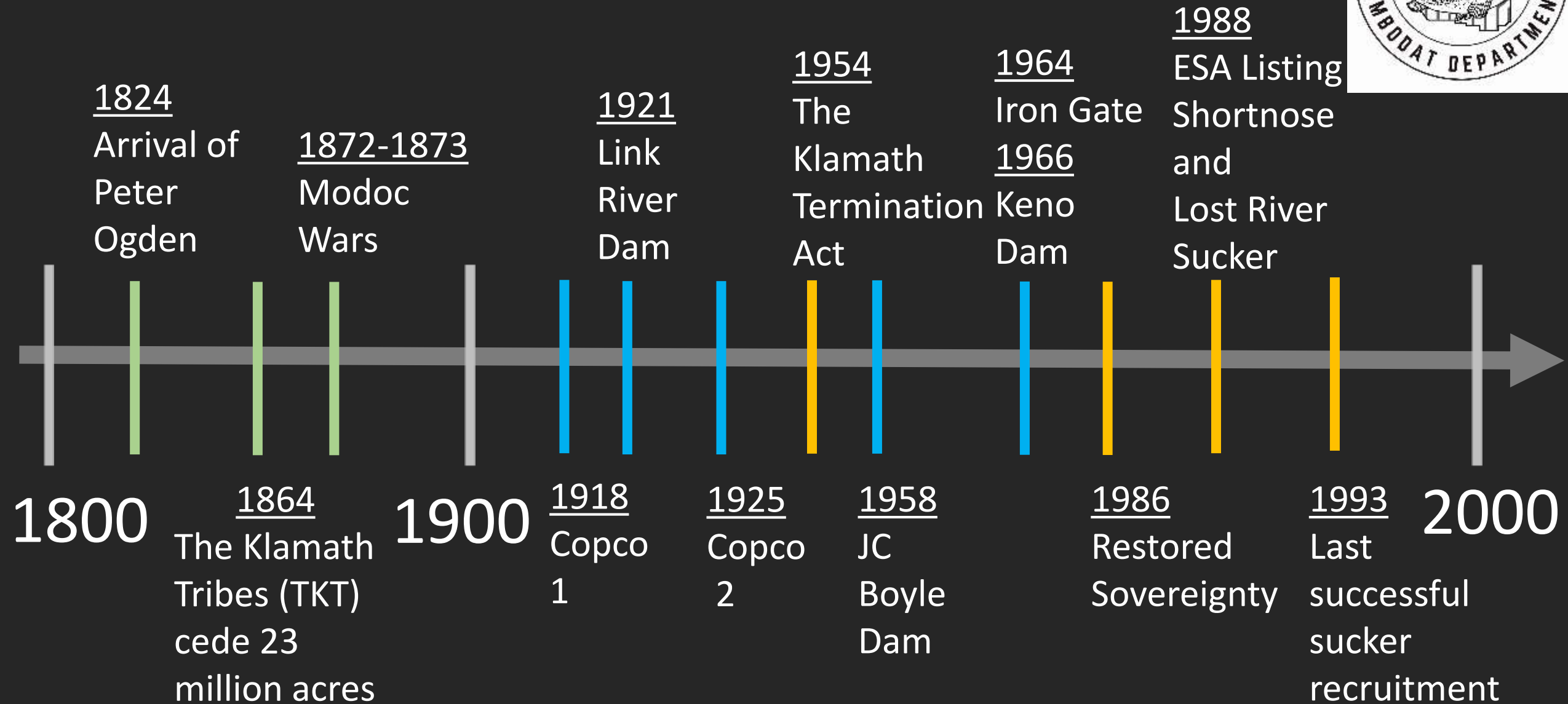
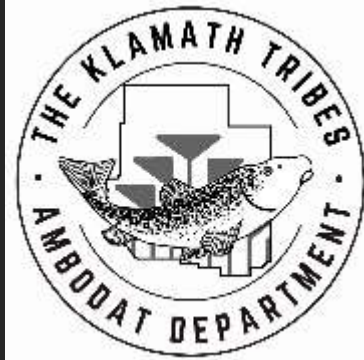
Rachelle Tallman

Graduate Student

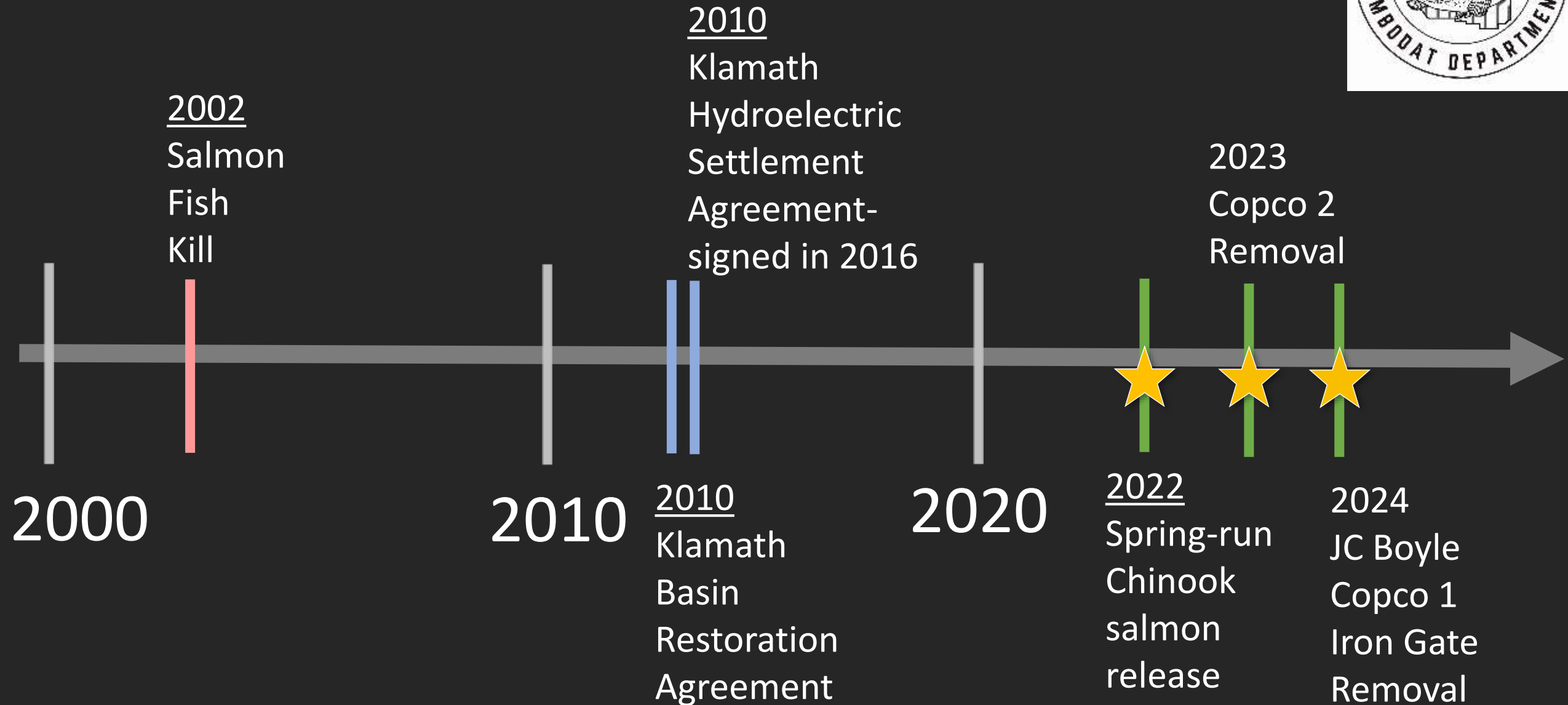
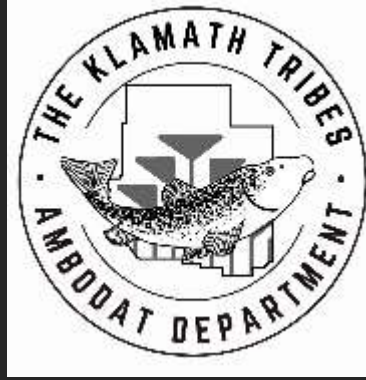
UC Davis



Klamath Basin Timeline



Klamath Basin Timeline cont.





SWIFTWATER
FILMS

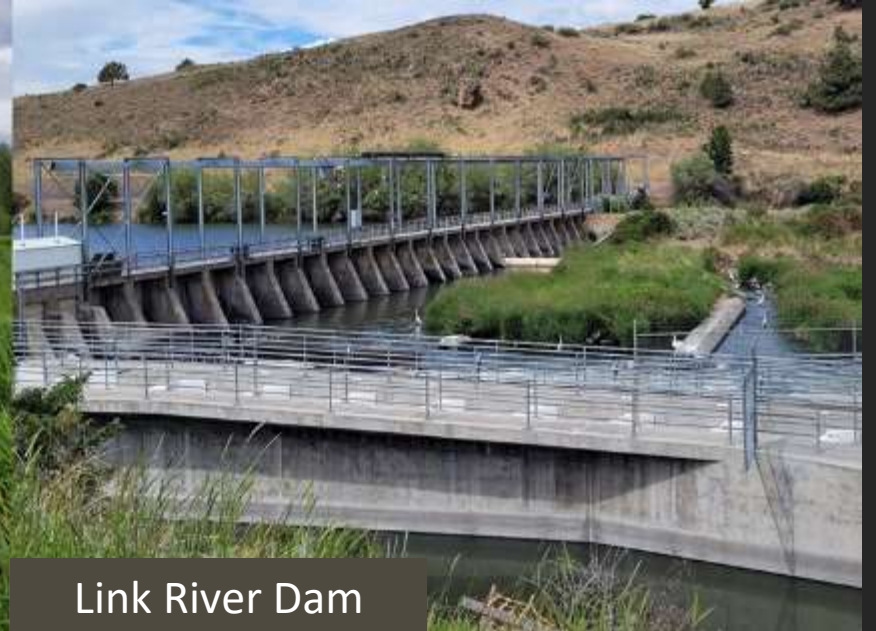
What is the out-migration survival of released spring-run Chinook in the Upper Klamath River Basin?



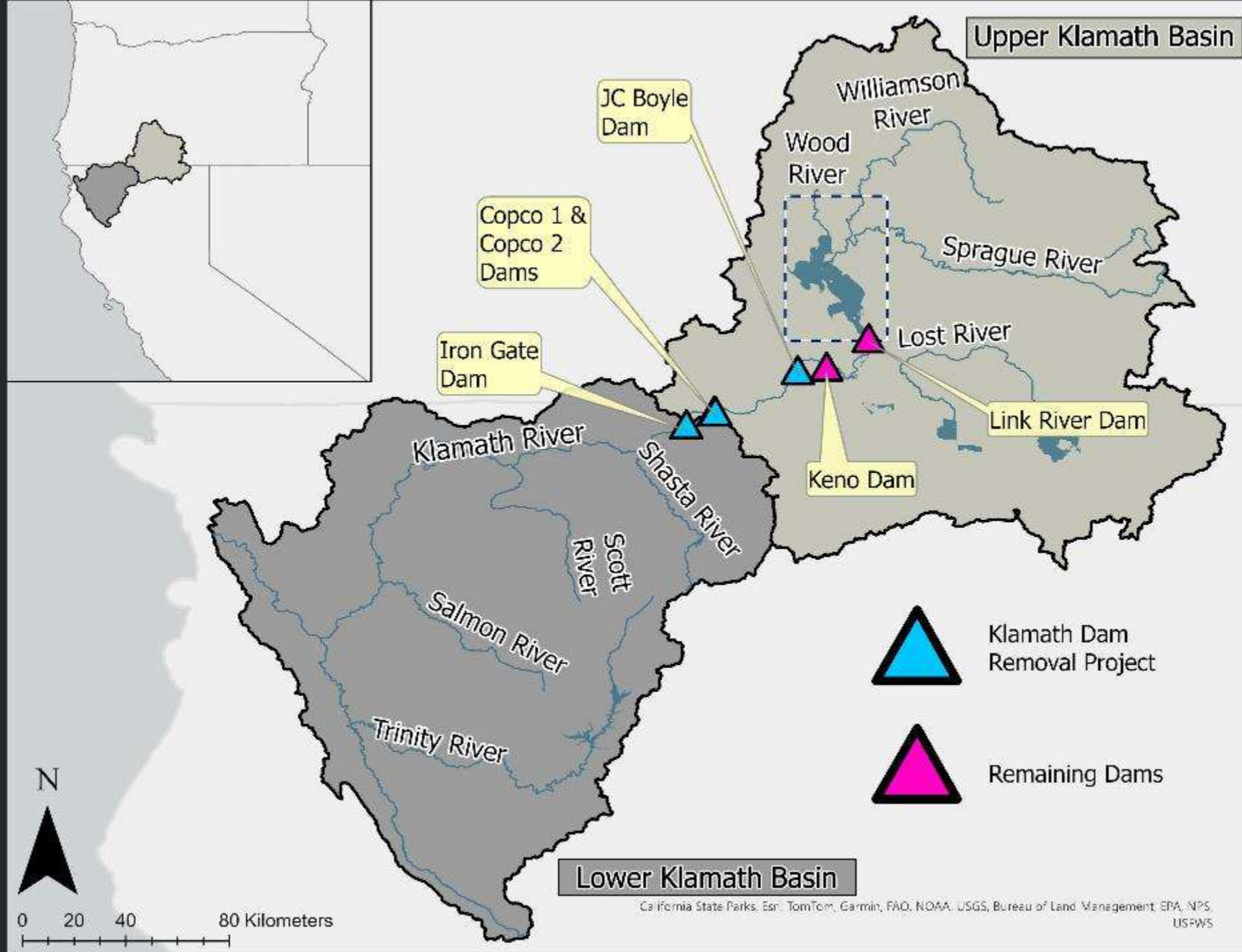
Williamson River

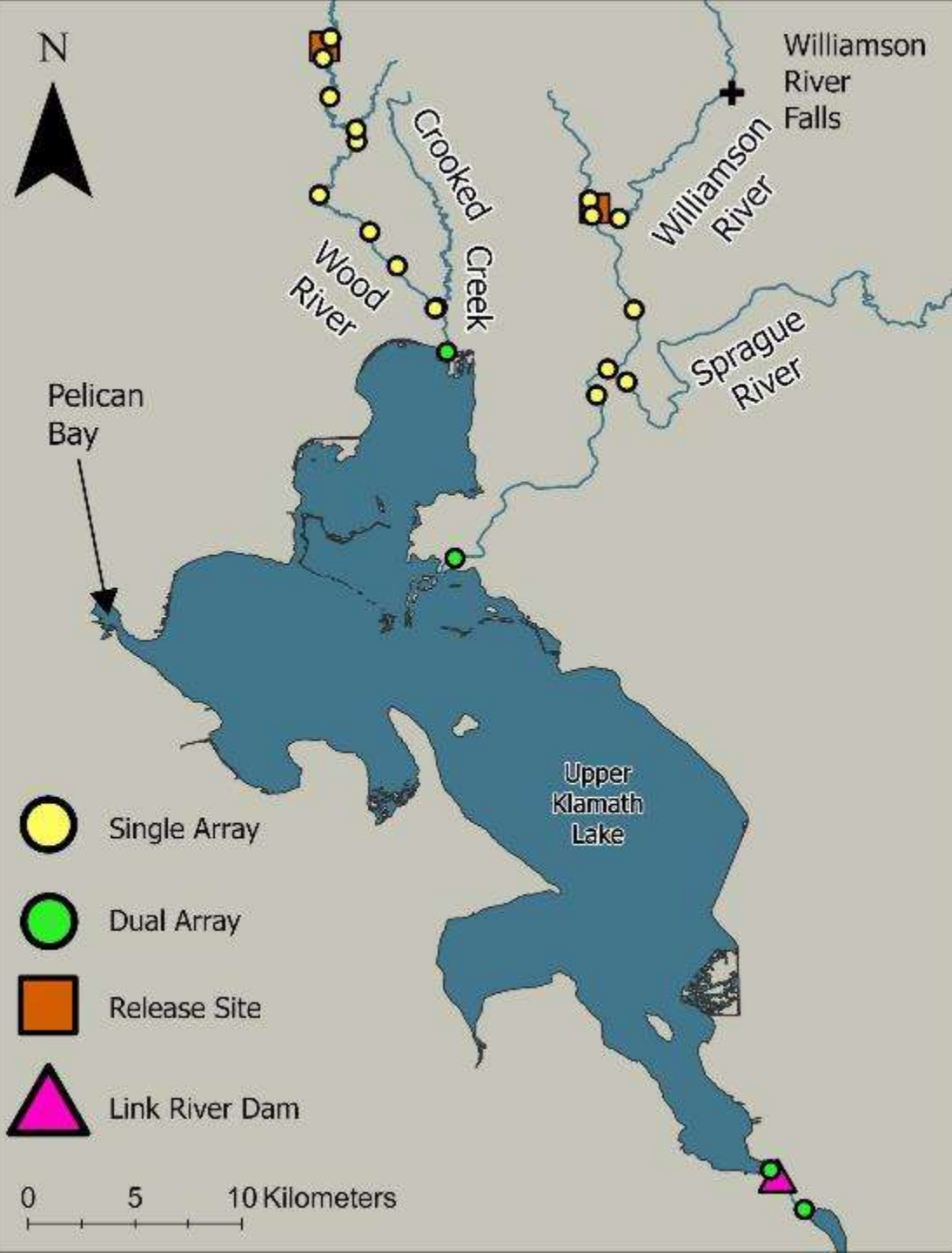


Wood River



Link River Dam





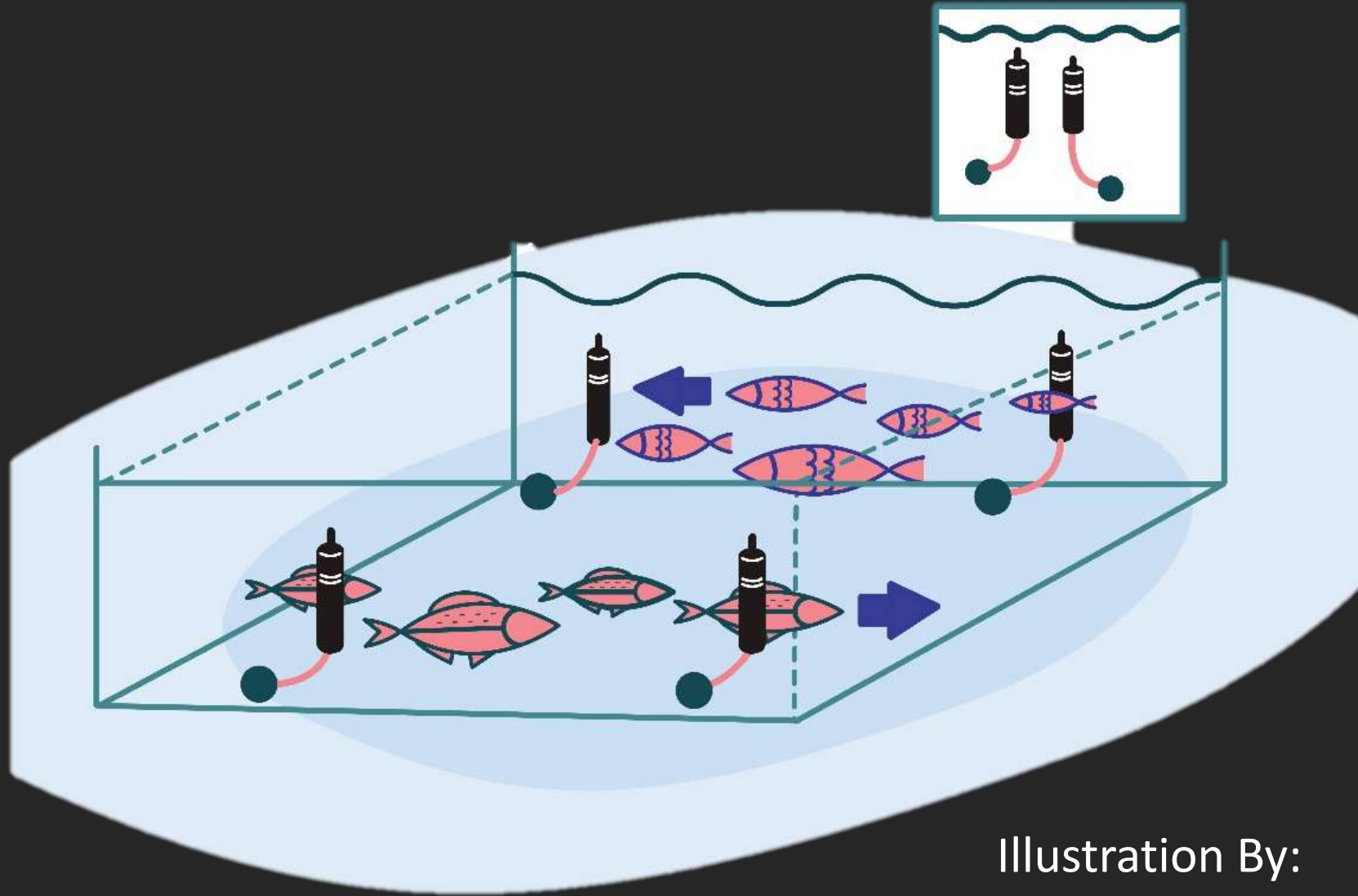


Illustration By:
Vi Hathaivaseevong

Acoustic Telemetry



ATS SS 300 Tag



Acoustic tagging from 03/28/22 - 04/01/22

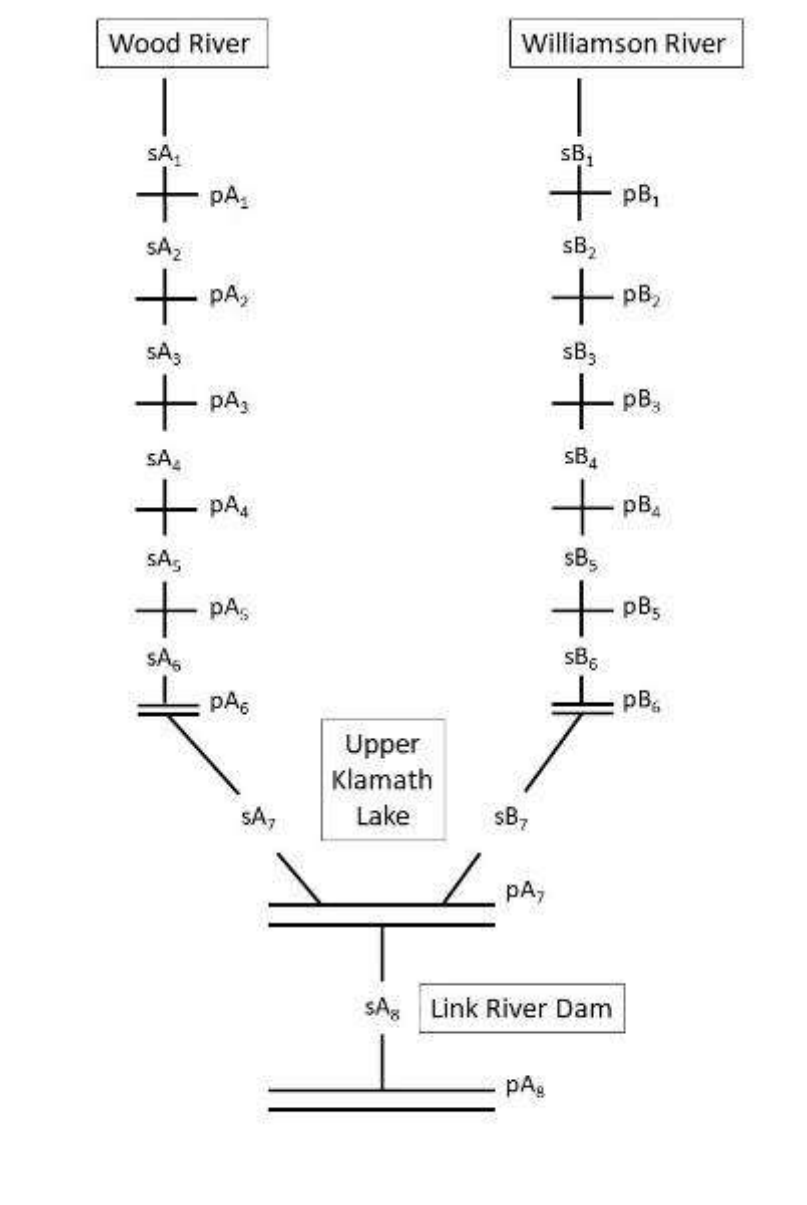


Fish Release 04/04/22

- **513** released in the Williamson River
- **513** released in the Wood River
- **131** were transported to OSU

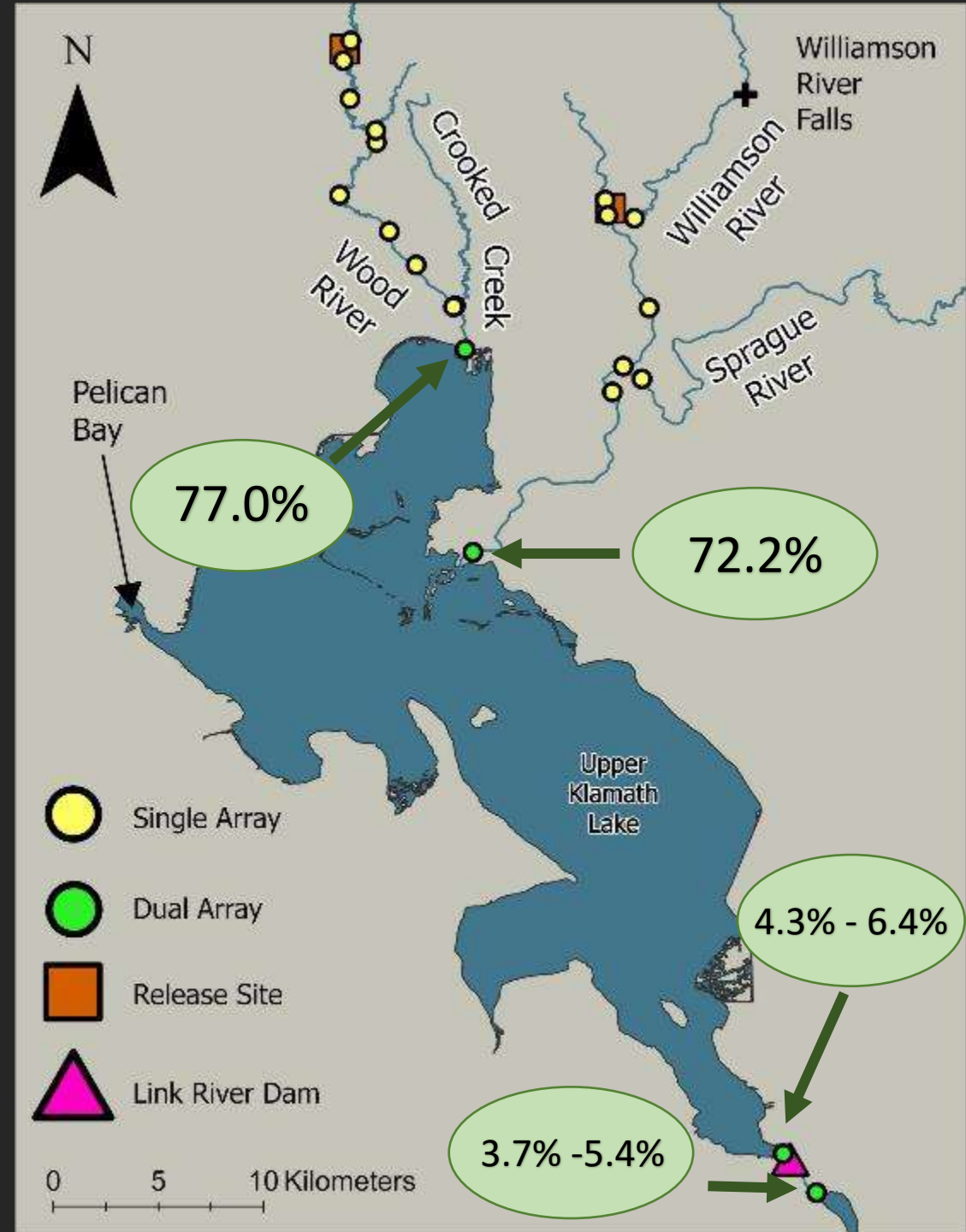


Multi-State Model



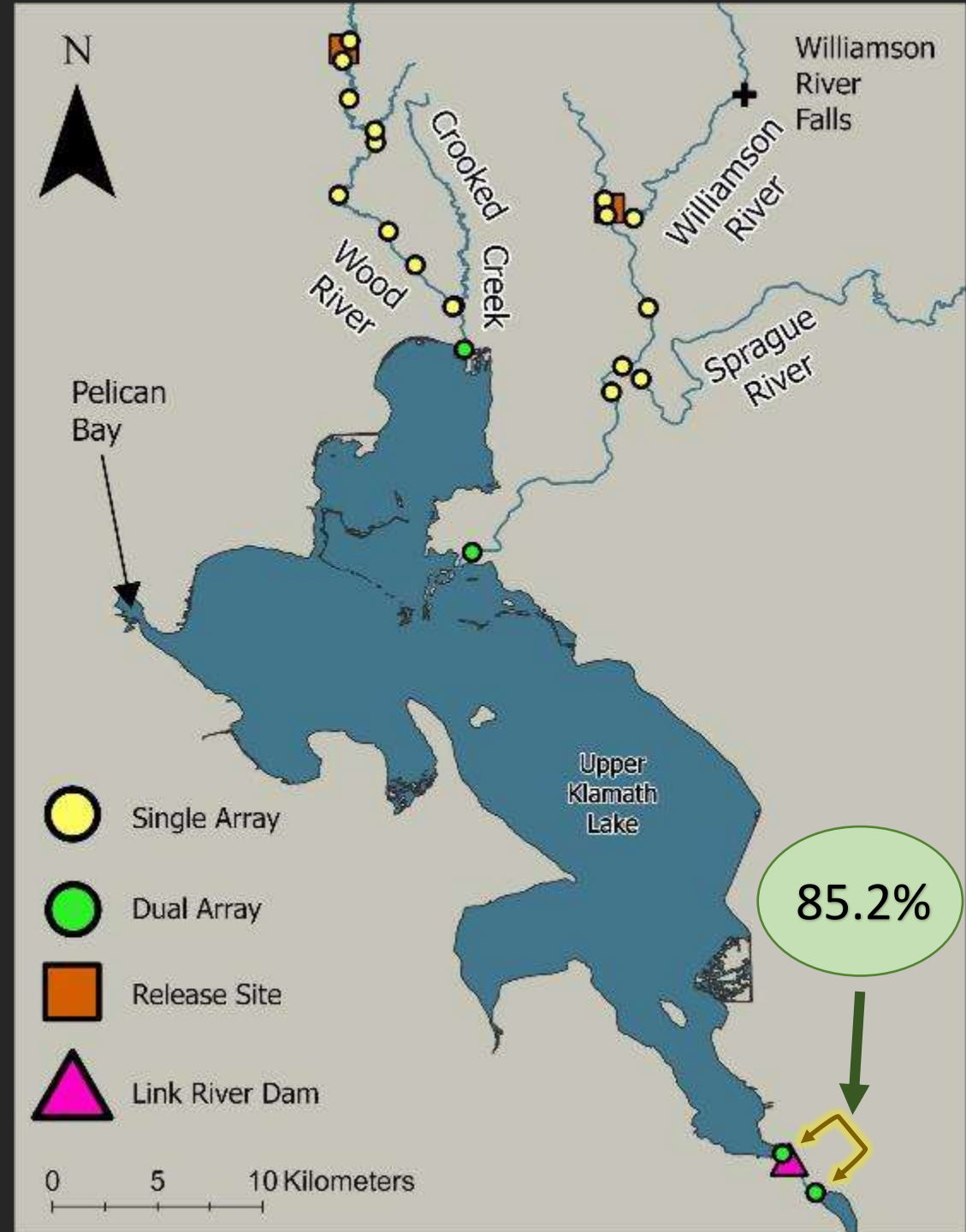
Preliminary Results

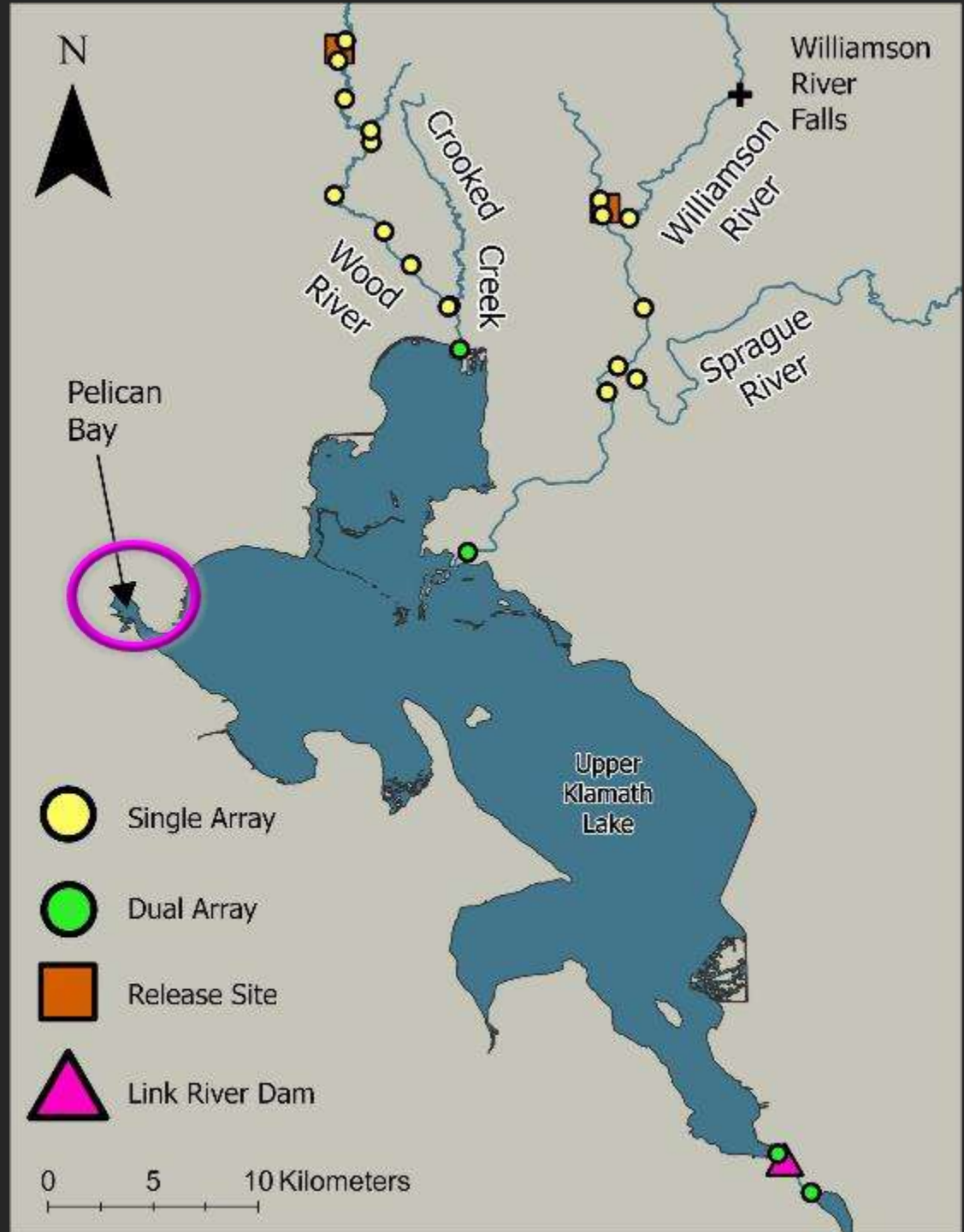
What is the survival of spring-run Chinook through the upper basin?



Preliminary Results

What is the survival of spring-run Chinook through the upper basin?





Takeaways / Future Directions

- Survival was high through the Wood and Williamson Rivers
- Survival decreased through Upper Klamath Lake
- Low survival -> cold-water refuge?
- Survival through the Link River Dam Reach was high



Takeaways / Future Directions

- Recalculating survival estimates based on acoustic battery types
- Estimate summer use of cold-water habitats by spring-run Chinook

Future Studies:

- Deploying acoustic receivers within other cold-water areas in the upper basin
- Deploying more acoustic receivers within Upper Klamath Lake

Estimate survival to the Pacific Ocean!



Special Thanks

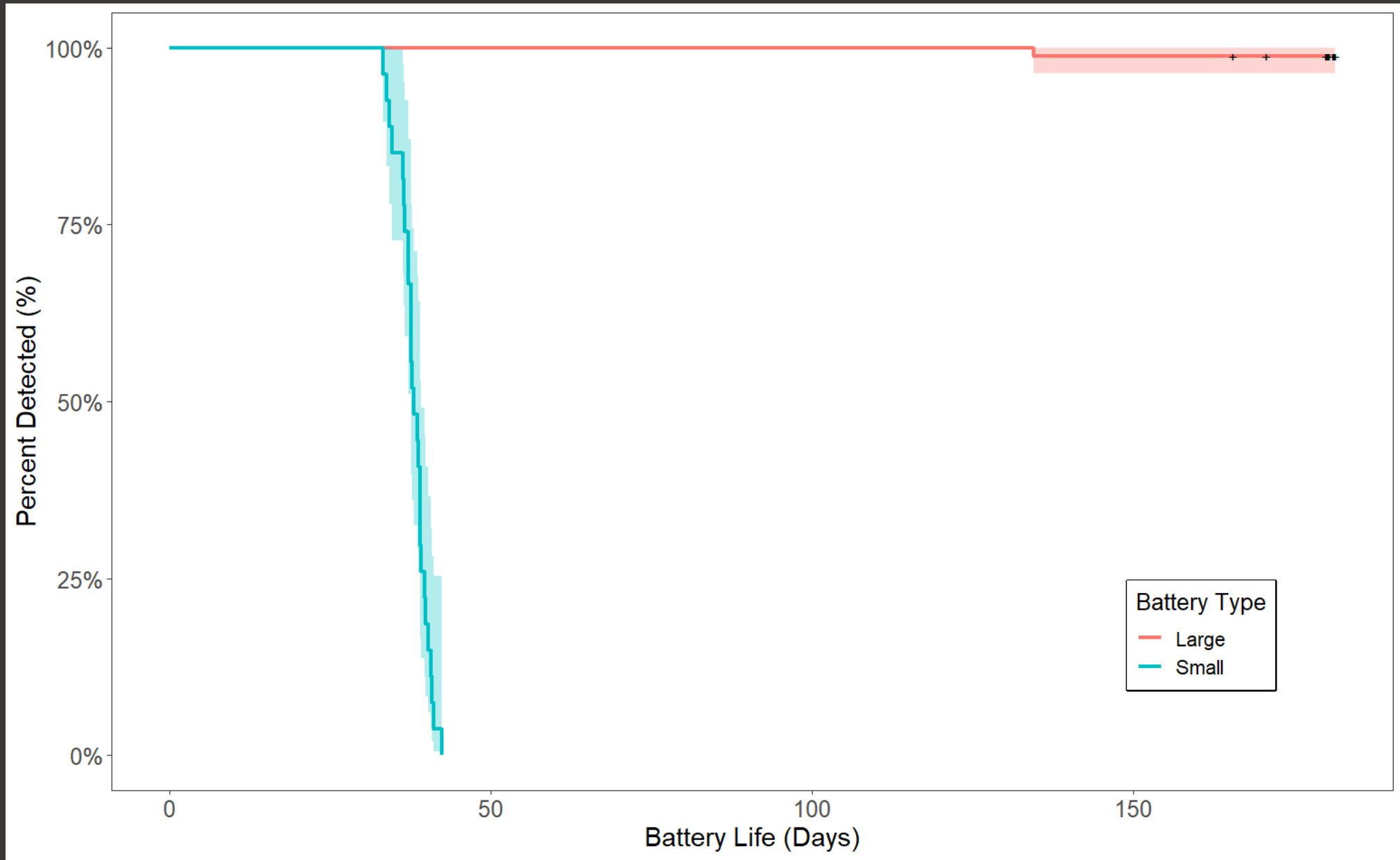


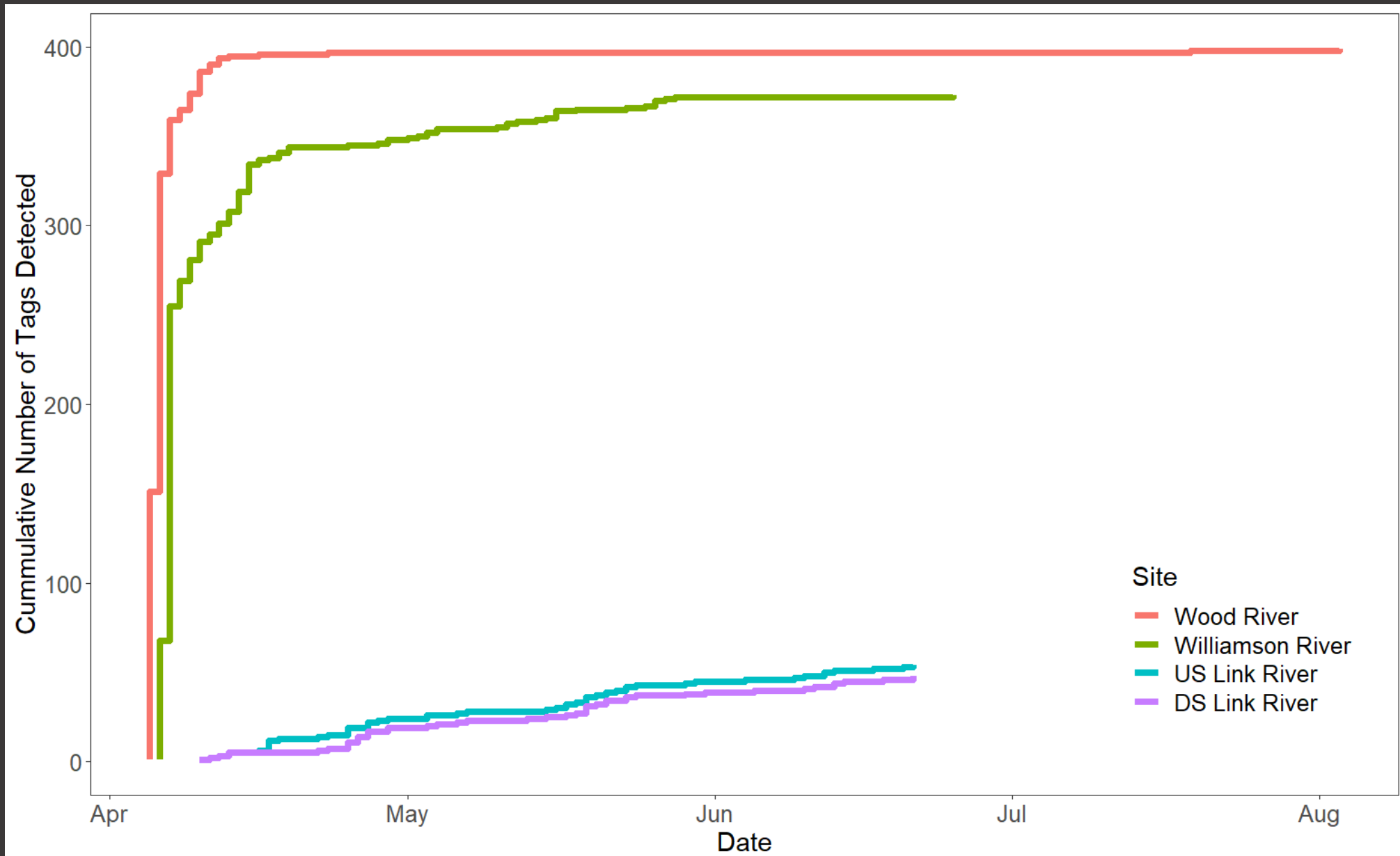


Land Acknowledgement:

Since time immemorial the Upper Klamath River basin has been the ancestral homeland of the Klamath, Modoc, Yahooskin-Paiute, and Shasta Nations. These Indigenous Nations maintain a longstanding connection with the land, engaging in ongoing stewardship and spirituality. We recognize the numerous challenges these communities have endured, from historical injustices of genocide, forced land removal, sovereignty revocation, and lack of federal recognition. Many of these challenges continue to persist, representing ongoing hardships for these communities. As researchers, we accept responsibility in educating ourselves about how these injustices continue to impact these communities. We acknowledge that these atrocities also wield a significant influence on our research and management strategies. We are dedicated to amplifying Indigenous voices, knowledge and resiliency as we continue to improve our efforts to protect threatened and endangered species.

It is also important to recognize that a land acknowledgement is only a starting point in supporting Indigenous communities. We hope this acknowledgement serves as a catalyst for other scientists to use their platforms in solidarity with Indigenous Nations. We encourage them to actively promote and prioritize the genuine collaboration and incorporation of Tribal voices in research and restoration projects.





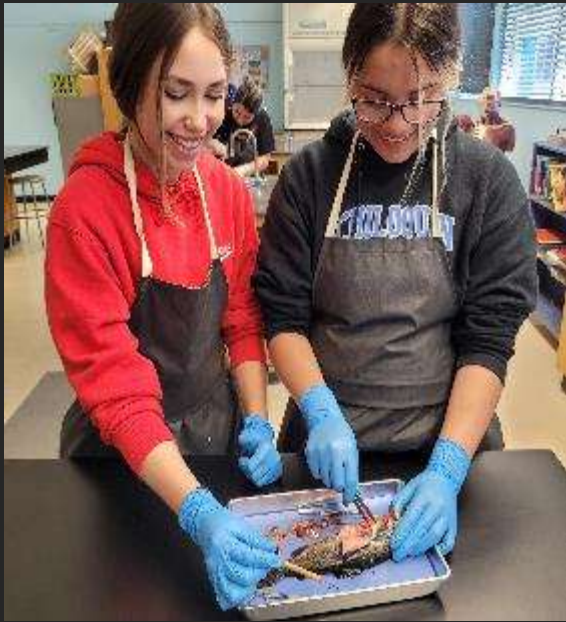
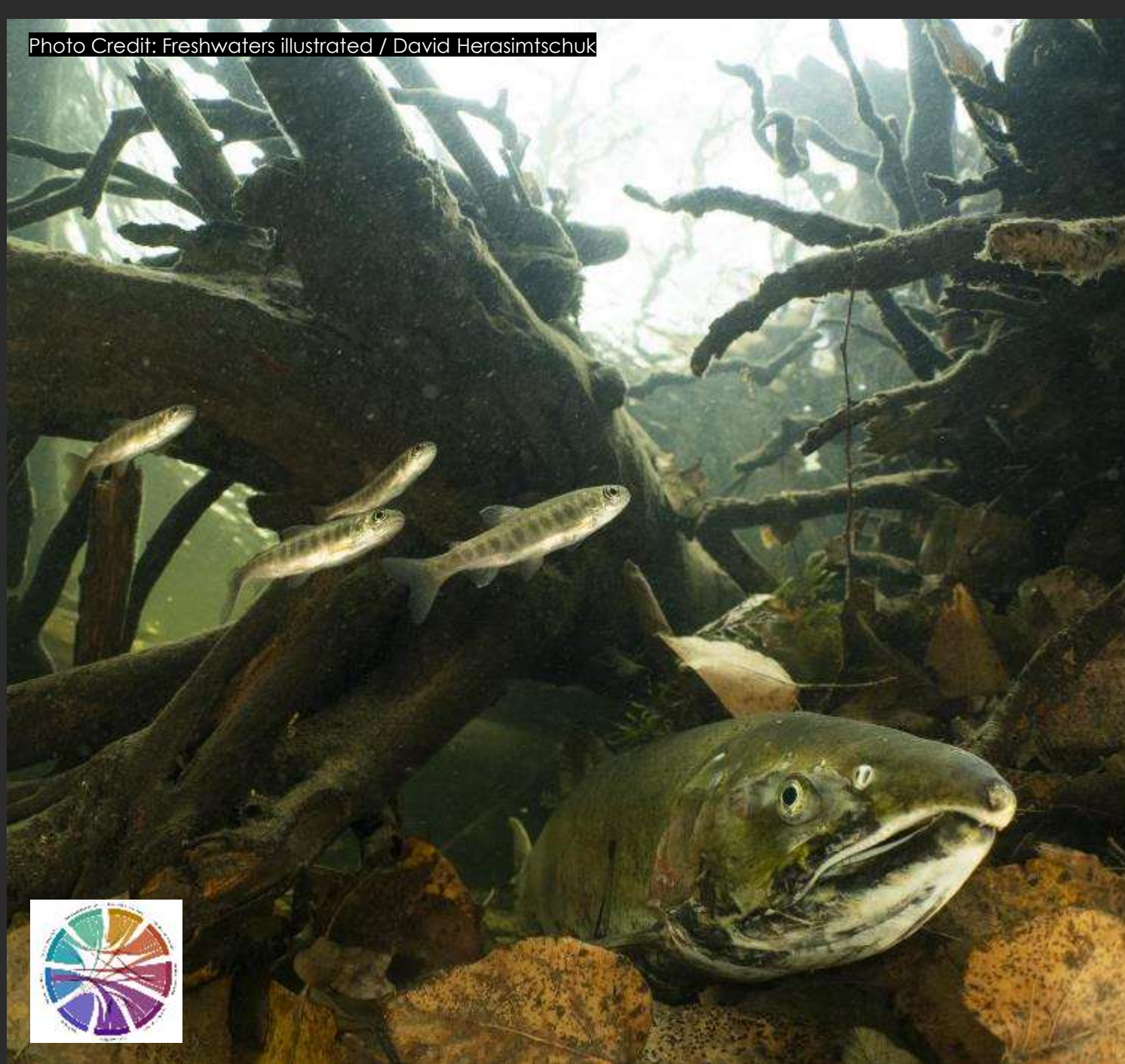


Photo Credit: Freshwaters illustrated / David Herasimtschuk



If you want to go far, go together

The Klamath Basin
Fisheries Collaborative:

Science and
Collaboration Across a
Newly Connected
Basin

Summer Burdick & Jacob
Krause, USGS

Betsy Stapleton, Scott River
Watershed Council

Erin Benham & Nancy Leonard,
PSMFC





KLAMATH DAM REMOVAL

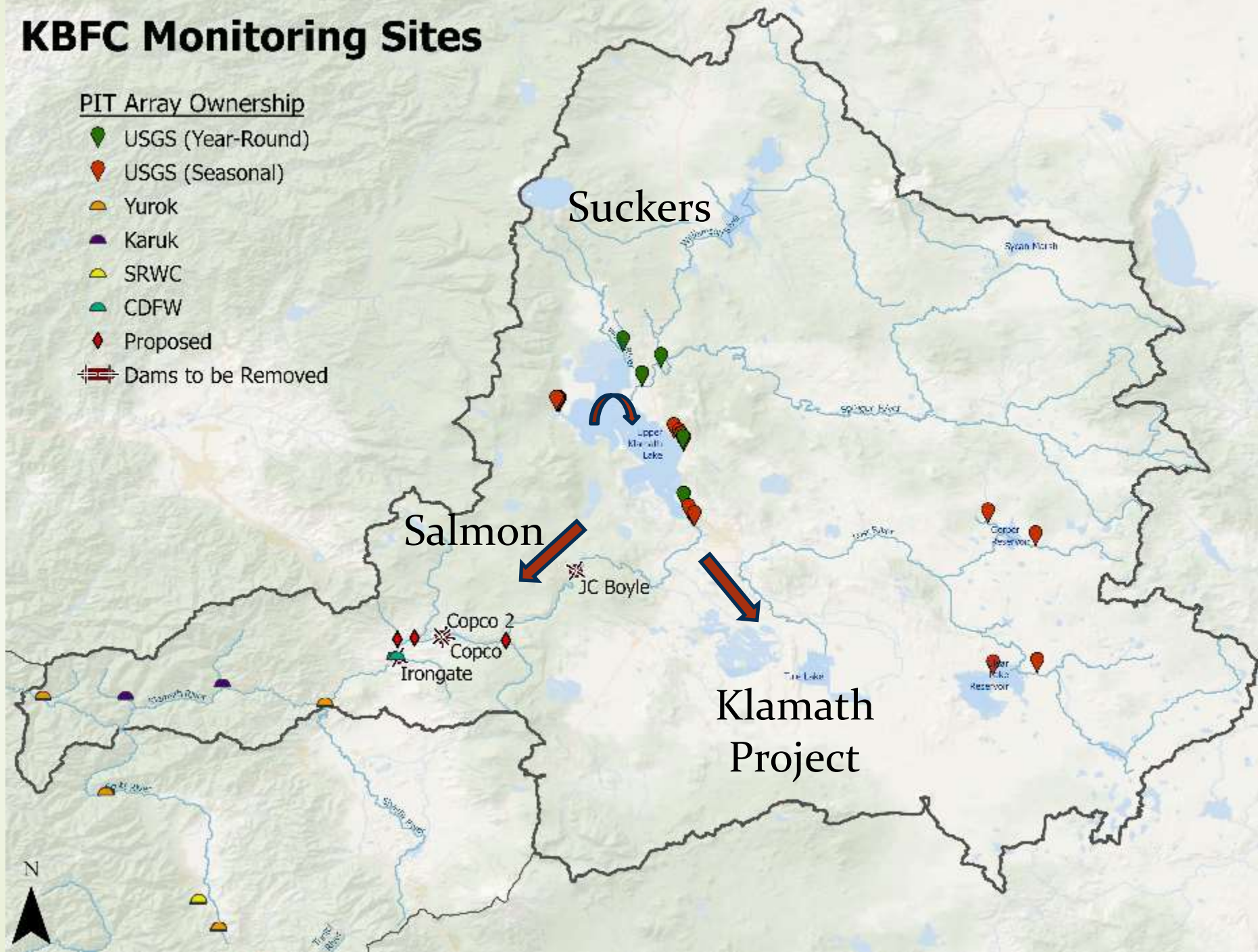


Water Allocations

KBFC Monitoring Sites

PIT Array Ownership

- USGS (Year-Round)
- USGS (Seasonal)
- Yurok
- Karuk
- SRWC
- CDFW
- Proposed
- Dams to be Removed

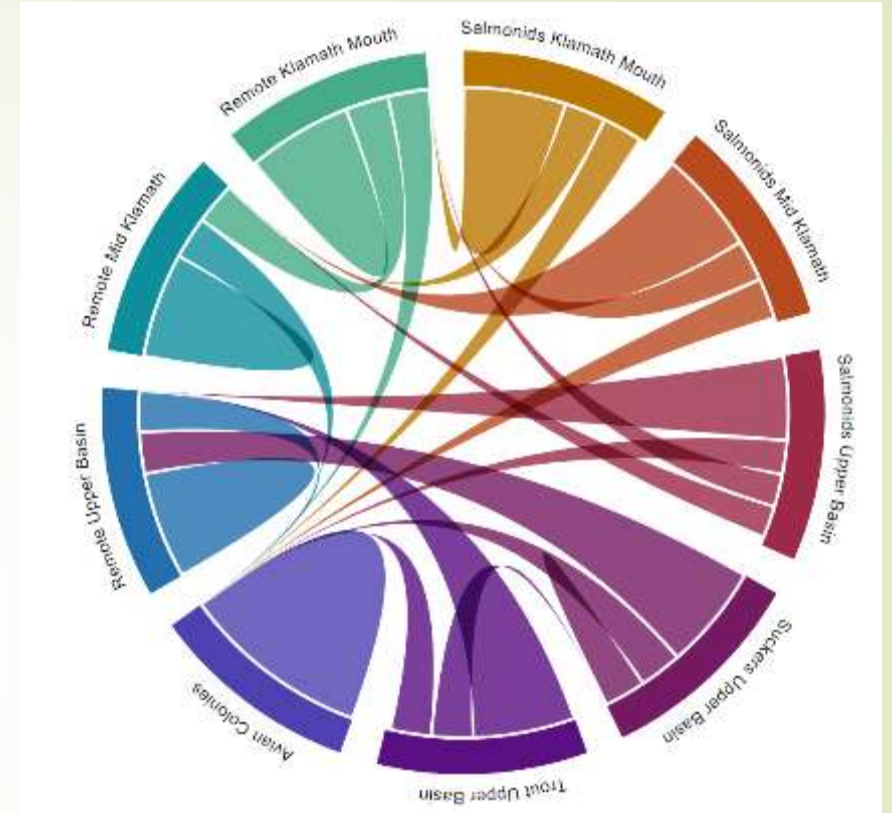


KBFC

Hosted by
Pacific States Marine Fisheries
Commission

The result of an organic coalescence
of fisheries data collectors and users in
the Klamath Basin, integrating data
across the entire basin as dams are
removed.

Identified in the Integrated Fisheries
Restoration and Monitoring Plan and
Supported by the USFWS BIL



A Collaborative:



What We Are:

- A data integration and management project
- A collaborative of over 30 fisheries tag data producers and users in the Klamath Basin
- A venue to share monitoring data, ideas, technical expertise and opportunities

Leadership Team

- Klamath Tribes
- Karuk Tribe
- Yurok Tribe
- USGS
- ODFW
- CDFW
- Scott River Watershed Council
- PSMFC- Support



What We Are Not:

- Direct members' monitoring plan, research priorities, or program



Accomplishments



- ✓ *Long term collaboration and communication across the basin*
- ✓ *Formal operating principles established*
- ✓ *Agreed upon control vocabulary and data exchange standard*
- ✓ *Elected chair and co-chair (upper basin and lower basin)*
- ✓ *Regular annual meetings (June 11-13, Klamath Falls)*
- ✓ *Operationalizing data sharing agreement*

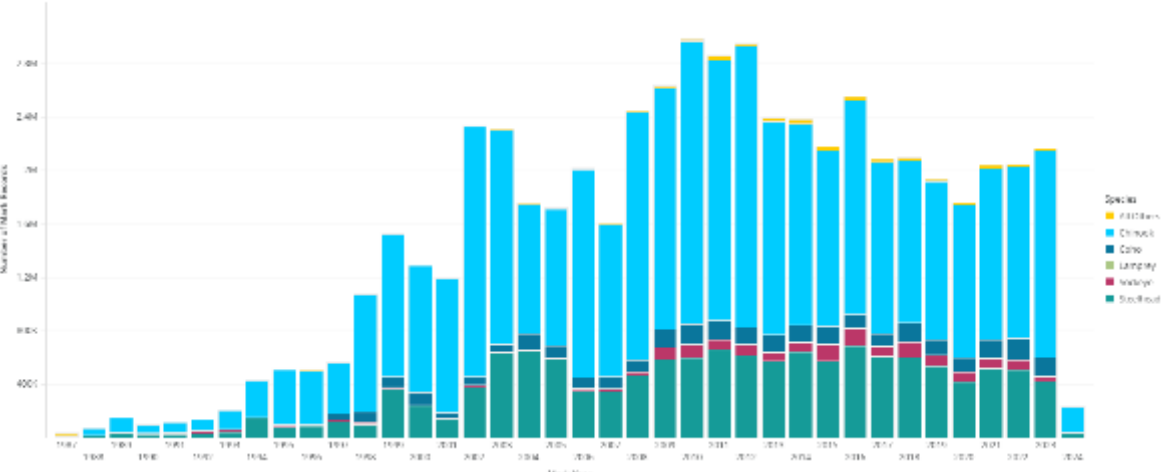
Access as defined by agreed upon rules

Online database to be released summer 2024

Facilitate electronic data entry

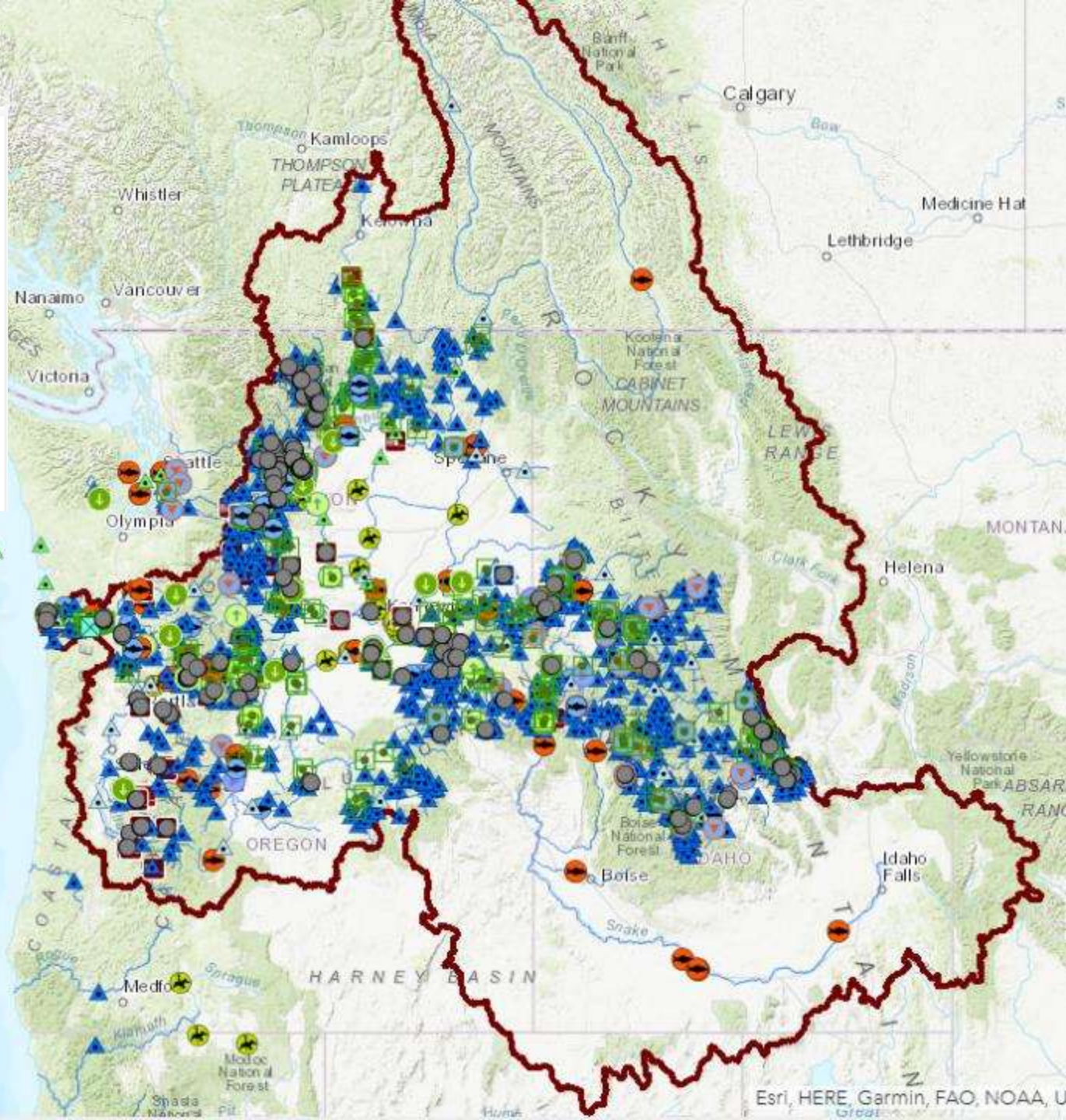


Fish PIT-tagged Annually



PTAGIS

>57 million PIT tagged fish by 56 organizations since 1987 (37 years)



PTAGIS and
KBFC data
systems
interoperable



KBFC Associated Features

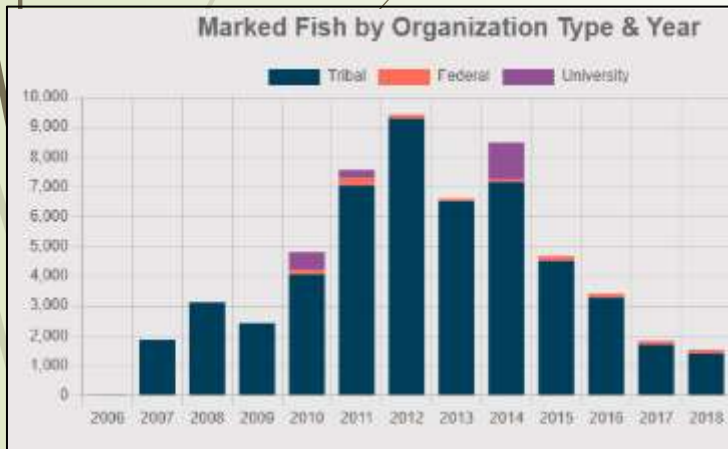
- Website
- API data exchange
- Electronic data support



A screenshot of a web browser displaying the website for the Klamath Basin Fisheries Collaborative. The browser's address bar shows "kbfishdev.psmfc.org". The website header includes the logo and name "Klamath Basin Fisheries Collaborative" on the left, and navigation links for "Annual Meeting", "Resources", and "About" on the right. The main content area features a large background image of a river with a dam. Overlaid on this is the heading "MONITORING KLAMATH BASIN SPECIES" in large white letters. Below the heading is a paragraph: "Several Klamath Basin species are monitored by the Collaborative including Coho and Chinook salmon, Lost River suckers, Shortnose suckers, steelhead and other native species." Underneath this text is a horizontal carousel of three images: a close-up of a fish, a salmon jumping over a dam, and a wooden bridge over a river. Below the carousel is a caption: "From left to right: Lost River sucker (photo credit: Jason Ching/USGS), Chinook salmon (photo credit: Dan Cox/USFWS), engineered beaver dam (photo credit: Monica Diaz/PSMFC). Background photo: Salmon (photo credit: The Nature Conservancy)". At the bottom of the page, there is a quote: "If you want to go fast, go alone; if you want to go far, go together." ~ African proverb. The footer contains the text "A FISHERIES DATA PROJECT OF THE PACIFIC STATES MARINE FISHERIES COMMISSION" on the left and the address "205 SE Spokane Street, Suite 100, Portland, OR 97202, 503.595.3100" on the right.

KBFC User Portal

- Web-based platform for users to view, input and download data



KBFishC
usgs@example.com
LOGOUT

- Dashboard
- File
- Site
- Project
- Deployment
- Detection
- Event Log
- Effort
- MRR Capture
- Test PITtag
- Administration
- Contact
- Organization
- Reader

Effort

ADD

🔍
📄
📄
1 2 3 4 5 >
25

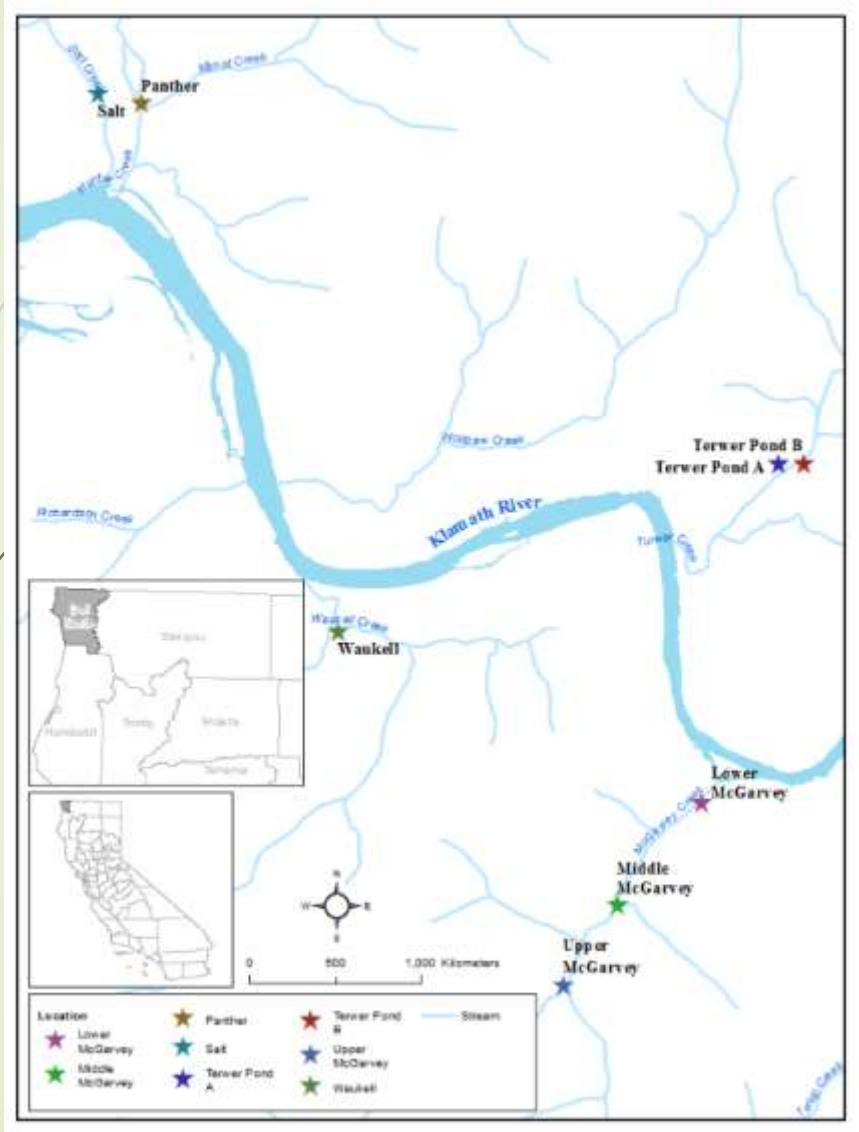
Filter SITE
USGS
Filter PROJE
Filter METHC
Dates:

EFFORT	SITE	ORG	CAP METHOD	START TIME	END TIME	HRS	CAPTURE
APR-30-20-6A0	1C UUKLCinderSpringsH	USGS	TRAMNT	2020-04-30 09:40	2020-04-30 12:14	3	7
APR-30-20-854	17C UUKLSuckerSpringsH	USGS	TRAMNT	2020-04-30 08:50	2020-04-30 11:50	3	1
APR-30-20-F7E	16C UUKLSilverSpringsH	USGS	TRAMNT	2020-04-30 08:30	2020-04-30 11:25	3	3
MAY-08-19-911	1C UUKLCinderSpringsH	USGS	TRAMNT	2019-05-08 08:34	2019-05-08 12:30	4	1
MAY-02-19-552	1C UUKLCinderSpringsH	USGS	TRAMNT	2019-05-02 08:26	2019-05-02 12:34	4	1
APR-30-19-5D0	17C UUKLSuckerSpringsH	USGS	TRAMNT	2019-04-30 08:37	2019-04-30 12:50	4	1
APR-30-19-90A	16C UUKLSilverSpringsH	USGS	TRAMNT	2019-04-30 08:35	2019-04-30 12:37	4	2
APR-29-19-00B	1C UUKLCinderSpringsH	USGS	TRAMNT	2019-04-29 08:38	2019-04-29 12:37	4	1
APR-26-19-AC3	17C UUKLSuckerSpringsH	USGS	TRAMNT	2019-04-26 08:45	2019-04-26 12:45	4	1
APR-26-19-00E	16C UUKLSilverSpringsH	USGS	TRAMNT	2019-04-26 08:43	2019-04-26 13:08	5	1
APR-23-19-67D	16C UUKLSilverSpringsH	USGS	TRAMNT	2019-04-23 08:50	2019-04-23 12:50	4	1

Preliminary Information-Subject to Revision. Not for Citation or Distribution.



Coho Ecology Study



The Role Of The Klamath River Mainstem Corridor In The Life History And Performance Of Juvenile Coho Salmon (*Oncorhynchus kisutch*)

Period Covered: September 2011–June 2017

Report Submitted June 2019

Submitted To:

U.S. Bureau of Reclamation
Mid Pacific Region, Klamath Area Office
600 Washburn Way
Klamath Falls, OR 97603

Prepared by:

Jimmy Faulker¹
Scott Silman²
Andrew Antenucci¹
Toz Soto¹
Alex Coram²
Estilo Tripp²
Larry Lestel²

¹ Yurok Tribal Fisheries Program
199 Klamath Blvd.
Klamath, CA 97648

² Karuk Department of Natural Resources
Karuk Tribe
3905 Hwy 96
Orleans, CA 95556

³ BioStream Environmental
17791 Ejued Drive NE STE AA
Preston, WA 98374

U.S. Fish & Wildlife Service

Arcata Fisheries Technical Report TR 2018-33

Estimating Freshwater Productivity, Overwinter Survival, and Migration Patterns of Klamath River Coho Salmon

Christopher V. Manhard, Nicholas A. Som, Russell W. Perry,
Jimmy R. Faulker and Toz Soto

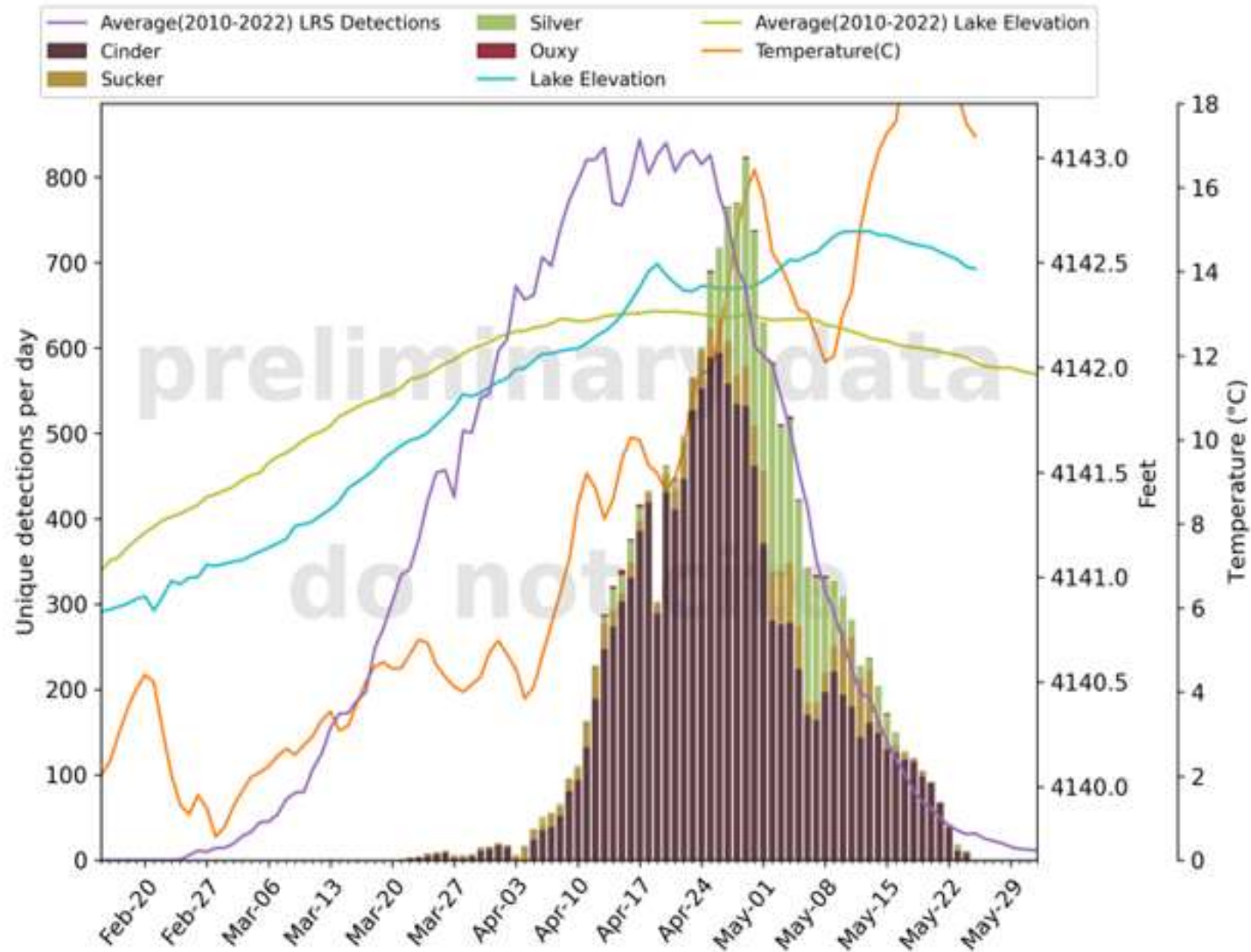


Extending the Stream Salmonid Simulator to Accommodate the Life History of Coho Salmon (*Oncorhynchus kisutch*) in the Klamath River Basin, Northern California

By Michael J. Dodrill, Russell W. Perry, Nicholas A. Som, Christopher V. Manhard, and Julie D. Alexander

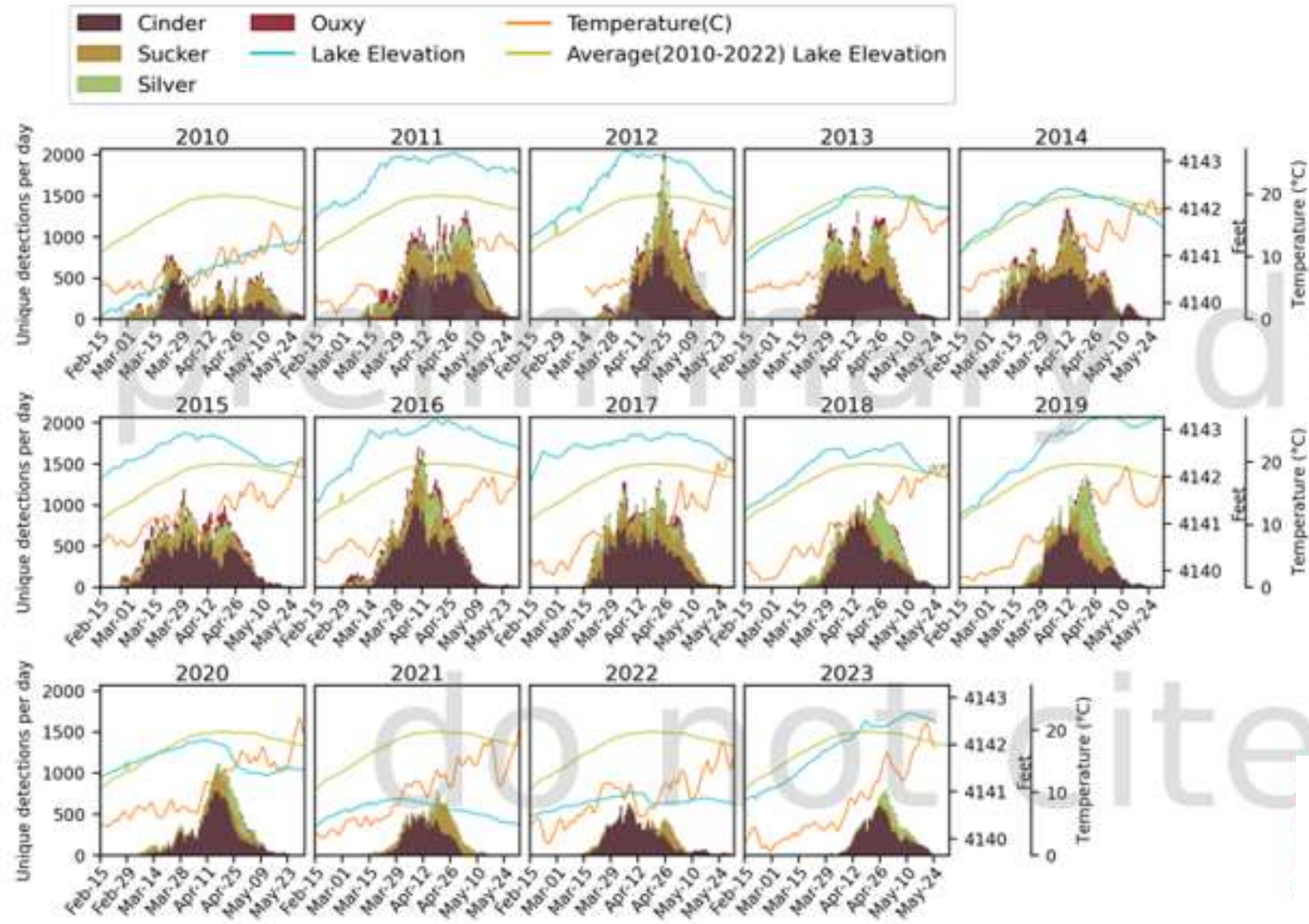
Inform Management

Upper Klamath Lake Lost River Sucker Shoreline Spawners 2023

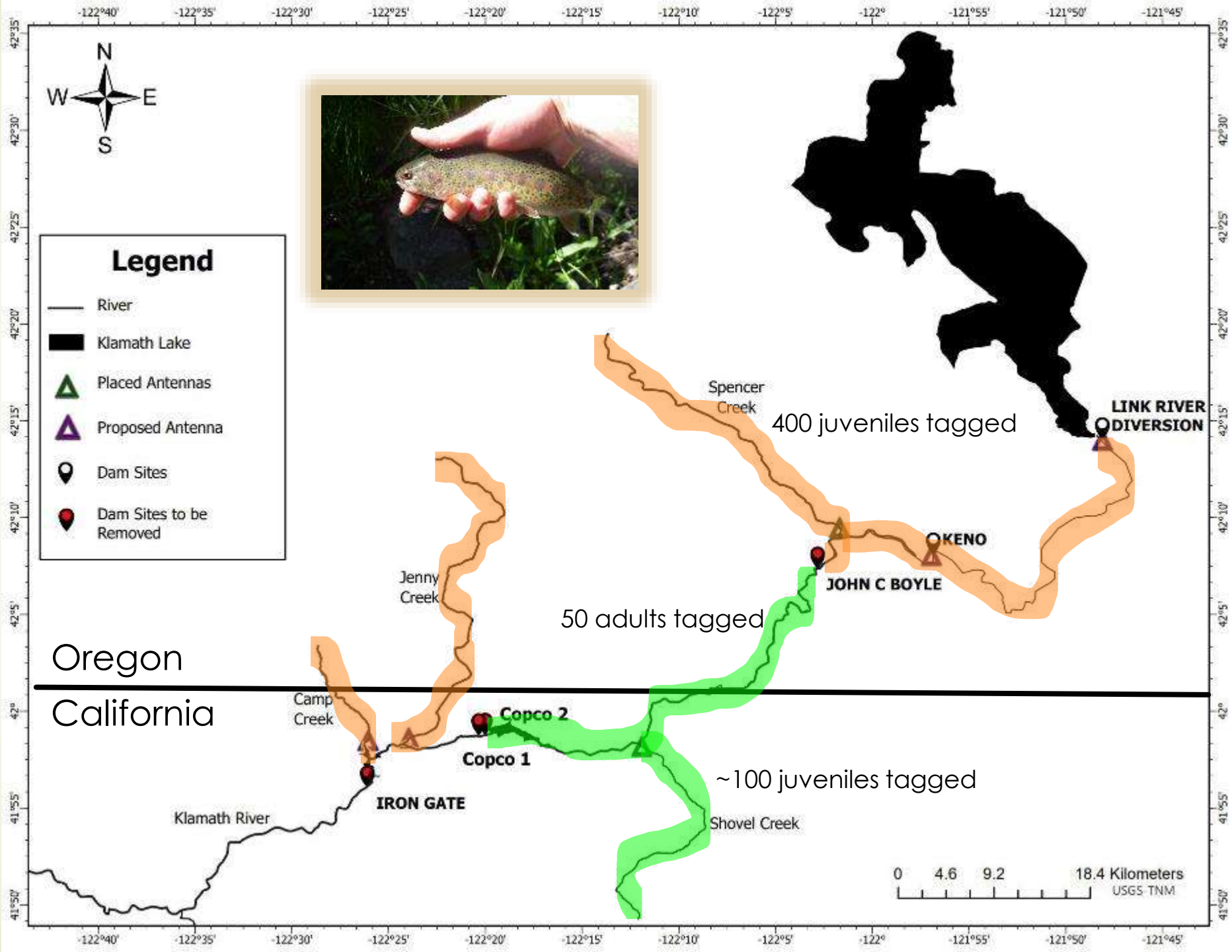


Track Long-Term Trends

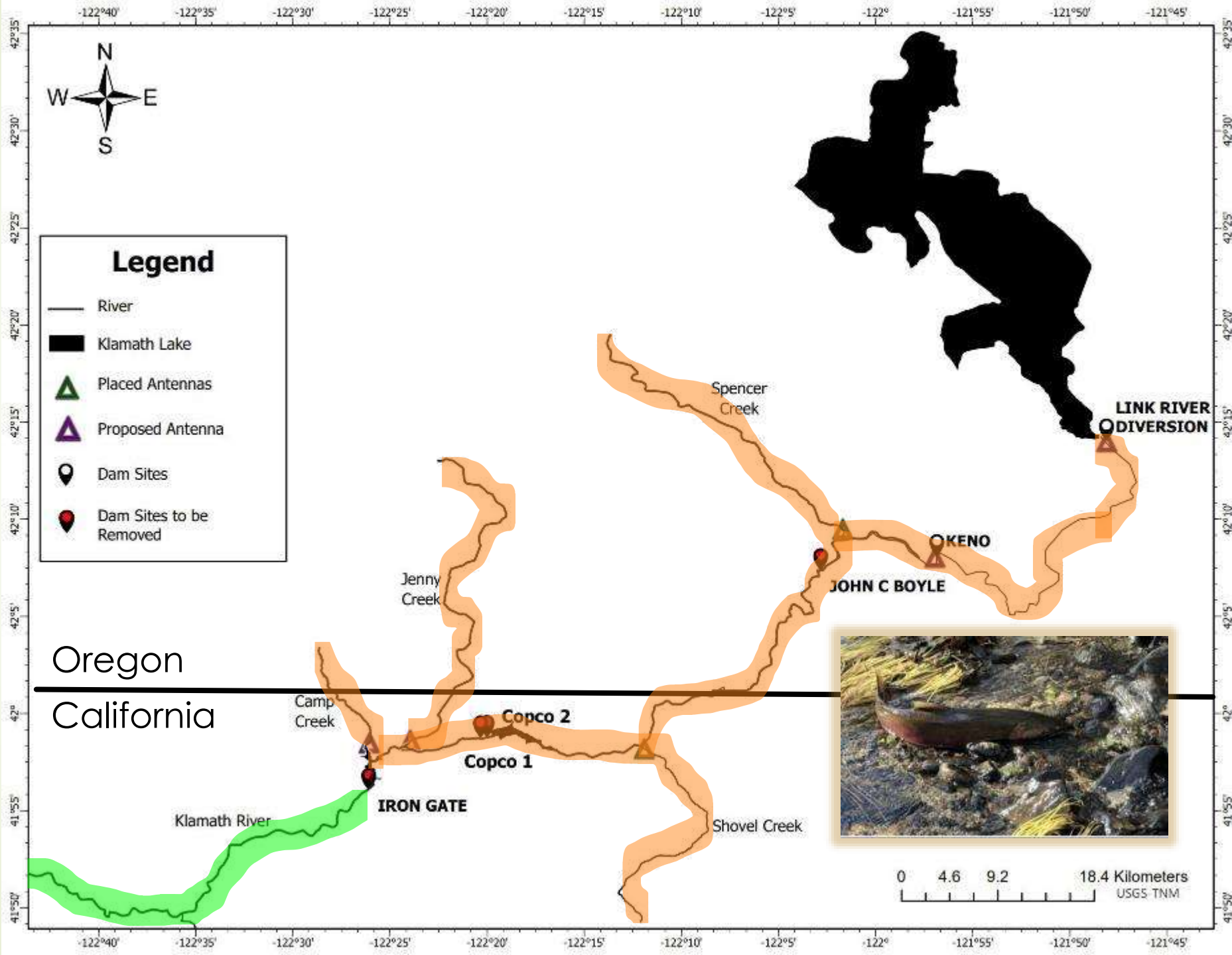
Upper Klamath Lake Lost River Sucker Shoreline Spawners



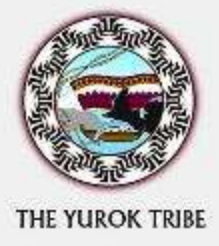
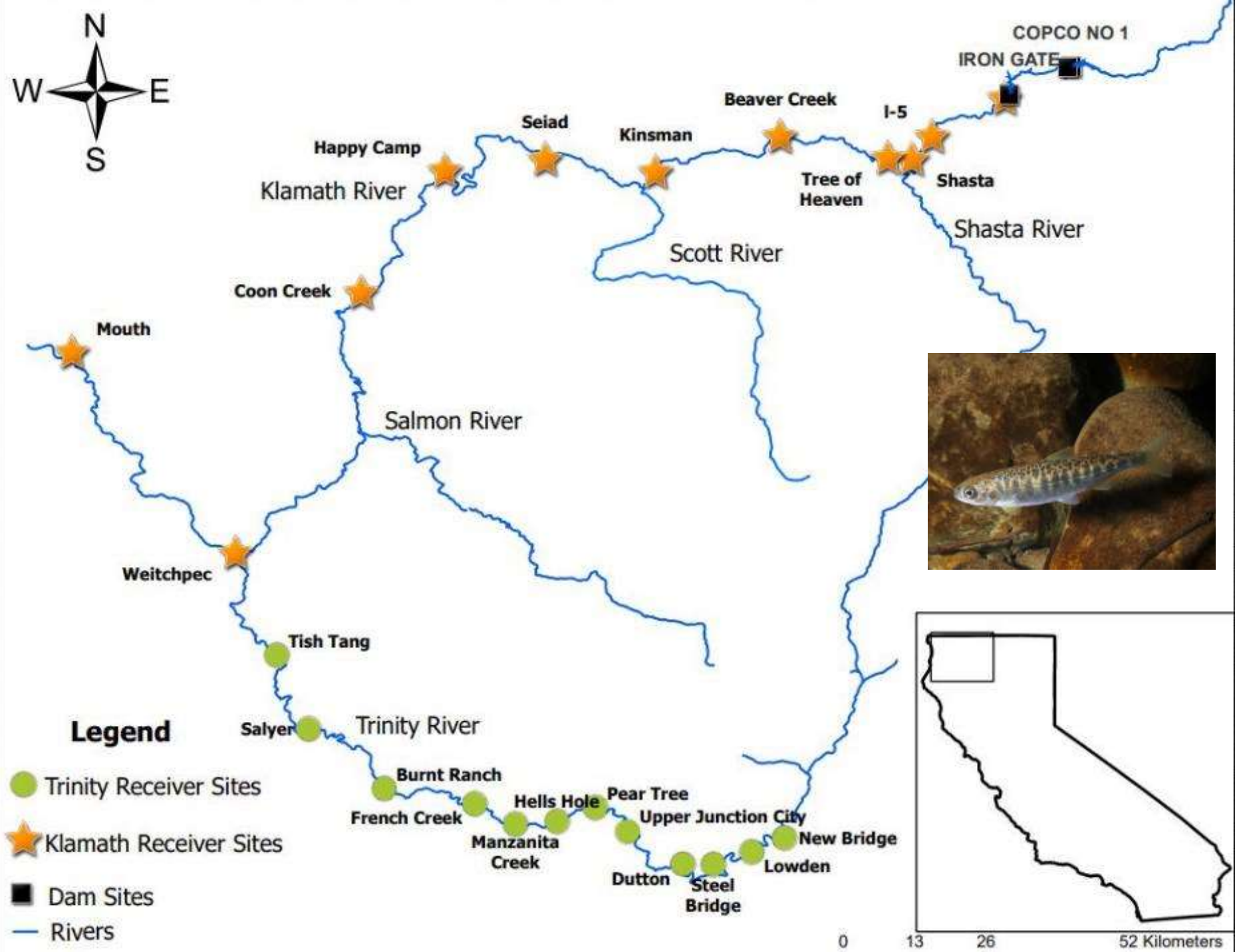
Monitor Dam Removal



Monitor Dam Removal

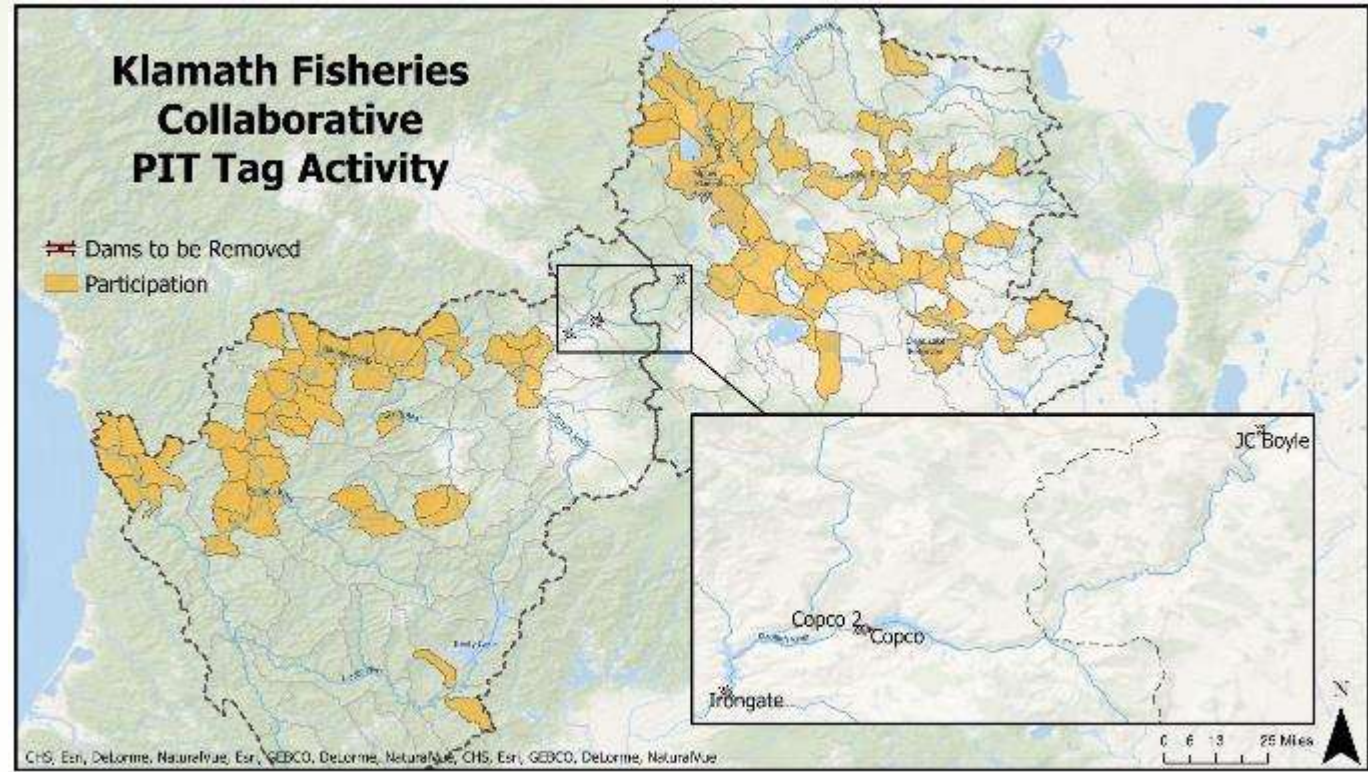


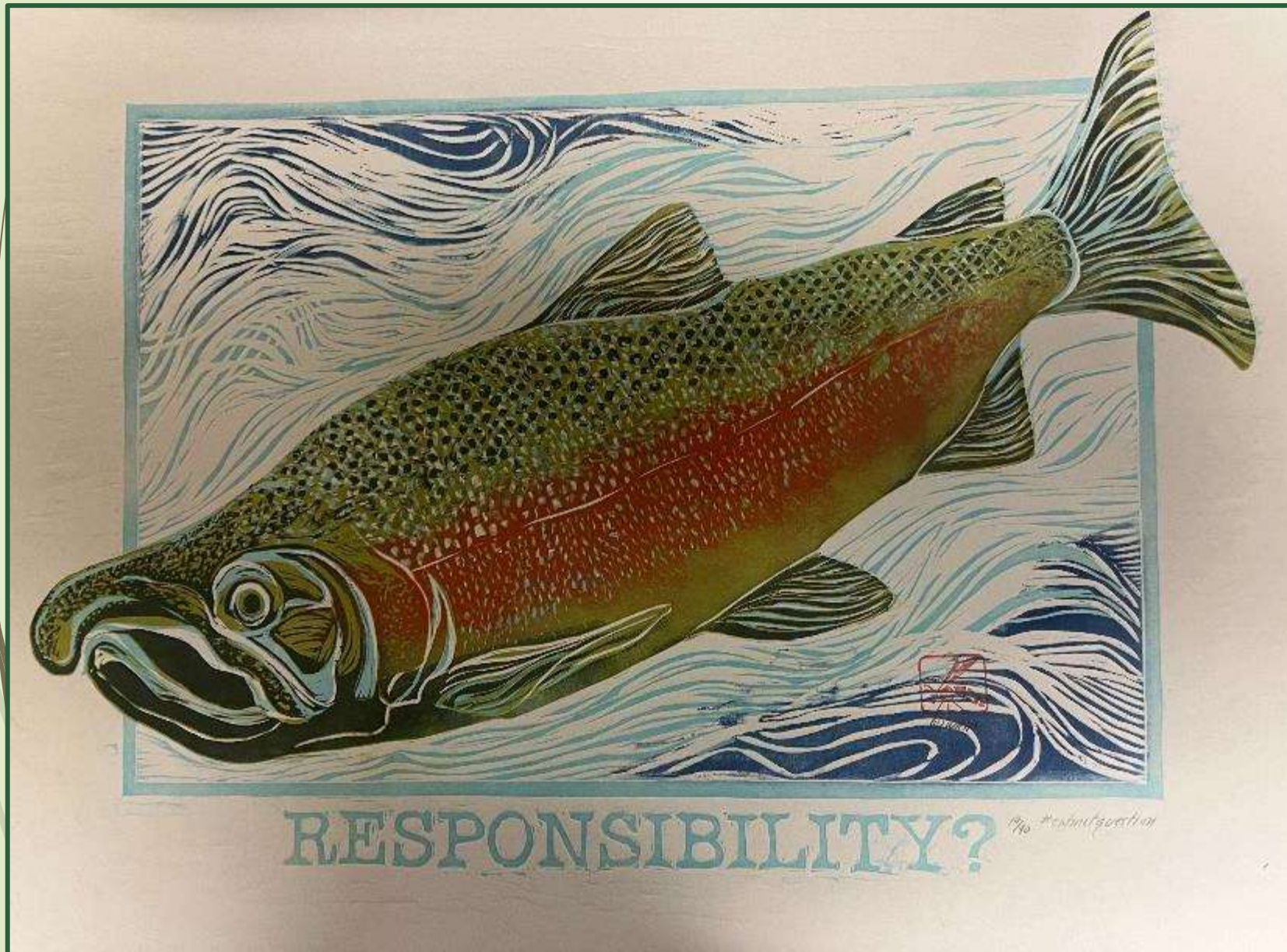
What's Next? Telemetry Data



Why should we continue to invest in the database?

- The Fish
- The People
- The Historic Opportunity
- The Future





Our Responsibility

What's Next?

- Grow Relationships- new partners, support grow of others, avoid duplication and competition
- Continued evolution of Data Sharing Agreement
- Electronic Data Collection
- New Monitoring Locations- Dam Removal Reach, Mainstem Arrays, RST
- New Species- Lamprey, Springers, ??
- New Technology and New Techniques
- Secure ongoing funding and resources for sustained collaboration and database adaptation.



**If you want to
go far, go
together**

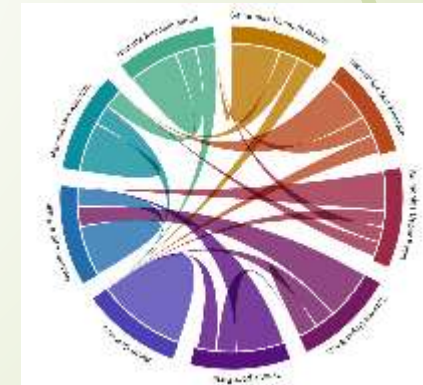
KBFC Meeting
June 11-12, 2024

<https://www.kbfishc.org/annual-meeting/2024-annual-meeting/>

sburdick@usgs.gov

betsy@scottriver.org

project@kbfc.org





Evaluating the effectiveness of dam removal on the Klamath River using SONAR and radio telemetry

Damon H. Goodman – California Trout

Toz Soto – Karuk Tribe



Klamath Dam Removal A Source of Inspiration



S. Anderson

Klamath Dam Removal A Source of Inspiration and Controversy.....

SCIENCE & ENVIRONMENT

California county declares local emergency over Klamath River water quality concerns



By Jane Vaughan (Jefferson Public Radio)
March 27, 2024 12:49 p.m.



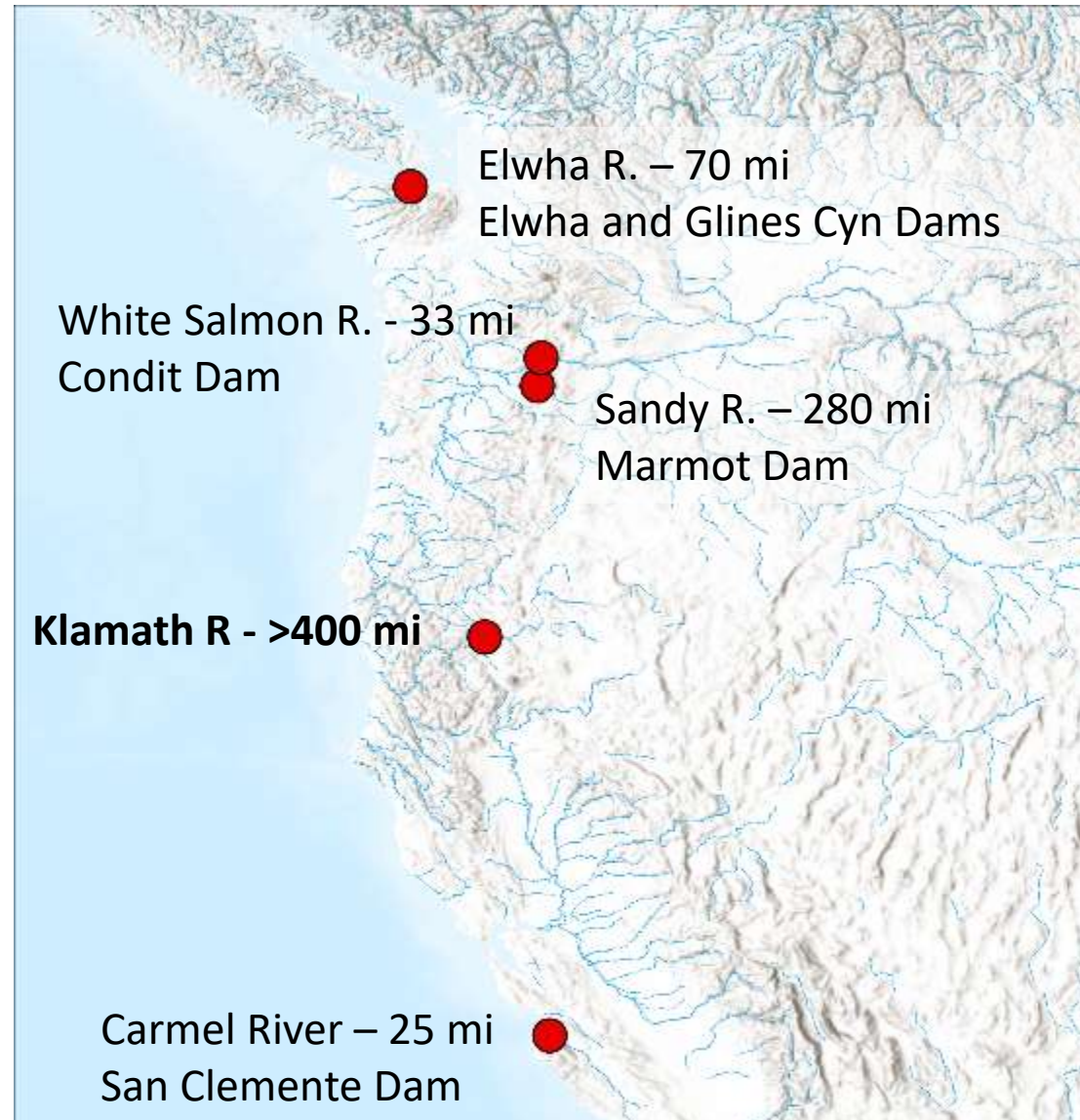
The Klamath River carving through the bed of the former Copco Lake reservoir
Julian D'Amico / JDF

Klamath River: And The Award Goes To...

Congratulations on the first annual 'River of Death' award
By William Simpson, March 11, 2024 3:44 pm

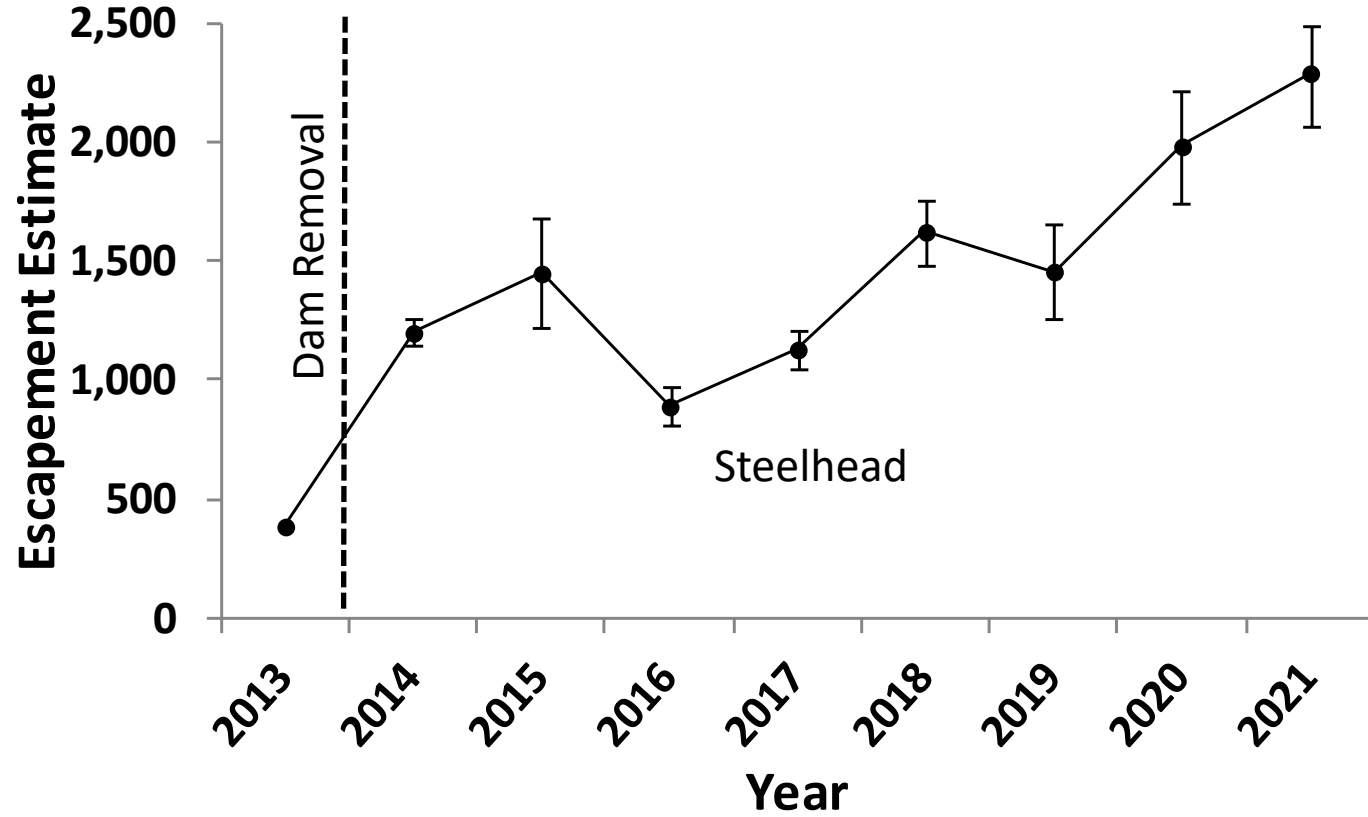


'River of Death' award. (Photo: Lindsay Rhea for William Simpson)



After 100 years dams are beginning to fall
Each one has its own story

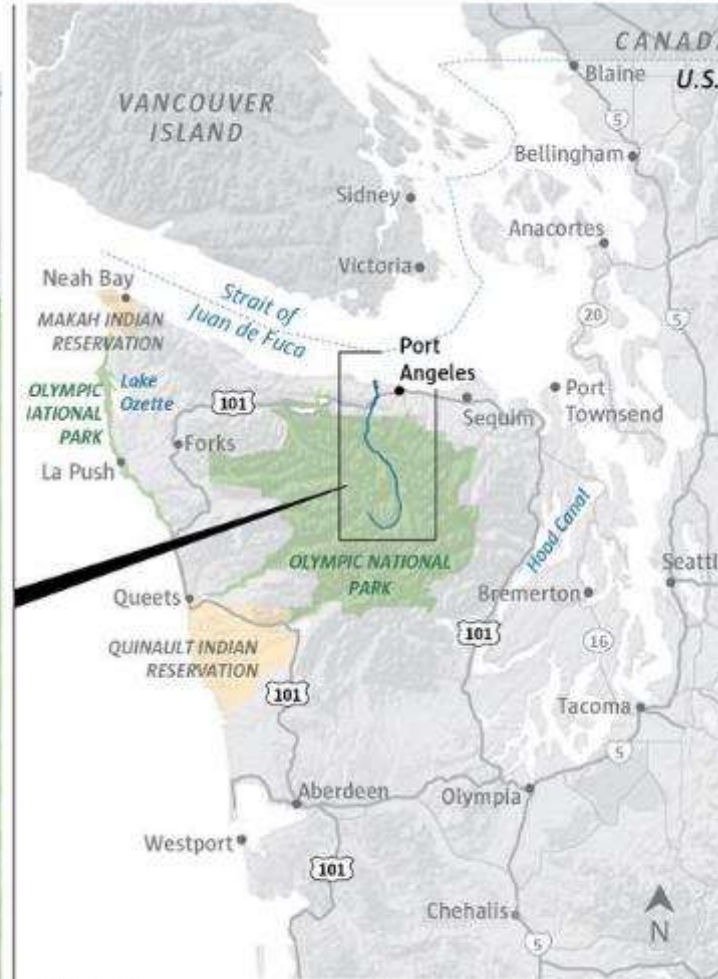
Results from the Elwha



Tribe catches coho salmon on free-flowing Elwha River, a first since dam removals

A historic fishery

The Lower Elwha Klallam Tribe embarks on its first fishery on the Elwha since dams removal was completed in 2014 to recover the river's fish runs.



Source: Esri

MARK NOWLIN / THE SEATTLE TIMES

How will Klamath Stocks Respond to Dam Removal?

- Expansion
- Abundance
- Timing
- Diversity



summer-run steelhead

spring-run Chinook Salmon



A Fishy Working Group

The Importance of Individuals

Toz Soto and Alex Corum – Karuk Tribe

Oshun O'Rurke – Yurok Tribe

Ryan Bardt – Klamath Tribes

Bog Pagliuco, Tommy Williams, George Pess, Cyril Michel – NOAA Fisheries

Crystal Robinson and Kurt Bainbridge – CDFW

Mark Hereford - ODFW

Keith Denton – K. Denton and Associates

Nicholas A. Som – USGS CRU and Cal Poly, Humboldt

Daniel Chase - RES

Damon H. Goodman – California Trout



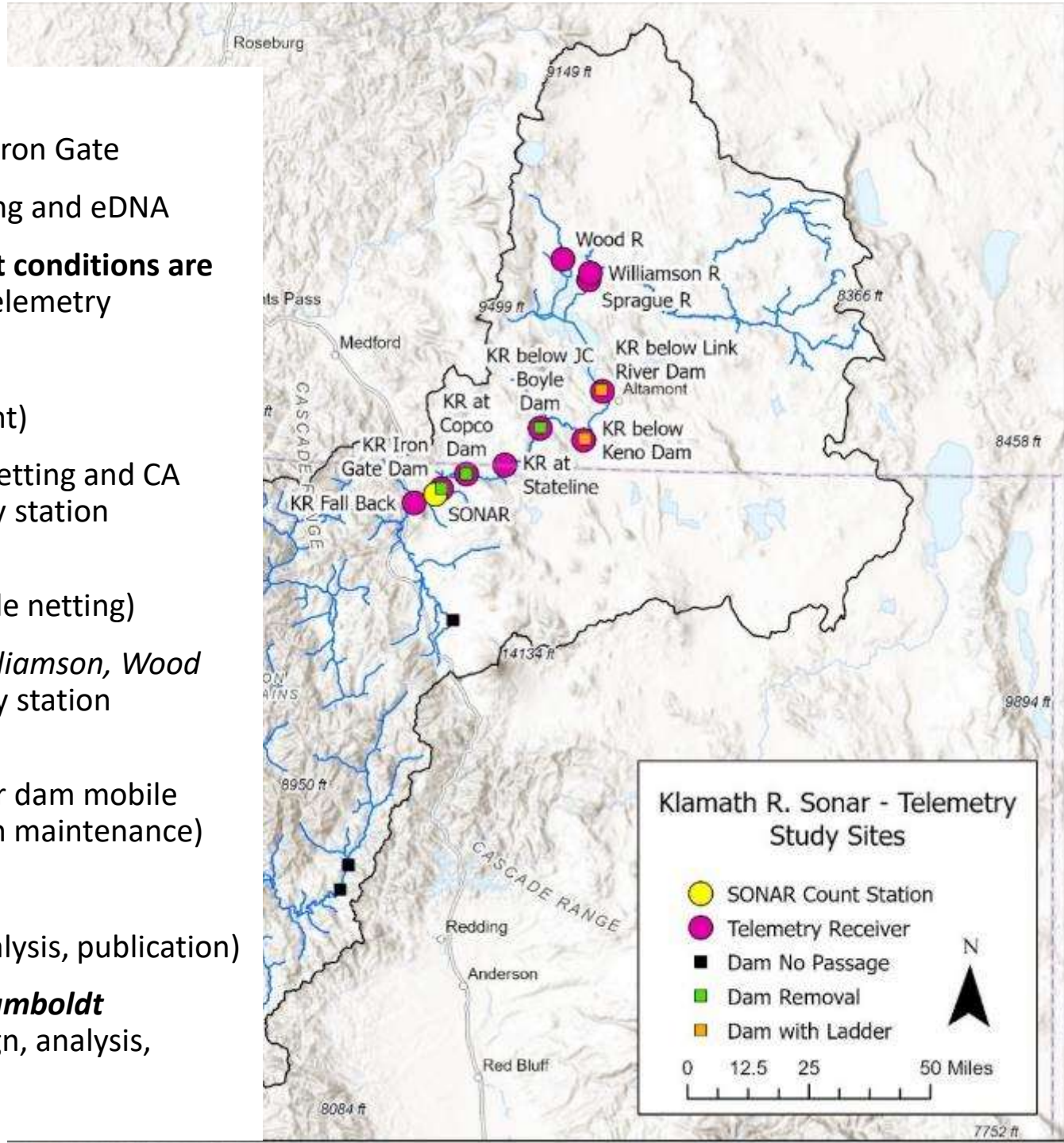


Study Design

- **How Many?** – SONAR below Iron Gate
- **What Species?** – Tangle netting and eDNA
- **Where are they going & what conditions are they experiencing?** – Radio telemetry

Partners

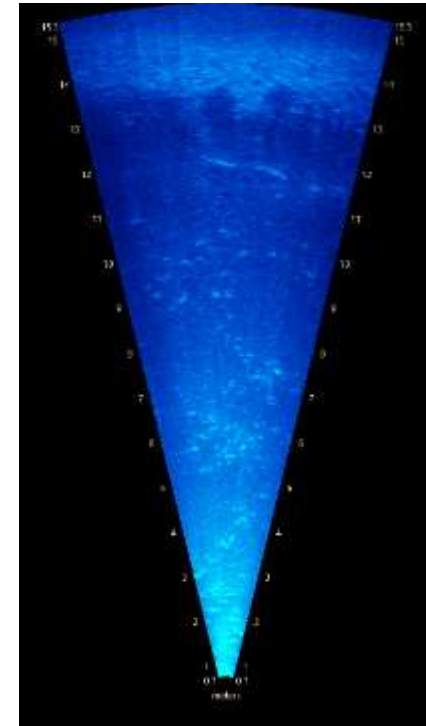
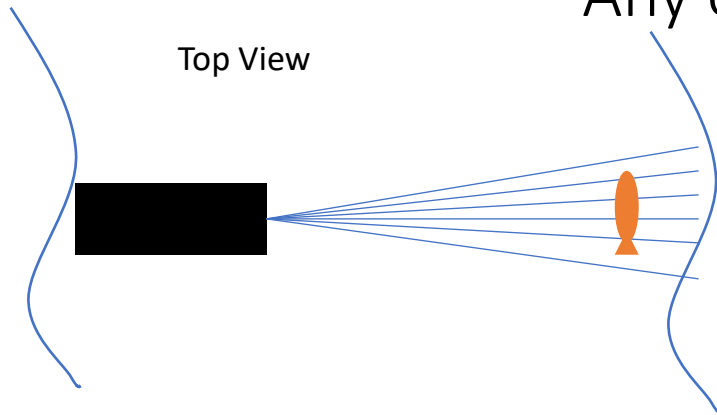
- **CalTrout** (project management)
- **Karuk Tribe** (SONAR, tangle netting and CA mobile tracking and telemetry station maintenance)
- **Yurok Tribe** (SONAR and tangle netting)
- **Klamath Tribes** (Sprague, Williamson, Wood mobile tracking and telemetry station maintenance)
- **ODFW** (State line to Link River dam mobile tracking and telemetry station maintenance)
- **CDFW** (one tech for SONAR)
- **SWFSC** (telemetry design, analysis, publication)
- **Keith Denton and Cal Poly Humboldt** (SONAR/apportionment design, analysis, publication)



Using SONAR to Enumerate Migrating Salmon



- Yukon, Elwha, Smith, Mad, Eel
- Any eye on the river

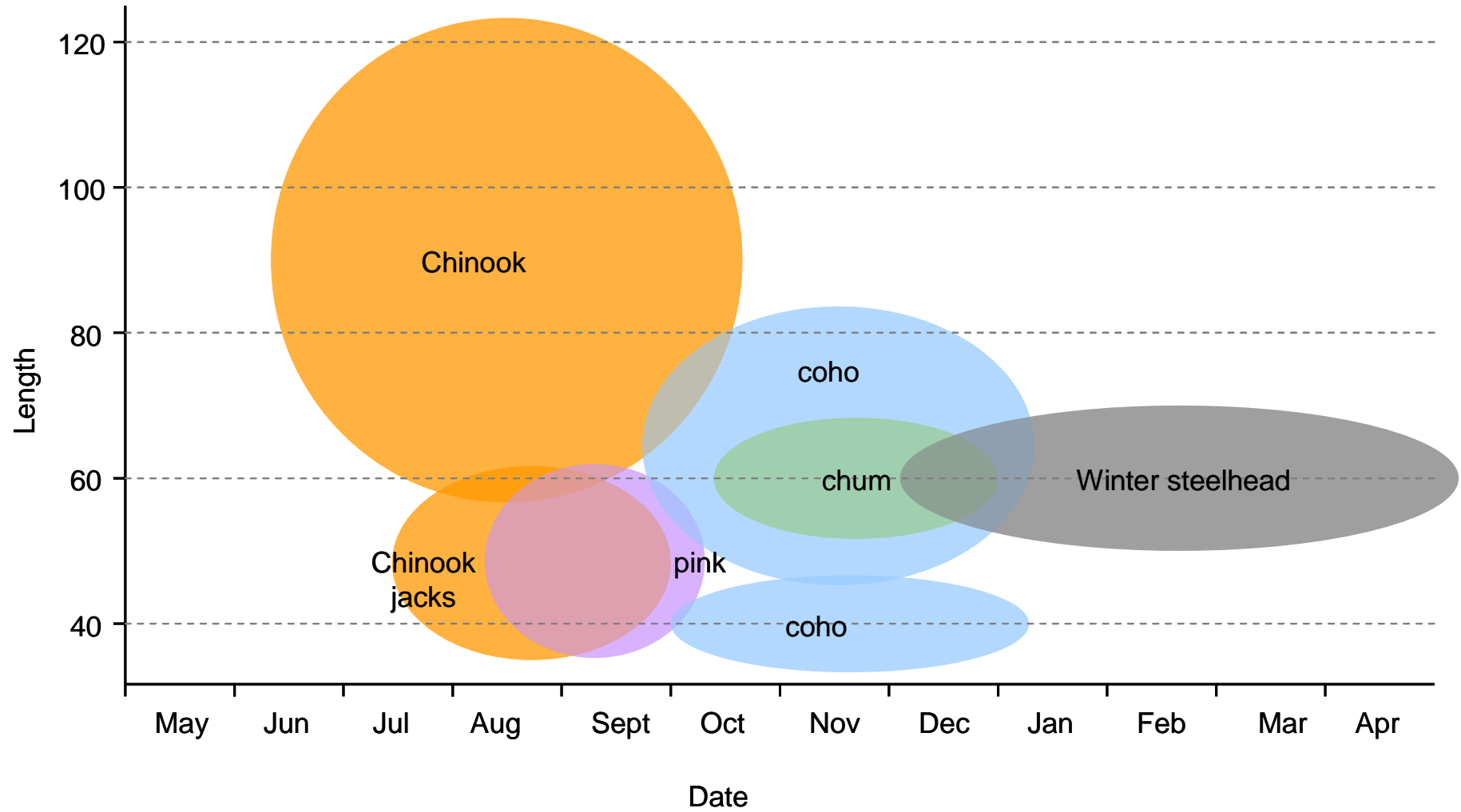


Keith Denton - Elwha



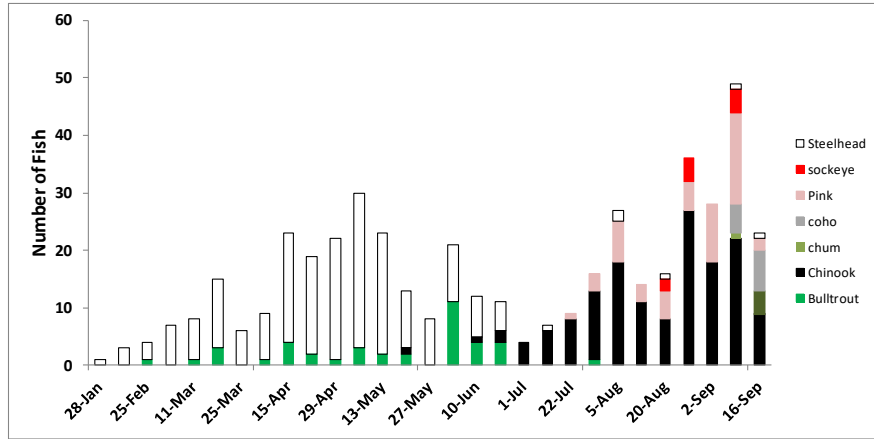
Species Composition

Moving beyond single-species monitoring

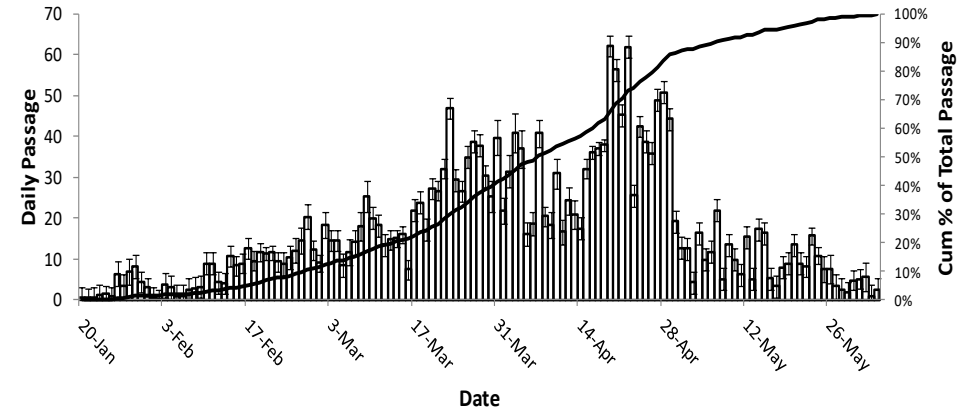


Elwha R Example

Species Composition

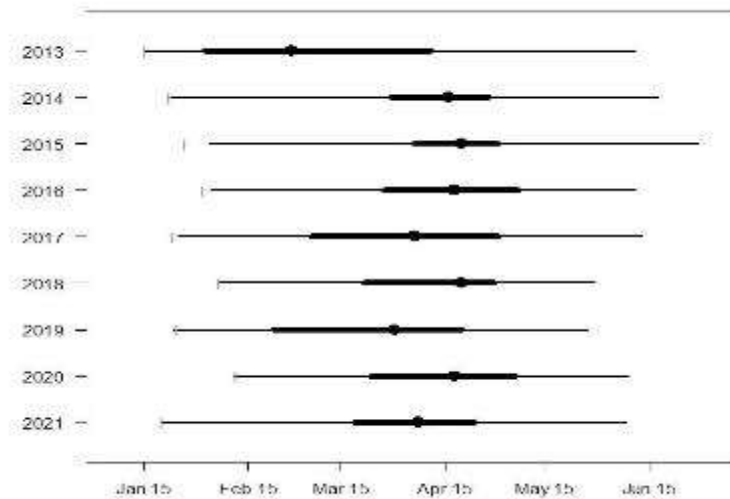


Daily passage

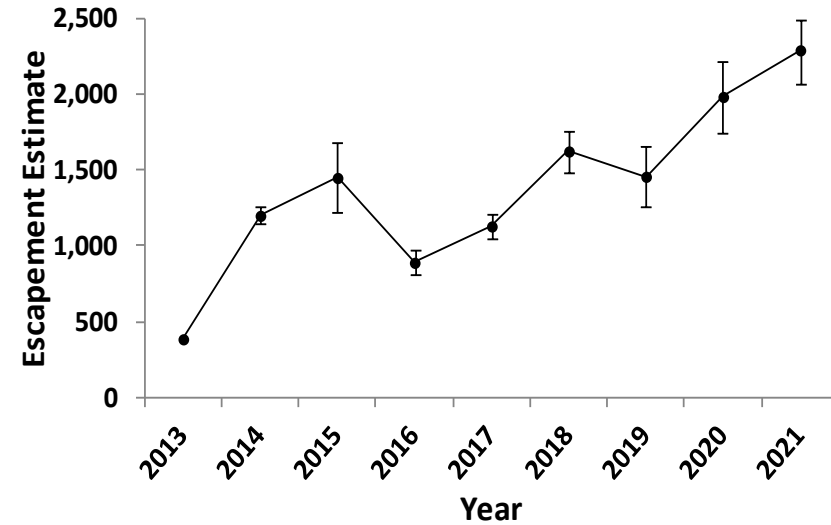


RESULTS

Run Timing

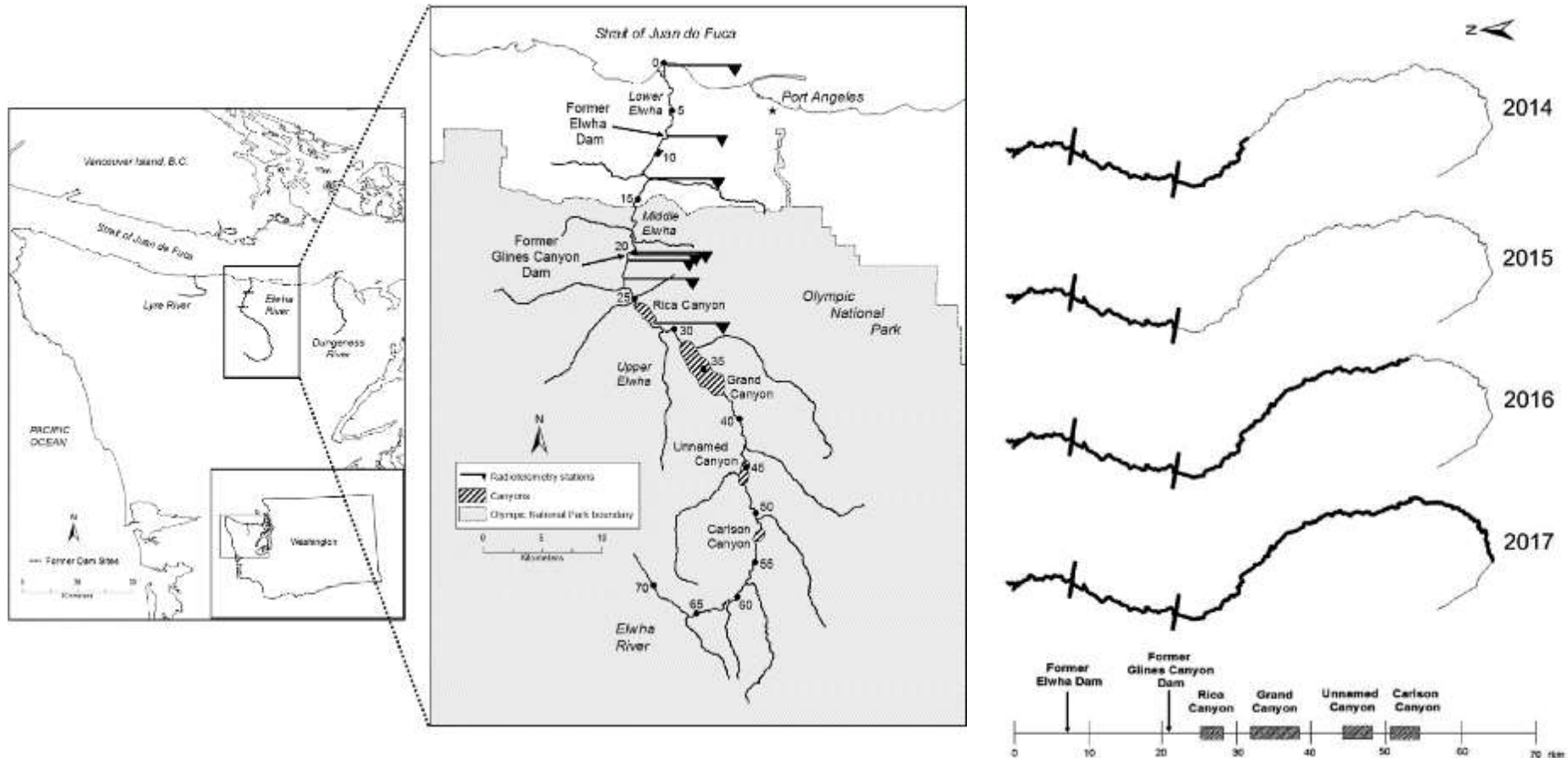


Annual Population Trends



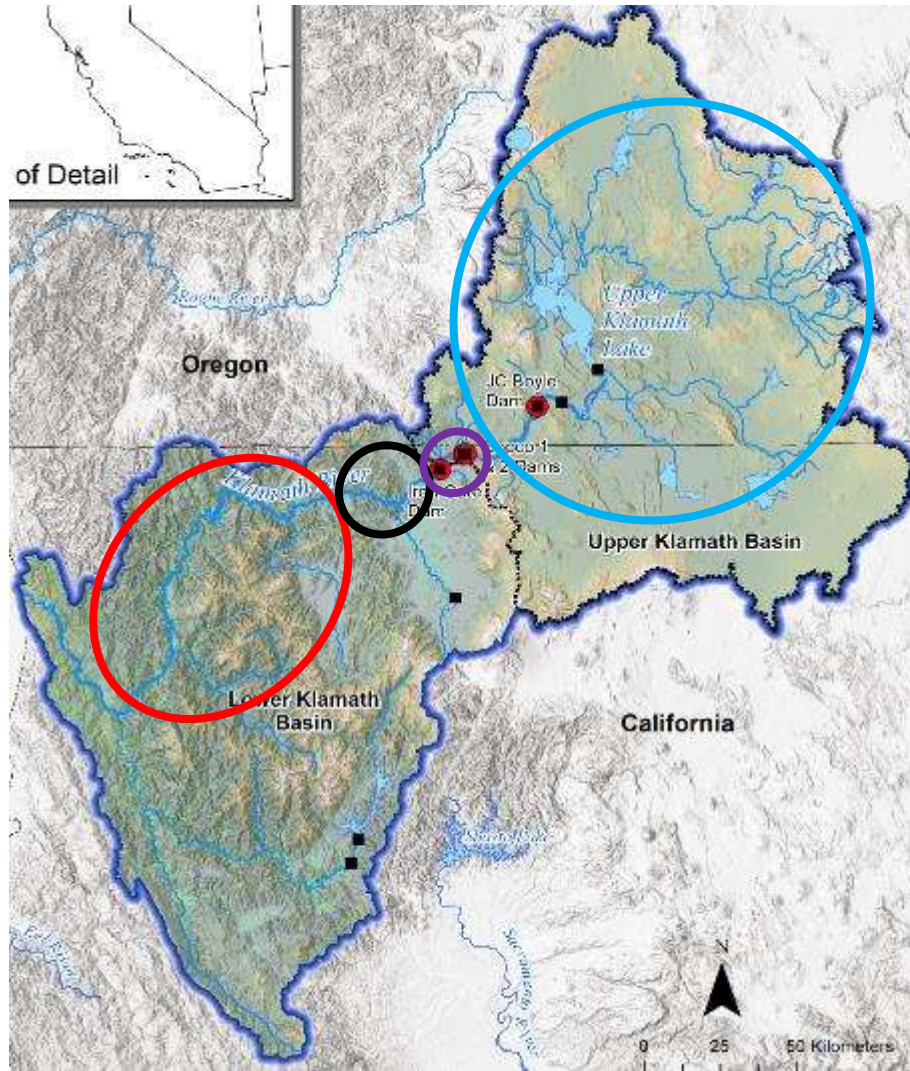
Radio Telemetry

Tracking Migration, Habitat Use and Thermal Scape



Elwha Example - Benkman et al. 2019

Complementary Monitoring Designs



Current and Future Monitoring efforts

Karuk/USFS/MKWC/CDFW – carcass and redd counts – lower and mid Klamath tributaries

Karuk/Yurok/USFWS – carcass and redd counts - Iron Gate to Wingate Bar

CDFW – PIT, carcass and redd counts – 4 tributaries in the Reservoir Reach

This project - ~350 -400 miles of habitat

- Klamath Mainstem from Iron Gate to Keno Dam
- Beaver Creek and Spencer Creek tributaries in reservoir reach
- Williamson River and Tributaries
- Wood River and tributaries
- Sprague River and tributaries

Questions?



TOP 6 CALIFORNIA
**DAMS
OUT**





Klamath River Dam Removal and the Future of Dam Removal in California: 4 Down, 150 to Go

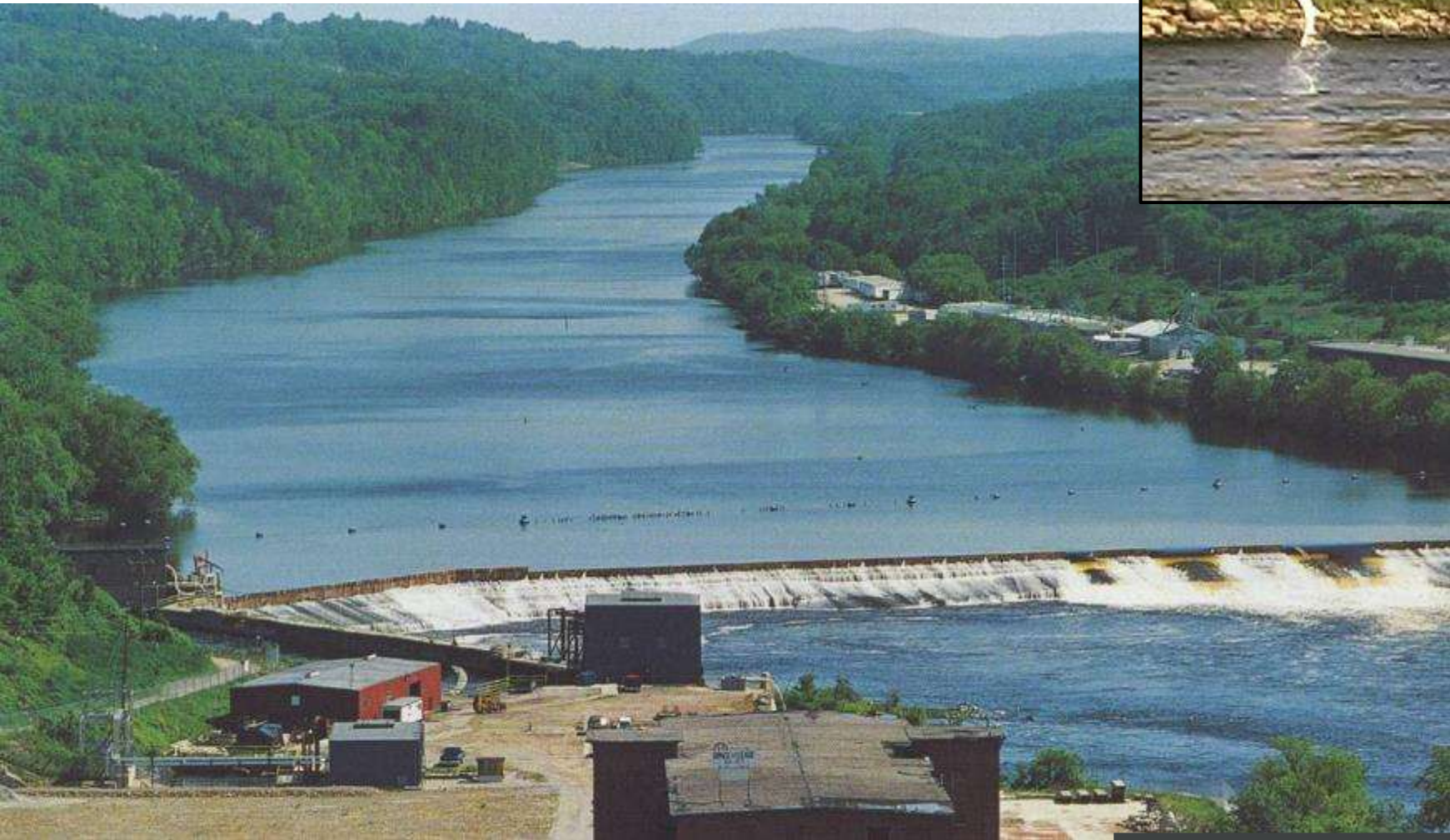
Ann Willis, PhD

California Regional Director

March 28, 2024



**AMERICAN
RIVERS**



State of U.S. Dam Removals

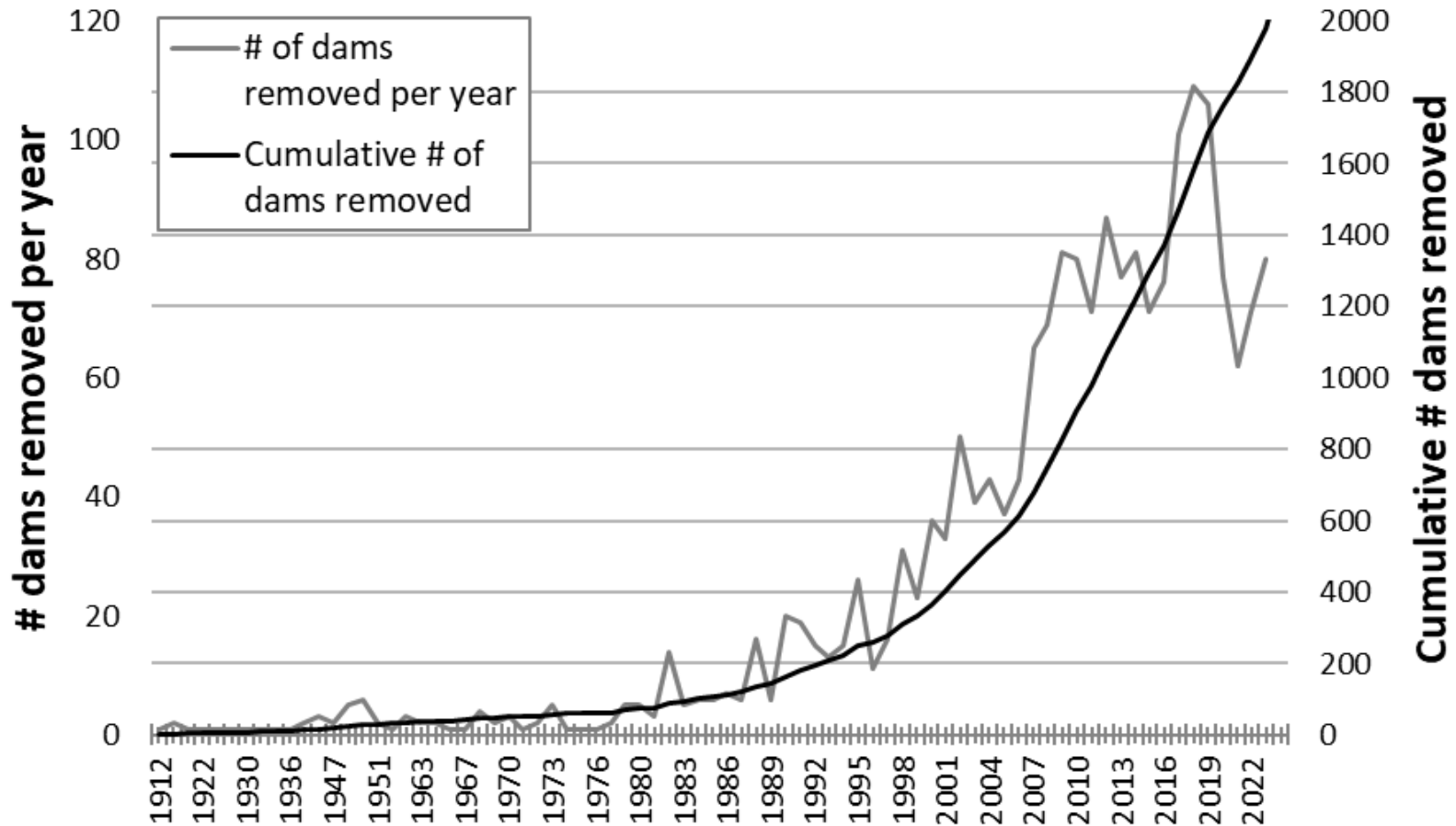
In 1999, the Edwards Dam removal on the Kennebec River in Maine spearheaded a national dam removal movement

FERC ordered removal of the 3.5-MW capacity hydropower dam blocking the most productive Atlantic salmon habitat in the U.S.

EDWARDS DAM
KENNEBEC RIVER, MAINE



State of U.S. Dam Removals



2,119 dams have been removed in the U.S. since 1912

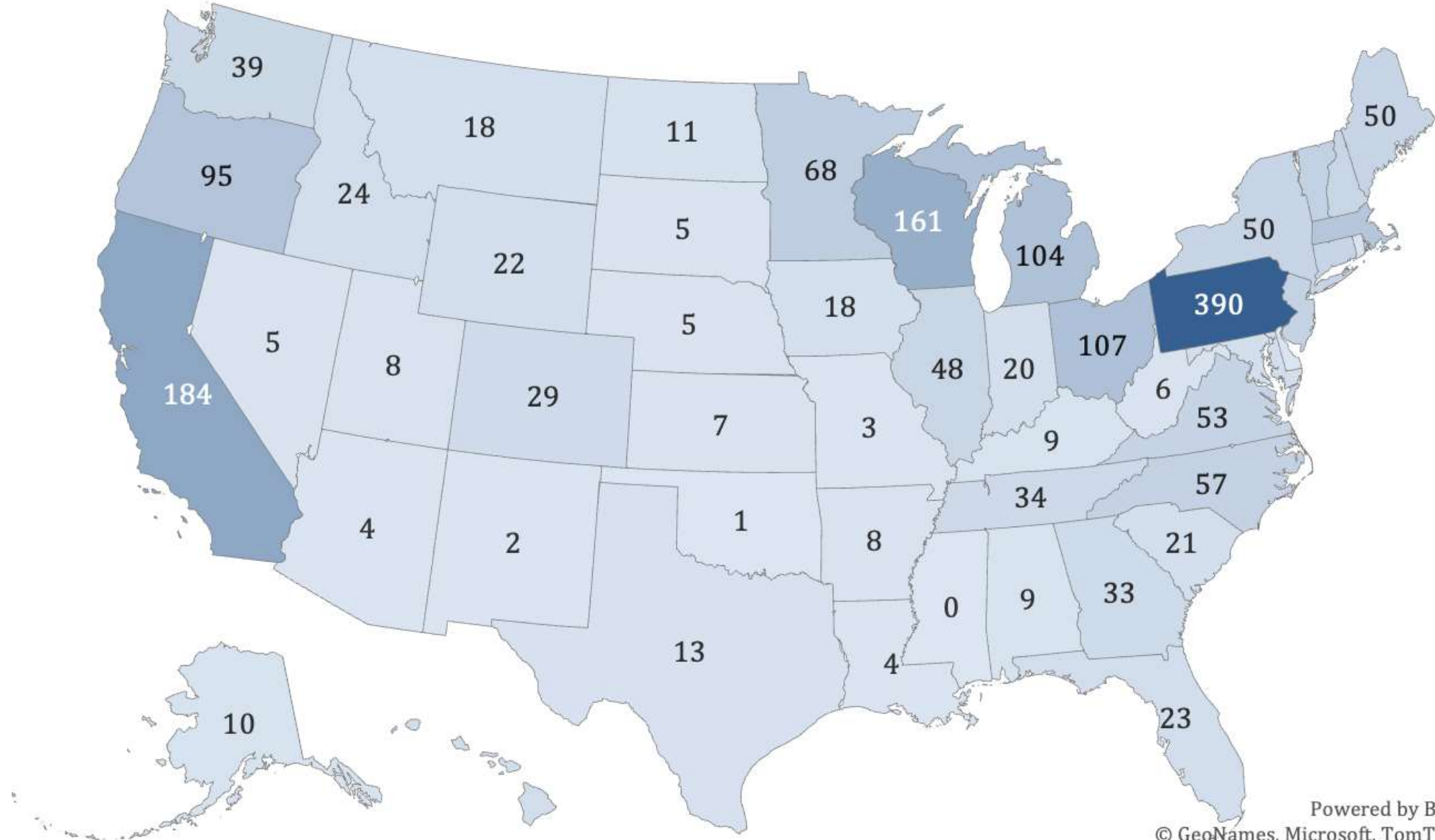
10.5% annual growth rate

Since the Edwards Dam Removal:

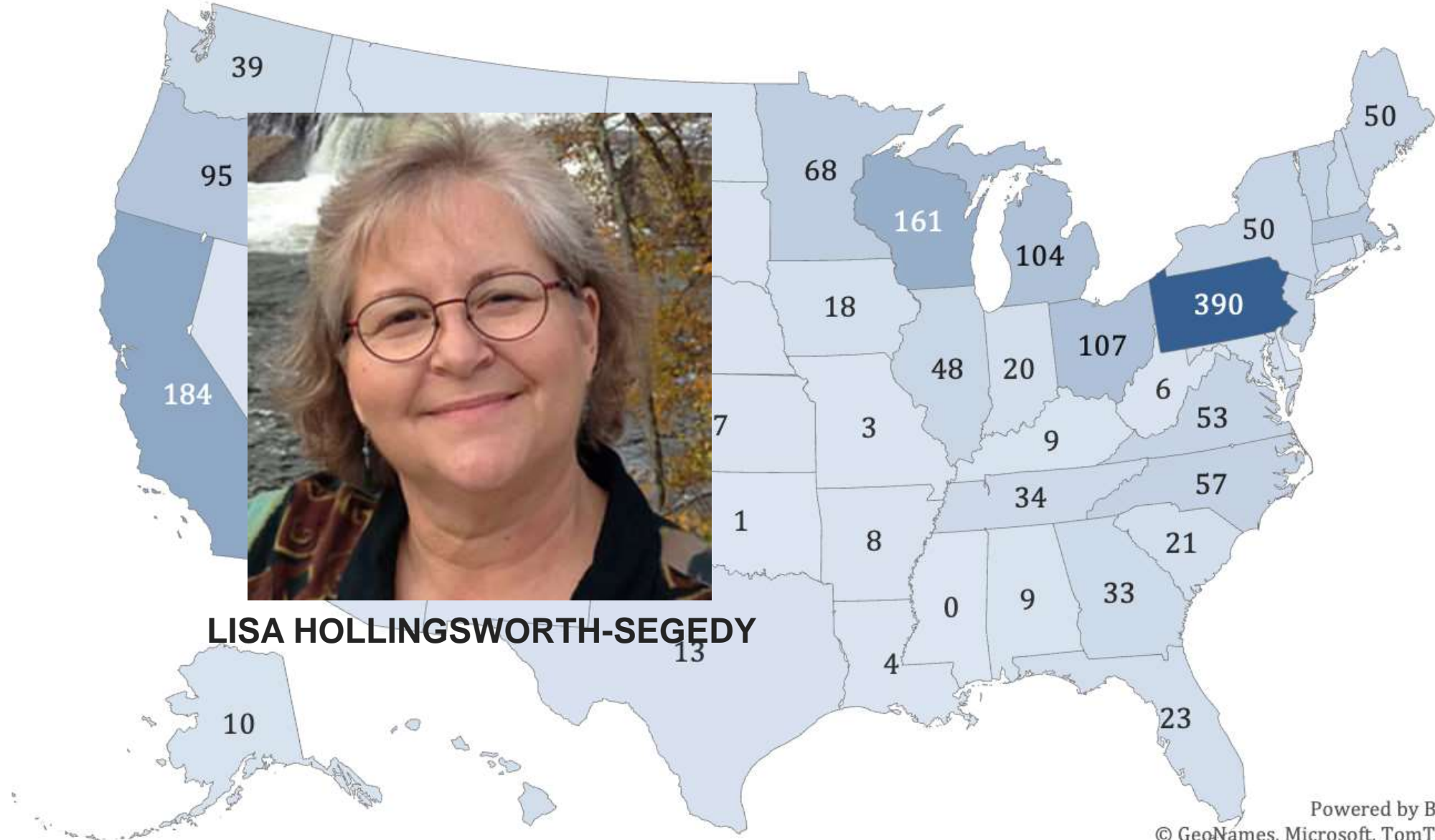
1,668 dam removals from 1999 – 2023



Number of Dam Removals By State 1912 — 2023



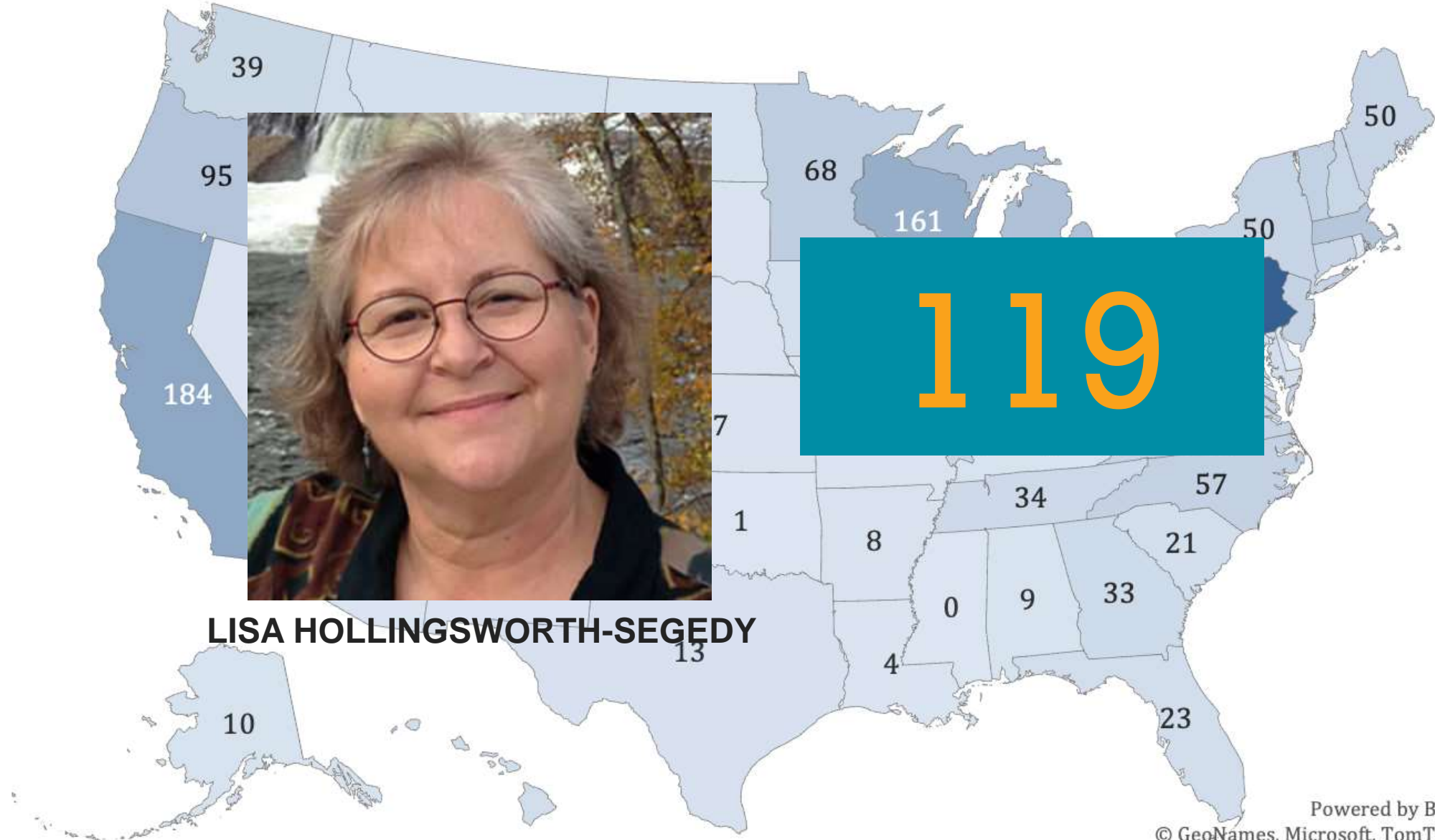
Number of Dam Removals By State 1912 — 2023



LISA HOLLINGSWORTH-SEGEDY



Number of Dam Removals By State 1912 — 2023



LISA HOLLINGSWORTH-SEGEDY



Current State of California Dam Removal

- Many (81) of the dams removals were part of a 2018 USFS effort to restore watersheds in the Cleveland National Forest.
- Watershed-wide and programmatic efforts that remove large numbers of smaller barriers can have significant benefits for a large geography in a shorter timeframe.
- States that have focused on coordinating smaller projects that can take advantage of streamlining benefits remove significantly more dams, annually.





IRON GATE DAM
KLAMATH RIVER, CALIFORNIA
MICHAEL WIER



KLAMATH DAM REMOVAL ADVOCACY
PATRICK MCCULLY



IRON GATE DAM
KLAMATH RIVER, CALIFORNIA

Getting to 30,000 Dam Removals

Build on the momentum of the Klamath dam removals as we did with Edwards 25 years ago

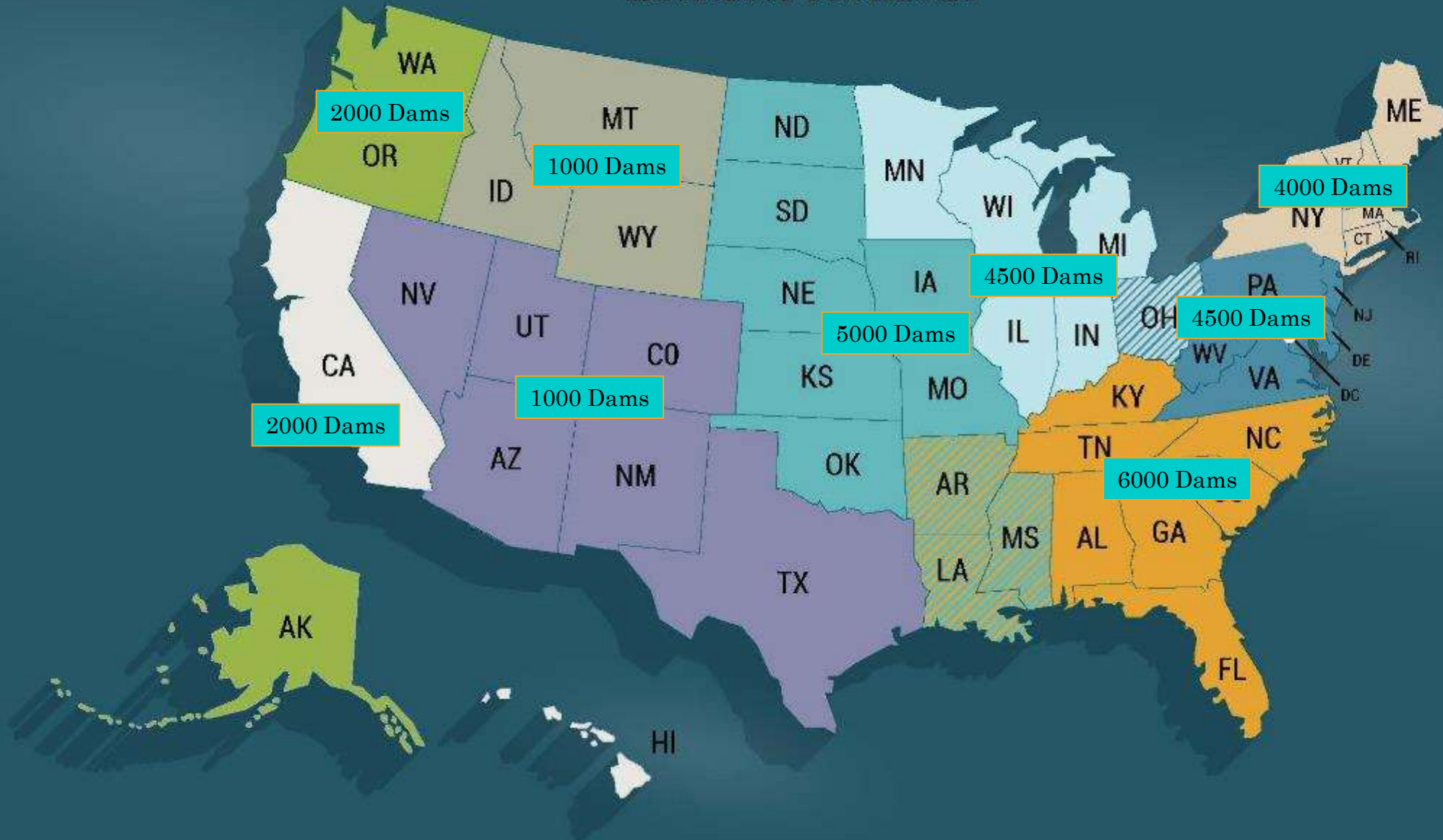
Do the work to make every dam removal project easier

Generate exponential growth in projects completed and river miles opened

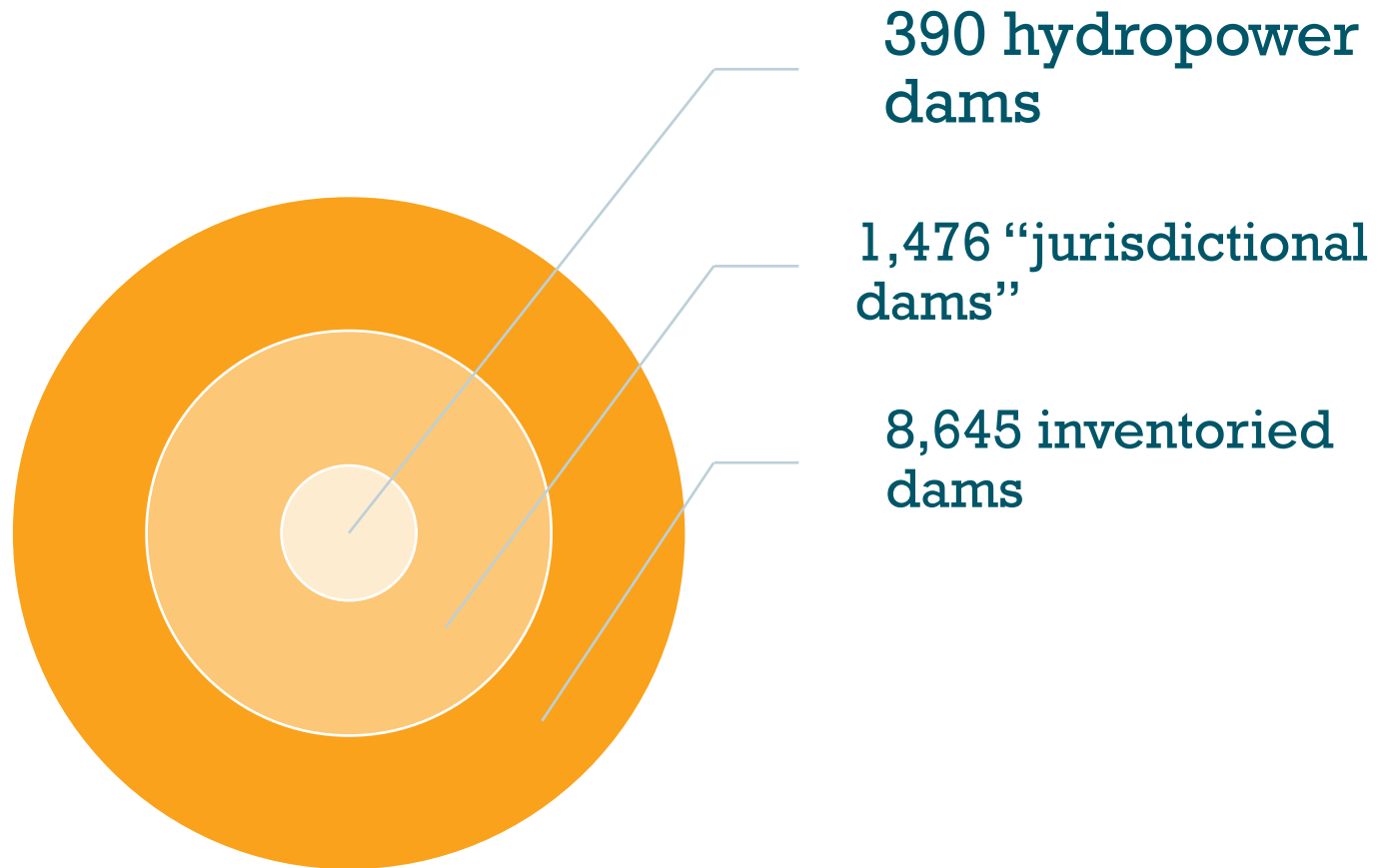


AMERICAN RIVERS

EXPANDING OUR IMPACT



How Many Dams Are in California?



Three Tracks of Dam Removal Projects

Small dam removals:

minimal complexity; can take advantage of streamlined permitting.

Medium complexity removals:

may have some degree of complexity, but relatively straight forward with dam owner support.

Complex dam removals:

involve complex issues, including hydropower and major water diversions/rights.



Increasing the Pace and Scale of California Dam Removal

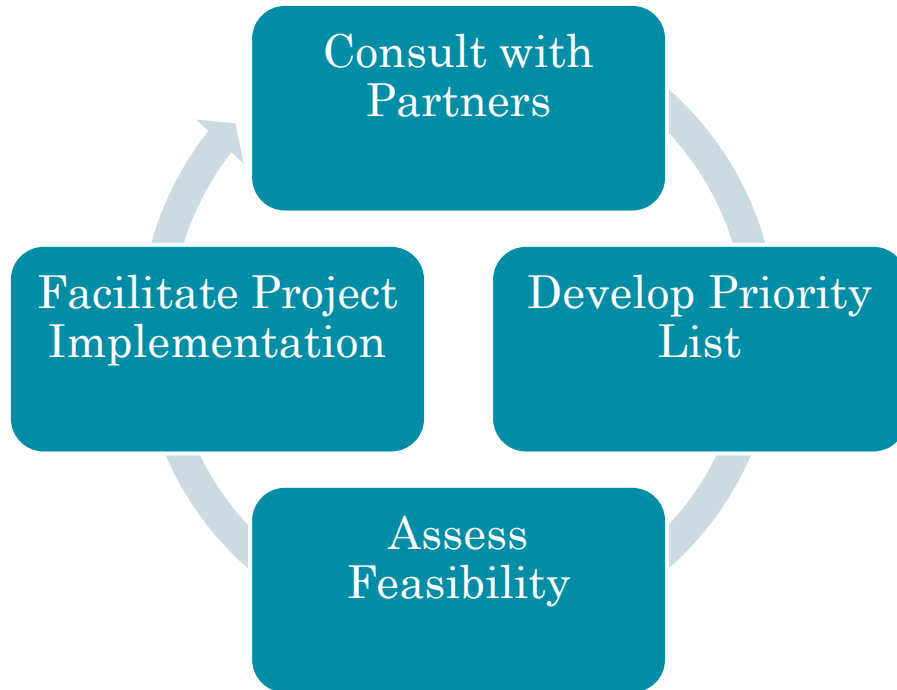
Focusing attention on smaller projects with reduced complexity allows for the removal of more dams at a faster pace.

- The size of a dam doesn't always correlate to a dam's impacts on a river, watershed, or the public.
- Restoration of tributary streams is complimentary to larger efforts, allowing for watershed-wide restoration.
- Assessing feasibility is key to this approach.



California Active 150: Desirability and Feasibility

Increasing the Pace and Scale of California Dam Removal Through Coordination and Collaboration



- **Concept:** assemble a list of 150 priority dam removal projects for fundraising and implementation
- **Prioritization:** gather information to inform project list, may focus on species, habitat quality, or environmental justice
- **Assess Feasibility:** examine development patterns, infrastructure, water rights, and owner willingness



Active 150 App

with ArcGIS Experience Builder



Legend

CA Active 150

- unsure
- yes
- maybe
- Other

Stay on Active

- No
- Yes
- Other

Dams - Past

- Dam re



Active 150 California

Next Steps



- Add data describing degree of regulation, groundwater dependent ecosystems, and Rivers of Opportunity
- Assess top 10 candidates from initial list
- Identify watersheds with potential to coordinate multiple removals



Life Depends on RiversSM

