Dams Out- The Next Rivers Poised for Reconnection in California

A Concurrent Session at the 42nd Annual Salmonid Restoration Conference
Santa Cruz, California, April 29 - May 2, 2025

Session Coordinator: *Charlie Schneider, Lost Coast Project Manager, CalTrout*

California has thousands of dams, from small earthen barriers to large dams hundreds of feet tall. Many of them provide critical water supply, flood control, and hydroelectric power, but many have outlived their functional lifespan, and the ecosystem and economic benefits of removal far outweigh the cost of leaving them in place. With the Klamath dams gone and scientists tracking ecosystem recovery, which are the next dams in California likely to be removed. This session will explore active dam removal efforts across the state and discuss the who, what, where, why, and how of each effort.

Presentations

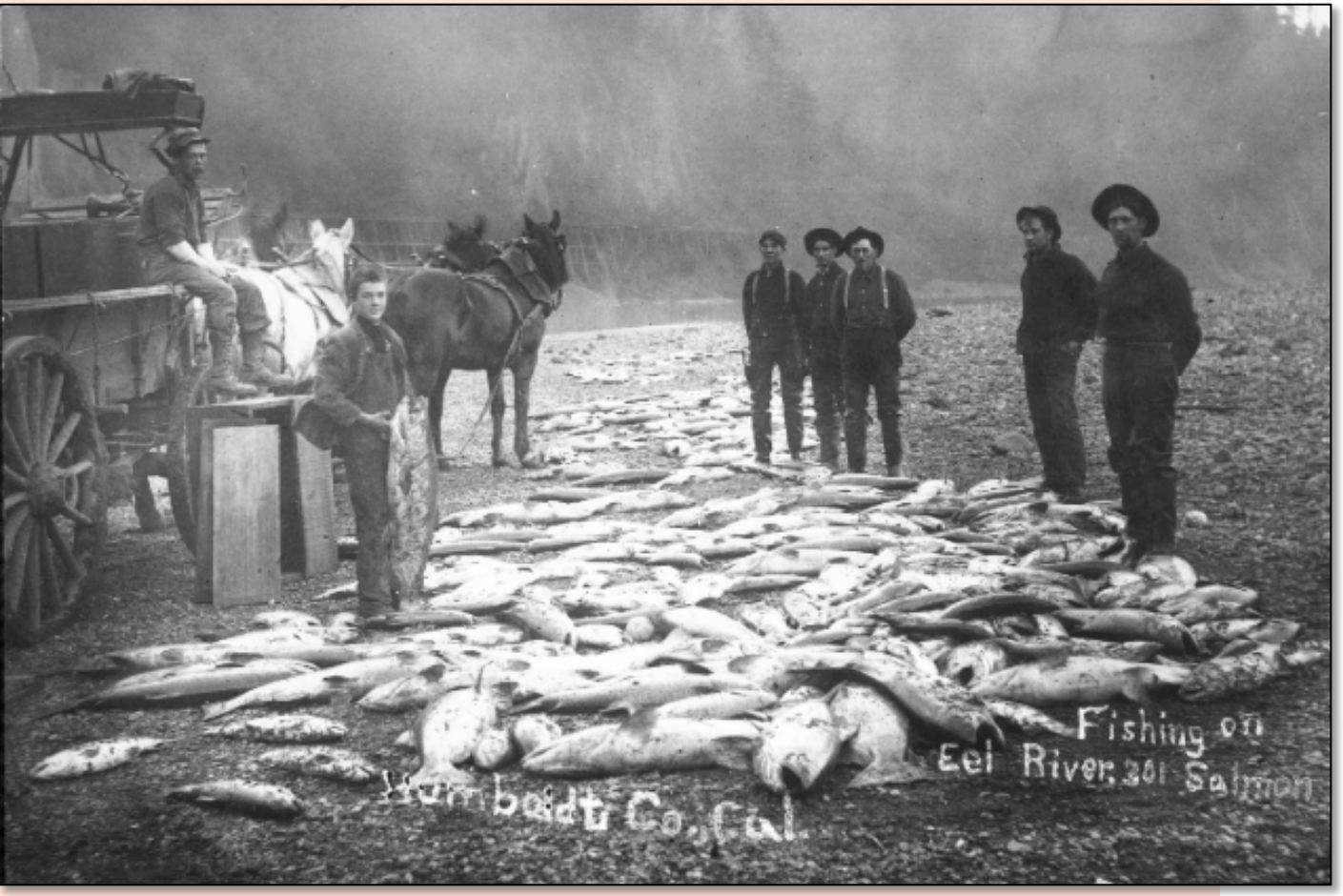
Restoring the Eel River: Advancing dam removal at the Potter Valley Project

Christine Davis
North Coast Project Manager

Charlie Schneider
Lost Coast Project Manager

May 2, 2025,
SRF Dams Out

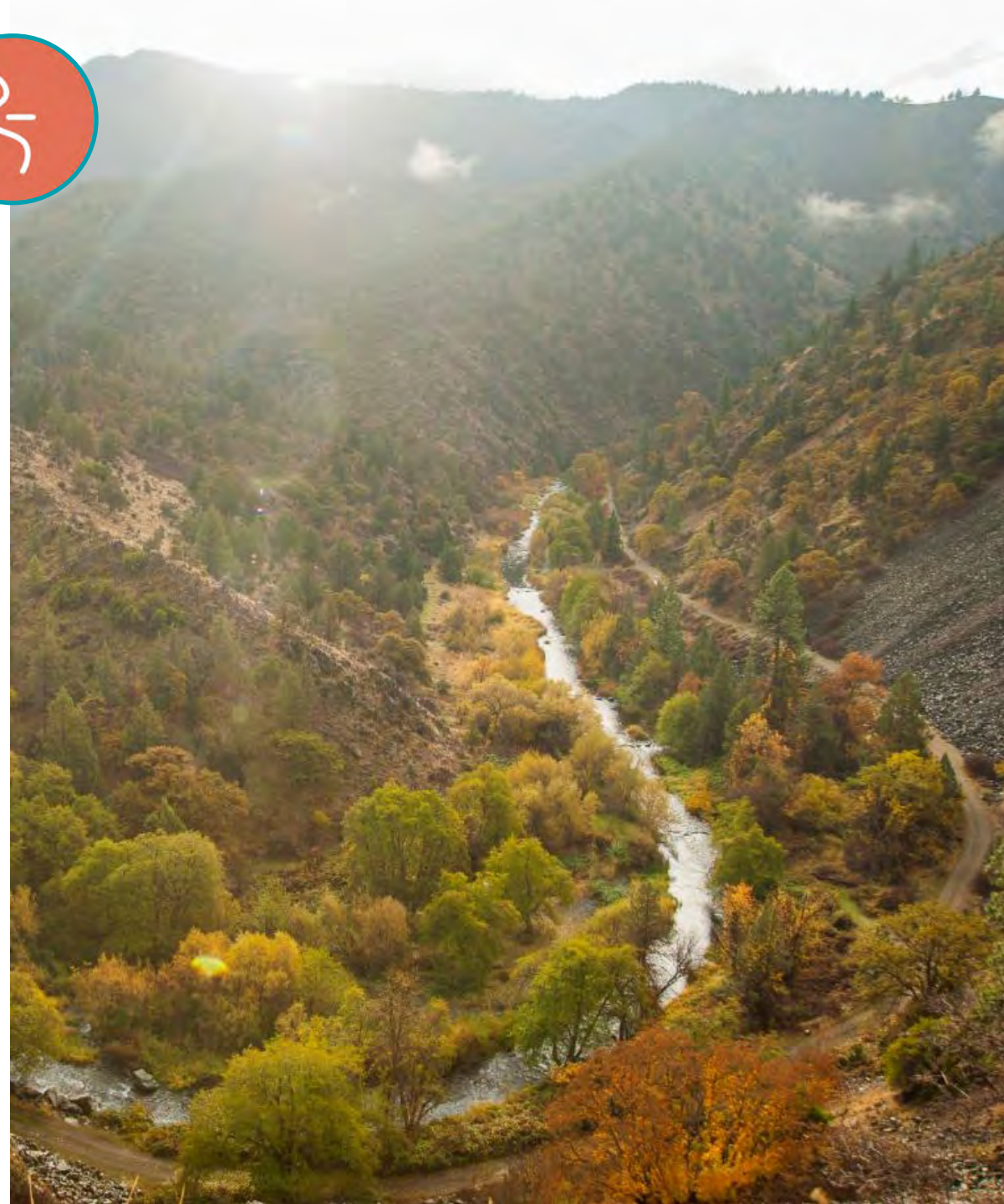
THE EEL RIVER WATERSHED

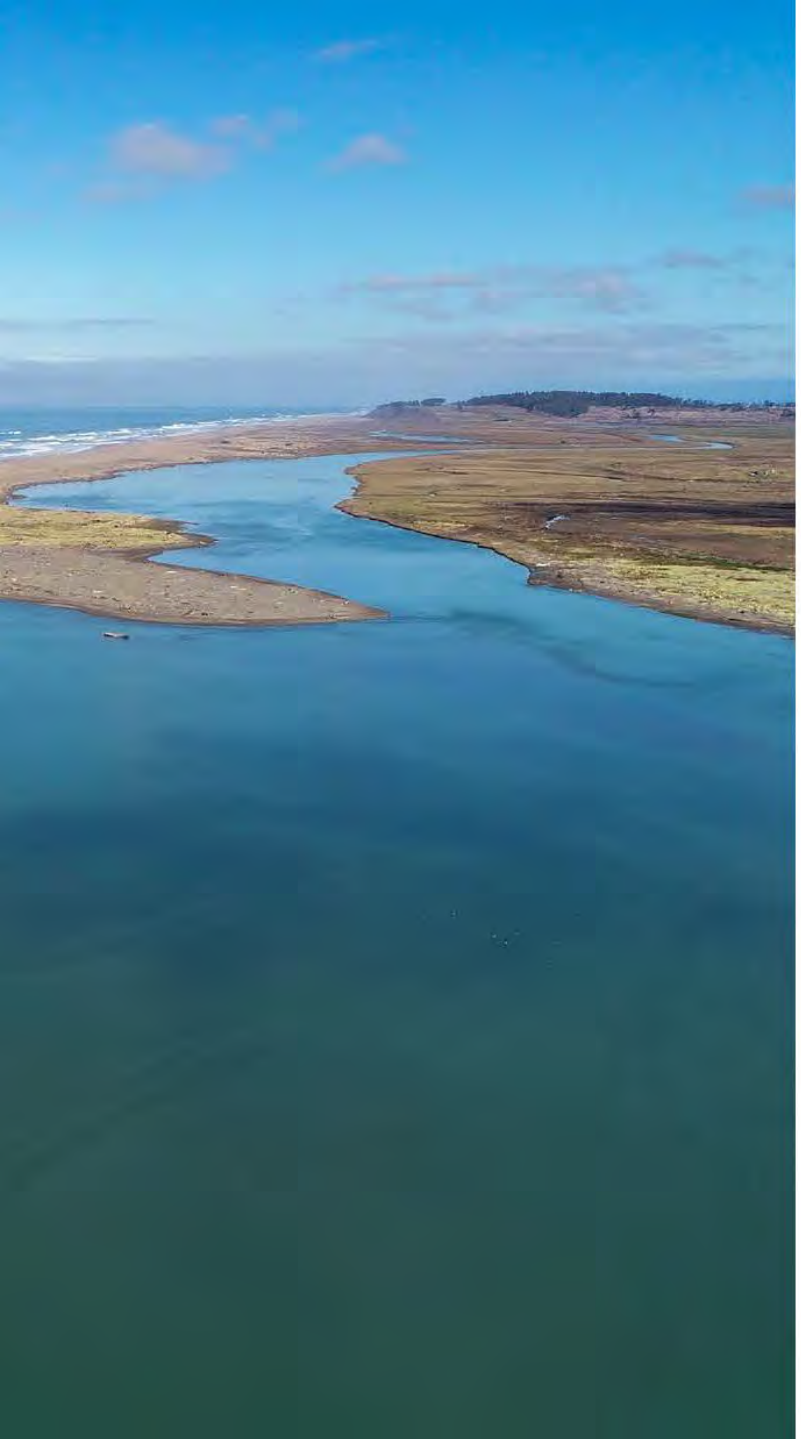



PROTECT
THE BEST
RECONNECT
HABITAT
RESTORE
ESTUARIES
STEWARD SOURCE
WATER AREAS
INTEGRATE WILD
FISH AND WORKING
LANDSCAPES
Strategies
Backed by
Science

Reconnect Habitat

Give salmon and steelhead access to diverse habitat by removing barriers and getting obsolete dams out.





Photos: Michael Carl, Mike Weir

Abundant Habitats

The need for watershed restoration & conservation

- Historical over-fishing, harvest, road construction, cannabis
- Historical flooding (1955, 1964), coarse and fine sediment changes, fine sediment loading
- Dams and diversions, passage barriers, flow alteration
- Introduction of invasive predatory fish
- Channel simplification, levee construction in estuary and lower river
- Climate change, drought and warming, water temperature warming

EEL RIVER FORUM / EEL RIVER ACTION PLAN 2016

Eel River Forum

The mission of the Eel River Forum is to coordinate and integrate conservation and recovery efforts in the Eel River watershed to conserve its ecological resilience, restore its native fish populations, and protect other watershed beneficial uses. These actions are also intended to enhance the economic vitality and sustainability of human communities in the Eel River basin.

Charter Members
California Trout
CA Department of Fish and Wildlife
CA State Parks
Coastal Conservancy
Eel River Recovery Project
Eel River Watershed Improvement Group
Environmental Protection Information Center
Friends of the Eel River
Friends of the Van Duzen River
Humboldt County Resource Conservation District
Mendocino County Resource Conservation District
National Marine Fisheries Service
North Coast Regional Water Quality Control Board
Pacific Gas and Electric Company
Potter Valley Irrigation District
Round Valley Indian Tribe
Salmonid Restoration Federation
Sonoma County Water Agency
US Bureau of Land Management
US Fish and Wildlife Service
US Forest Service
Wiyot Tribe

THE EEL RIVER ACTION PLAN

A COMPILATION OF INFORMATION AND RECOMMENDED ACTIONS

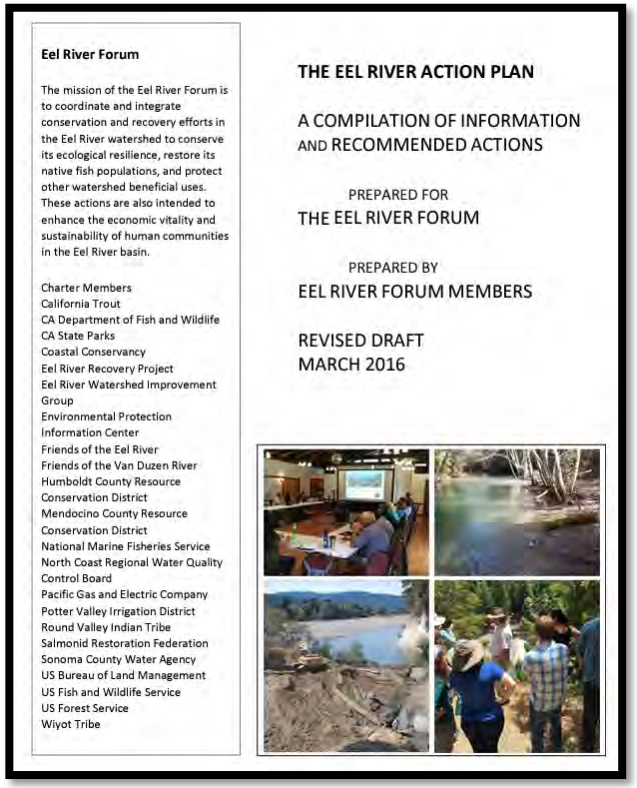
PREPARED FOR
THE EEL RIVER FORUM

PREPARED BY
EEL RIVER FORUM MEMBERS

REVISED DRAFT
MARCH 2016

2016

Eel River Action Plan



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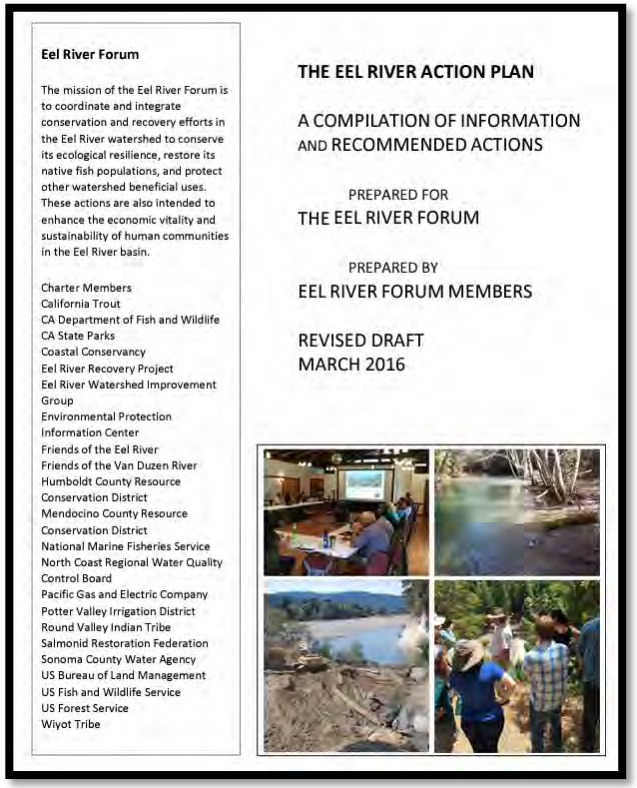
Eel River Action Plan

2021

Framework



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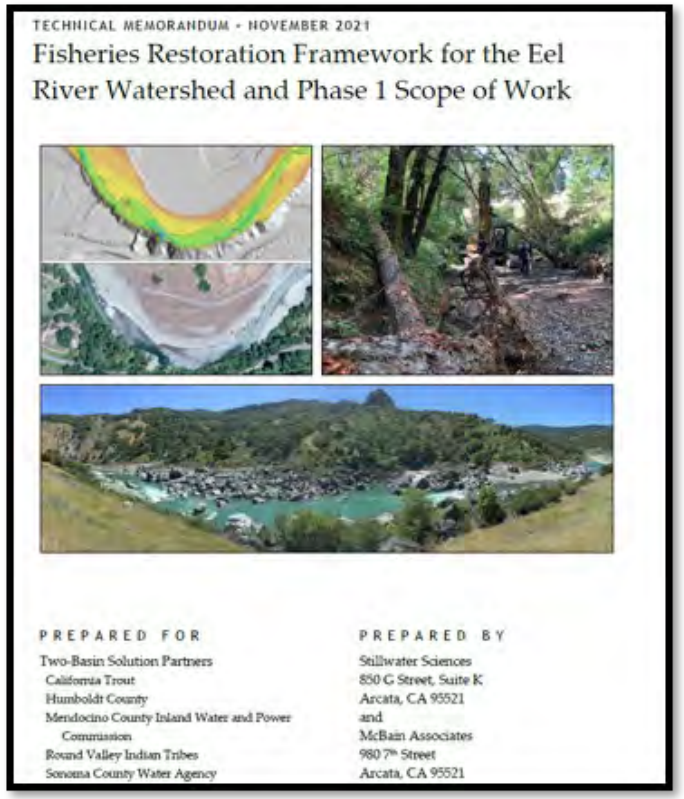


TECHNICAL MEMORANDUM - NOVEMBER 2021

Fisheries Restoration Framework for the Eel River Watershed and Phase 1 Scope of Work

PREPARED FOR

Two-Basin Solution Partners
California Trout
Humboldt County
Mendocino County Inland Water and Power Commission
Round Valley Indian Tribes
Sonoma County Water Agency

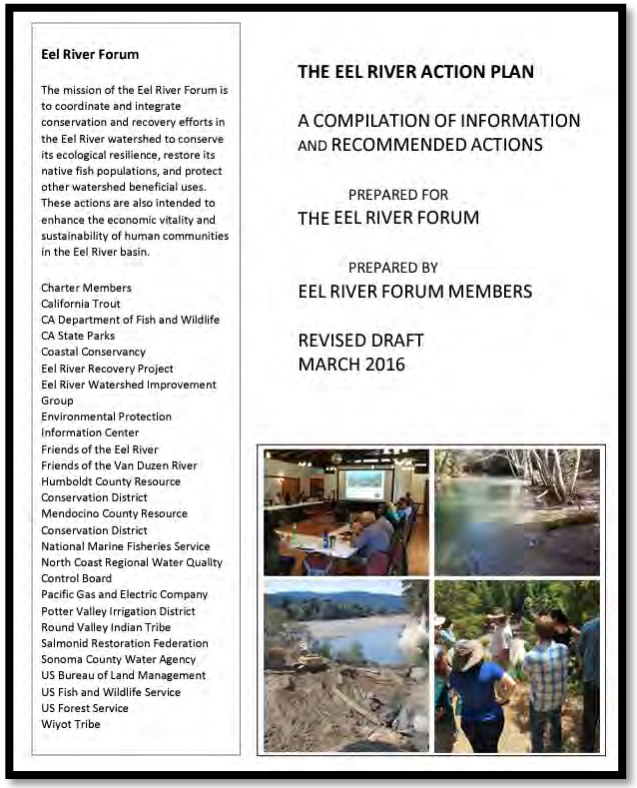
PREPARED BY

Stillwater Sciences
850 G Street, Suite K
Arcata, CA 95521
and
McBain Associates
980 7th Street
Arcata, CA 95521

The Eel River Watershed
RESTORATION AND CONSERVATION PROGRAM

2016

Eel River Action Plan



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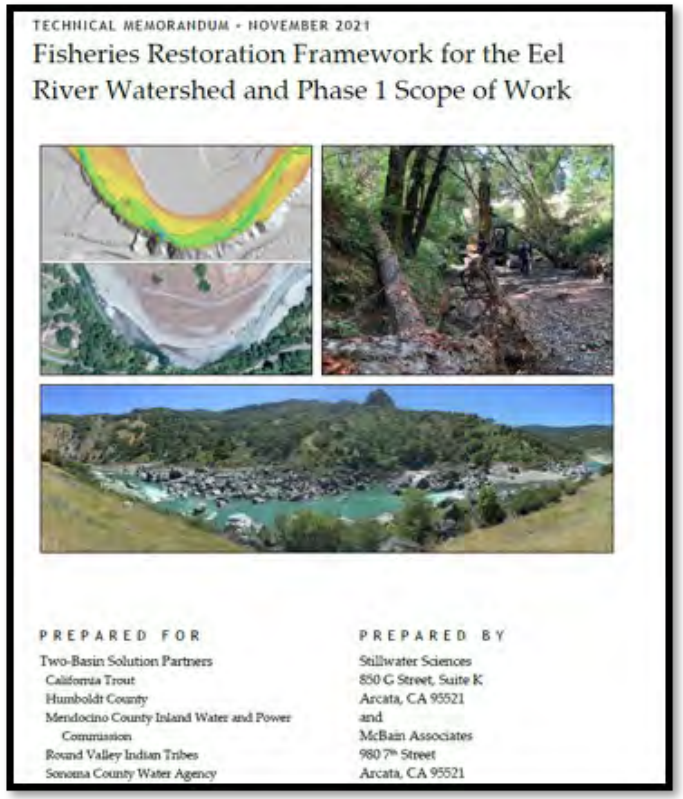

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2022-2028…

Plan, Prioritization, Program, implementation, monitoring

The Eel River Watershed

RESTORATION AND CONSERVATION PROGRAM

2022-2024 | 2025-2028 | 2028- 2058...

PHASE 1
Planning

- Develop program vision, goals and objectives
- Compile spatial data
- Identify spatial data organization
- Select focal species
- Develop species conceptual models
- Characterize life history diversity
- Describe restoration and conservation objectives and actions
- Develop prioritization framework
- Develop monitoring and assessment framework
- Construct program administrative and management framework
- Integrate community and Technical Advisory Committee feedback

Outcome:
EEL RIVER RESTORATION AND CONSERVATION PLAN

PHASE 2
Program Formation & Prioritization

- Form restoration program entity and bylaws
- Identify program leadership and staff
- Finalize and execute prioritization process
- Develop prioritized restoration and conservation objectives and actions
- Continue and expand existing salmonid baseline monitoring
- Integrate community and Technical Advisory Committee feedback

Outcome:
PROGRAM FORMATION AND EEL RIVER PRIORITY ACTION PLAN

PHASE 3
Implementation, Monitoring & Assessment

- Program governance, funding and resource allocation
- Program level monitoring:
  - Fish populations (escapement, production)
  - Life History diversity and survival
- Project level monitoring:
  - Habitat quality and quantity
  - Biological response to restoration
- Program assessment and refinement
- Integrate community and TAC feedback

Outcome:
IMPLEMENTATION & REFINEMENT OF RESTORATION PROCESS AND ACTIONS

Reevaluate goals and objectives
Refine species conceptual models
Reassess key limiting factors

Refine designs and reassess priorities

CALIFORNIA TROUT
FISH · WATER · PEOPLE

APPLIED RIVER SCIENCES

Stillwater Sciences

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

The Eel River Watershed

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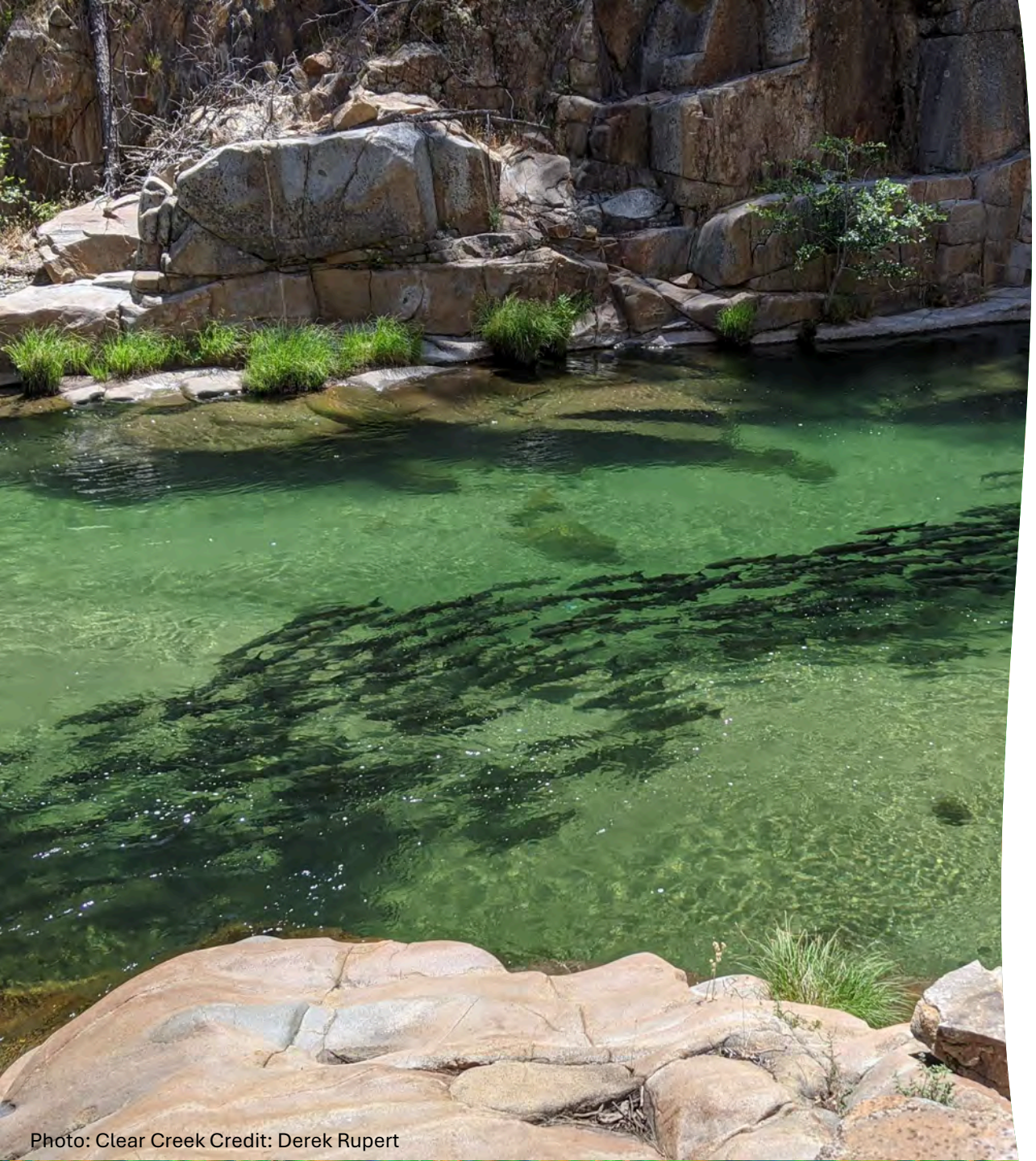


Photo: Clear Creek Credit: Derek Rupert

Phase 2: 2025-2028

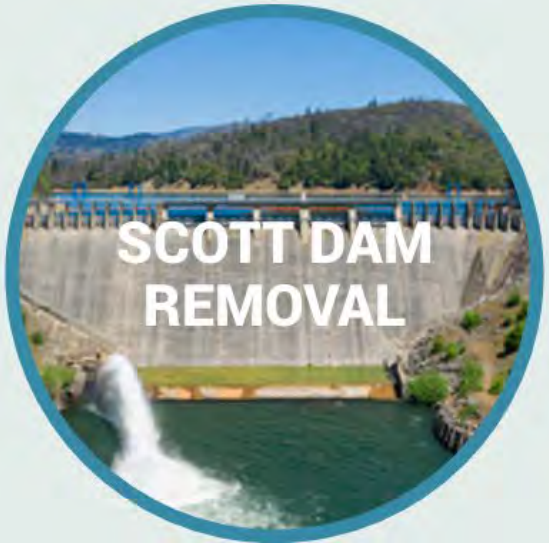
- Prioritize restoration and conservation actions
- Identify riparian climate refugia
- Reconnect the landscape, watershed scale approach
- Facilitate communication about watershed restoration goals
- Form the Eel River Program: coordination of restoration and conservation actions

Restoration Approach

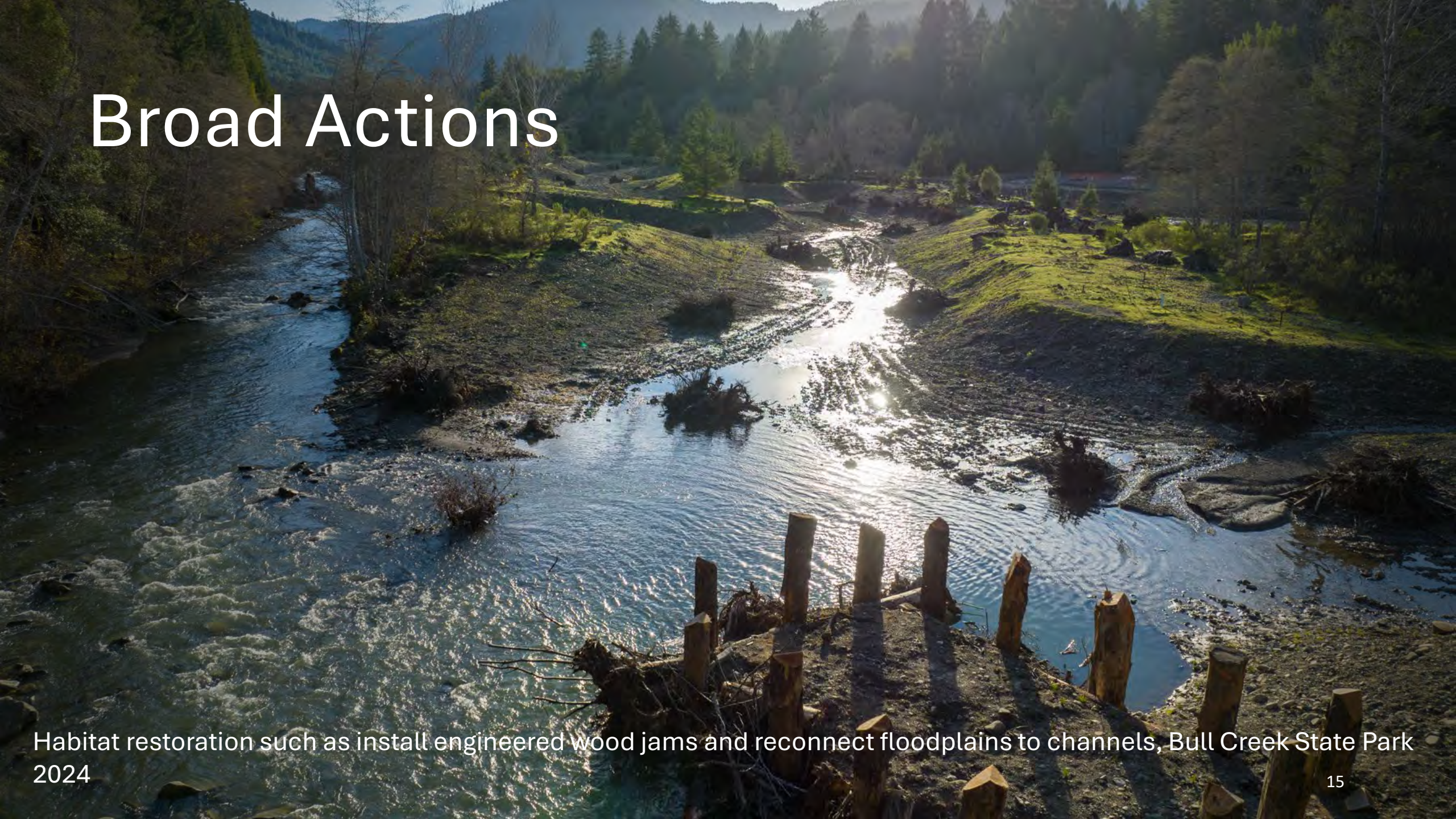
INCREASED SPECIFICITY OF ACTIONS

BROAD ACTIONS: Actions that could be beneficial across the Eel River watershed

SPECIFIC ACTIONS: Specific projects known by experts that will have a strong benefit on restoration of the watershed.



Broad Actions



Habitat restoration such as install engineered wood jams and reconnect floodplains to channels, Bull Creek State Park 2024

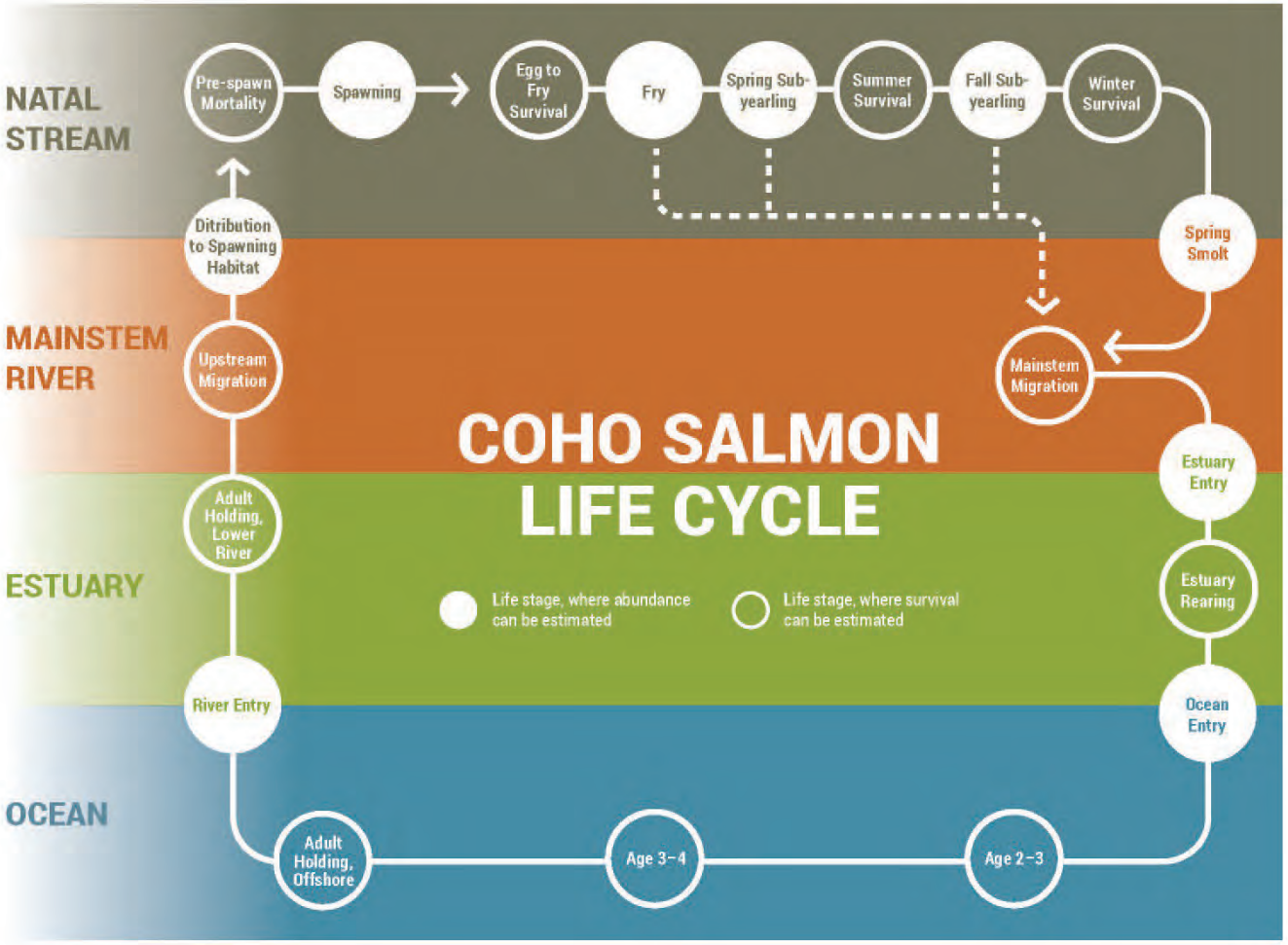
Broad Actions

Winter fish rearing habitat, in off channel areas, Bull Creek State Park 2024

Specific Actions

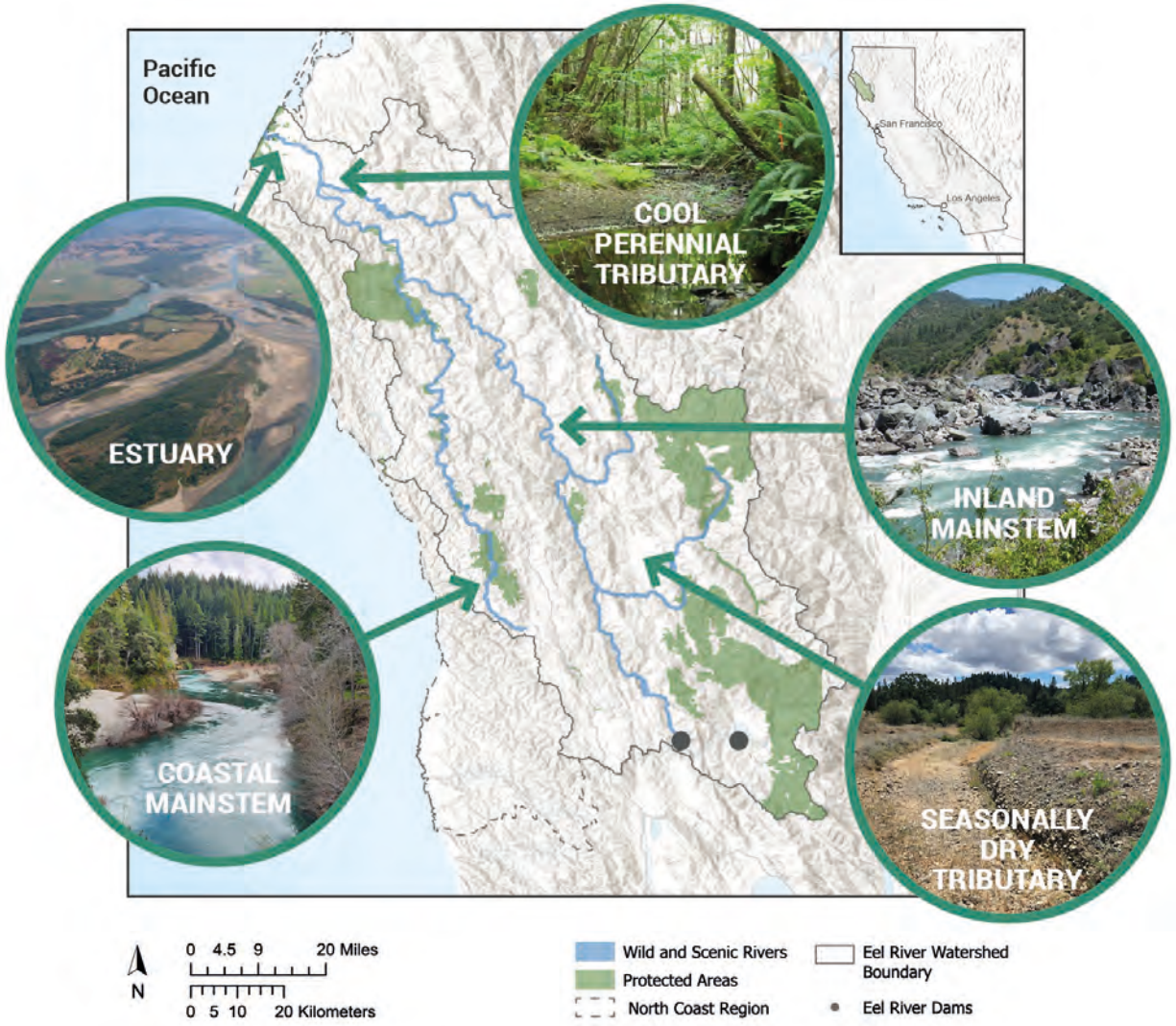
Scott Dam removal (Photo by David Keller 2014)

Diverse habitat needs



Coho - Native Fish Society

The whole watershed is important



EEL RIVER WATERSHED

9,538 km²

7 SUB-WATERSHEDS

~1,500 km² each

113 HUC-12 SUB-BASINS

~50 km² each

CHANNEL SEGMENTS

<1 km each

COUNTY PARCELS

size varies

Focal species Channel Archetypes (in process)

"*Channel archetypes*" are functionally unique due to:

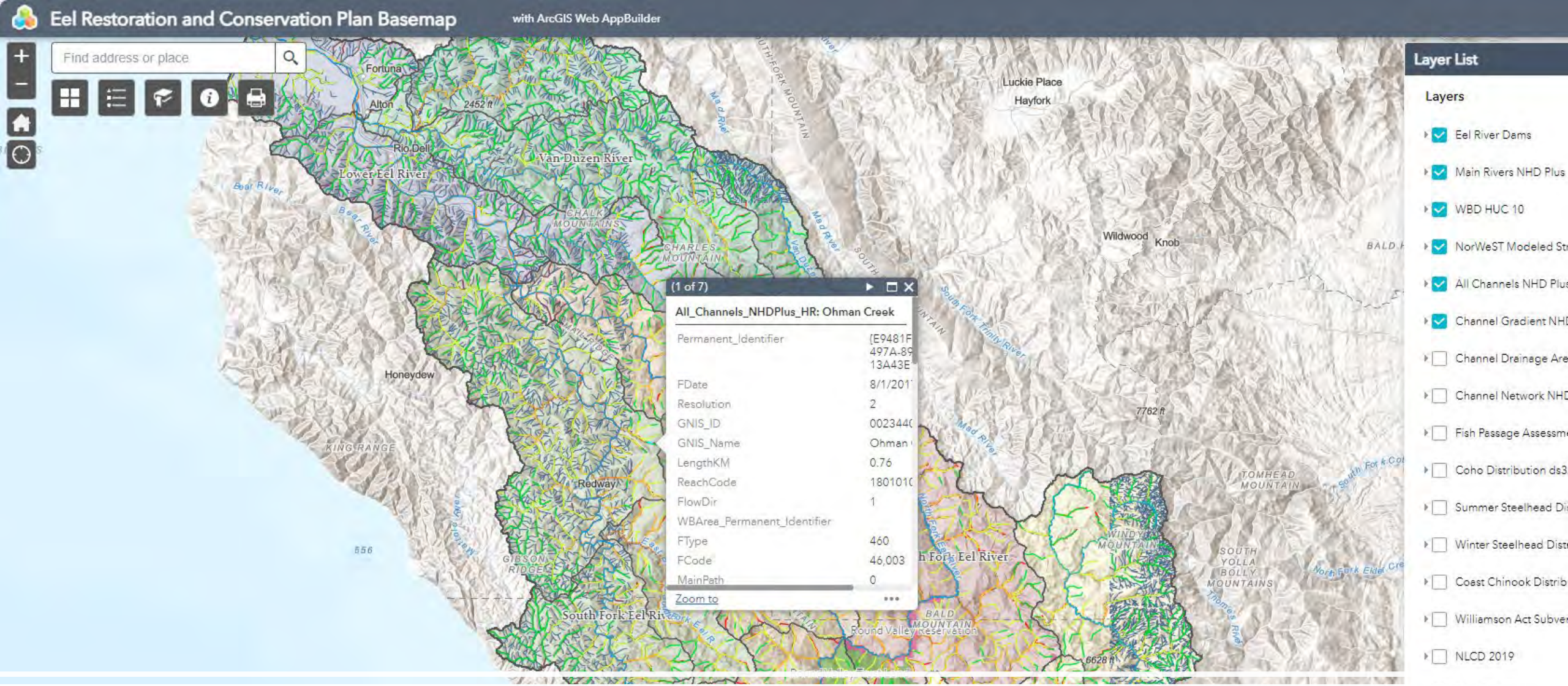
- geomorphic,
- hydrologic, and
- thermal properties

Groupings were developed based on:

- drainage area,
- slope,
- temperature regime

Channel archetypes differ in:

- species and life history tactics they might be able to support
- possible restoration actions



Eel River Restoration and Conservation Plan Basemap 2024

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Upper Main Eel River: Mike Weir

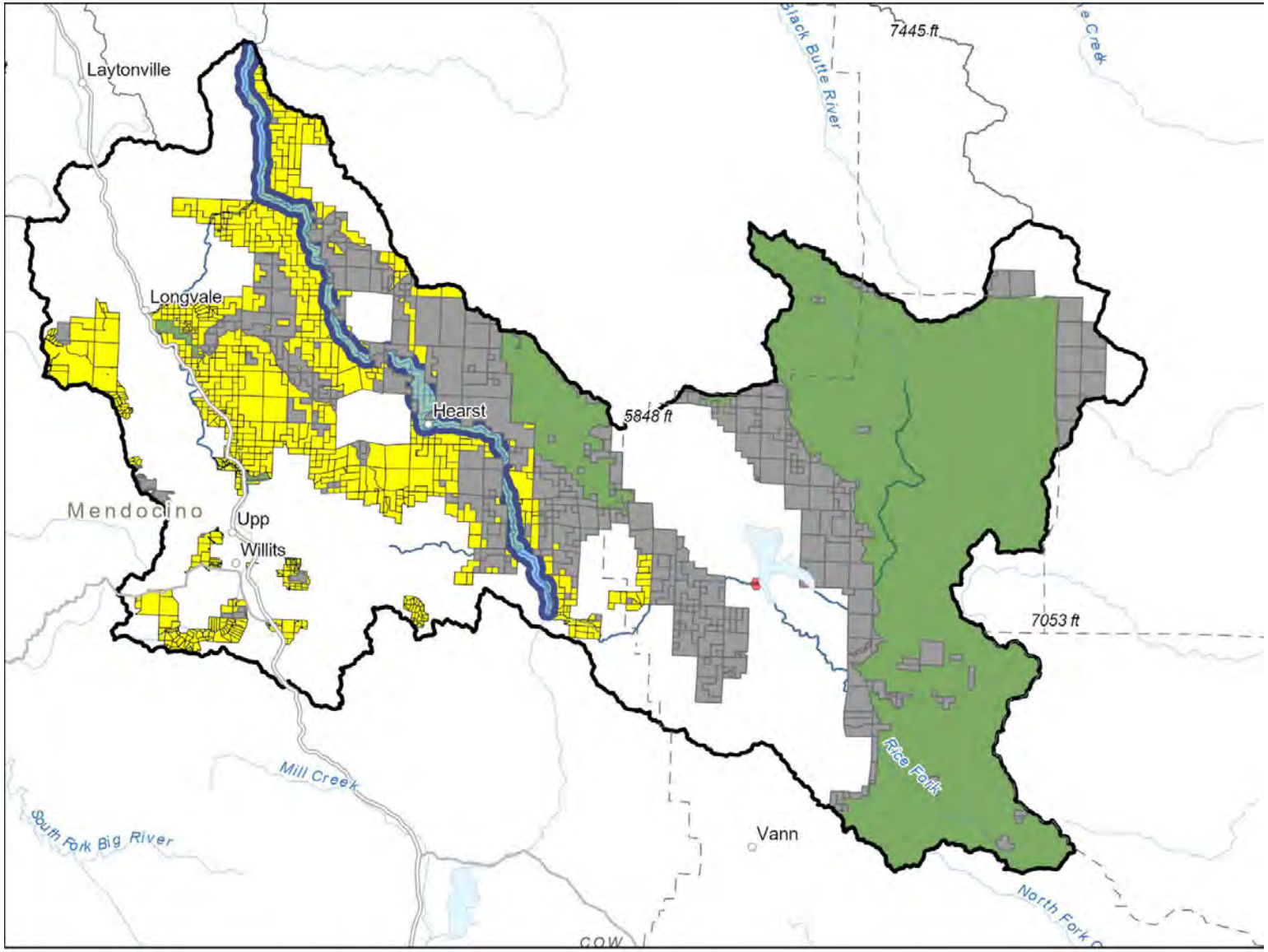
Upper Main Eel River

Conservation planning

Case study

Conservation analysis – parcels

Upper Eel River sub watershed:	**1837 km²**
Solution total: 1094 km²	56% of sub watershed
Solution not yet protected: 606 km²	**33% of sub watershed**
Existing protected areas within solution: 488 km²	27% of sub watershed, 80% of solution
WSR not yet protected 46 km² 228 parcels	75% of WSR
USFS not yet protected 106 km² 166 parcels	10% of solution
BLM not yet protected 37 km² 20 parcels	3% of solution
Public lands not protected: 319 km² ~700 parcels	29% of solution
Private lands not protected: 287 km² ~1000 parcels	26% of solution

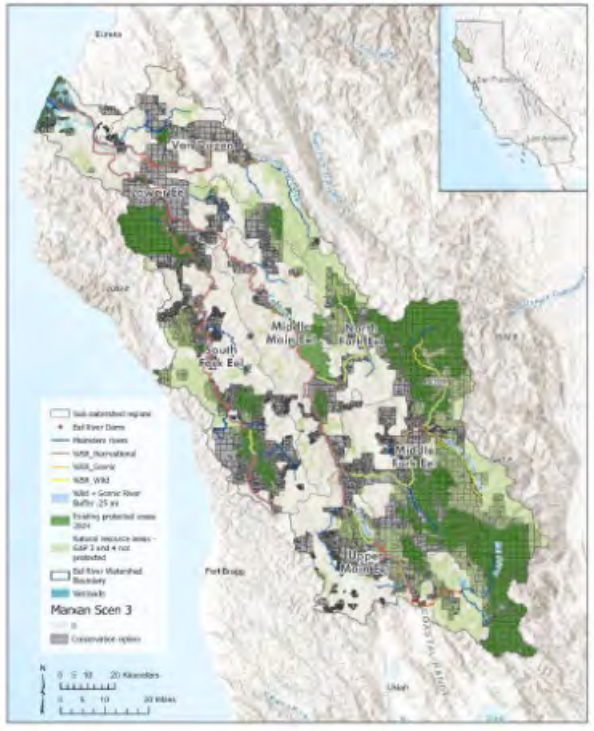


Eel River Watershed Conservation Solutions

Christine Davis June 2024

California Trout

The Eel River Watershed
RESTORATION AND CONSERVATION PROGRAM



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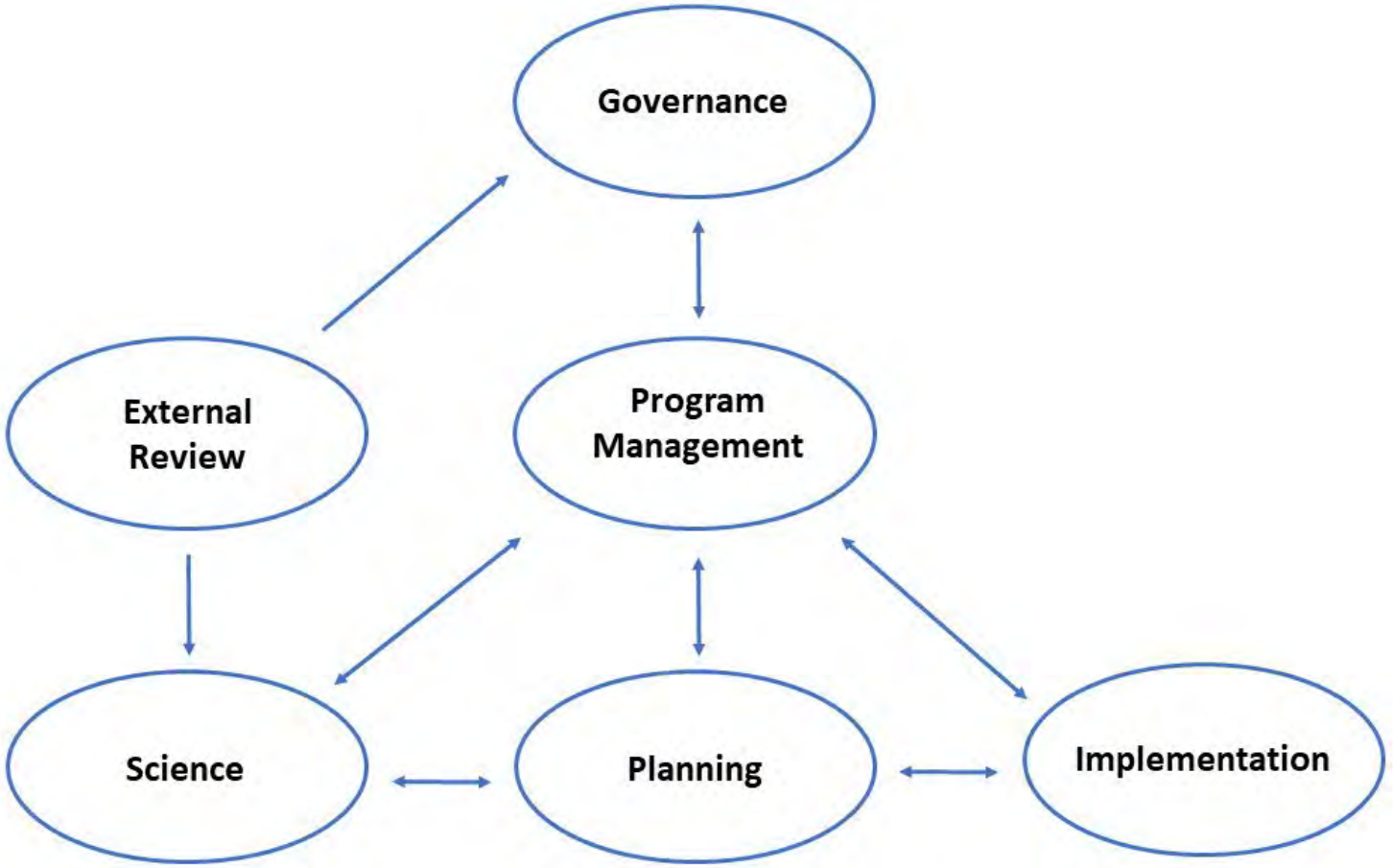
Program formation



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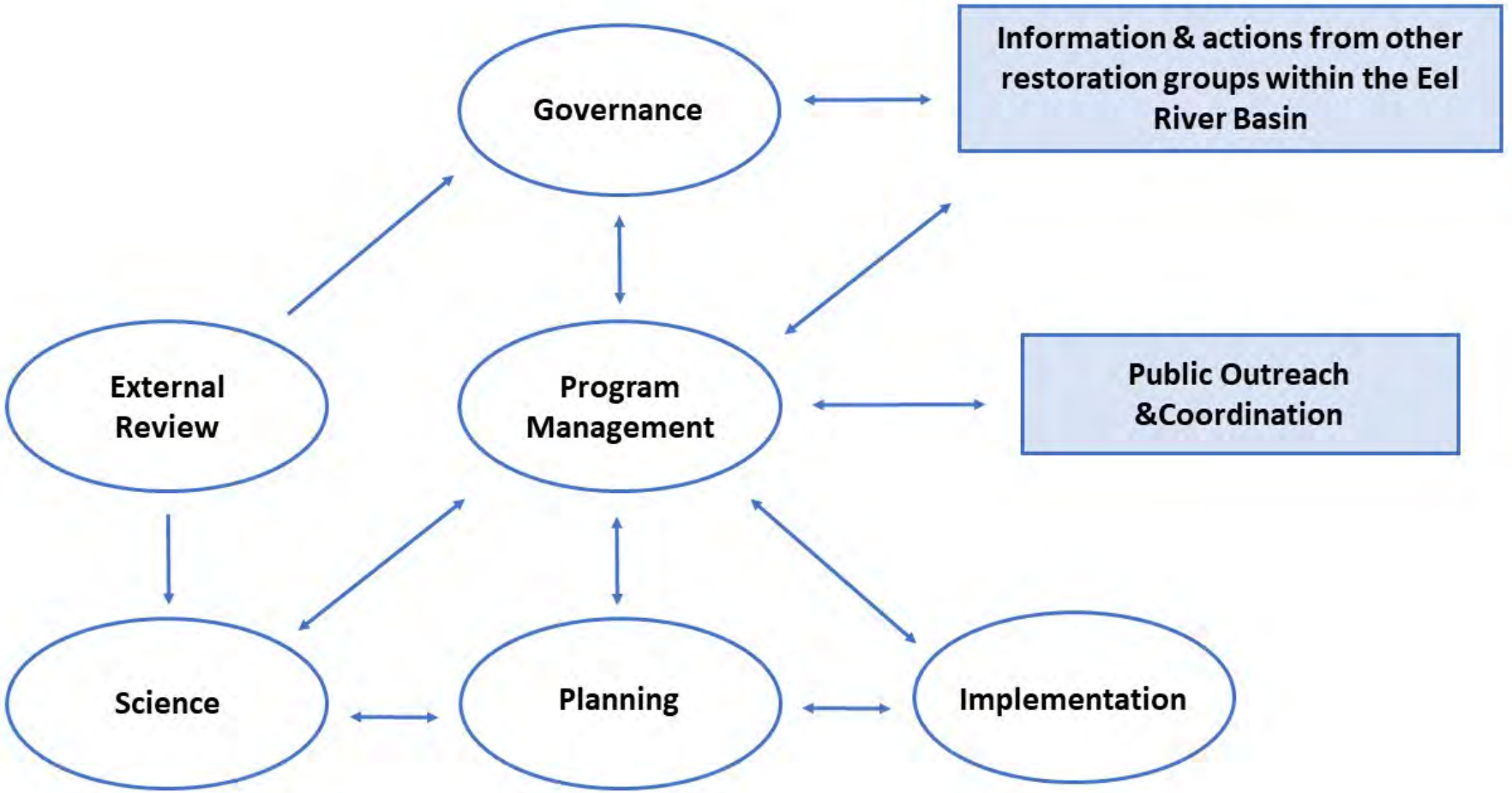


Acknowledgements

- California Department of Fish and Wildlife (CDFW),
- The Resources Legacy Fund (RLF),
- Holdfast
- Larry Garlick,
- Nomellini Family

Join
The Eel River
Forum!

Thank you
cdavis@caltrout.org

https://caltrout.org/eel-river-watershed-program

Potter Valley Project

- Cape Horn Dam, 1908
- Scott Dam, 1922

- PG&E owns the Project

- PG&E determined nearly ten years ago that the Potter Valley Project was uneconomic

- Began looking for a future owner of the project

- Now working to decommission the facilities

Potter Valley Project

- Scott Dam blocks a 300 sq/mi watershed

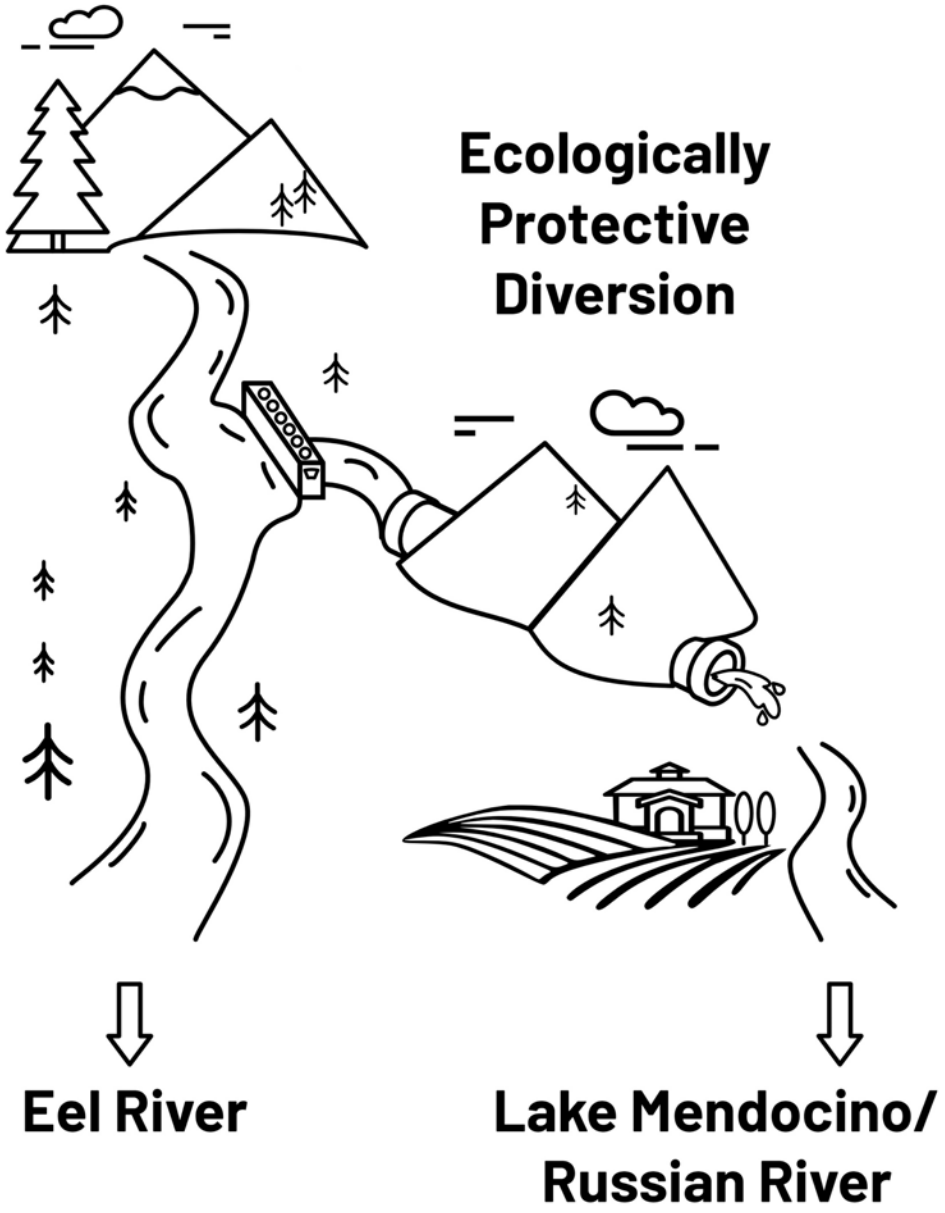
- Important high-elevation cold-water habitat

- “some of the best spawning grounds in the entire watershed”
  - Shapovalov 1930

- Relatively well protected in public lands

What's Next

- PG&E will propose to remove both dams and other facilities, July 2025
- Regional collaborative negotiated a MOU to include new diversion structure to help meet water needs
- Management plans/consultation
- Federal Regulators must approve the plan
- Dam removal could begin as early as 2028



Decommissioning Plan (PG&E)

- Removal of Scott and Cape Horn Dams followed by site restoration
- Restoration of the remnant inundation zones
- Removal and site restoration of Project recreational facilities
- Removal or leaving in place the remaining Project support facilities and features

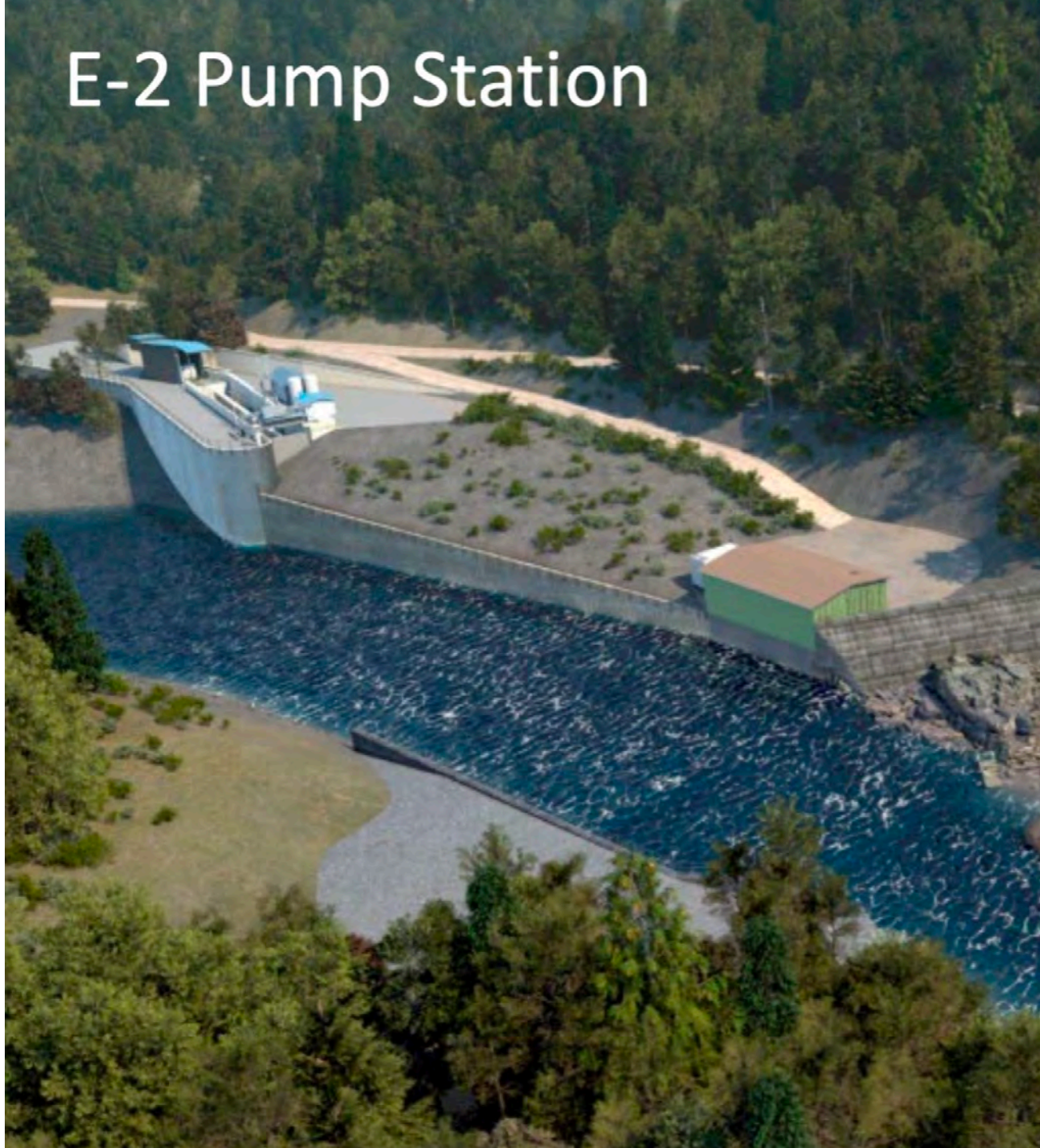
Image: Katie Falkenberg, Swiftwater Films

Non-Project Use of Project Lands (ERPA)

- Would allow Eel Russian Project Authority to build new facility in Project footprint

- MOU recently signed by regional partnership on terms of future diversion

- CalTrout, Sonoma Water, Mendocino Inland Water and Power Commission, Round Valley Indian Tribes (RVIT), Trout Unlimited, Humboldt County, and CDFW



MOU Components

- Water rights owned by RVIT

- Limited water diversions based on the needs of Eel River fisheries

- Facility design that allows a free-flowing river

- Initial term (30yrs) with a conditional renewal term (20yrs)

Landmark deal will secure water reliability for people and agriculture in the Russian River while returning Eel River water rights to Round Valley Indian Tribes and restoring salmon

MOU Components (cont)

- Support for dam removal with no delay

- Annual payment to RVIT for lease of water right

- Annual payment for Eel River restoration

- Funding equity between basins

Landmark deal will secure water reliability for people and agriculture in the Russian River while returning Eel River water rights to Round Valley Indian Tribes and restoring salmon

Support from CDFW

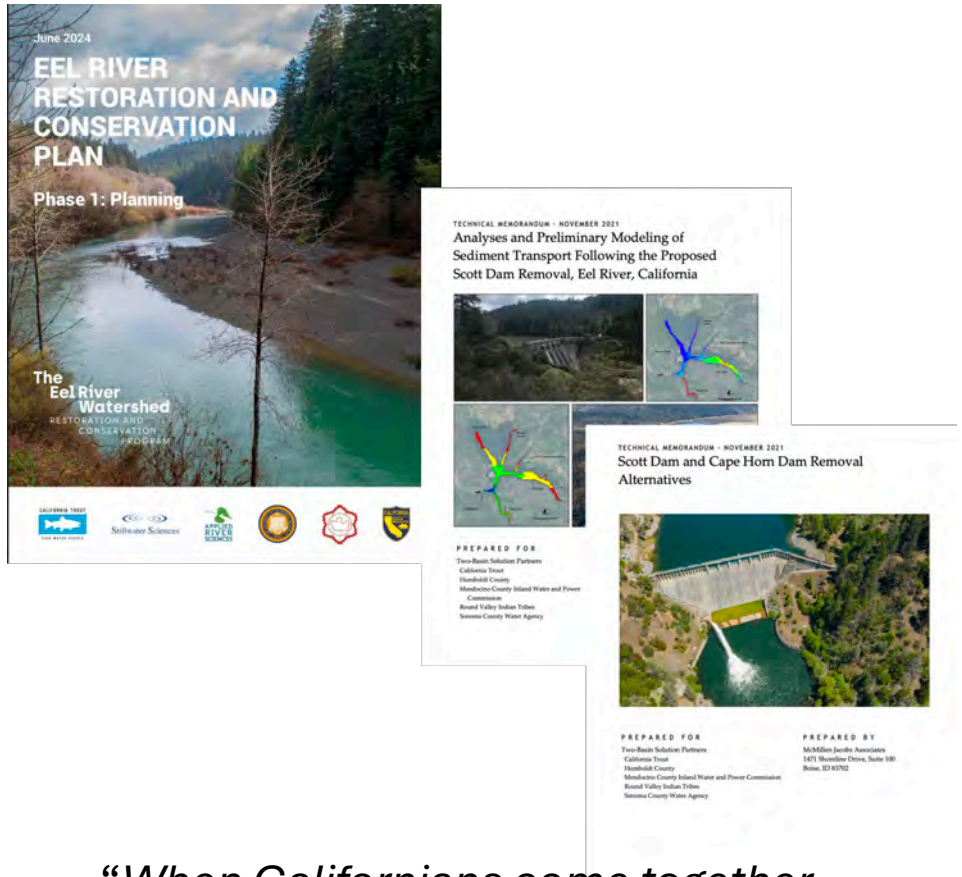
- Cannabis funding for early feasibility studies

- Eel River Restoration and Conservation Plan

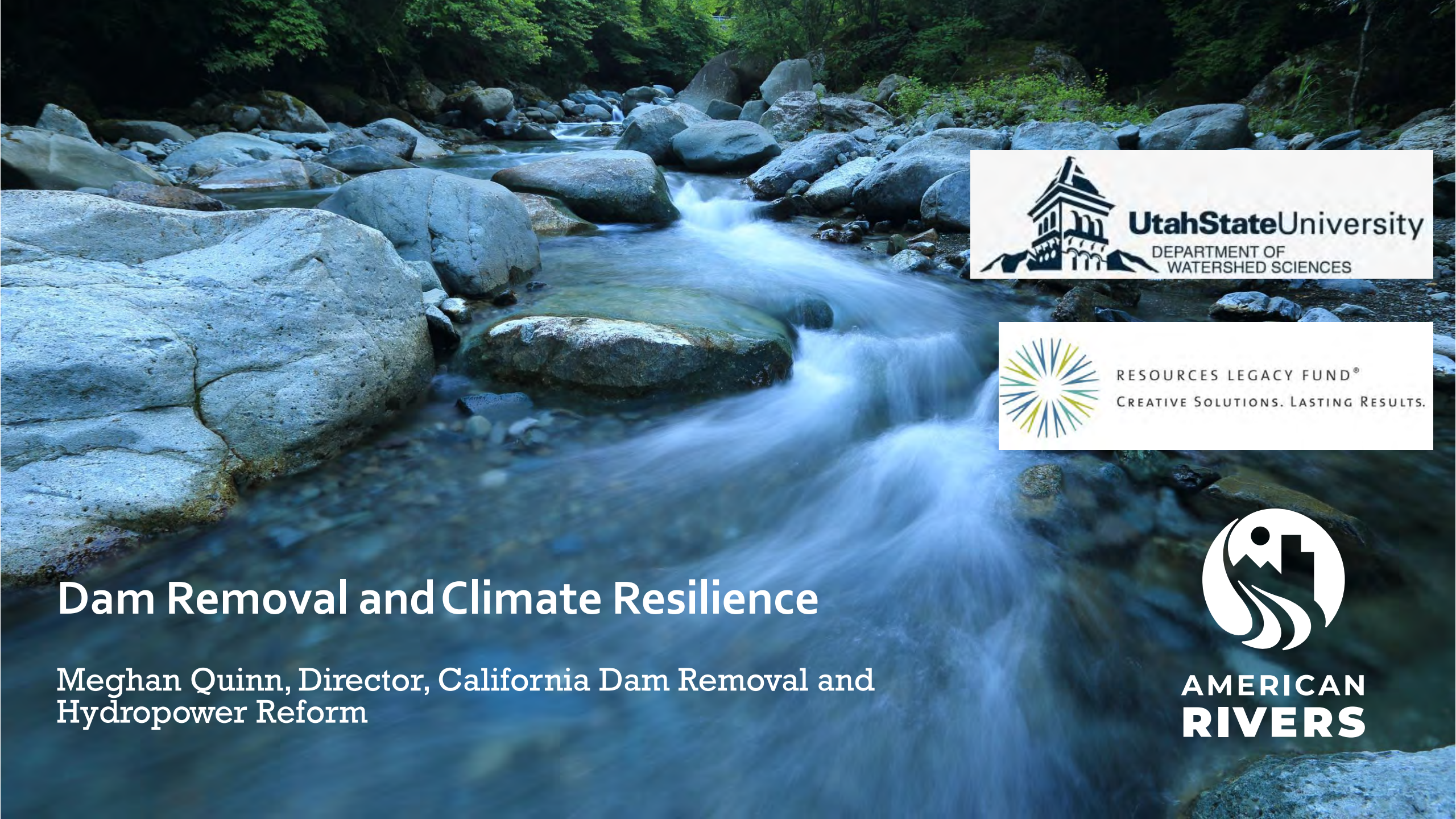
- $18m for partnership

    - $9m for modernizing the old diversion

    - $9m for Eel River Restoration Fund



"When Californians come together, they deserve thanks. We can restore that river and bring salmon home. Water supply for people in the Russian River can be protected."
- Director Bonham



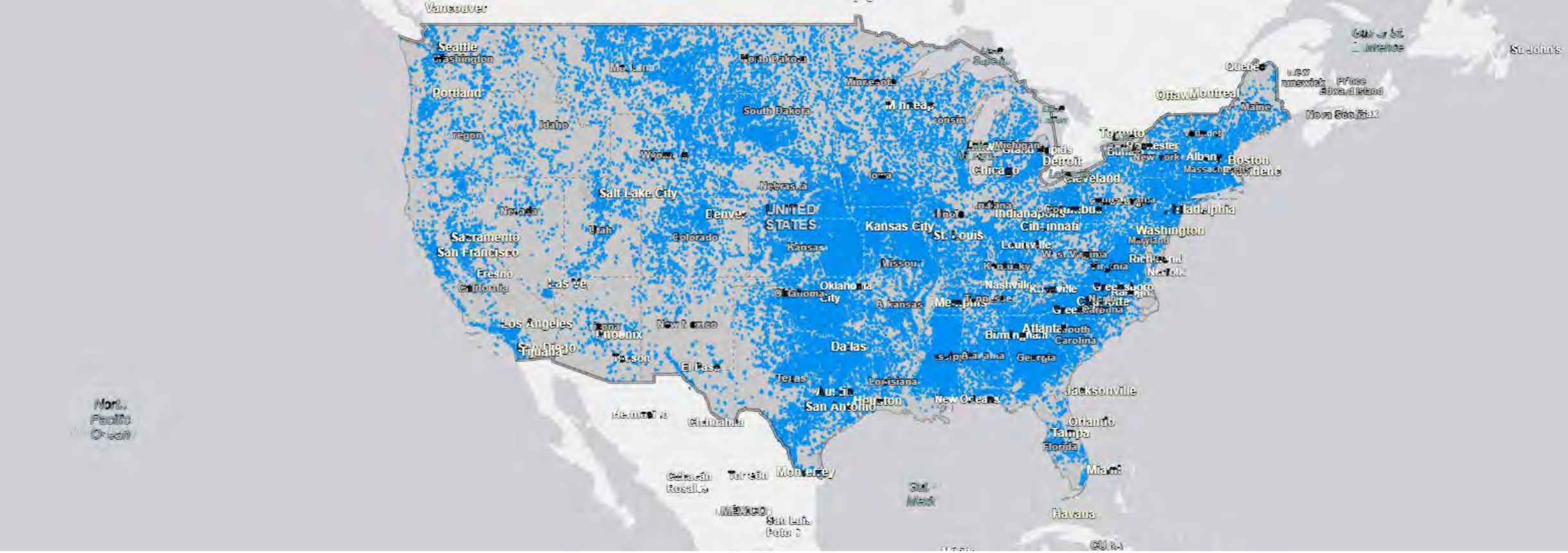
Dam Removal and Climate Resilience

Meghan Quinn, Director, California Dam Removal and Hydropower Reform

Utah State University
Department of Watershed Sciences

Resources Legacy Fund®
Creative Solutions. Lasting Results.

American Rivers



National Inventory of Dams – 92,000

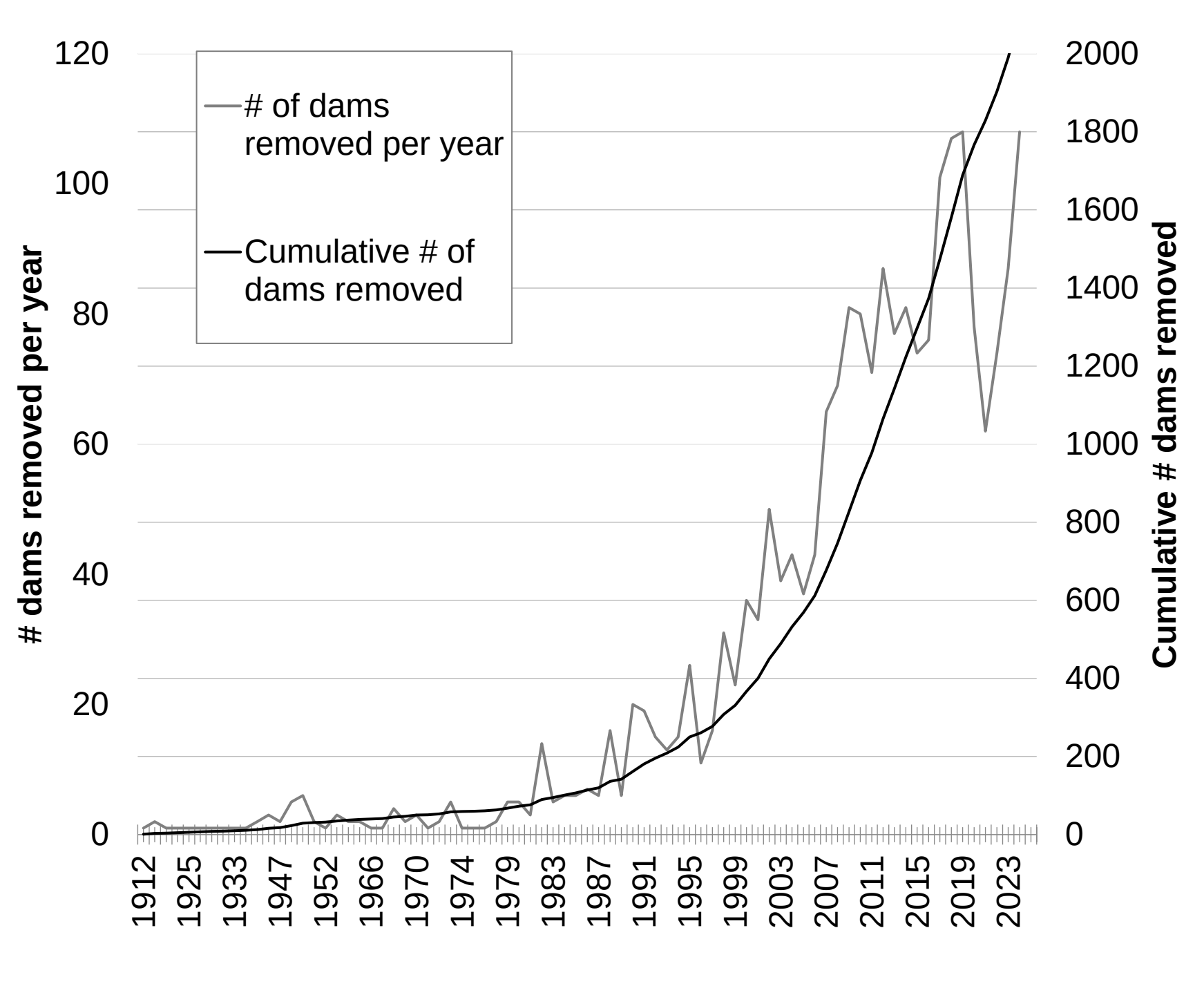
But many additional barriers exist…

AMERICAN RIVERS

Obsolete Dams

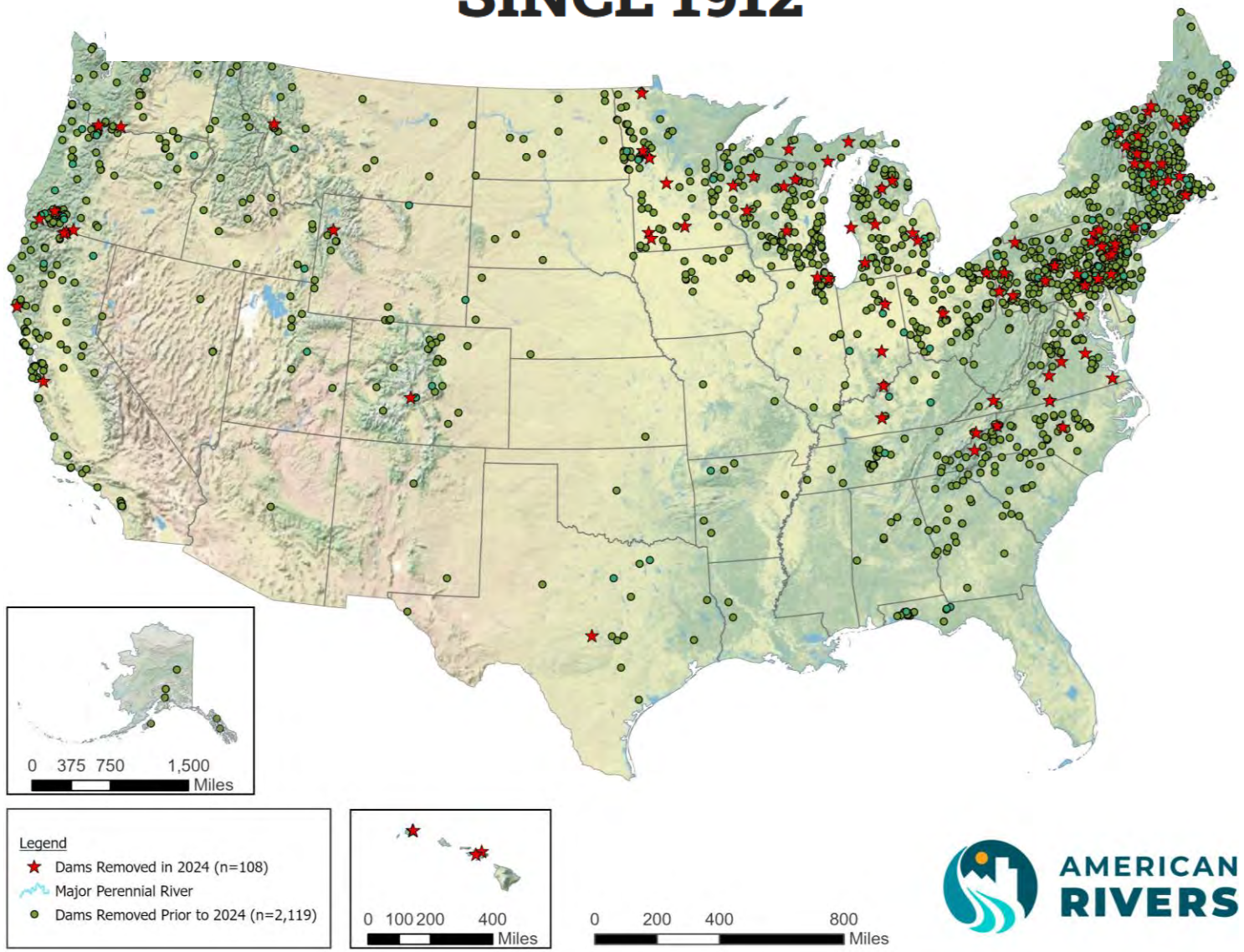
Roller Mill Dam, Jesse Thomas-Blate

Willow Creek Dam, Mooretown Rancheria



From 1912 – 2024 2,240 dams have been removed nationwide

MAP OF U.S. DAMS REMOVED SINCE 1912



Most removed infrastructure includes small dams and barriers that outlived their useful life, and a few large, highly visible dam removals

Is Dam Removal a Strategy for Climate Resilience?

Climate resilience = The ability to prepare for, respond to, and recover from adverse events related to climate change.

Climate pressures that impact river systems

Reduced Dam Utility

Karl Ronning, Tippecanoe Dam

Table 3: Estimated Project Costs for Dams with a Condition Assessment Rating of Less than Satisfactory

Bins (Dam Heights in feet)	Dams Less than 50 Years Old	Dams Greater than or Equal to 50 Years Old	
	Less than Satisfactory Condition	Fair Condition	Poor and Unsatisfactory Condition
	Repair	Retrofit	Rehabilitation
1 (≤ 15)	$400,000	$1,380,000	$2,870,000
2 (> 15 & ≤ 25)	$790,000	$1,890,000	$2,670,000
3 (> 25 & ≤ 50)	$1,410,000	$4,000,000	$6,230,000
4 (> 50 & ≤ 100)	$1,360,000	$4,800,000	$8,580,000
5 (> 100 & ≤ 200)	$3,080,000	$20,000,000	$23,840,000
6 (> 200)	$9,180,000	$26,340,000	$95,300,000

Maintenance costs increase with age

Close to 85% of NID dams are in less than satisfactory condition; 13% are high hazard dams that present a risk to downstream communities

AMERICAN RIVERS

The Aging Dam Fleet

The American Society of Civil Engineers report card gave national dam infrastructure a D+ due to aging infrastructure, lack of funding and maintenance, and increasing number of deficient high hazard dams

Willow Creek Debris Control Dam | Mooretown Rancheria

- The average age of our nation's dams is over 60 years, while 7 of 10 dams nationwide are expected to reach 50 years by 2025.
- Many aging dams no longer serve their purpose and are not maintained, putting them in danger of failing, particularly during increasingly severe storm events.
- Over the last 20 years, the number of high-hazard-potential dams has more than doubled as development steadily encroaches on once-rural dams and reservoirs.

Changing Hydrology

Maiya Greenwood, South Yuba River

Associated Press, Oroville Reservoir

The Trillion Gallon Question: Extreme weather is threatening California's dams. What happens if they fail?

Christoper Cox, New York Times

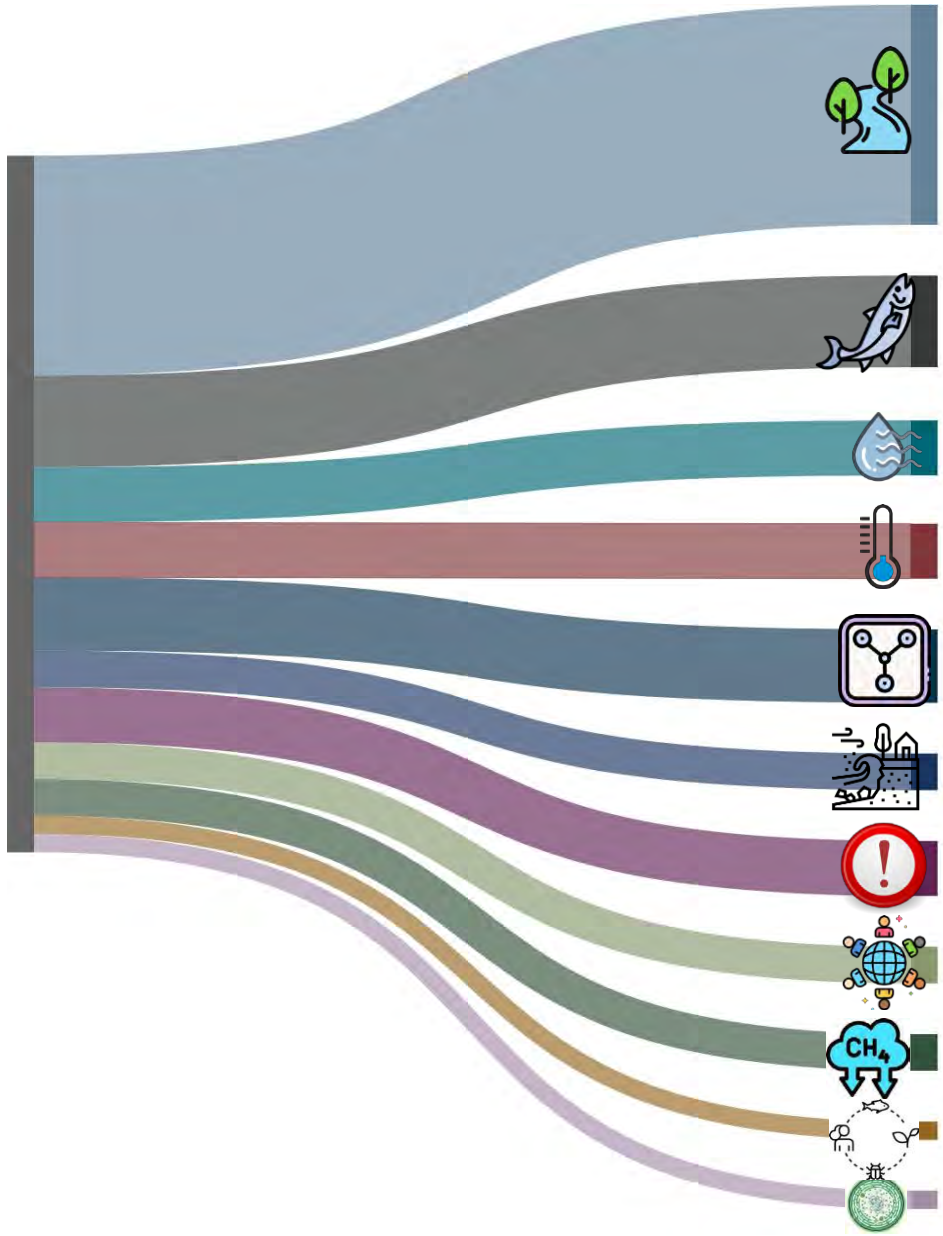
Oroville Dam Spillway – CA Dept of Water Resources

Rapidan Dam Failure, ASDSO

Dam Failures:
An average of 50 incidents per year from 2020 – 2023 (ASDSO)

Tribal Justice and Fisheries Restoration

Removing dams increases climate resilience by:



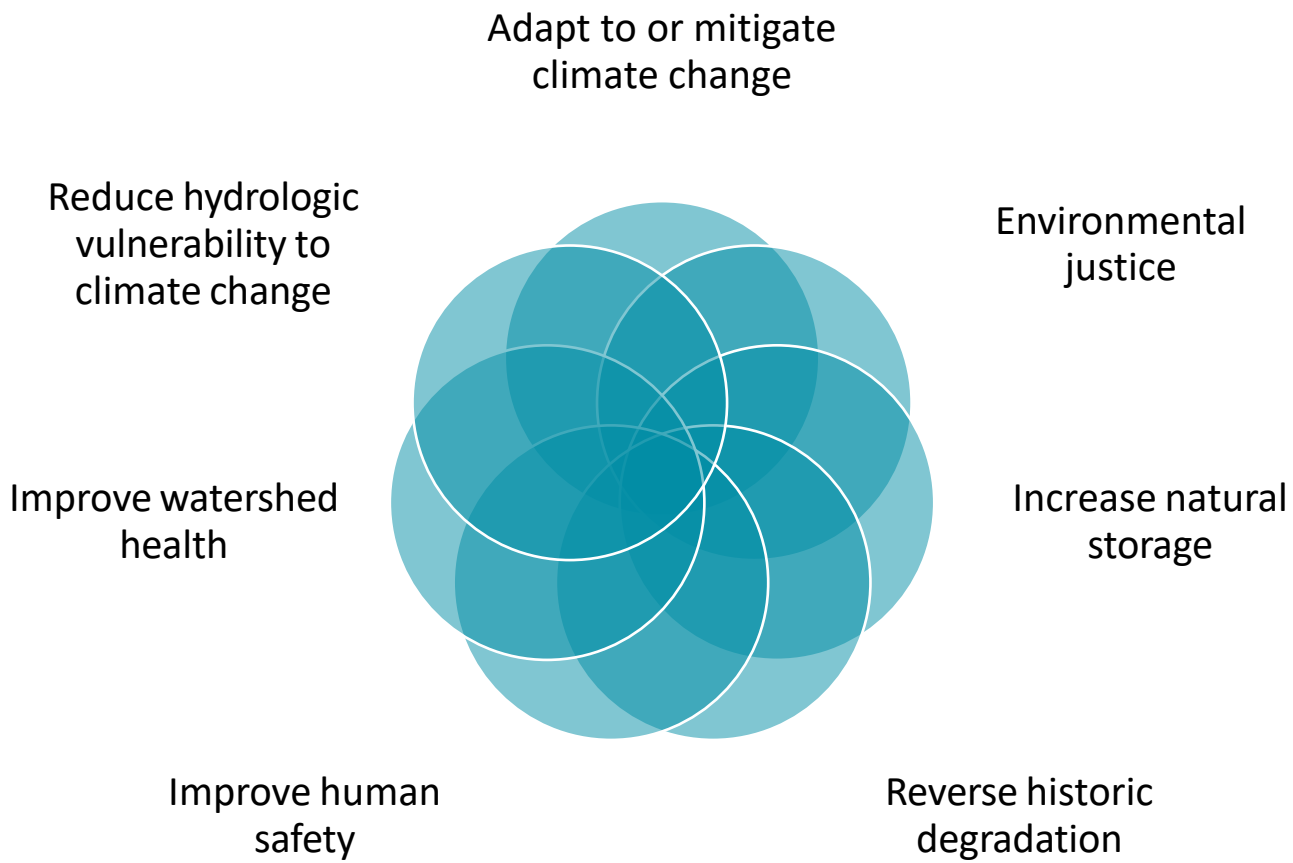
- Connected habitats
- Fish production
- Flow regime
- Cooler stream temperature
- Connected fluxes
- Coastal sediment
- Reduce dam failures
- Tribes & cultures
- Methane reduction
- Biodiversity
- Reduce harmful algal blooms

PRESIDENTIAL ACTIONS

Putting People over Fish: Stopping Radical Environmentalism to Provide Water to Southern California

The White House | January 20, 2025

How to quantify climate resilience:



What's Next?

- Pre- & post-removal environmental monitoring.
- Describe & quantify how dam removal affects climate resilience.
- Integrate river restoration, safety, and economics for climate-resilient dam removal decisions.
- Incorporate climate resilience into relicensing policy to incorporate it into dam removal decision-making.
- Include climate futures in dam removal modeling.

National Dam Removal Community of Practice

AMERICAN RIVERS

NATIONAL DAM REMOVAL COMMUNITY OF PRACTICE

Upper Citico Creek Dam Removal | Photo by Erin Singer McCombs

Dam removal practitioners are invited to join our National Dam Removal Community of Practice.

Life Depends on Rivers℠

AMERICAN RIVERS

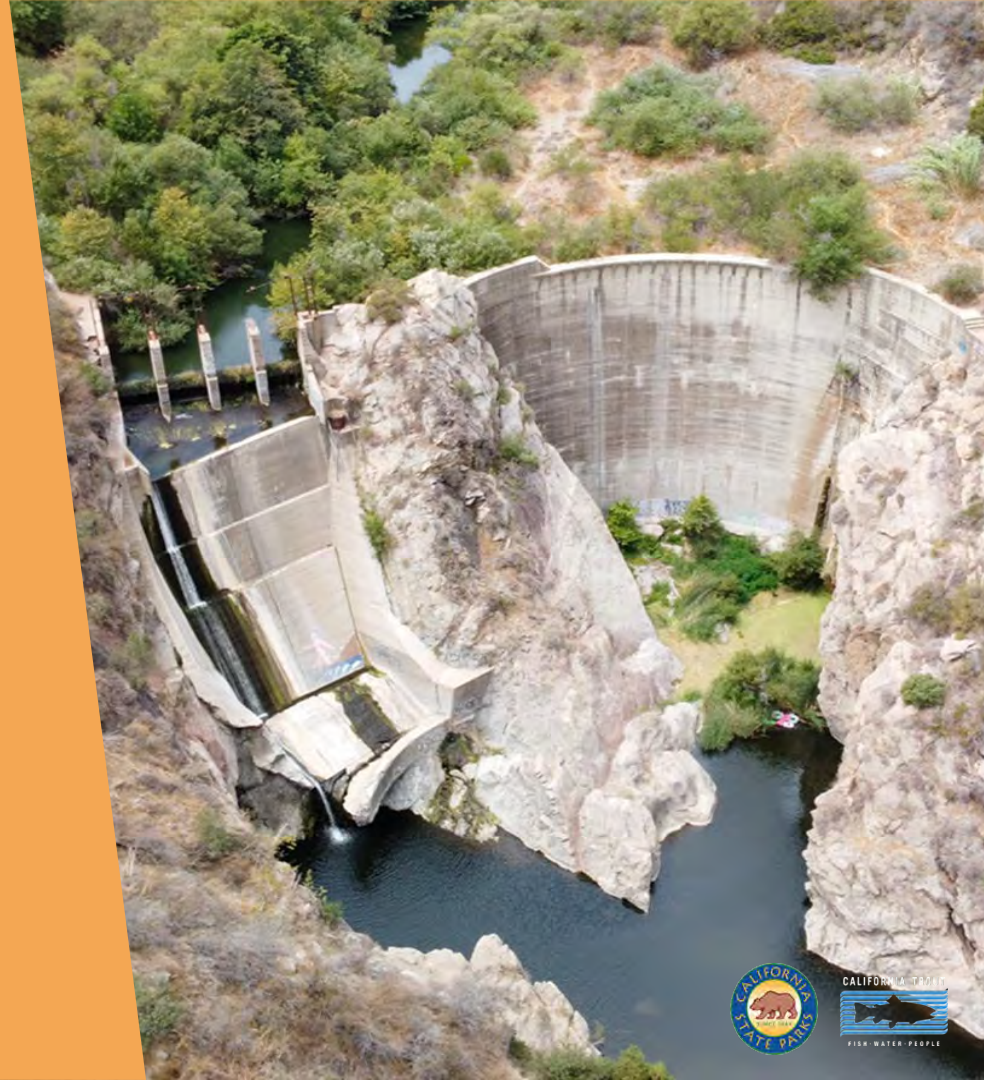
MALIBU CREEK
ECOSYSTEM RESTORATION PROJECT

R.J. Van Sant
Senior Environmental Scientist
California State Parks

SRF Conference
2025

THE BASICS

- Removal of Rindge Dam
- Removal of stored sediment
- Modification of eight (8) barriers upstream of the dam
- Restore stream processes & habitat for *O. mykiss*

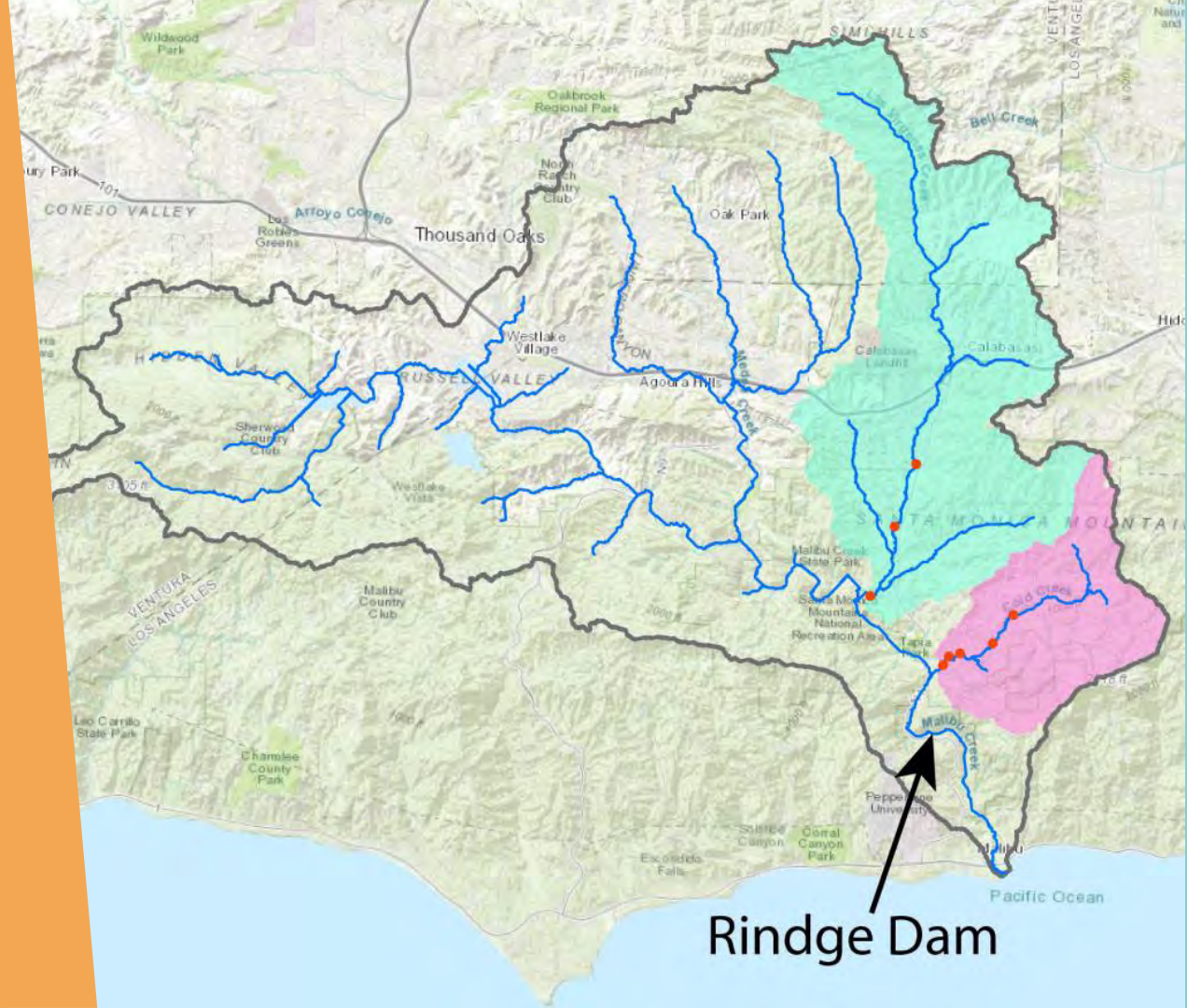


LOCATION

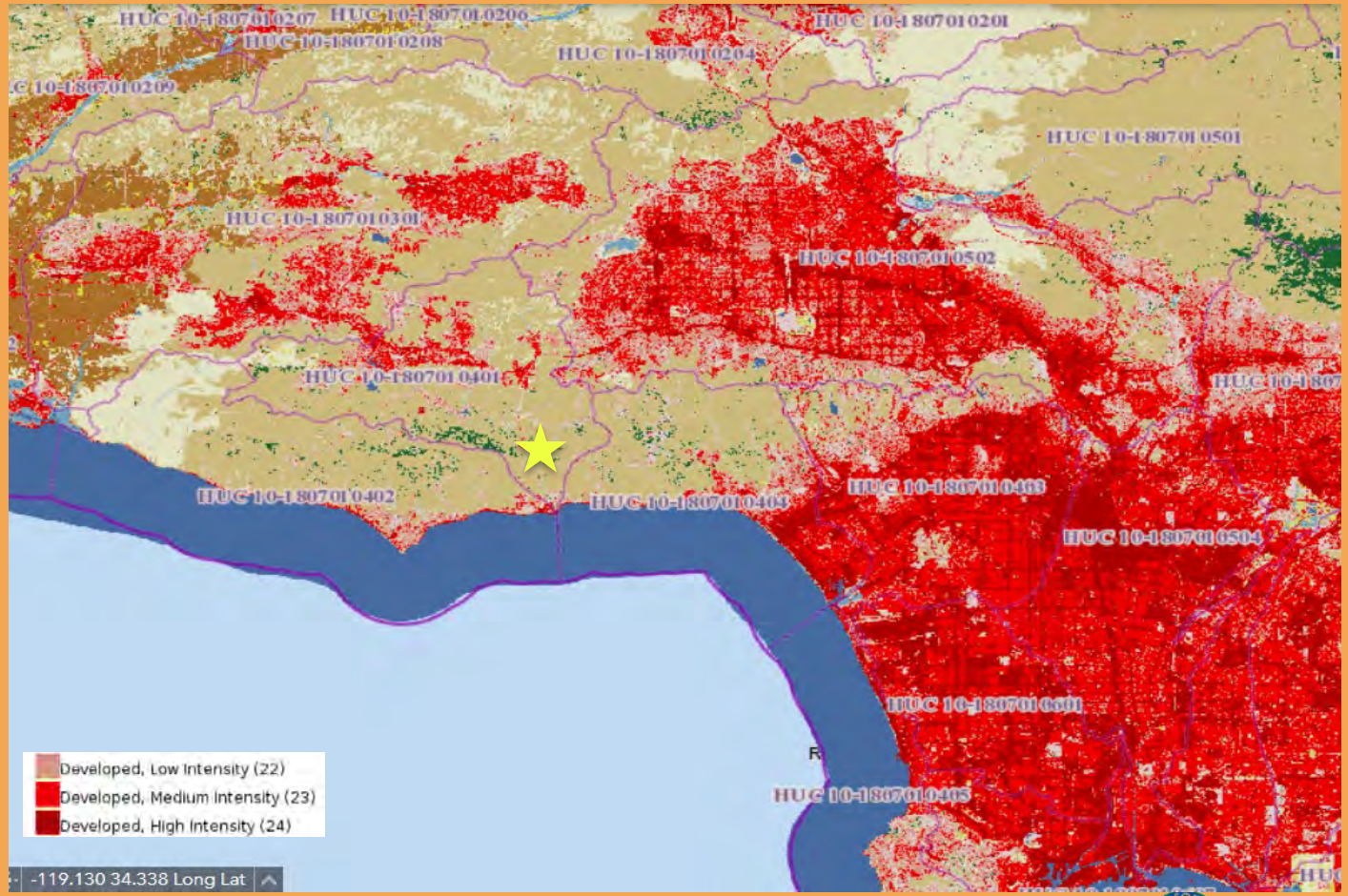

Thousand Oaks
Simi Valley
Los Angeles
Santa Monica
West Covina
Rancho Cucamonga
El Monte
Pomona
Ontario
Riverside
Banning
Cathedral City
Palm Desert
Anaheim
Corona
Long Beach
Santa Ana
Mission Viejo
Murrieta
Lake Forest
Oceanside
Escondido
Westlake Village
Calabasas
Agoura Hills
HIDDEN VALLEY
RUSSELL VALLEY
BONEY MOUNTAIN STATE
POINT MUGU
MALIBU CREEK
TOPANGA
Malibu
Santa Monica
Santa Monica Mountains National Recreation Area
Pacific Coast Hwy
Ventura Fwy
San Diego Fwy
Thousand Oaks Blvd
Lynn Rd
W Potrero Rd
Kanan Rd
Malibu Canyon Rd
Las Virgenes Rd
Topanga Canyon Blvd
Westlake Blvd
Santa Monica Muni Airport

MALIBU CREEK WATERSHED

- 110 sq. miles
- 75% undeveloped
- Long periods of boredom with brief periods of terror
- High sediment yields



LAND COVER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HUC 10-1807010206
HUC 10-1807010208
HUC 10-1807010204
HUC 10-1807010201
HUC 10-1807010209
HUC 10-1807010501
HUC 10-1807010301
HUC 10-1807010502
HUC 10-1807010401
HUC 10-1807010402
HUC 10-1807010404
HUC 10-1807010403
HUC 10-1807010504
HUC 10-1807010601
HUC 10-1807010405
Developed, Low Intensity (22)
Developed, Medium Intensity (23)
Developed, High Intensity (24)
-119.130 34.338 Long Lat

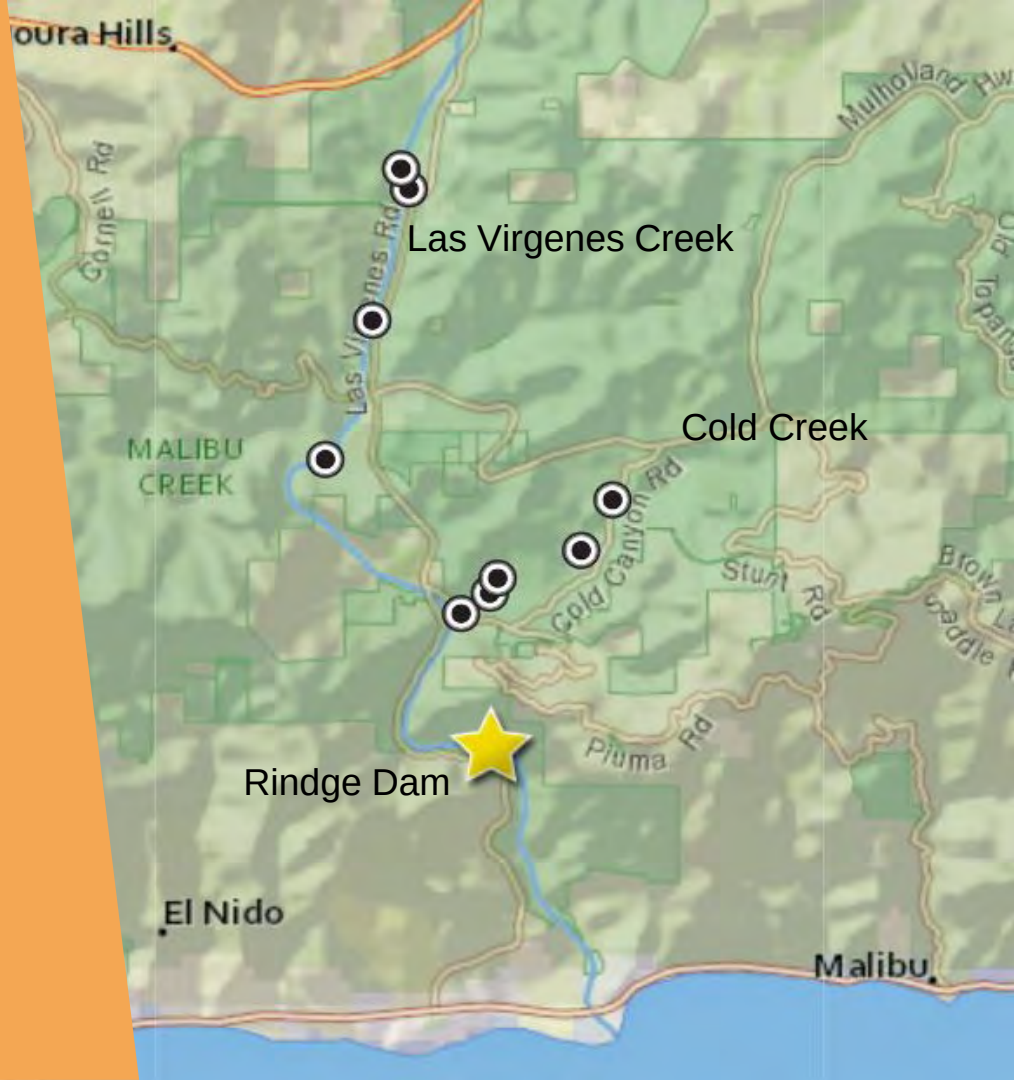
LOCATION – RINDGE DAM

- 3 miles upstream of coast
- Malibu Creek State Park

LOCATION – US BARRIERS

- Cold Creek and Las Virgenes Creek

- Malibu Creek State Park
  County of LA
  City of Calabasas
  Private property



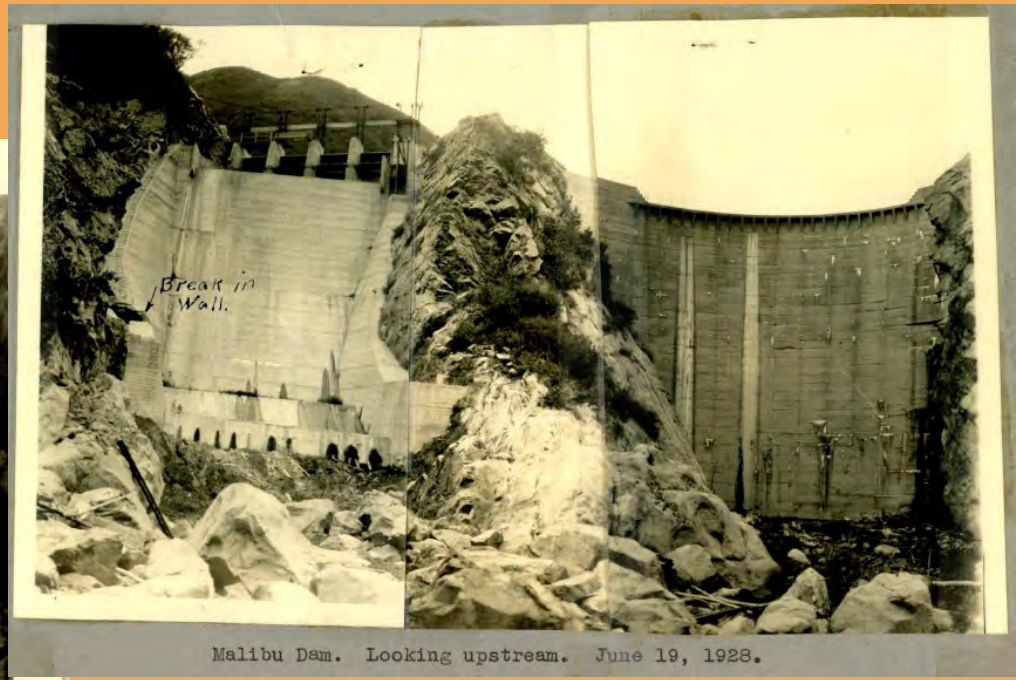
LAND HISTORY

- Traditional lands of the Chumash, Fernandeñoand Gabrielino/Tongva people.
- Spanish land grant, homesteaders
- Rindge family purchased 13,315 acres in 1892 for $10/acre. 22 miles of ocean front.
- Sought lands with a “trout brook”

RINDGE DAM

- Completed in 1926
- Concrete arch– 100 feet tall
- 1950– full of sediment
- 1967– decommissioned
- 1976– acquired by State Parks
- Listed on NRHP

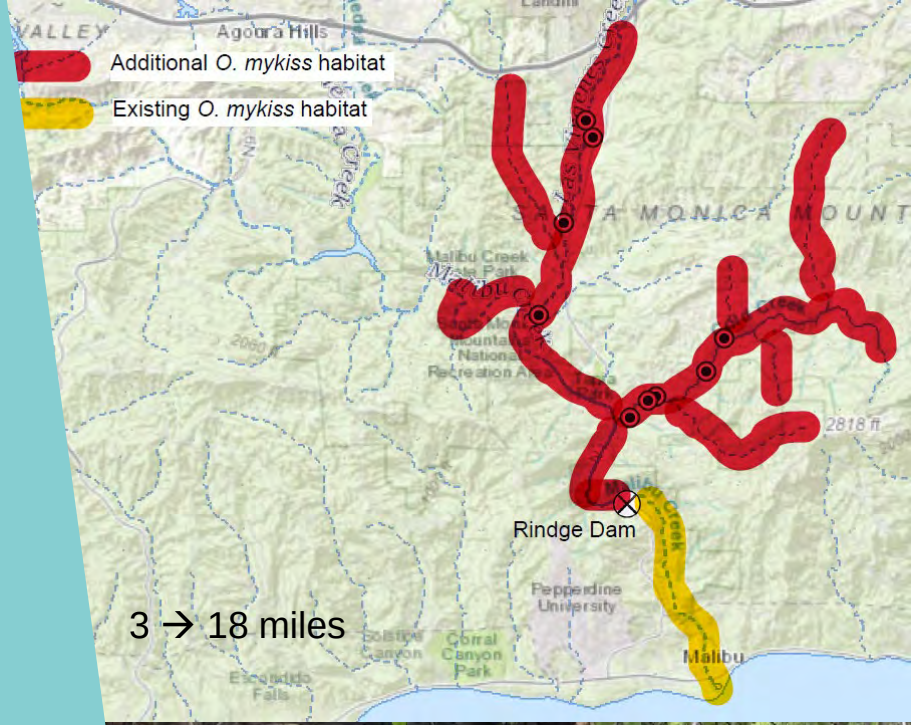
Malibu(Ringe)Dam
Feb. 22, 1925



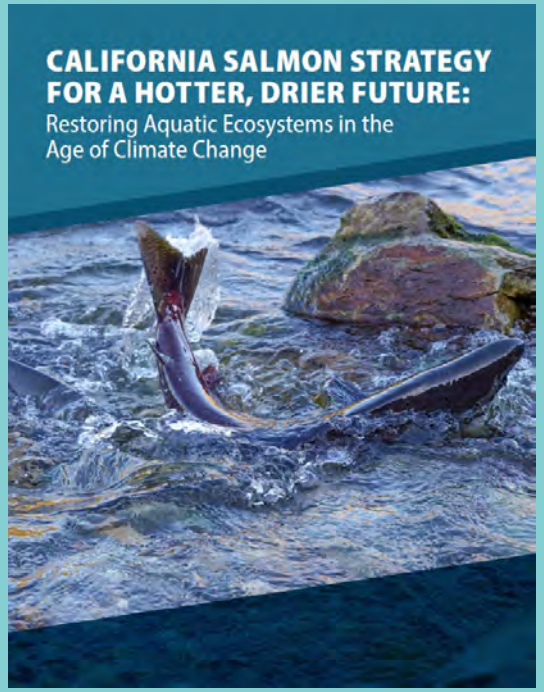
Malibu Dam. Looking upstream. June 19, 1928.

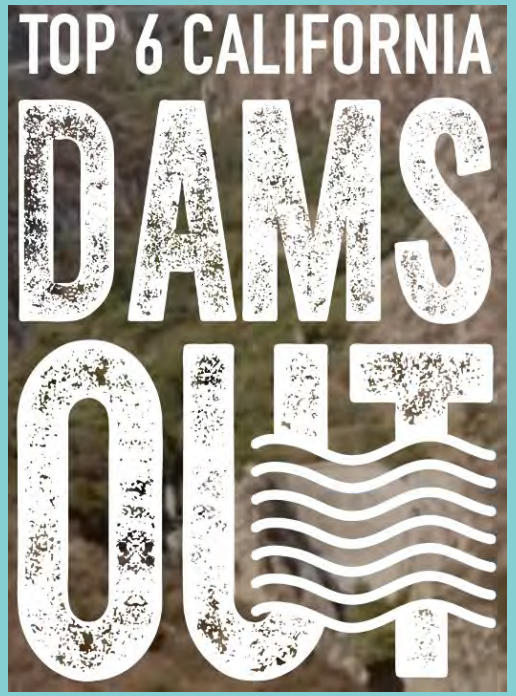
OBJECTIVES AND BENEFITS

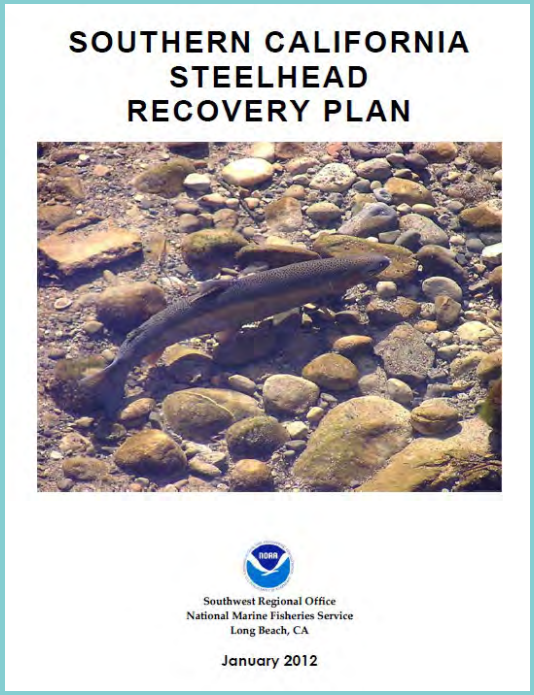
- Ecosystem function and stream processes
- Habitat connectivity – aquatic and terrestrial
- Natural sediment transport
- Dam – no flood control or water storage



OBJECTIVES AND BENEFITS





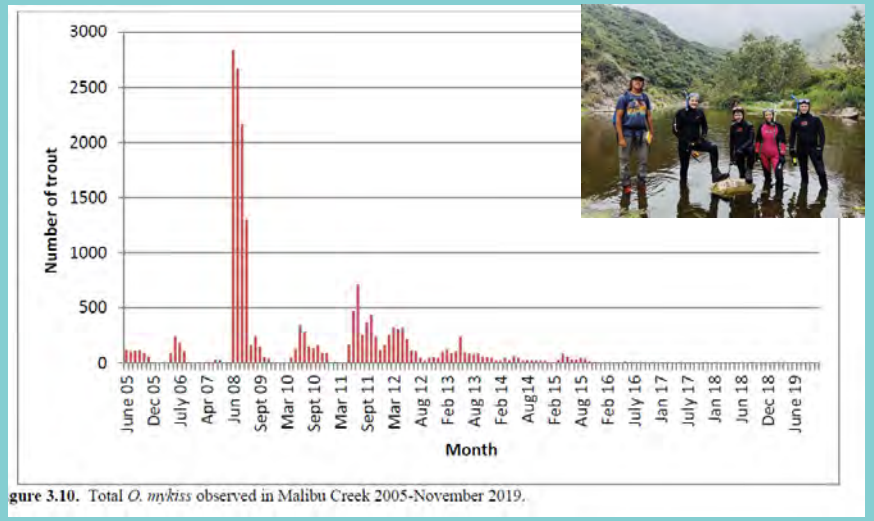


O. MYKISS POPULATION

- SoCal DPS– 177 anadromous adults from 1994– 2018 (Dagit et. al 2020)

Malibu Creek

- No residents
- 2006– population crash
- 2008– recovery
- 2013– abundance has declined
- No *O. mykiss* since 2018



gure 3.10. Total *O. mykiss* observed in Malibu Creek 2005-November 2019.

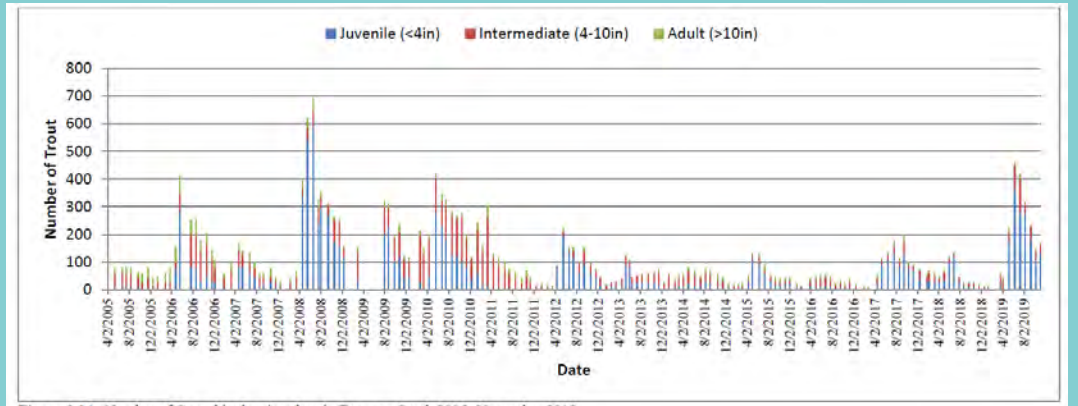


Figure 3.34. Number of O. mykiss by size class in Topanga Creek 2005- November 2019.

Dagit et. al 2019

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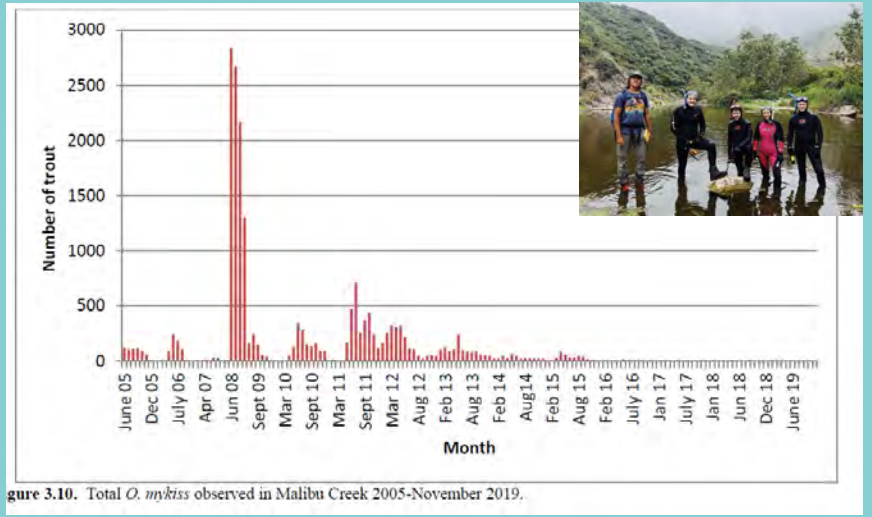
- 2013– abundance has declined
- No *O. mykiss* since 2018

Topanga Creek

- *O. mykiss* regularly present



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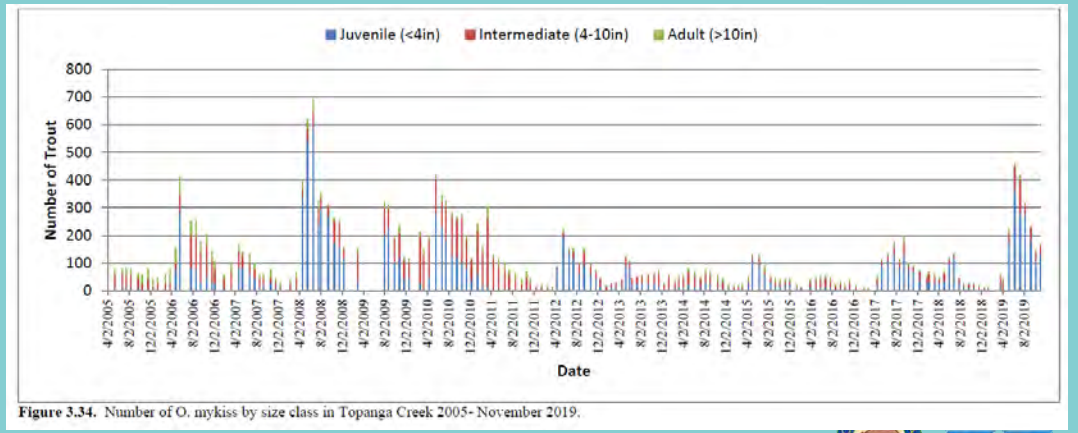


Figure 3.34. Number of O. mykiss by size class in Topanga Creek 2005- November 2019.

Dagit et. al 2019

PROJECT DETAILS

Current project (EIR/EIS)

- Excavate and truck out all sediment behind dam – 800k CY
- Sediment taken to landfill (2/3) and placed in nearshore (1/3)
- Dam removed in stages over 7-8 years
- 90 trucks/day for 150 days/year
- ~$280 million

PROJECT DETAILS

Can we do better?

- Incorporate natural sediment transport
- Reduce truck trips/emissions, disposal at landfill
- Reduce traffic, cost, timeline

….modeling to look at natural transport

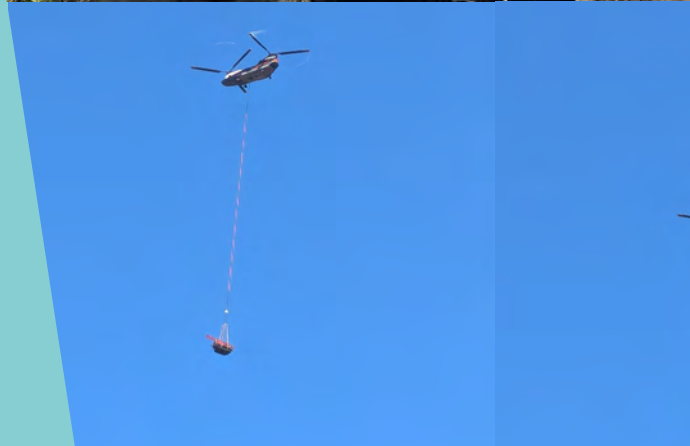
GEOTECHNICAL EXPLORATION

Sediment characteristics of material behind dam

- 1993: Law/Crandall – 3 borings
- 2002: USACE – 8 borings

2024: GeoServ - 10 borings

- Soil type, sediment gradation, liquefaction, chemical characteristics
- Dam coring

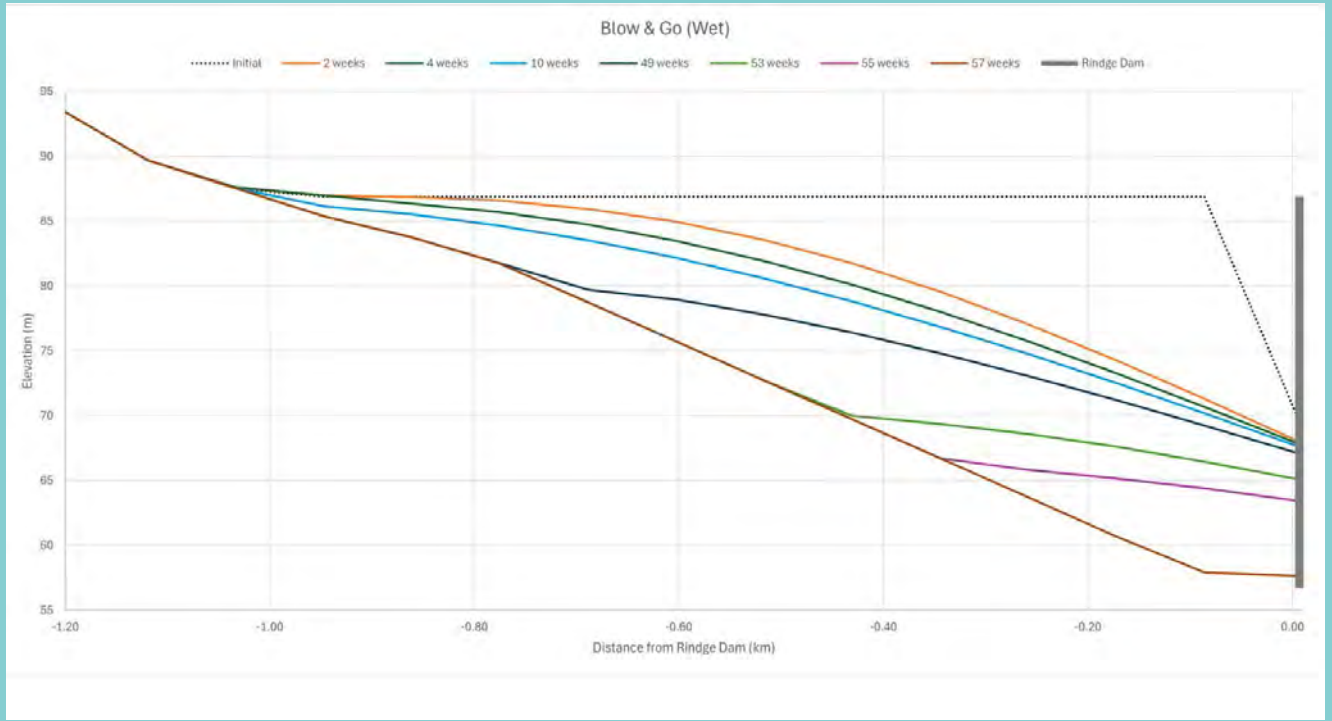


MODELING

Dam removed all at once

Wet period

All sediment flushed out in 57 weeks

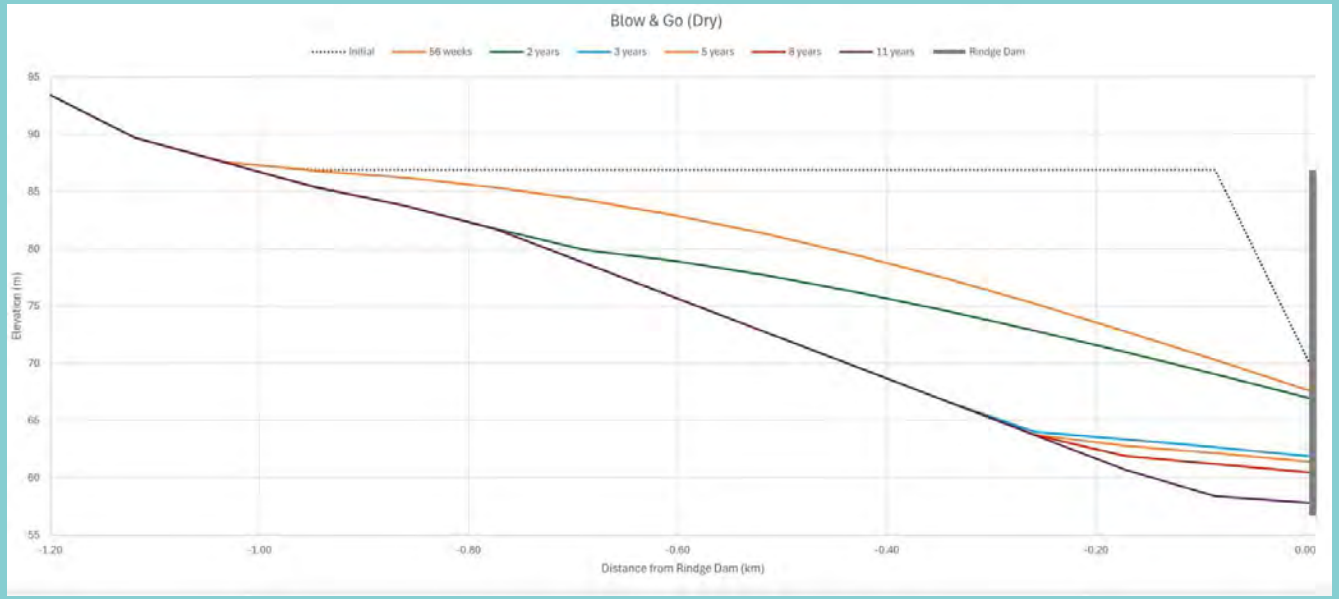


MODELING

Dam removed all at once

Dry period

Sediment flushed out in 11 years

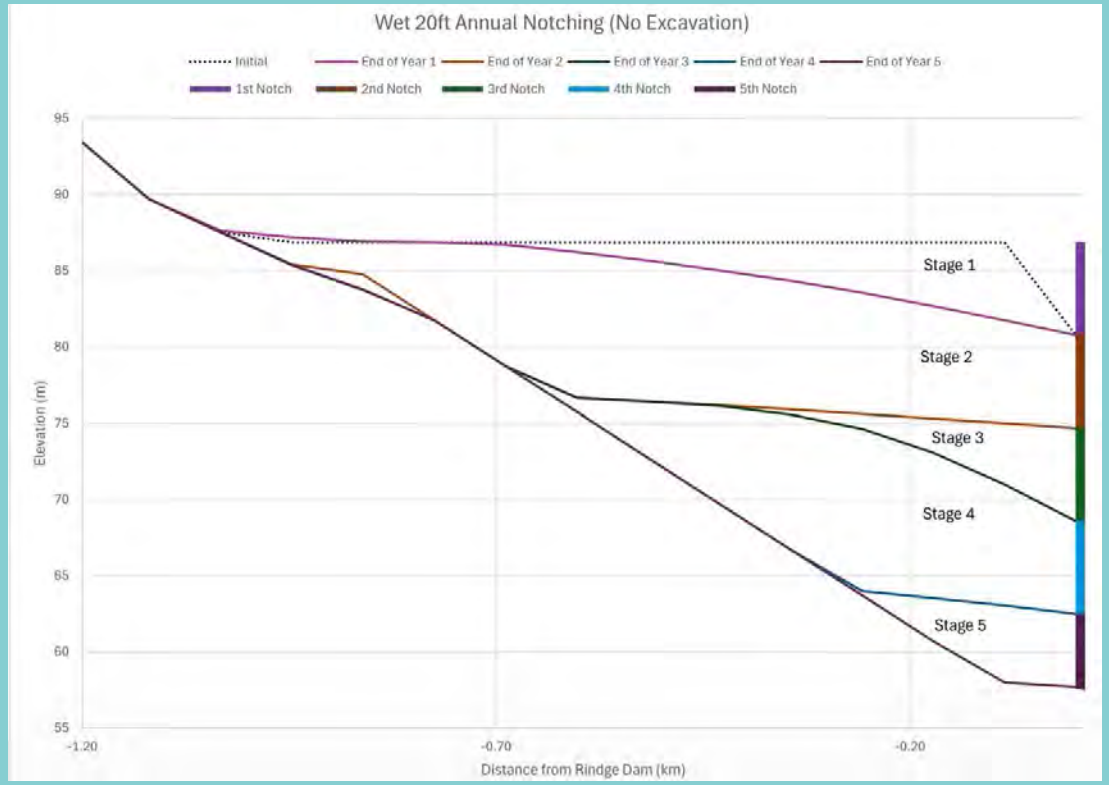


MODELING

20 ft increments over 5 years.

Wet period

Sediment flushed out in 5 years

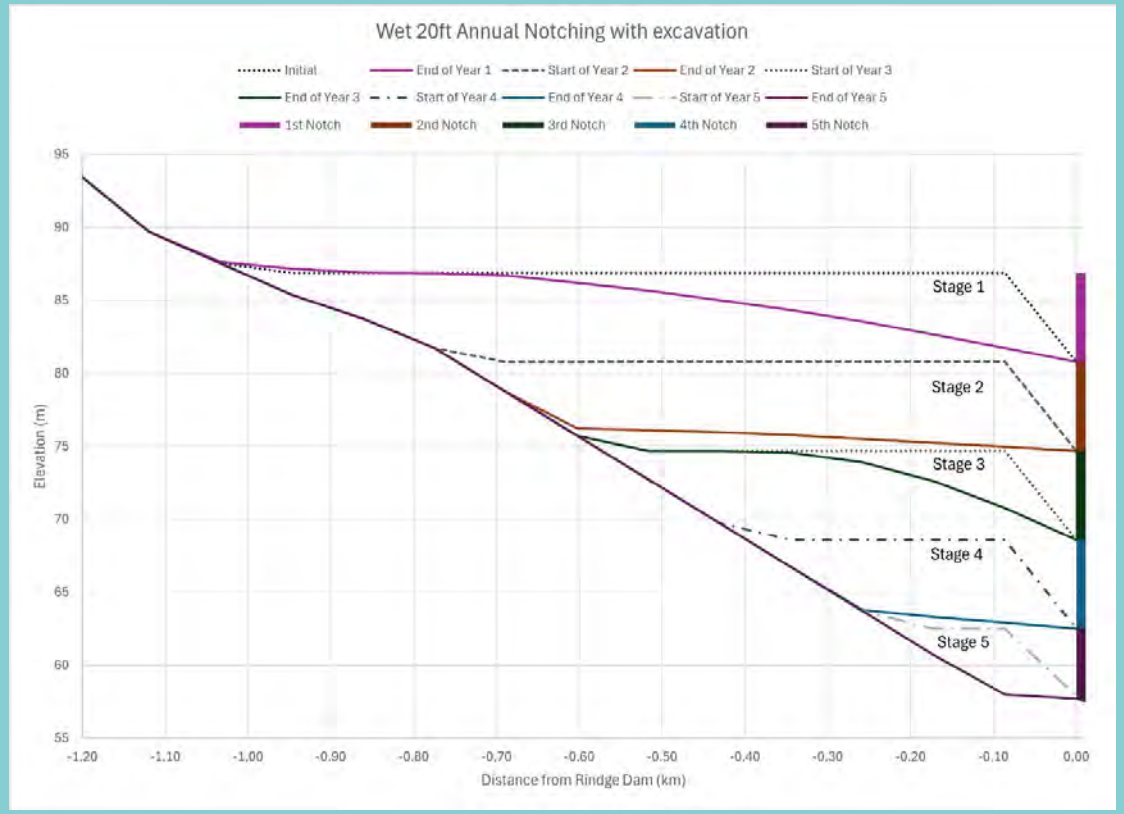


MODELING

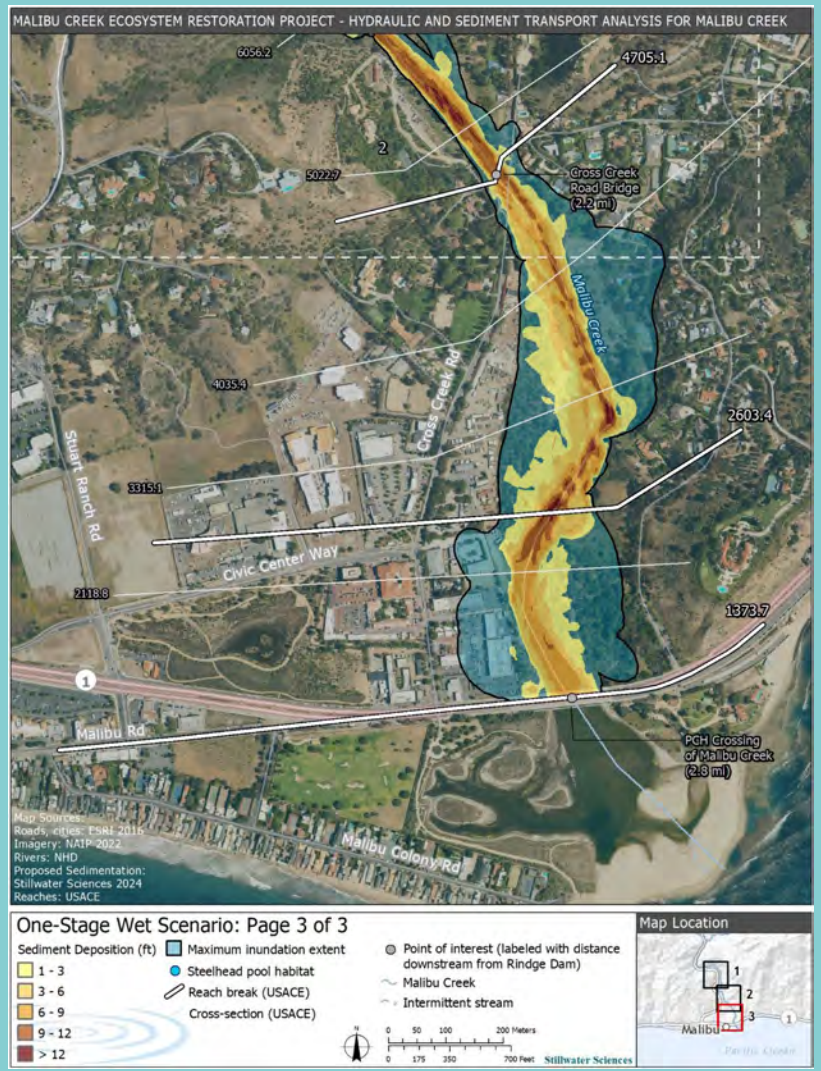
20 ft increments over 5 years. Remainder mechanically excavated.

Wet period

Sediment flushed out in 5 years




MALIBU CREEK ECOSYSTEM RESTORATION PROJECT - HYDRAULIC AND SEDIMENT TRANSPORT ANALYSIS FOR MALIBU CREEK
1
Lunch Pool
9072.9
Upper Twin
Lower Twin
Mullet Pool
8005.5
Malibu Canyon Rd
Start Pool
7093.4
Malibu Creek
6056.2
4705.1
3
5022.7
Cross Creek Road Bridge (2.2 mi)
Map Sources:
Roads, cities: ESRI 2016
Imagery: NAIP 2022
Rivers: NHD
Proposed Sedimentation:
Stillwater Sciences 2024
Reaches: USACE
One-Stage Wet Scenario: Page 2 of 3
Sediment Deposition (ft)
1 - 3
3 - 6
6 - 9
9 - 12
> 12
Maximum inundation extent
Steelhead pool habitat
Reach break (USACE)
Cross-section (USACE)
Point of interest (labeled with distance downstream from Rindge Dam)
Malibu Creek
Intermittent stream
0 50 100 200 Meters
0 175 350 700 Feet
Stillwater Sciences
Map Location
Malibu
Pacific Ocean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Cross Creek Rd
Stuart Ranch Rd
2603.4
3315.1
Civic Center Way
2118.8
1373.7
1
Malibu Rd
PCH Crossing of Malibu Creek (2.8 mi)
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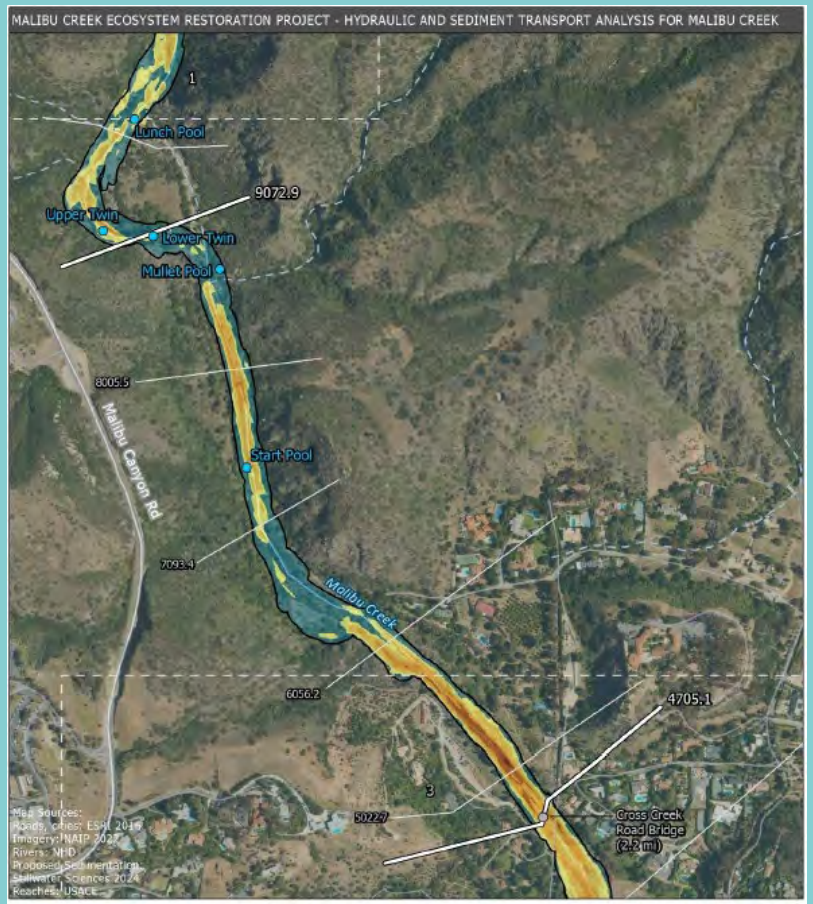
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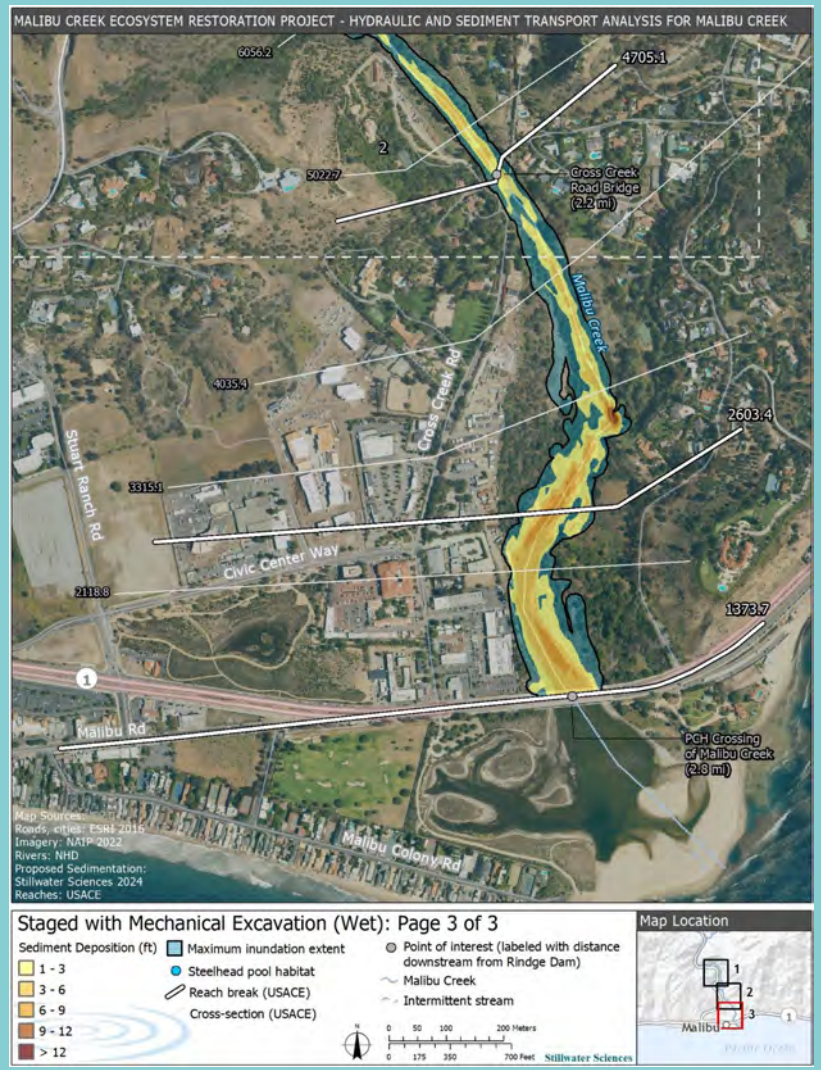
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SEDIMENT ACCUMULATION IN DS REACH

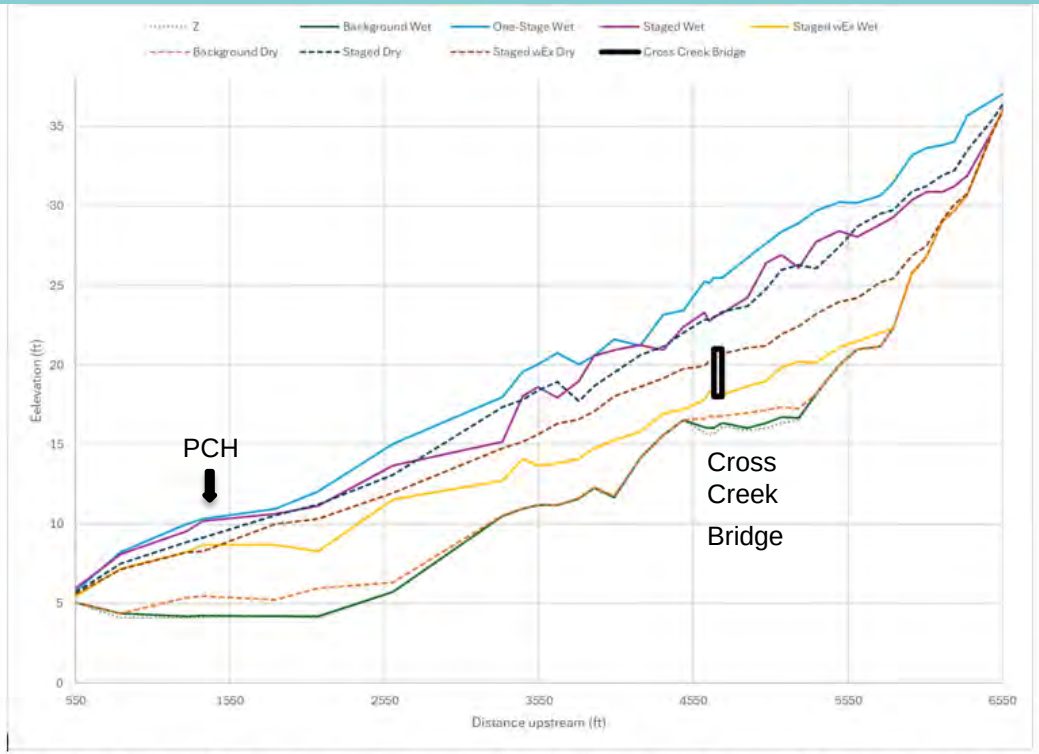


Figure 14. Average bed elevation during maximum sediment accumulation for the modeled dam removal alternatives near the Cross Creek Road Bridge.

PROJECT DETAILS

What has this told us?

PROJECT DETAILS

What has this told us?

Full sediment transport not an option

PROJECT DETAILS

What has this told us?

Full sediment transport not an option

Partial transport with excavation may be an option

PROJECT DETAILS

- Summer, Spring, Fall
  - Remove dam in ~20 ft sections
  - Sort sediment (silt, sand, cobble)
  - Place sand at local beaches
  - Rock/cobble? TBD
- Winter
  - Storms carry small grained sediment DS

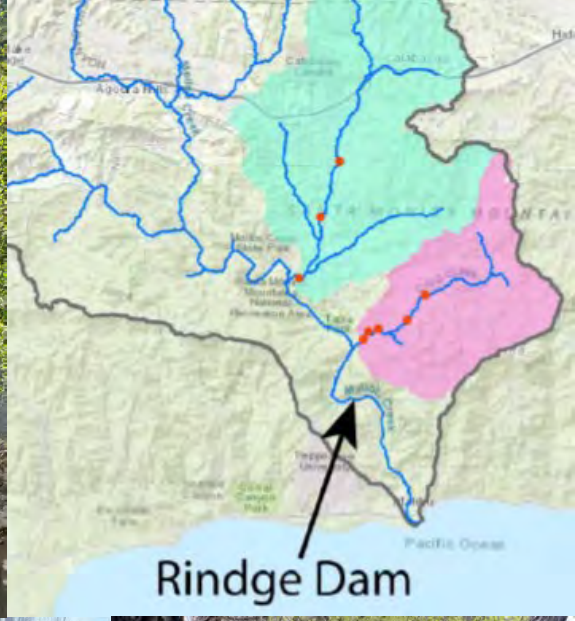
Additional modeling underway…

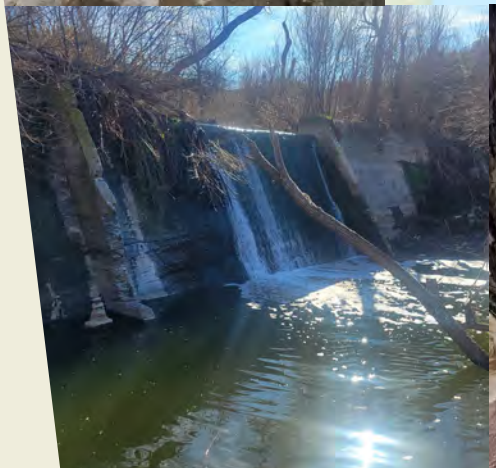
UPSTREAM BARRIERS

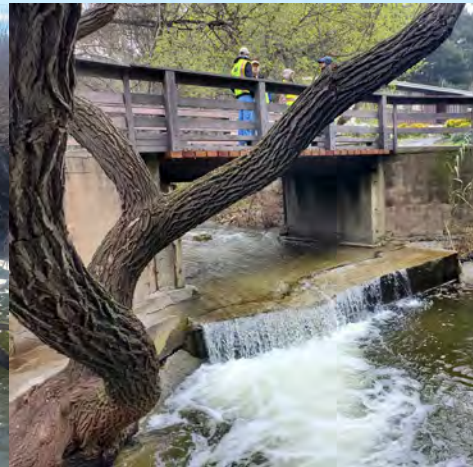
Remediation of 8 upstream barriers

- Tributaries to Malibu Creek
- Full bridge/culvert replacement
- Removal of dam/low water crossing
- Modification for fish passage

- 35% design complete







CHALLENGES

- What to do with sediment
- Avoid DS flooding
- Cost/funding ~$280M
- Truck traffic/emissions
- Community support
- Ecological impacts

TIMELINE

2020-23

2020
EIR/EIS complete

2021
$12.5 mil for design and planning

2022
RFQ and consultant team selected

May '23
First public meeting for design phase

2023-28

Steelhead surveys

June - Dec '23
Baseline studies, data gathering

Jan '23- July '25
River and lagoon modeling, alternatives, design

Summer/Fall '25
35% design for dam removal and 90% for US barriers

2026
90-100% design, start US barrier removal

'27/'28
Dam removal and US barrier removal

www.parks.ca.gov/MCERP
www.restoremalibucreek.org
@restoremalibucreek

MALIBU CREEK
ECOSYSTEM RESTORATION PROJECT

CALIFORNIA STATE PARKS
CALIFORNIA TROUT
FISH · WATER · PEOPLE

Managing Complexity:

Planning for the Removal of Matilija Dam

Sam Jenniches, California State Coastal Conservancy
David Yardas, Aqua Currit Consulting

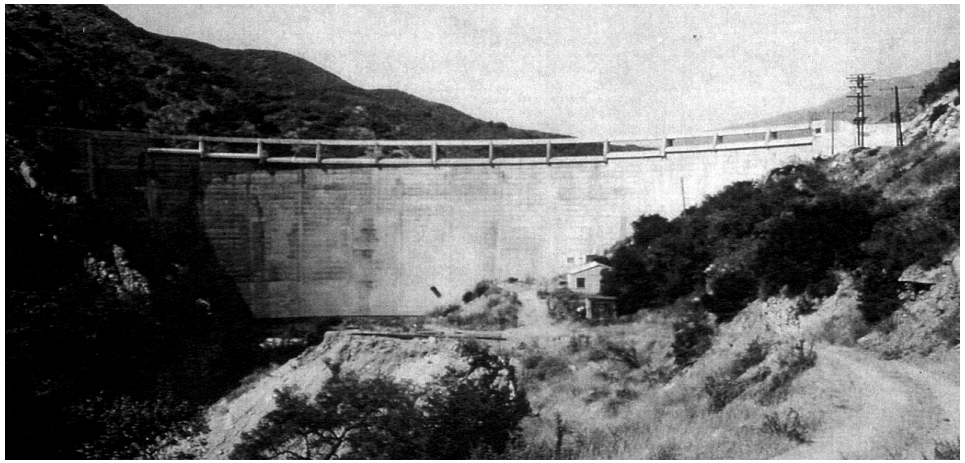
Dams Out: The Next Rivers Poised for Reconnection in California

42nd Annual Salmonid Restoration Federation Conference

Santa Cruz, California

May 2, 2025

Matilija Dam and Reservoir



1948: as constructed, ~61m tall

1960: Reservoir full of water

2024: Dam crest <50m, Reservoir full of sediment

Functionally obsolete
Alkali Silica Reaction (ASR)
High hazard - poor condition
Seismic risks

Matilija Dam and Reservoir

March 30, 2024

Right abutment and dam crest
(view near left abutment)

Vegetation growth and sedimentation
in reservoir near dam crest

Photos by Mark Capelli 3/30/2025

CAUSE FOR HOPE!

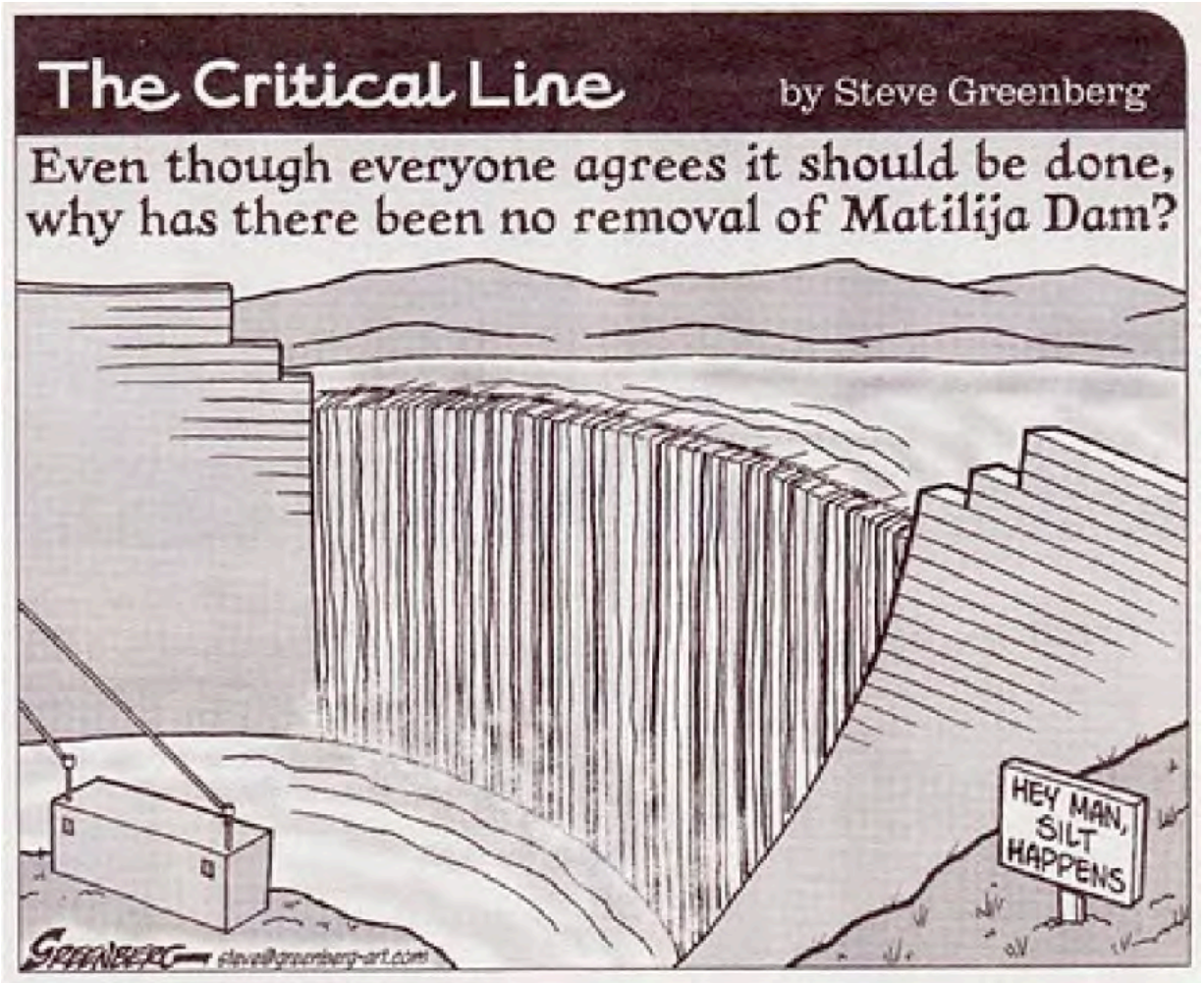
Onchorynchus mykiss Adult – Upper North Fork Matilija Creek, upstream of Matilija Dam – Steve Howard, March 6, 2024

2004 Feasibility Study Recommended Plan Design Features:

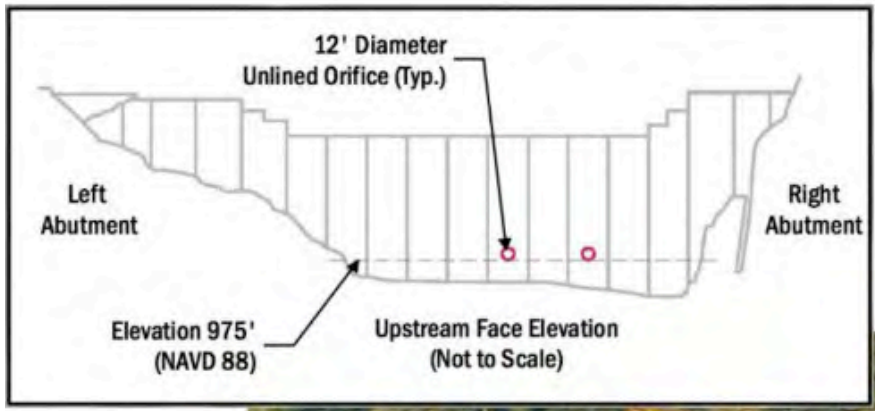
- Wells
- Levees/ Floodwalls
- Bridge Modifications
- Robles Diversion High Flow By Pass
- Robles Diversion Desilting Basin
- Fine sediment slurry and downstream disposal
- Coarse sediment stabilized on site
- Dam Removal

Federal Project authorized in 2007, falls apart by 2011 due to sediment management disputes

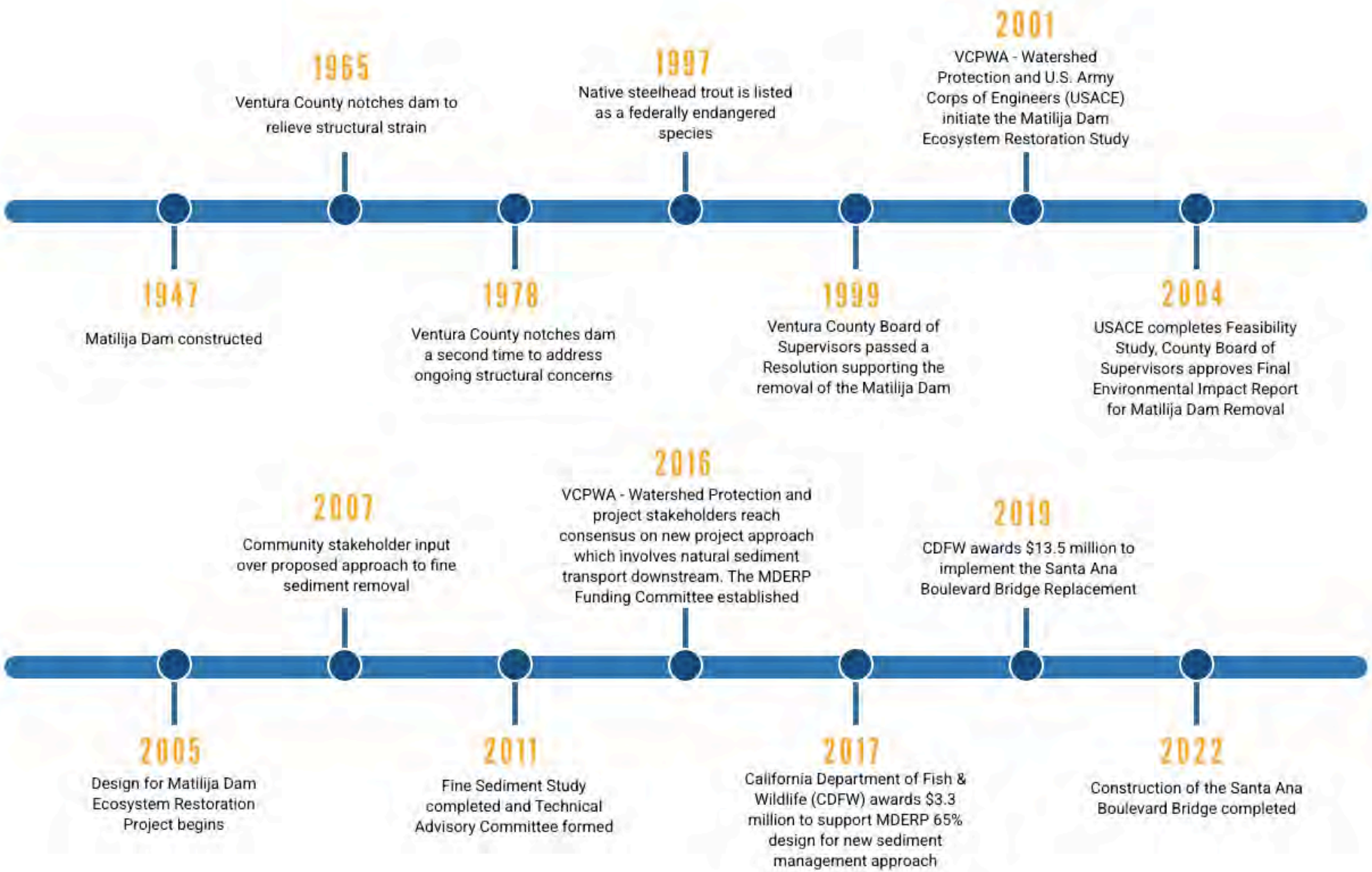
Ojai Valley News ~2007



Stakeholder Consensus Project 2016



Low level outlets will flush sediment out of reservoir during a flood as demonstrated on Condit Dam in 2011



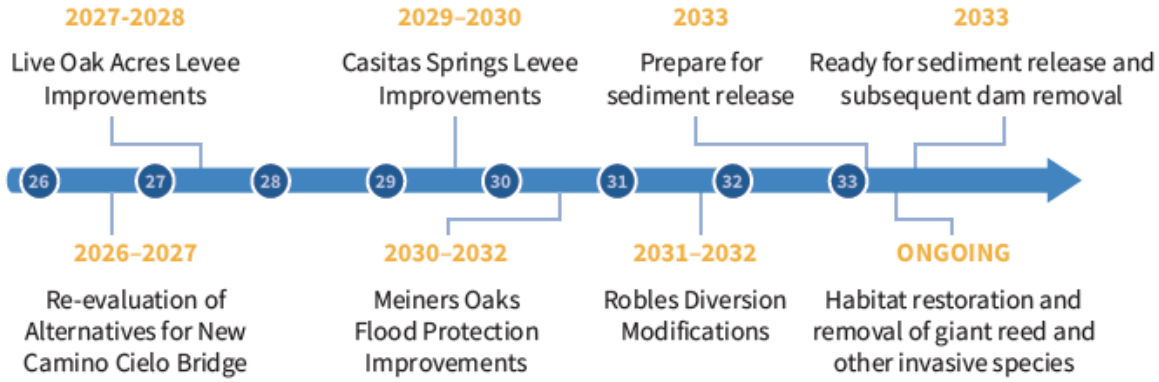
https://matilijadam.venturacounty.gov/history/

PROJECT BENEFITS

- Modernize downstream infrastructure for long-term resilience
- Improve watershed habitat through removal of invasive species
- Restore natural processes to support beach replenishment through transport of sediment and cobble downstream
- Enhance recreational opportunities
- Restore endangered steelhead access to Matilija Creek headwaters
- Support economic growth and job creation

Total Cost: $300M
Secured: $ 50M
Pending: $150M
Developing: $100M

IMPLEMENTATION TIMELINE



Water Systems Consulting for VCWPD 2023-2025 (updates in progress)

Complexity and Risk

Risks from the Project

- Increased Sediment
- Water Supply Impacts
- Fish Passage Challenges
- Increased Flood Risk
- Property and Infrastructure Impacts

Risks to the Project

- “Edge of the Art” modeling
- Regulatory Uncertainty
- Funding Needs
- Capacity to Execute
- Public Perception
- Risk Aversion

Worst case: the Project becomes untenable.

It happened before; it could easily happen again.

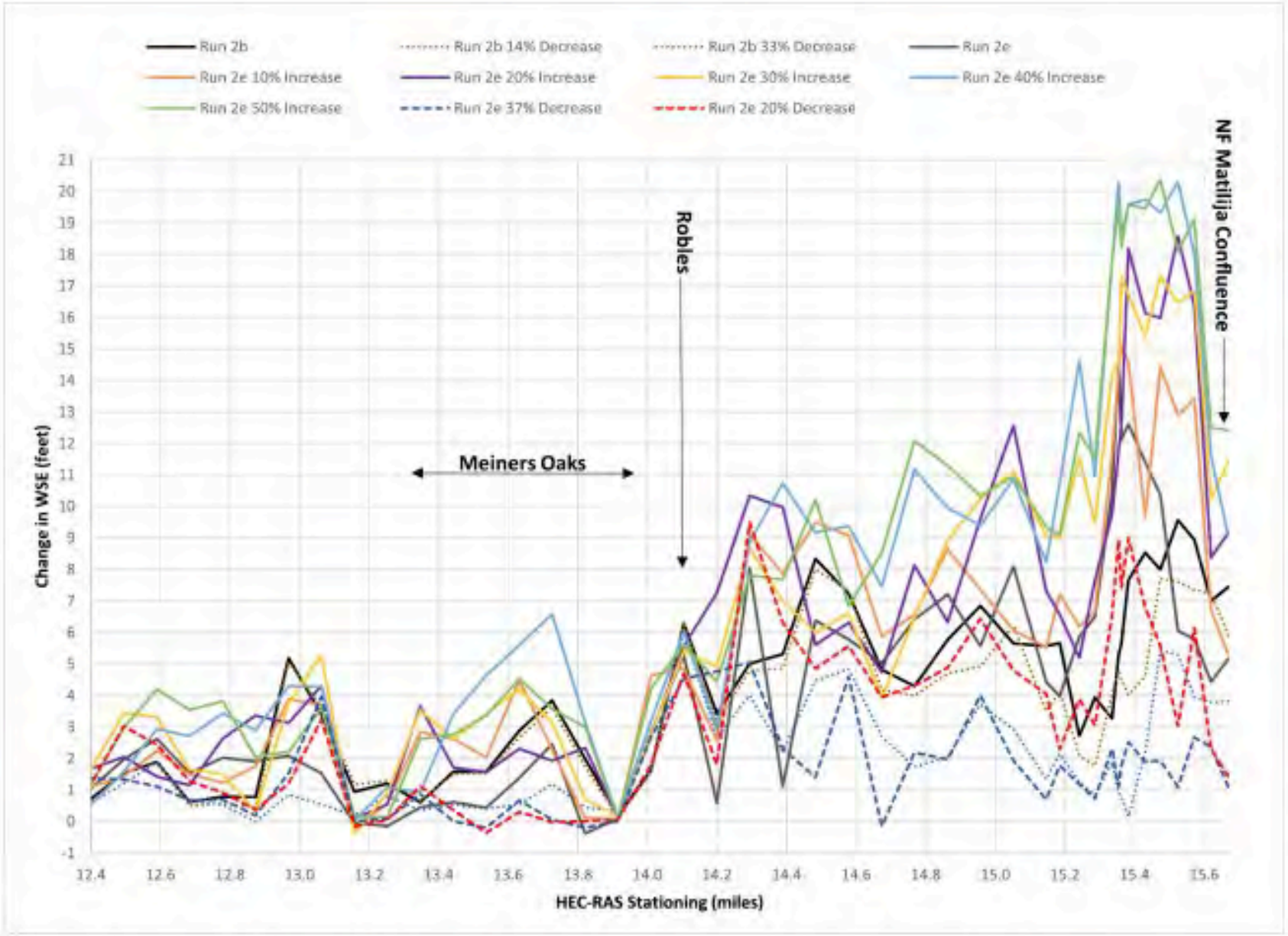
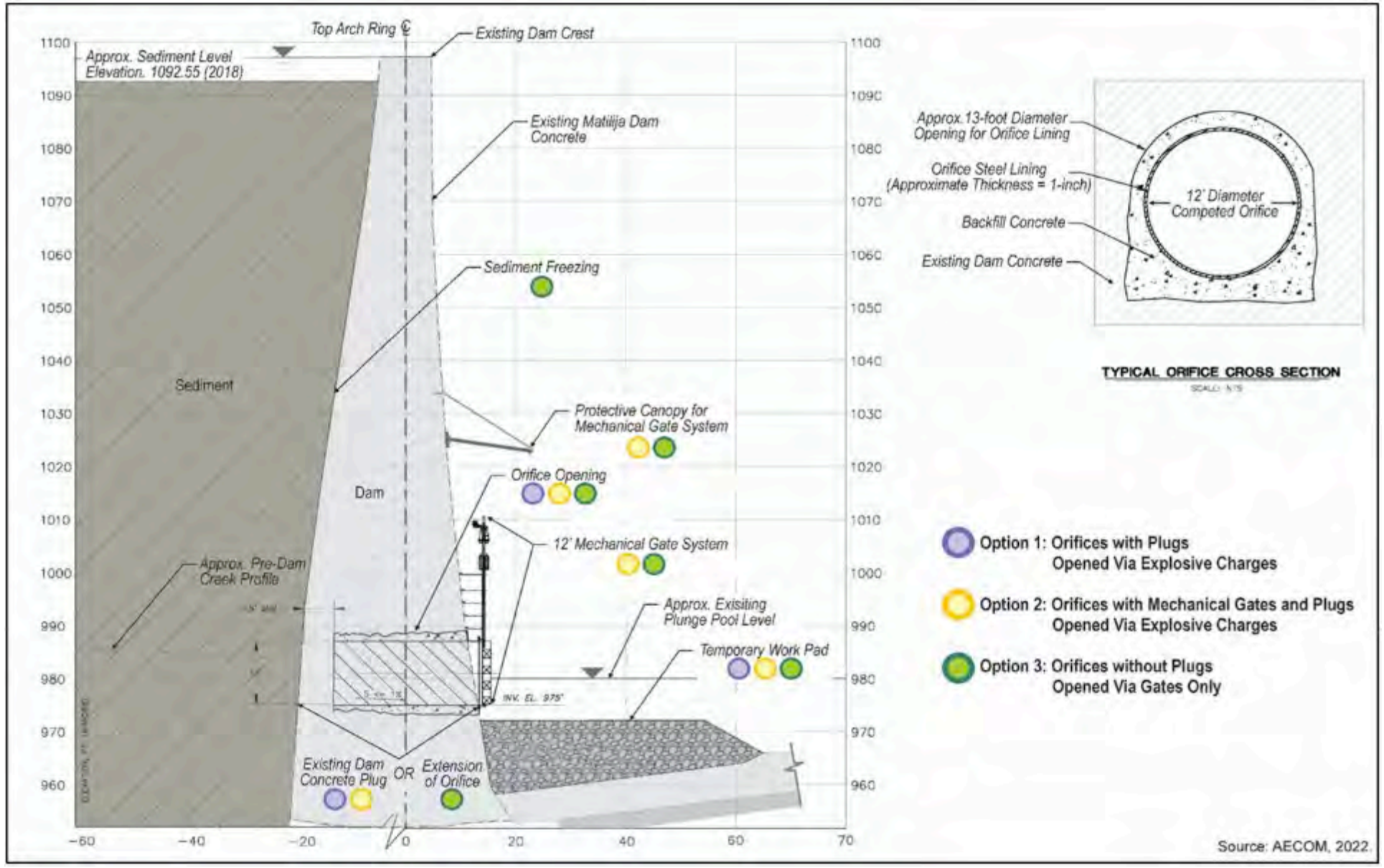


Figure 3-14. Sensitivity analysis for changes in WSE resulting from dam removal for Phase III upstream model.

RISKS FROM THE PROJECT

- Increased sediment transport
- Adverse water supply impacts
- Fish passage challenges
- Increased flood risks
- Property and infrastructure impacts



Matilija Dam Removal – Orifice and Gate Options 2018

Matilija Dam Removal and Robles

Sediment passing downstream

- Matilija reservoir is full, fine sediment is passing downstream towards Robles.
- Sediment load in Robles will increase 2 to 3 times in the long term and ~10 times immediately after Matilija dam removal

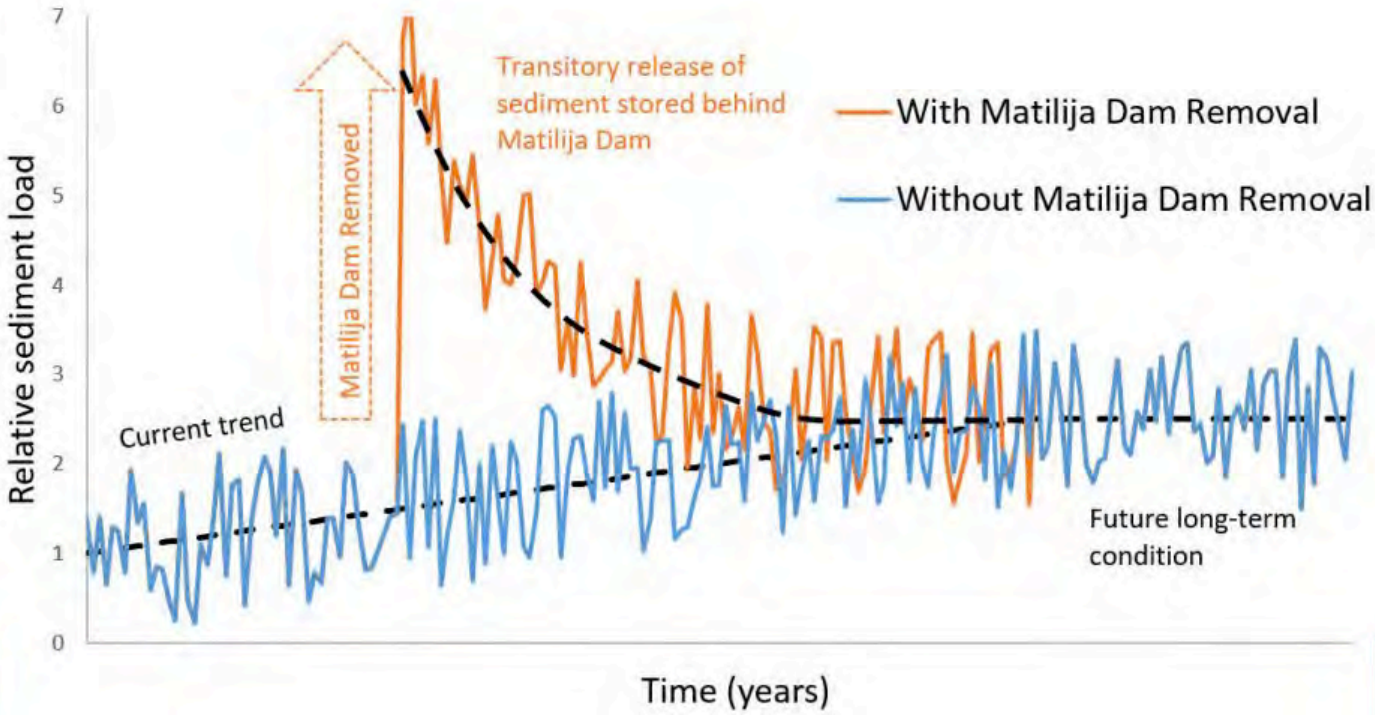


Photo 1. Robles Diversion Facilities (September 2020)

Robles Diversion post-storm aerial – January 15, 2023 © Rich Reid Photo

RISKS TO THE PROJECT

- *Edge of the art* modeling studies
- Regulatory uncertainty
- Funding needs
- Capacity to execute
- Public perception
- Risk aversion

TECHNICAL REPORT ◦ MARCH 2025

Matilija Dam Removal 65% Design Subtask 2.9: 2D Hydraulic and Sediment Transport Modeling in SRH-2D

PREPARED FOR

AECOM Technical Services, Inc.
1999 Avenue of the Stars, Suite 2600
Los Angeles, CA 90067

PREPARED BY

Stillwater Sciences
2855 Telegraph Avenue, Suite 400
Berkeley, CA 94705

FUNDED BY

California Department of Fish and Wildlife's Watershed Restoration Grant Program & California Coastal Conservancy

Stillwater Sciences

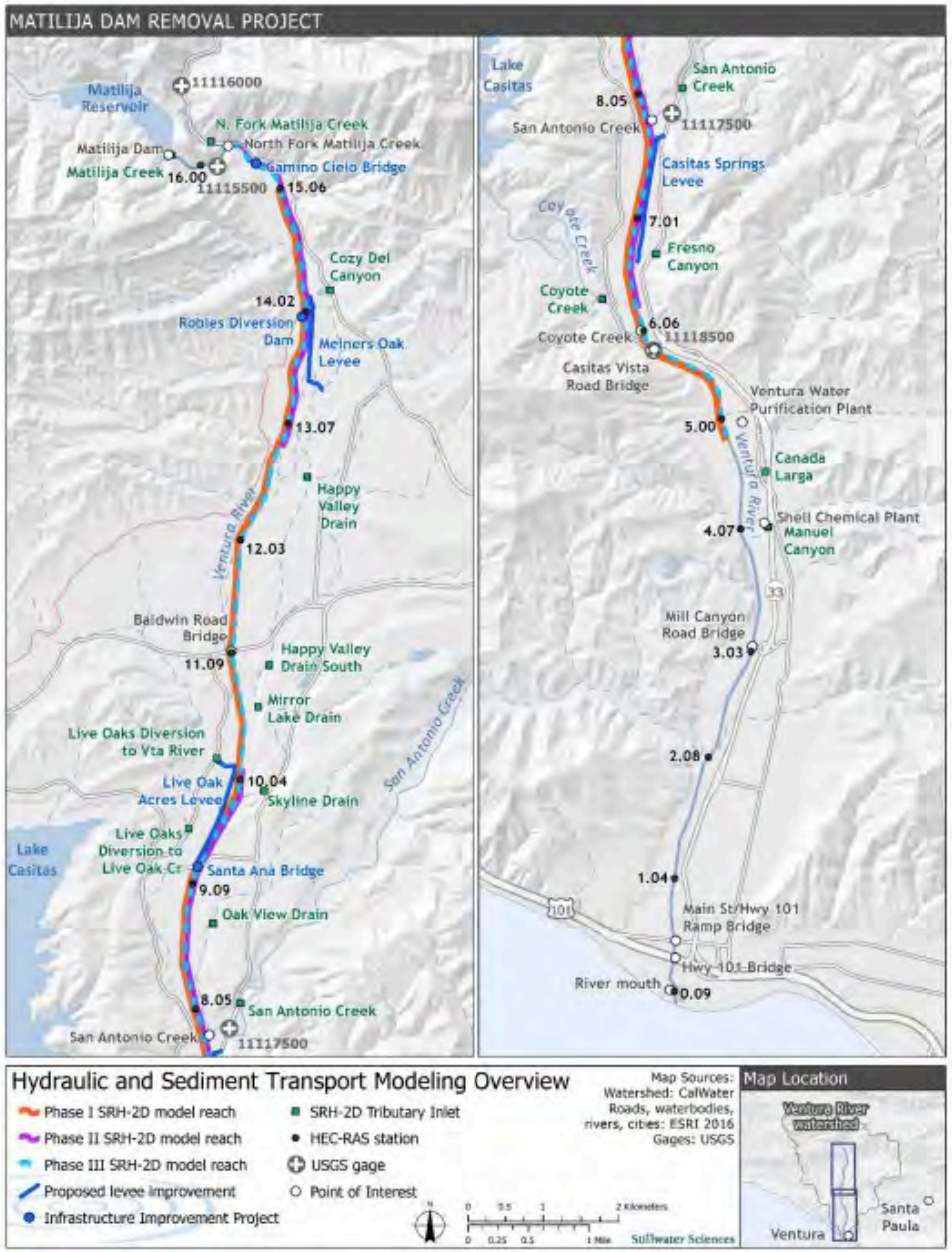


Figure 1-2. Overview map for SRH-2D hydraulic and sediment transport models.

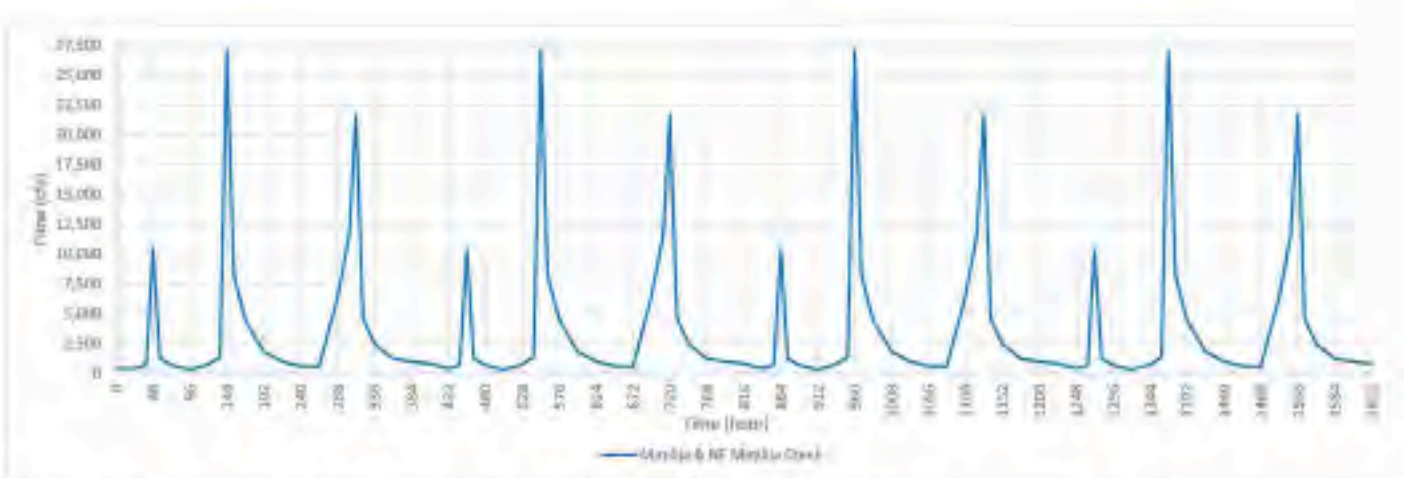


Figure 3-2. Extended hydrograph used for the SRH-2D sediment transport models, representing 4 cycles of the 1969 hydrograph with lower flow periods removed for modeling efficiency (the "Run 2b" hydrograph).

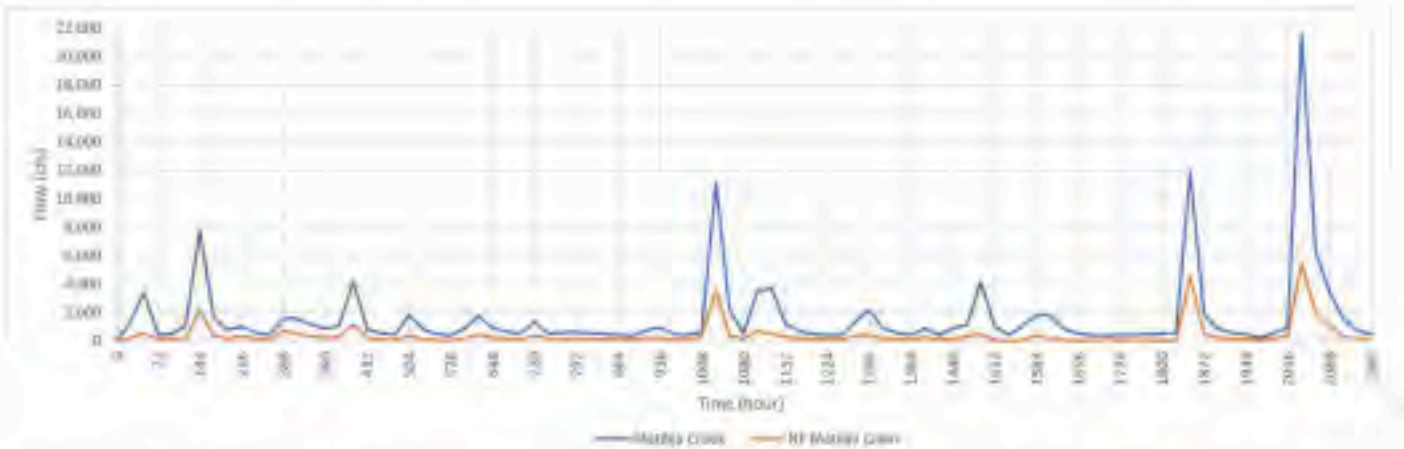


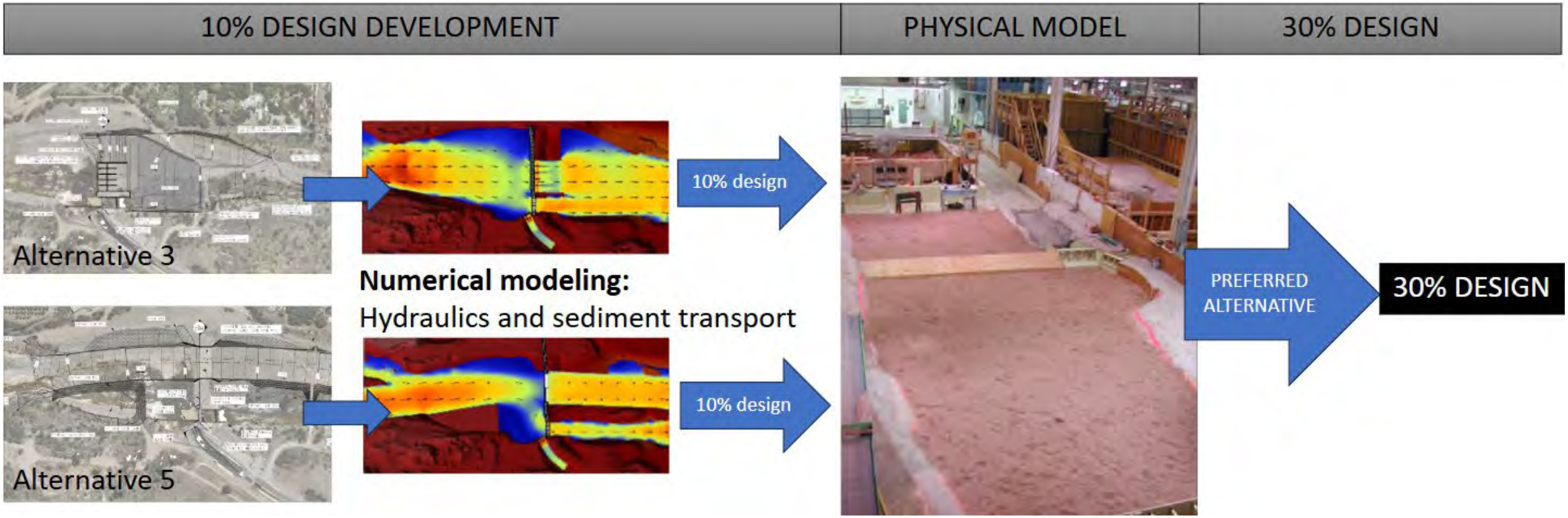
Figure 3-3. Additional hydrograph used for the SRH-2D sediment transport model, using the hydrograph of "Run 2e" from DREAM-2 with lower flow periods removed for model efficiency, and with a 100-year storm event that begins at hour 2016.

Ventura River @ Robles Diversion Facility, January 2023

Northwest Hydraulic Consultants 2024 (using aerial photo from Scott Lewis, Casitas MWD, January 2023)

Robles Phase 2 Design Development

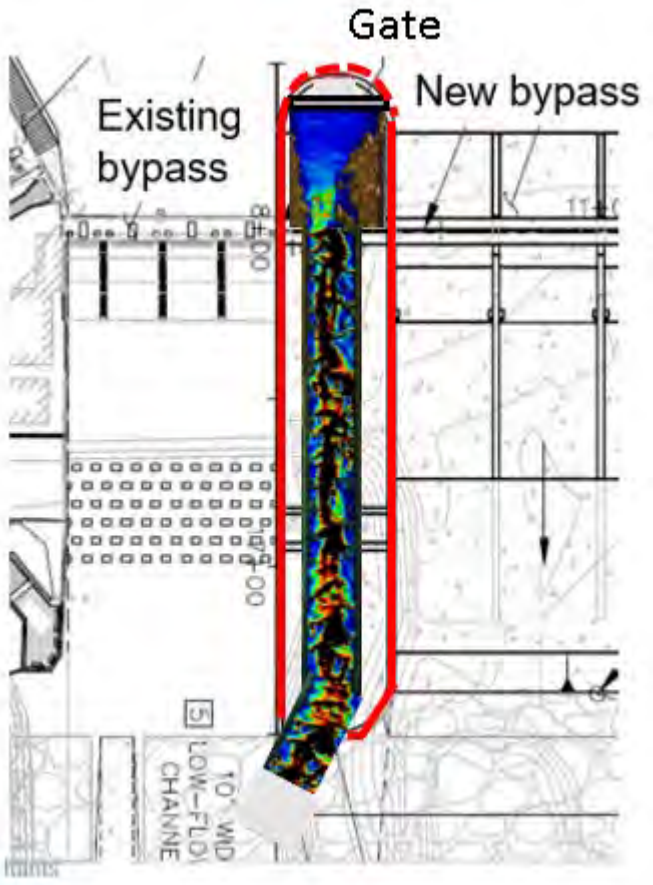
- Two 150-ft wide bypass Alternatives 3 and 5 are being considered. New physical model will assess sediment transport and arrive to a preferred design.



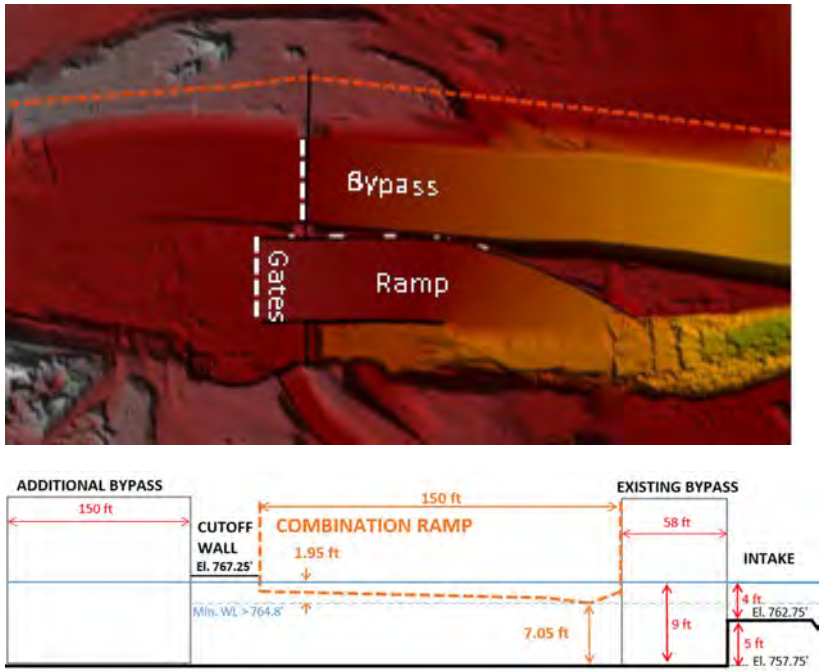
Northwest Hyraulic Consultants, February 2025

MDERP Robles Facility Modifications

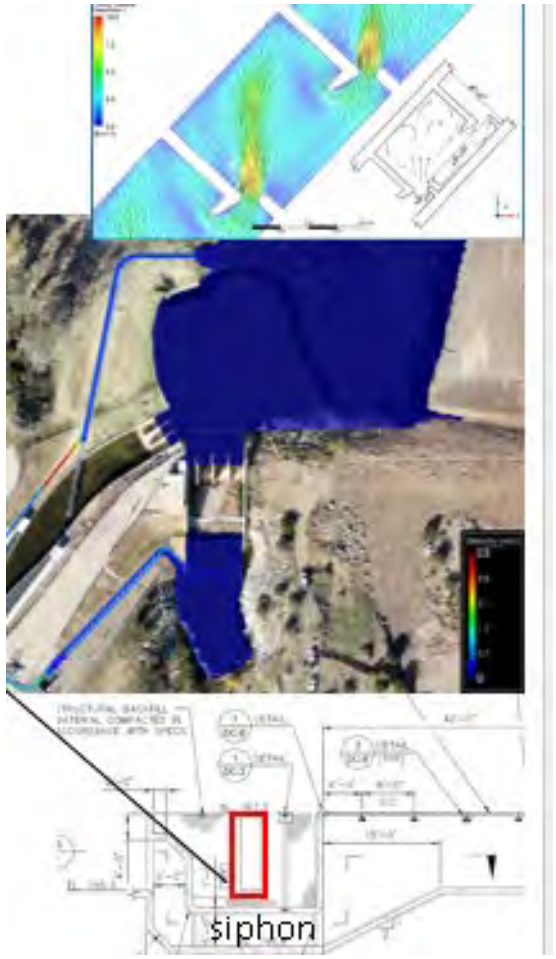
Potential Fish Passage Improvement Options – February 2025



Option 1: Low Flow Ramp



Option 2: Combination Ramp with High Flow Passage



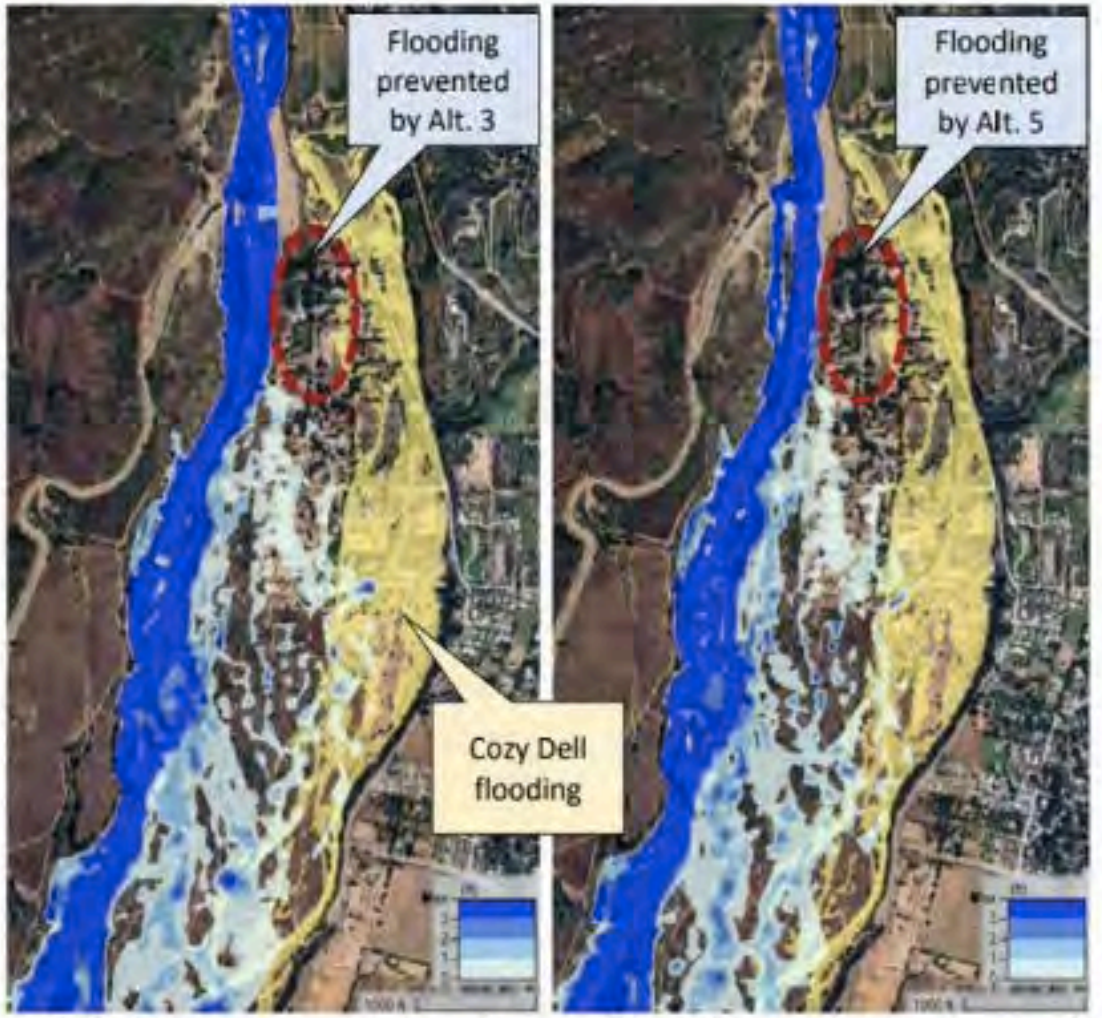
Option 3: Retrofit Existing Fish Ladder

Northwest Hydraulic Consultants, February 2025

MDERP Potential Property Impact Areas - Ventura River Floodplain, Fall 2023

Impacts on Meiners Oaks

- Looked at flood potential for Existing Conditions, Alternatives 3 and 5
- Analyzed with sedimentation in the system (Stillwater Sediment Modeling) and assumption on channel adjustment to pre-dam conditions (USBR) for Alternatives
- Both Alternatives resulted in better sediment transport and lower risk than existing
- Looking at alternatives to mitigate remaining risk through additional modifications
- Work to continue alongside Robles Alternative Developments



Alt 3 (post dam removal) Alt 5 (post dam removal)

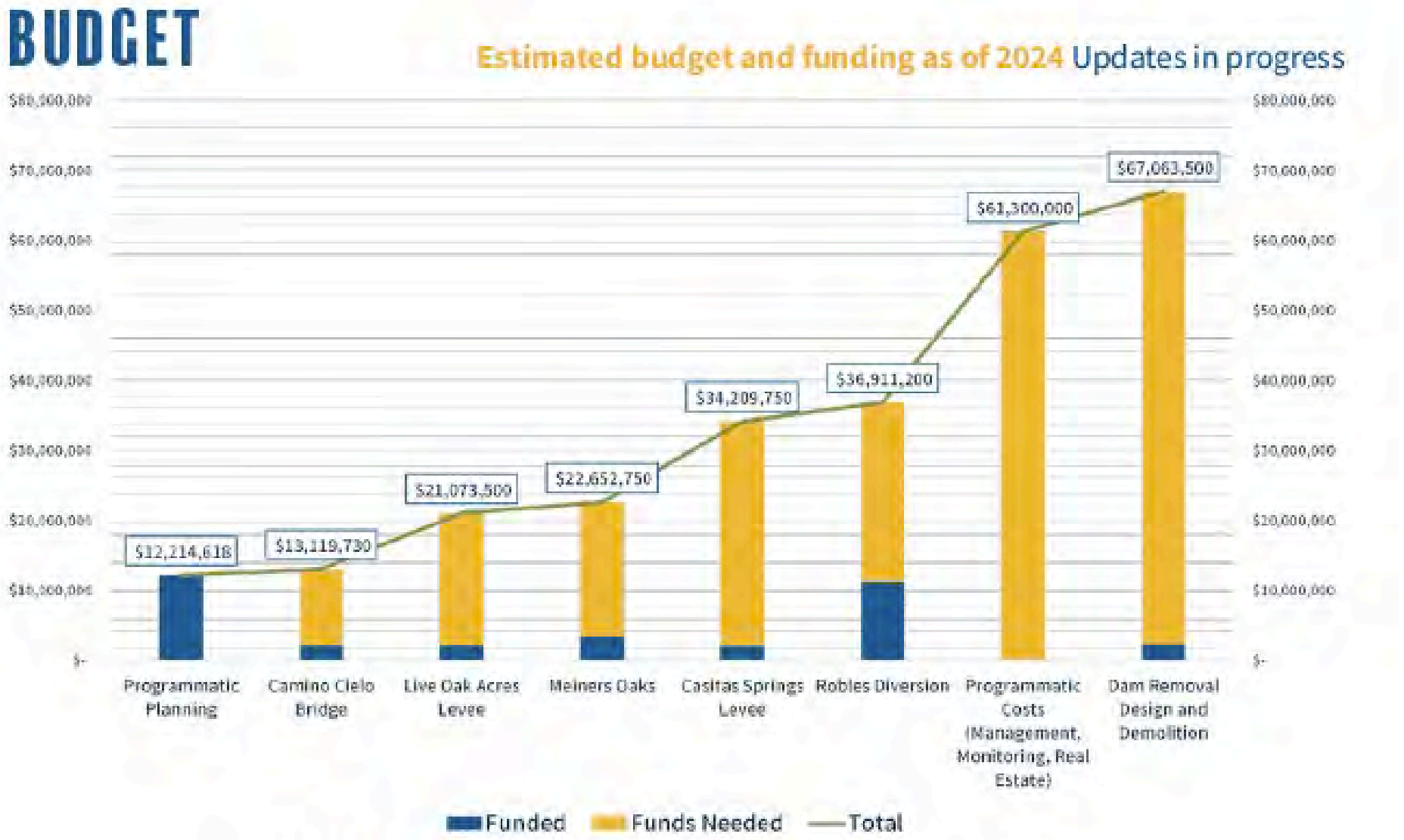
Meeting with Ventura County, Funders, and Other Stakeholders: Matilija Dam

November 15, 2024

Risk Management Approach: Klamath Dam Removal

Richard Roos-Collins
Water and Power Law Group PC

BUDGET



Total Additional Funding Required: $250M

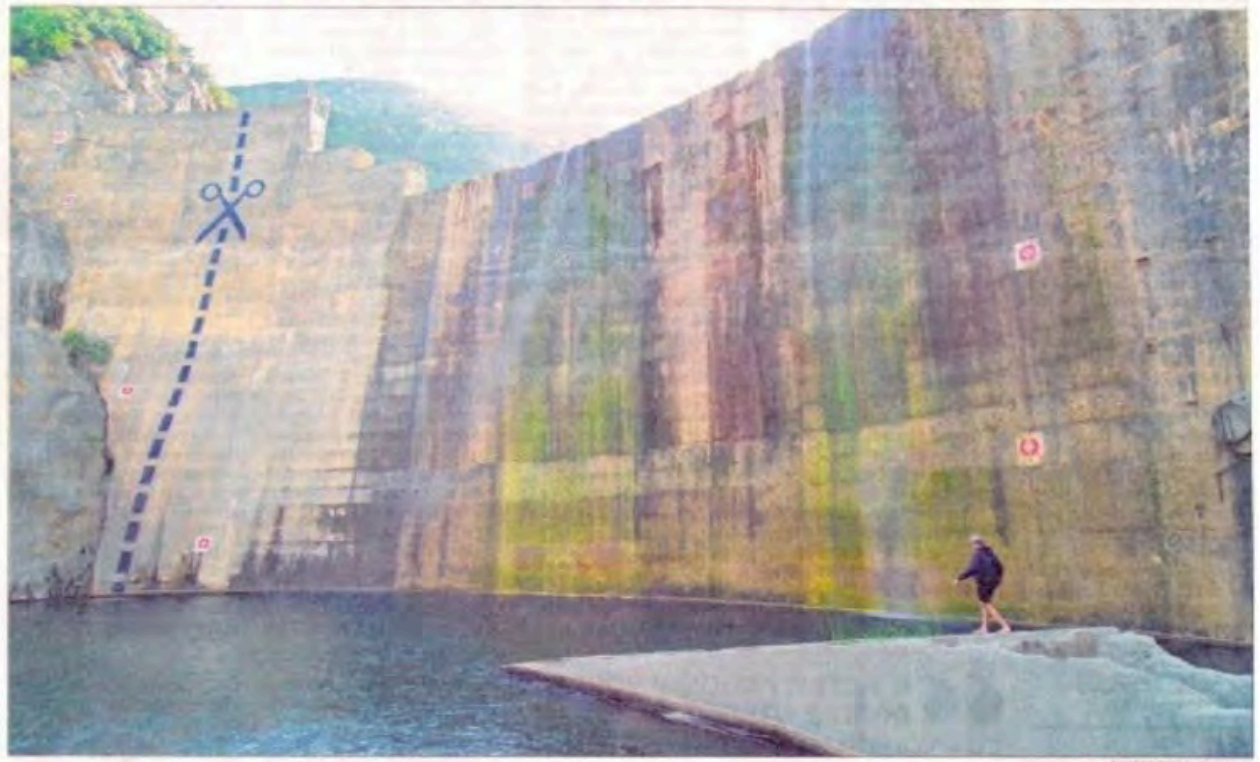
Water Systems Consulting for VCWPD, April 2025 – updates in progress

MDERP Brochure, Water Systems Consulting, April 2025

MATILIJA DAM
Ecosystem Restoration Project

Total by Source 2017-2024		
CDFW	$	26,768,200
WCB	$	10,666,000
SCC	$	9,347,100
CDWR	$	88,500
USBR	$	1,500,000
NRCS	$	700,000
NGO	$	3,134,700
	$	**52,204,500**
State	$	46,869,800
Federal	$	2,200,000
NGO	$	3,134,700
	$	**52,204,500**

AN ARTSY SOLUTION FOR DAM'S ENIGMA



RICH REID/SPECIAL TO THE STA

Paul Jenkin walks below Matilija Dam, where an anonymous graffiti artist recently painted a pair of scissors on the defunct dam that needs to be torn down.

Graffiti draws grins as few doubt barrier's fate

By Zeke Barlow
zbarlow@vcstar.com
805-437-0258

Exactly how to tear down Matilija Dam has been a debate for years.

But some enterprising graffiti artist has a simple solution: Use a pair of 28-foot-tall scissors.

Sometime around Sept. 7, a gigant pair of scissors was painted on the face of the 200-foot dam along with 8-foot-tall dotted lines guiding where the massive shears should go.

It was no teenage kid with a spray can who pulled this off.

The dotted line runs from the top of the defunct concrete dam down to the waterline. It likely took at least two people rappelling the face of the dam — one to hold a stencil, another to spray the black paint that forms the images.

"It took some planning, for sure," said Paul Jenkin, director of the Matilija Coalition, who first saw the painting last week. "I thought it was pretty cool."

See SCISSORS, 2A

Ventura County Star, September 26, 2011

Managing Complexity: Concluding Thoughts

- Managing for complexity should start early and be as all encompassing as possible.
- Design for what you can insure - part of comprehensive Risk Management Program or “soft infrastructure” development.
- Look to other projects for insights, ideas, inspiration.
- Look for opportunities to bring in new eyes and voices.
- Continually re-kindle your working partnerships.

Matilija Dam and Reservoir ~2017

https://matilijadam.venturacounty.gov/

MATILIJA DAM
Ecosystem Restoration Project

Matilija Creek after Dam Removal – 2035 concept

Managing Fish Populations in Reservoirs and Their Downstream Reaches – Insights from Dewatering Projects

Robert Stoddard and Jon Walsh

Agenda

1. Context
2. Challenges Associated with Dam Removal
3. Planning for Dewatering
4. Project Case Studies and Insights
   - San Clemente Dam Removal
   - Fordyce Seepage Repair
   - Middle Fork American River Interbay Sediment Removal Project
5. Key Lessons

Context

Dam Removal Is On The Rise Due To:

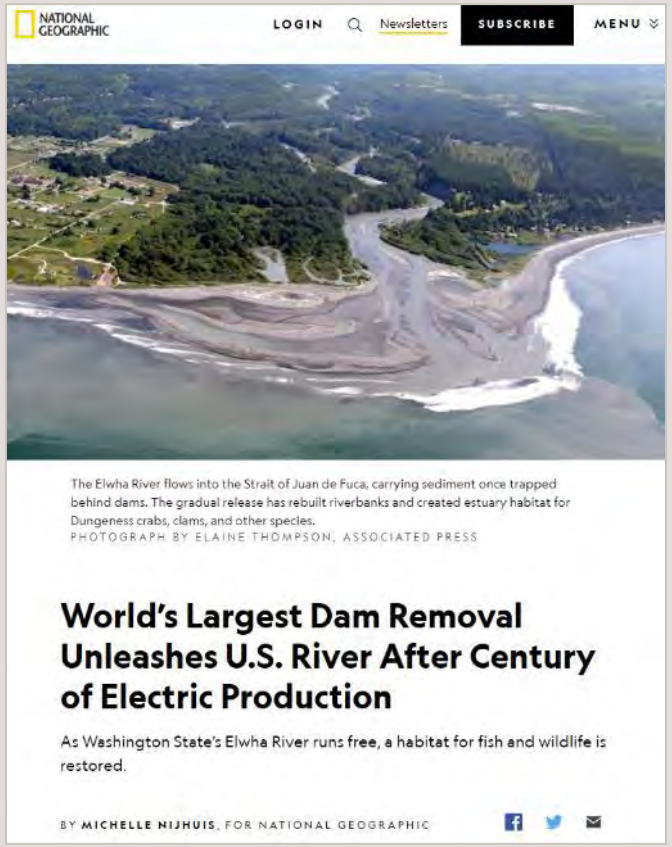
- Economics
- Public Safety
- Water Quality
- Wildlife Protection and Enhancement

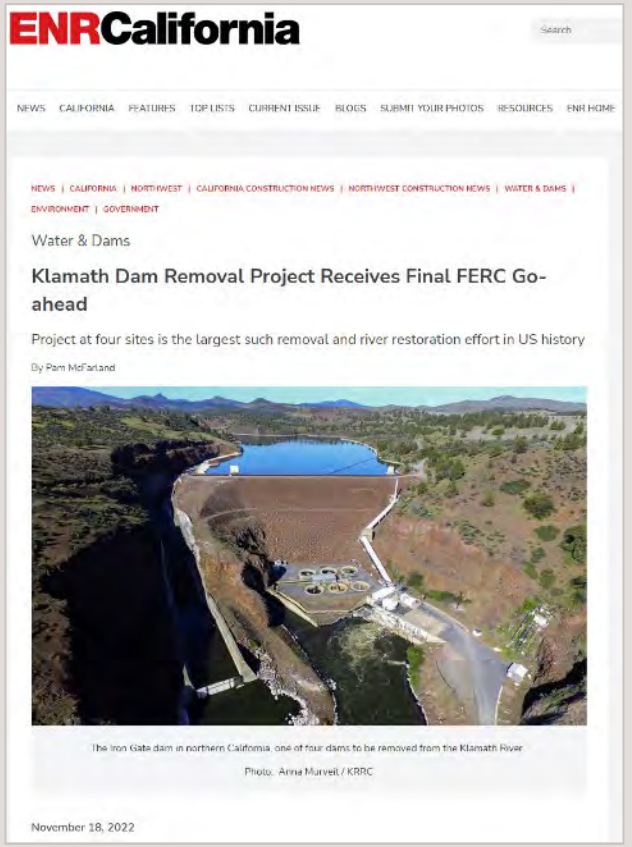
Dam Removals:

- ~2,000 dams removed since 1910
- Next Dams Up?

Improving Our Dam Removal Processes Will:

- Best Possible Project Outcomes
- Shorten Project Durations



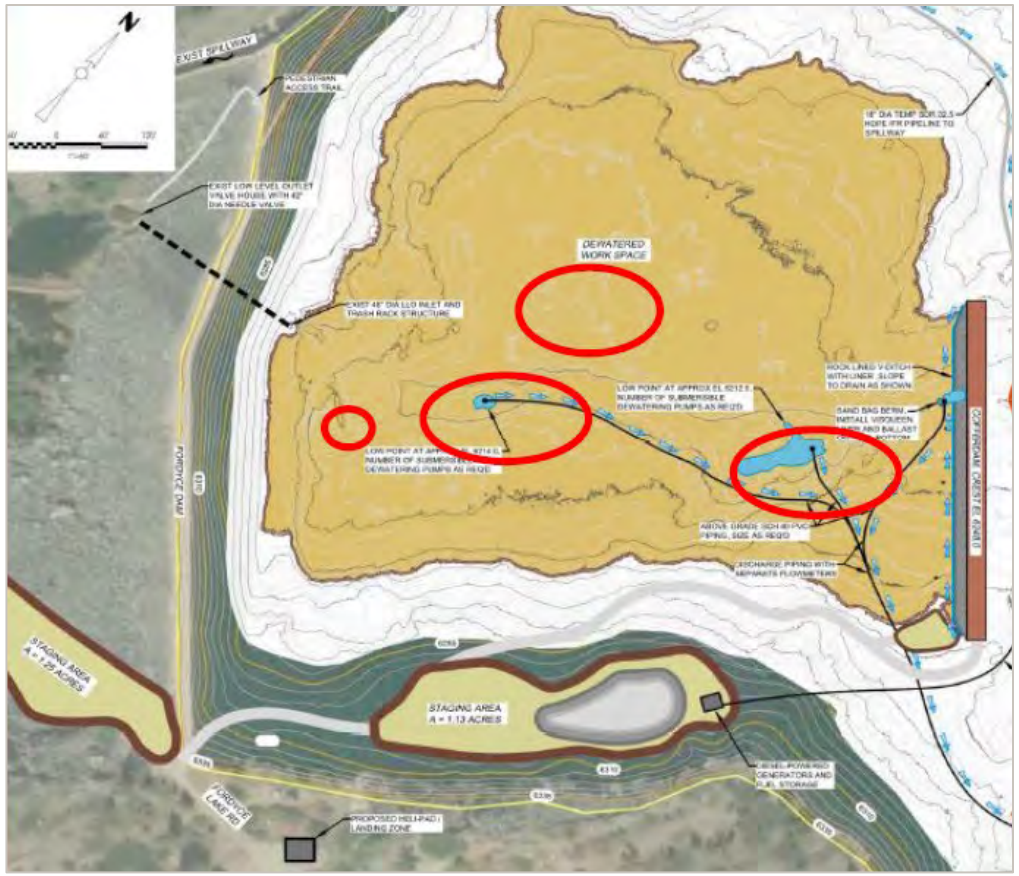


Many Challenges Associated With Dam Removals Including…

- Cost
- Permitting
- Tribal, cultural, and social considerations
- Construction sequencing
- Sediment management
- Water management
- Aquatic and wildlife considerations
  - **Fish populations impacted by dewatering associated with dam removal**
- Site restoration

Planning Considerations During Reservoir Dewatering

- Team roles, responsibilities, and coordination
- Site access / work windows
- Dewatering/ rewatering controls
- Identifying stranding areas
- Restricting fish movement into project areas
- Permit conditions
- Rescue methods
  - Numbers of fish present
  - Rescue timing
  - Release locations



Project Case Studies

San Clemente Dam Removal (Carmel River, 2012 to 2015)

Fordyce Seepage Mitigation Project (South Yuba River, 2024)

Middle Fork Interbay Sediment Removal Project (Middle Fork American River, 2022)

Steelhead smolt. Photo Credit: Chris Hogle

San Clemente Dam Removal Background

- Built in 1920 (95 years old at time of removal)
- Dam located at river mile 19.0 on the Carmel River
- 106 feet tall
- Original storage capacity 1,425 acre feet
- Filled with approximately 2.5 million cubic yards of sediment
- Drawn down in years prior to dam removal for safety reasons
- Removed in 2015

Photos of San Clemente Dam. Photo Credit, Robert Stoddard

San Clemente Dam Removal Key Challenges

- Three-year effort with reservoir dewatering/ rewatering during each year
- Multiple ESA listed species including SCCC steelhead and California red-legged frog
  - o Rigorous take requirements
- Multiple exclusion/ rescue methods including:
  - o Fyke traps
  - o Beach seines
  - o Backpack electrofishers
- Project area with 4,000 to 5,000 steelhead
- Migratory life stages present (YOY, smolts and adults)
- Large coordination effort

Fyke trap setup. Photo Credit: Robert Stoddard

Live-cars. Photo Credit: Robert Stoddard

Inside view of live cars. Photo Credit Stantec

Crews using backpack electrofishers for fish removal. Photo Credit: Stantec

Photo Credit: Stantec

San Clemente Dam Removal Release Locations

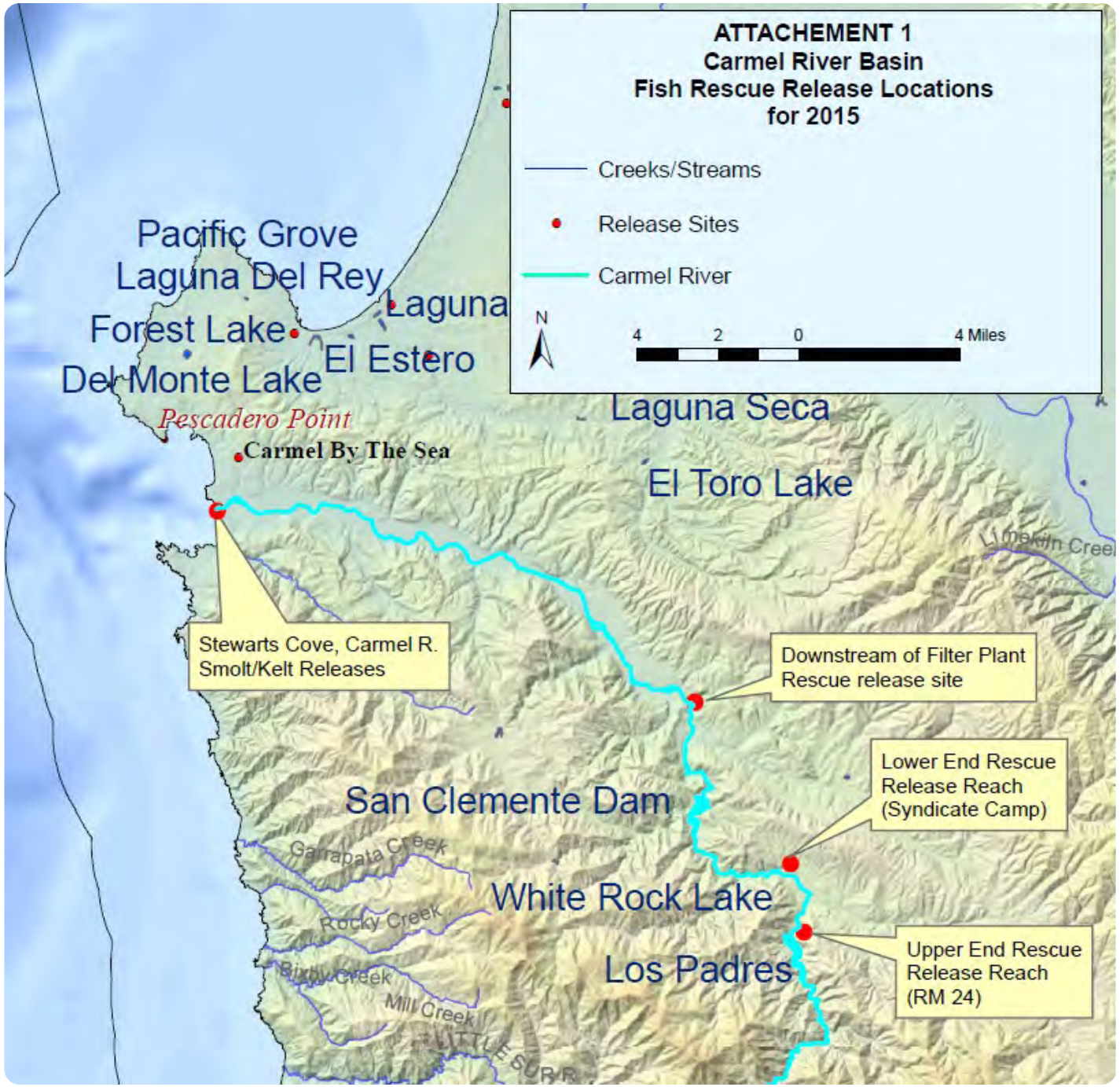
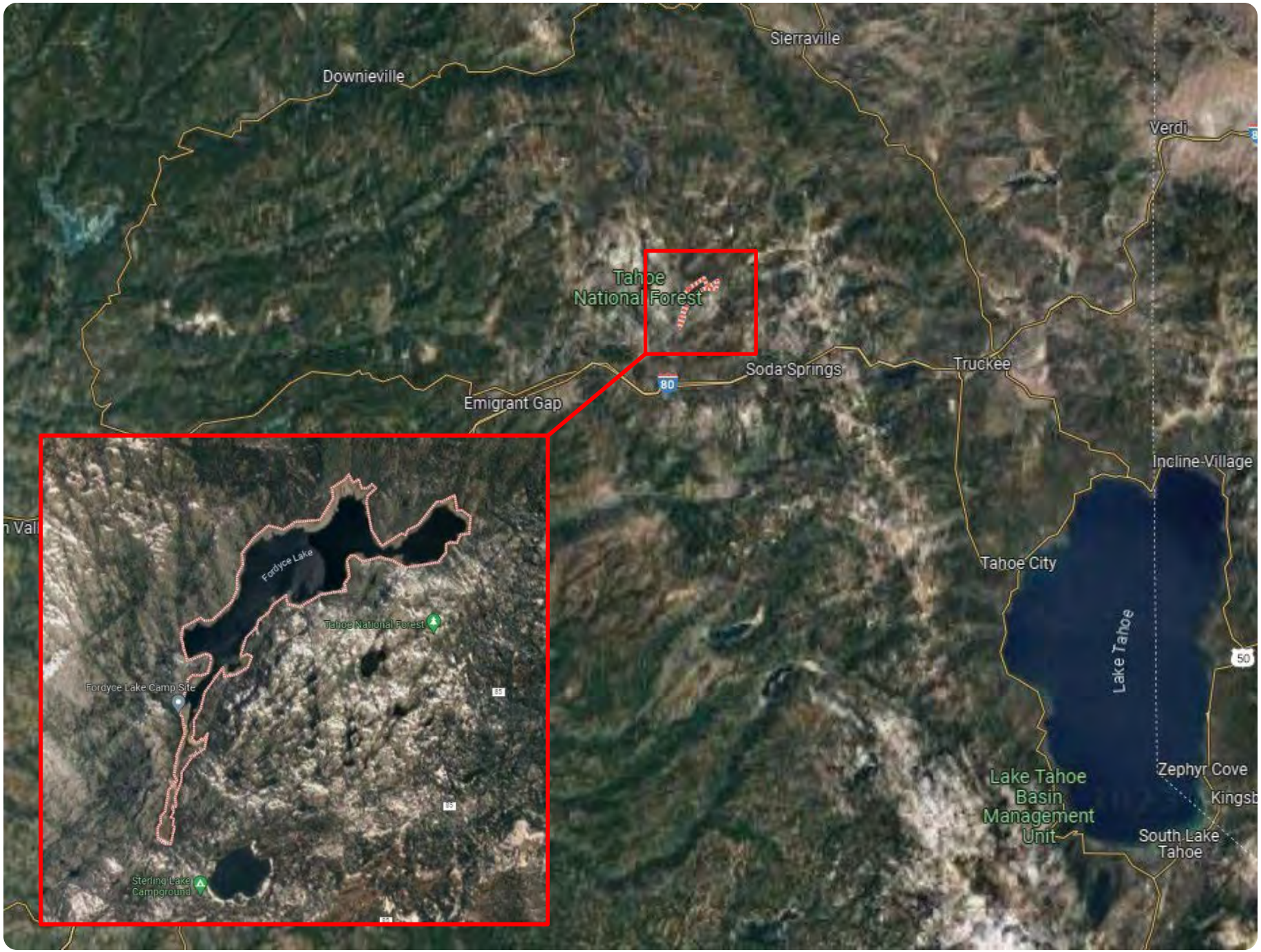


Photo Credit: Stantec

Fordyce Dam Seepage Mitigation

- Dam located on Fordyce Creek, a tributary of the South Fork Yuba River
- Dam is large (~1200’ length, 156’ high)
- Built in the late 1800s
- ~6300’ elevation
  - Limited Work window
- Dam Safety repair
- Size of work area
  - Watered area behind the cofferdam ~10 acres

Lake Fordyce Dam and Reservoir - Location



Fordyce Dam Seepage Mitigation -- Key Challenges

- Unknown site conditions
  - o Limited bathymetry
  - o Limited knowledge of sediment conditions
- Remote location
  - o Impacts to scheduling
  - o Impacts to manpower
- Limited to vehicle access around dam
- Number of fish in dewatered area is uncertain

Planning

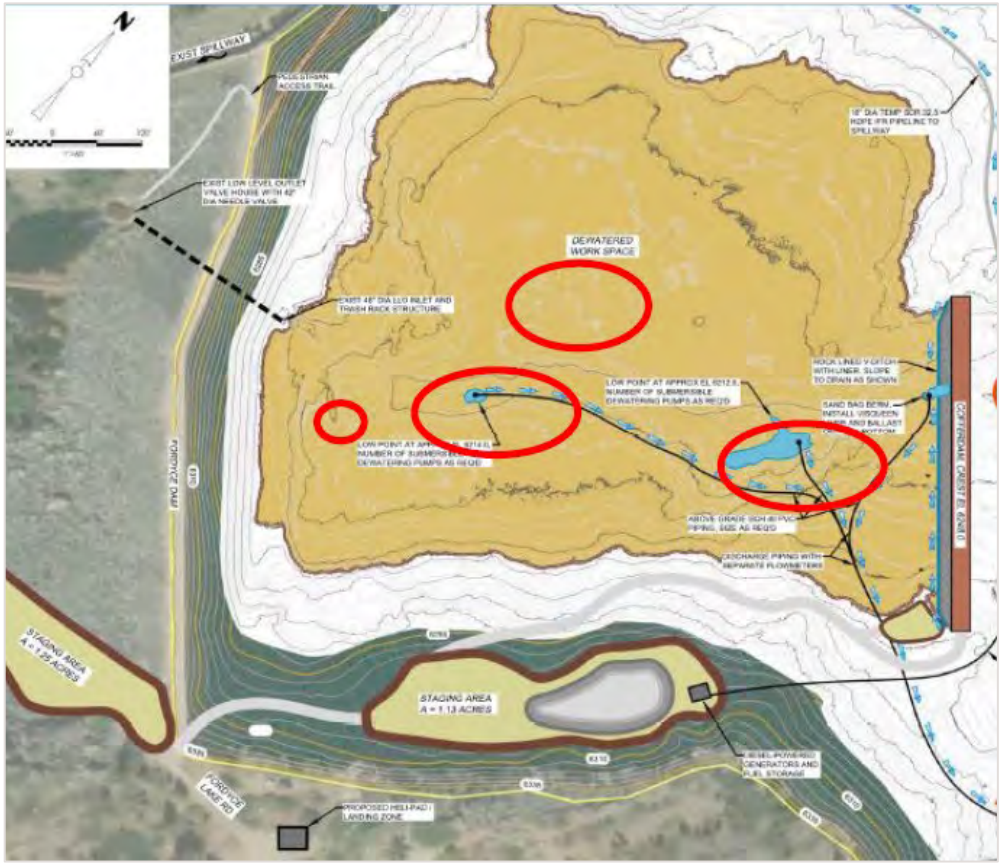
Dewatering Plan

- Draw down reservoir through normal means to just below minimum pool
- Build rock cofferdam
- Draw down dewatered area through LLO and pumps
    - Estimate was 3-4 days

Managing the Fish Population During Dewatering

Fish Relocation

- 3-4 Backpack electrofishing crews
    - Supported by UTVs and sleds to ferry fish
- Crews had two access points
- Fish were to be released on upstream side of cofferdam



Fordyce - Fish Stranding Areas

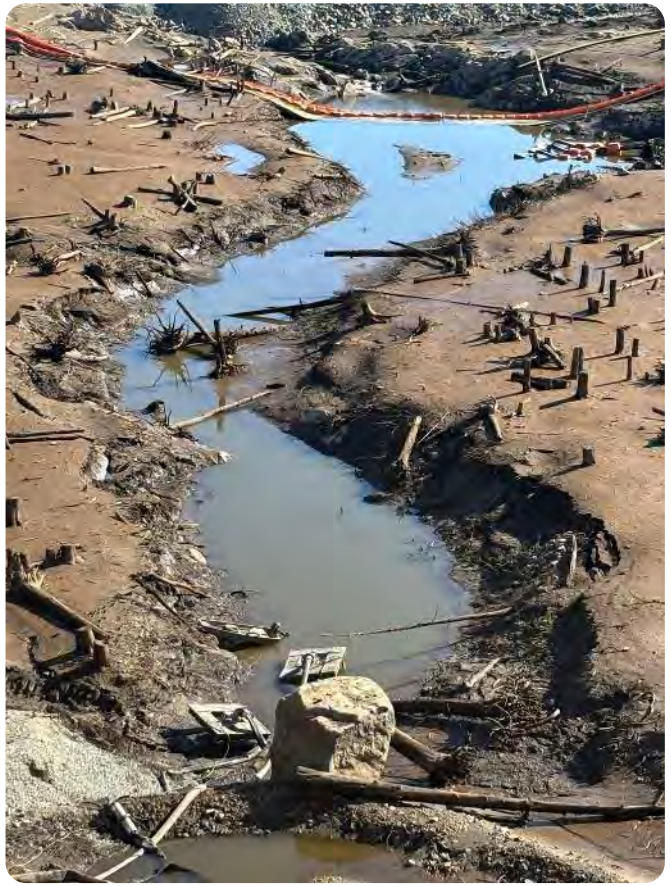
9/30 – Onset of Dewatering

10/6 – Day 6

Site Access
Fordyce Dewatering – Day 6

Terrible Access

- 3-4’ Mud depth ~ 100’ from pools
- Steep banks in thalweg
- Lots of old stumps, debris



Obstacles Encountered After Dewatering

Cofferdam leakage

- Seepage path through bedrock underneath the cofferdam.
    - ~10-14 cfs
- Could not pump out the water in the work window for backpack electrofishing
- Bright side – very few stranded fish observed
    - Slower ramping
    - Residual pool with clean inflow

Middle Fork Interbay Sediment Removal Project

- Located on the Middle Fork of the American River
- Dam built in 1966
- Dam height 70 ft
- 155 acre-feet of original storage
- Low-level outlet issues and reduced storage capacity from sediment inputs

Middle Fork Interbay Dam: Photo Credit Robert Stoddard

Middle Fork Interbay Key Challenges

- Site access
- Water quality during dewatering
- Release site location
- Keeping on schedule
- Phasing and sequencing dewatering and rewatering
- Fish numbers
    - 2,000 to 3,000 fish (rainbow and brown trout)

Reach below dam. Photo Credit: Robert Stoddard

Redundancies Provide Flexibility

Coffer Dam and Diversion Intake System. Photo Credit Robert Stoddard

Diversion Pumps. Photo Credit Robert Stoddard

Hydrogen Sulfide Gas Release. Photo Credit: Robert Stoddard

Greasy film. Photo Credit: Robert Stoddard

Brown Trout Rescued in Middle Fork Interbay. Photo Credit: Robert Stoddard

Dewatered reservoir. Photo Credit: Robert Stoddard

The Challenges of Dewatering and Rewatering the Site

Photo Credit: Robert Stoddard

Photo Credit: Robert Stoddard

Key Insights for Consideration of Future Dam Removal Projects

- Know your site
  - Access is a critical consideration
- Integrate teams (owner, engineering, construction, and environmental) with frequent communication
  - Both planning and implementation
- Communication onsite during construction
- Build in flexibility
  - Contingency planning
- Dewatering **AND** rewatering should be a key consideration for all dewatering projects
- Engagement with regulators
  - Permit flexibility rather than violations
  - More realistic and achievable take authorizations
- Safety issues and work windows are real planning obstacles
- Lessons learned post-project debrief is essential

Thank you

Removing Barriers to Fish Recovery – A Cooperative Approach to Reconnect Salmonids with Historical Habitat in Battle Creek

5/2/2025

Salmonid Restoration Federation

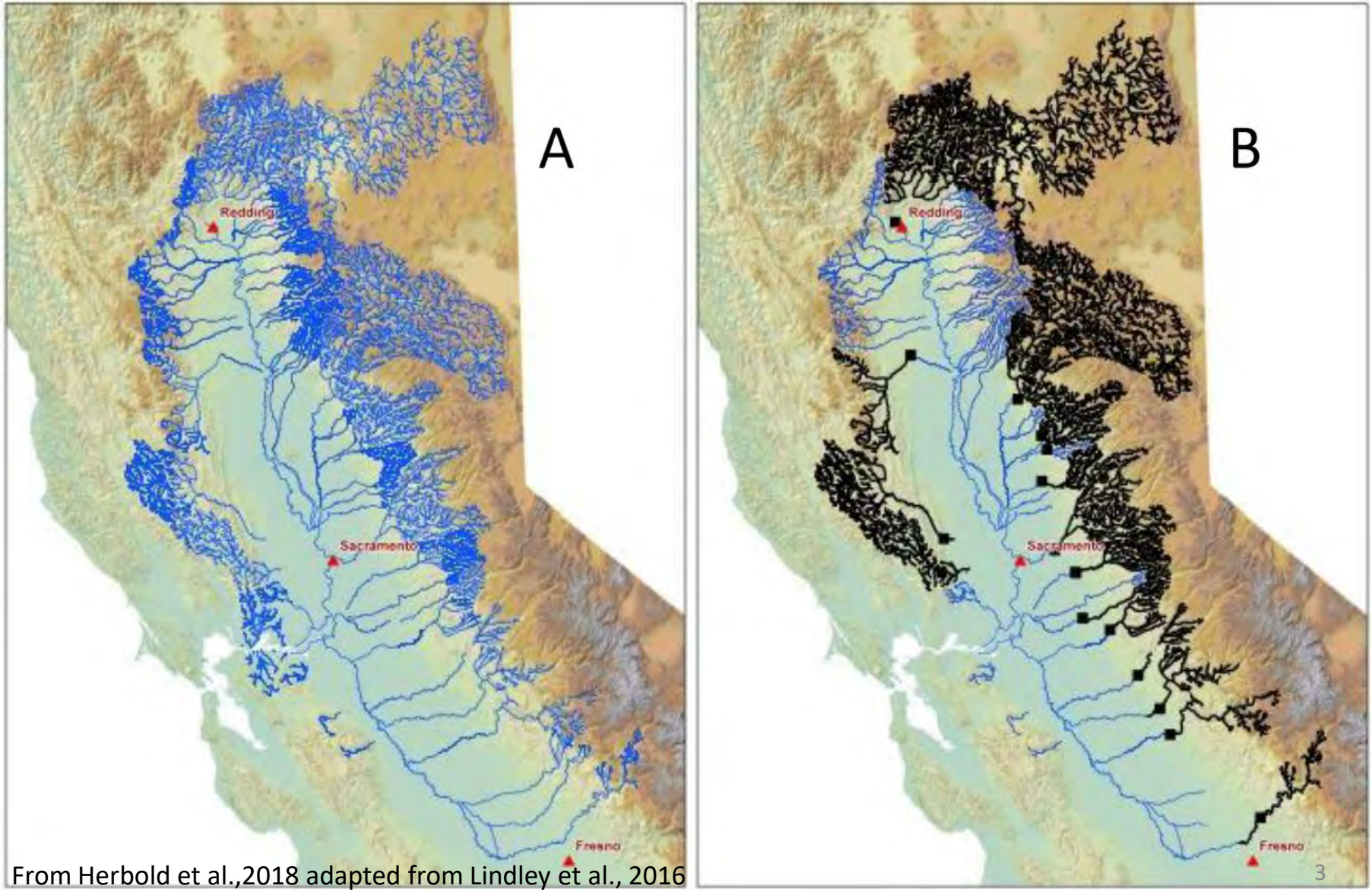
Emily Moloney, Project Manager, California Trout,

Angelina Cook, Restoration Associate, CA Sportfishing Protection Alliance

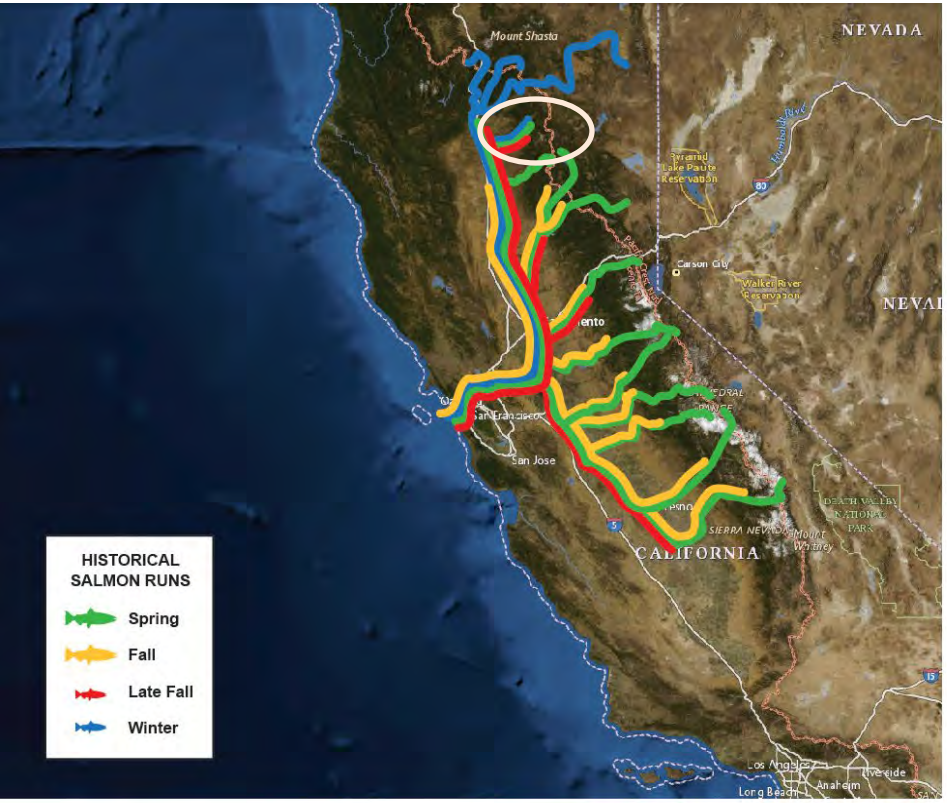
Overview

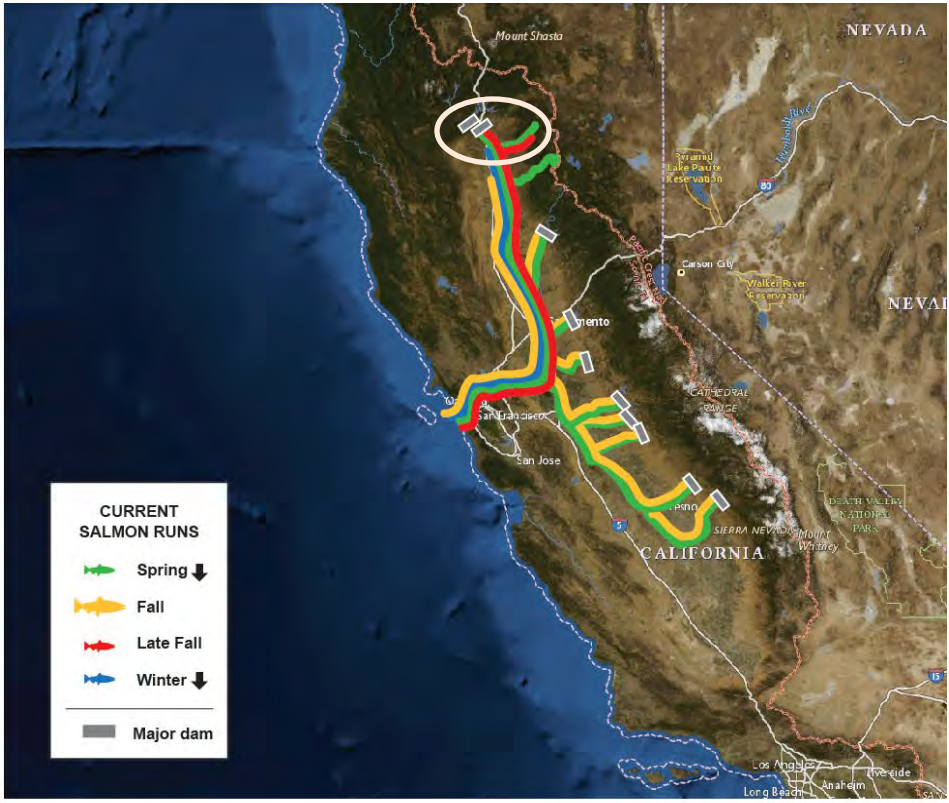
- Setting - Cultural & Ecological
- Brief History
- Process & Timeline
- Coalition Members & Activities
- Goal – Understand the importance of Battle Creek restoration

Significant loss of anadromous fish habitat with the construction of dams



From Herbold et al.,2018 adapted from Lindley et al., 2016


Mount Shasta
NEVADA
Carson City
Walker River Reservation
San Francisco
San Jose
Fresno
CALIFORNIA
Los Angeles
Anaheim
Riverside
HISTORICAL SALMON RUNS
Spring
Fall
Late Fall
Winter


Mount Shasta
NEVADA
Carson City
Walker River Reservation
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Fresno
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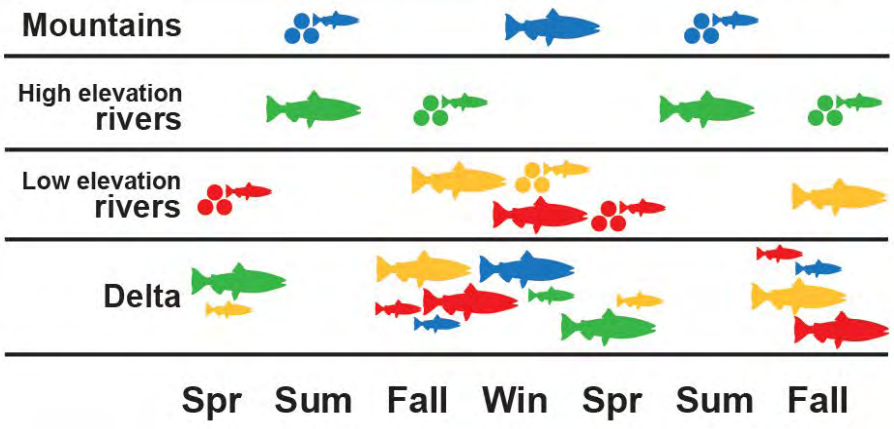
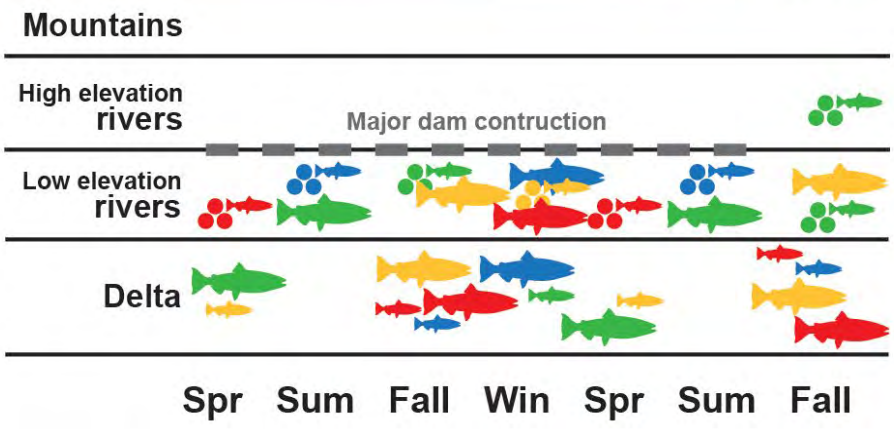
Los Angeles
Anaheim
Riverside
CURRENT SALMON RUNS
Spring
Fall
Late Fall
Winter
Major dam


Mountains
High elevation rivers
Low elevation rivers
Delta
Spr
Sum
Fall
Win
Spr
Sum
Fall

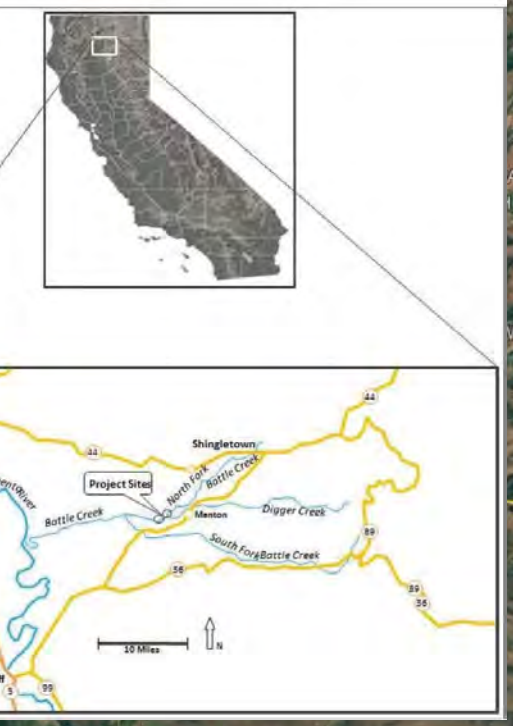

Mountains
High elevation rivers
Major dam contruction
Low elevation rivers
Delta
Spr
Sum
Fall
Win
Spr
Sum
Fall

Mount Lassen

western drainage
southernmost volcano in Cascade Ring of Fire

Land bridge connects volcanic Cascades with runoff reliant Sierra Nevada Range

Pop. 3,000 mostly reside in two unincorporated rural communities



The Battle Creek Watershed

Cultural Significance of Battle Creek

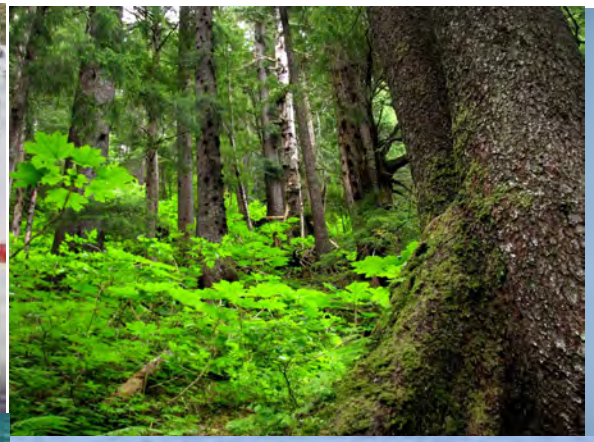
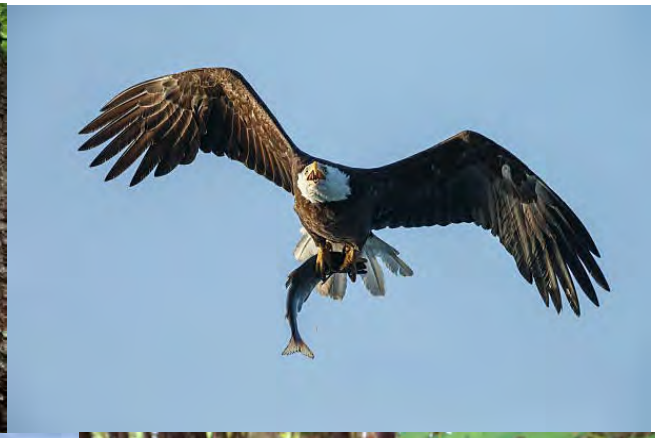
Yana Nation – Redding Rancheria, also represents Wintu and Pit River Tribes.

Adjacent to Pit River, Winnemem Wintu, Wintu, and Paskenta Band of Nomlaki Tribal lands.

Detrimental impacts of salmon declines:

- Dietary - diabetes, heart, obesity
- Depression - loss of livelihood, customs & moral dilemma of dishonoring natural heritage.
- All Californian's suffer from salmon decline, especially Tribes.

Ecological Significance of Salmon

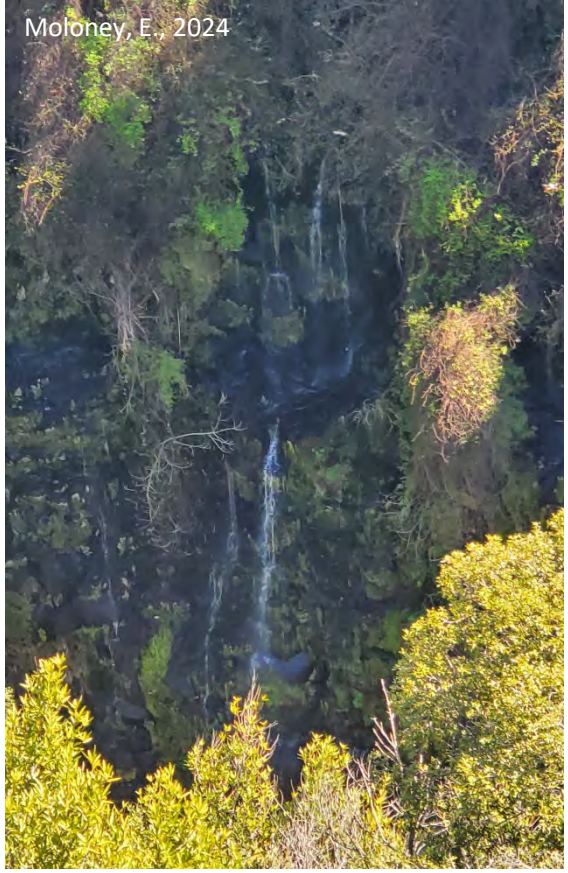





- Keystone species – 147 organisms rely on salmon for food or fertilizer.
- Upper watersheds deprived of marine derived nutrients and biodiversity - depletes ecosystems and food webs, increases vulnerability to drought/wildfire/extinction.

Ecological Significance Battle Creek

Confluence w/ Sacramento downstream of Shasta & Keswick dams

Winter run refugia + 46 miles of habitat



BATTLE CREEK HYDROELECTRIC SYSTEM

1901 NORTHERN CALIFORNIA POWER COMPANY 1911

·VOLTA · SOUTH · INSKIP · COLEMAN·

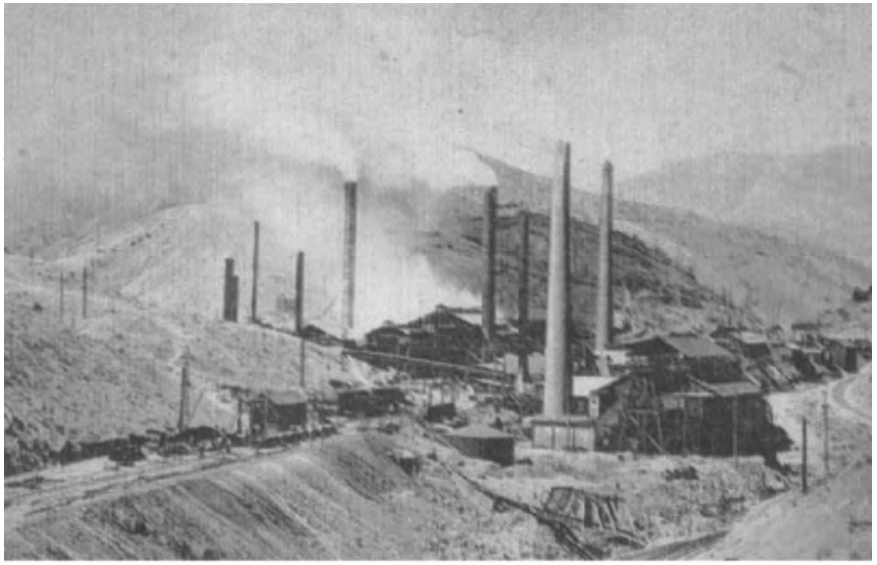
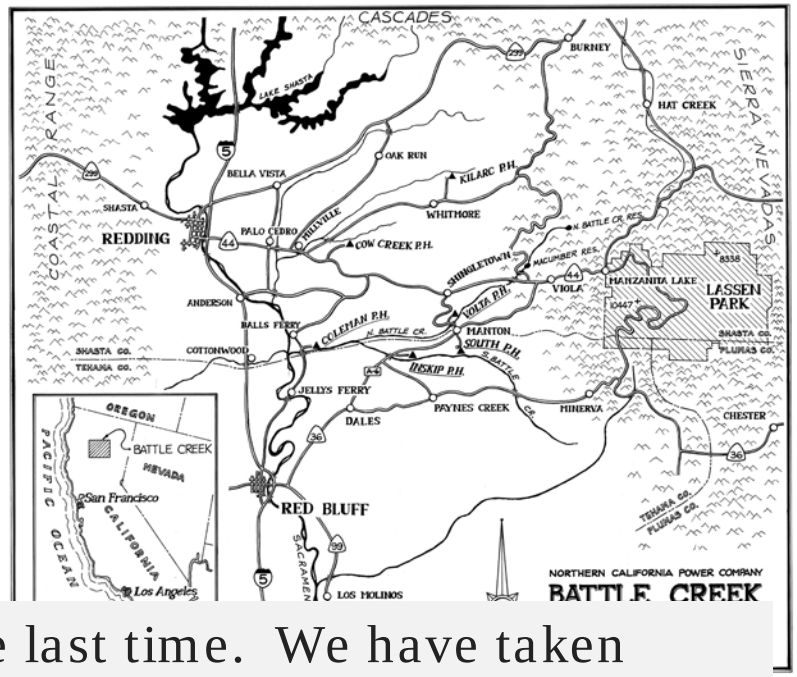


Photo of Keswick Smeltery Photo circa 1902-06



DELINEATED BY: John R. Bowie; 1980

BATTLE CREEK HYDROELECTRIC PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
HISTORIC AMERICAN ENGINEERING RECORD

BATTLE CREEK HYDROELECTRIC SYSTEM (NORTHERN CALIFORNIA POWER COMPANY), 1901-1911
ALONG SOUTH BATTLE CREEK AND NORTH BATTLE CREEK
NEAR RED BLUFF SHASTA AND TEHAMA COUNTIES CALIFORNIA

SHEET 1 of 20

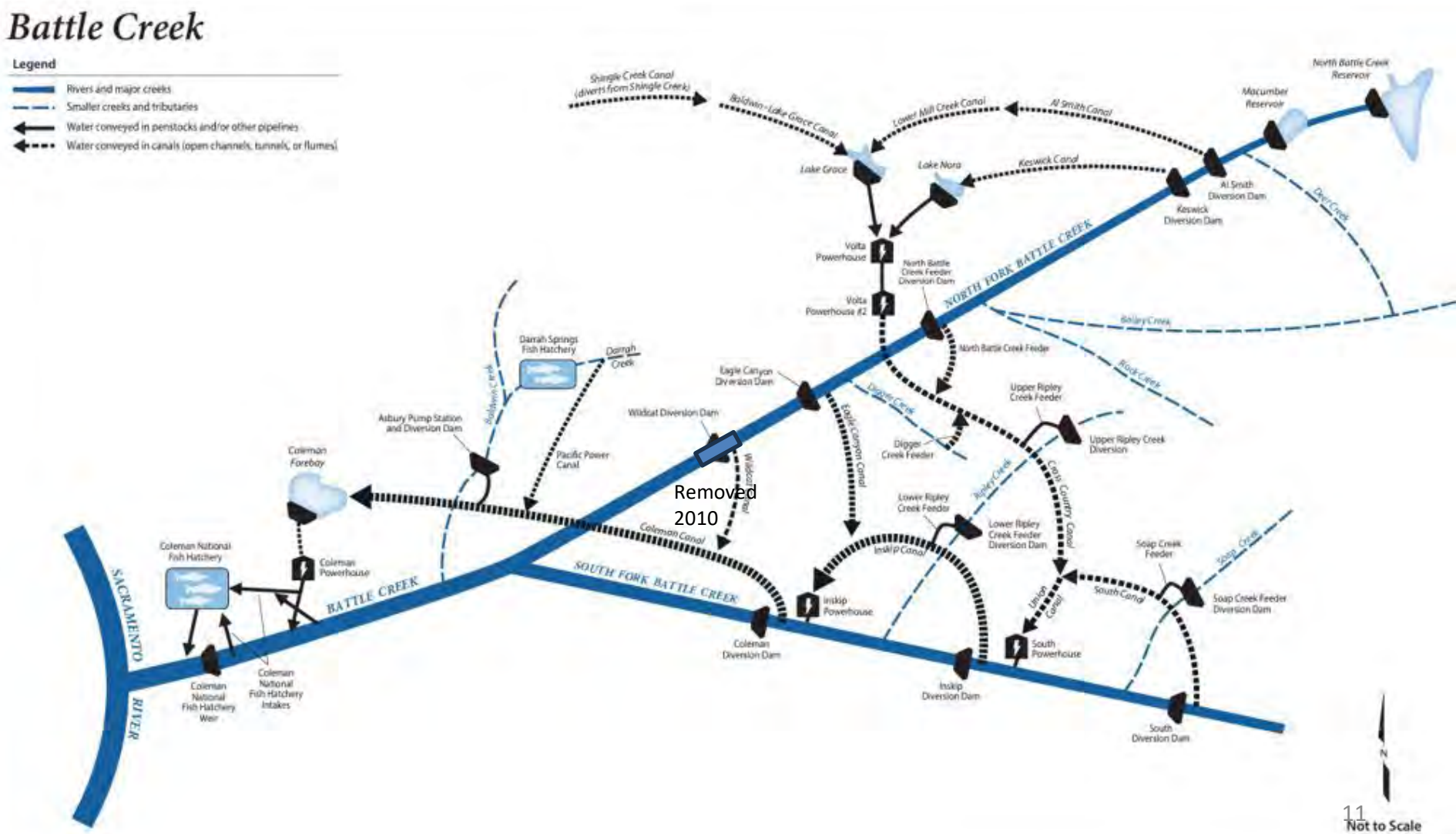
HISTORIC AMERICAN ENGINEERING RECORD CA-2

IF REPRODUCED, PLEASE CREDIT: HISTORIC AMERICAN ENGINEERING RECORD, HERITAGE CONSERVATION & RECREATION SERVICE, NAME OF DELINEATOR, DATE OF THE DRAWING

"At Coleman we use the water for the last time. We have taken from it all but its wetness."

- Hamden Noble, Northern California Power Company - 1912

PG&E Battle Creek Hydroelectric Project FERC 1121



MOU (PG&E resource agencies)

1999

PG&E NOI to surrender License

2020

NEPA/CEQA, Permitting, Consultations

2028-2030

2010–2029

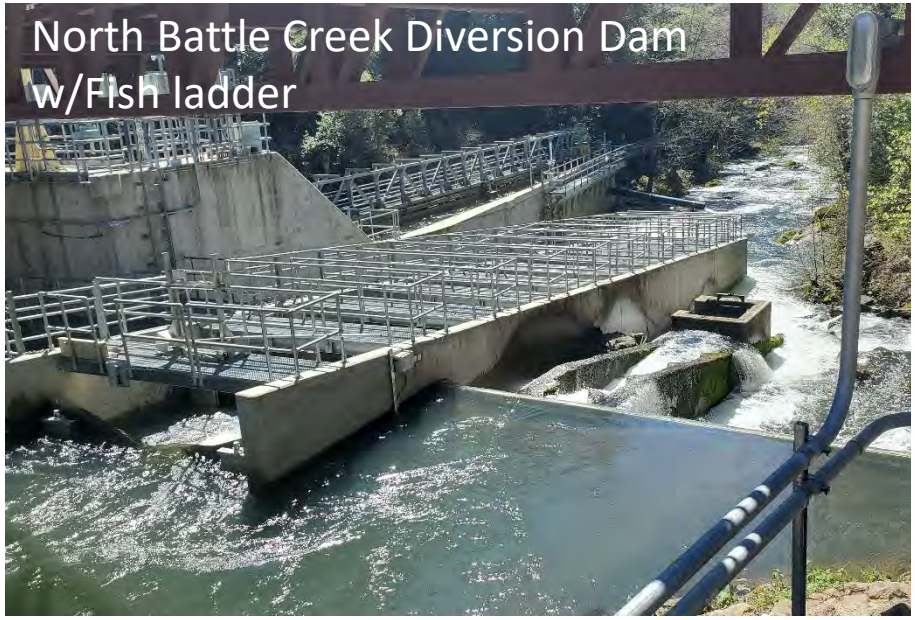
Salmon and Steelhead Restoration Project and Inskip Dam Removal

2025–2028

PG&E License Surrender, Decommission Planning

2030–2033+

Decommissioning



The hydro project after restoration of the South Fork

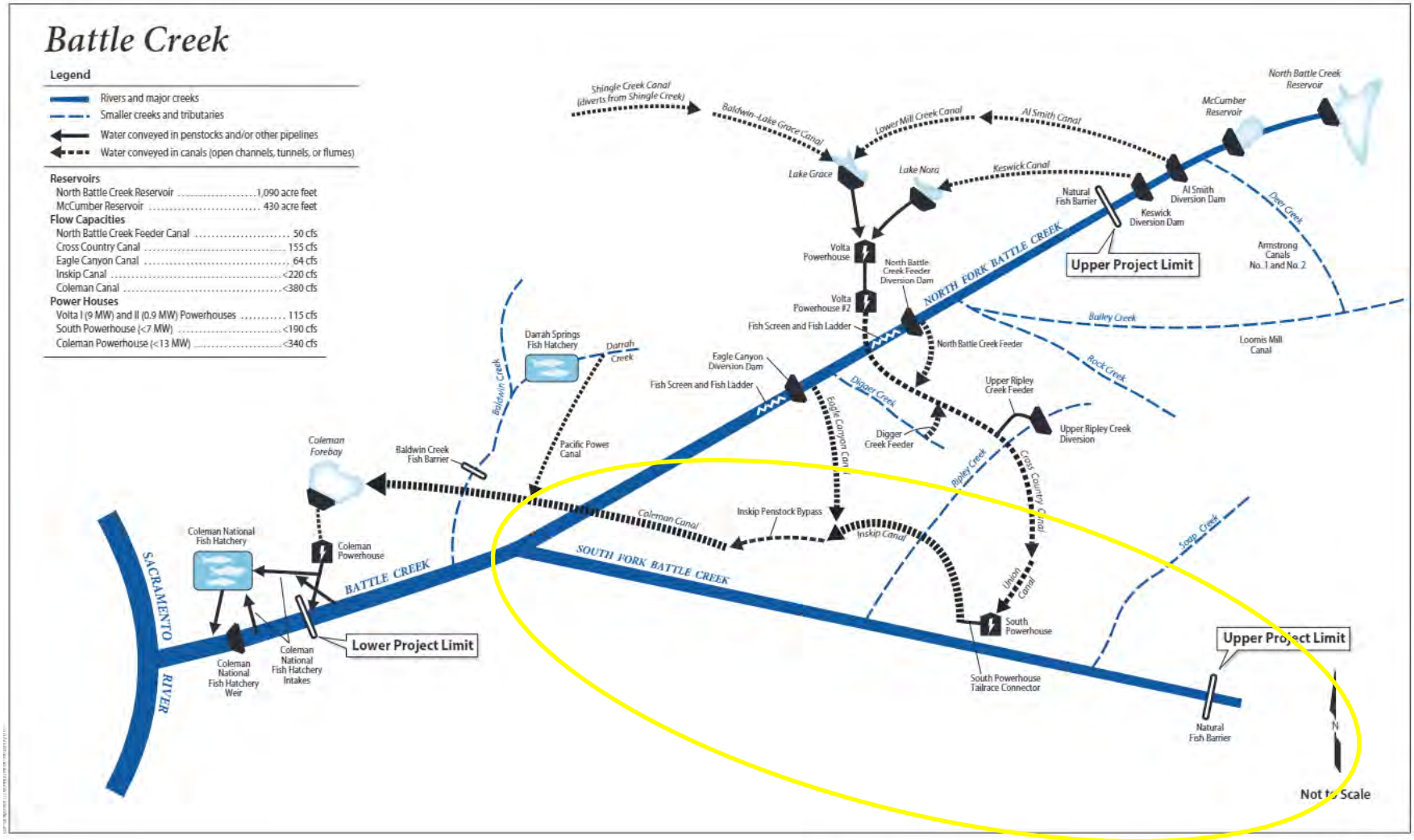


Figure 6B
Alternative 5: Restoration Project without Inskip Powerhouse and Inskip Dam (After Completion)

The watershed after full removal of the hydro project

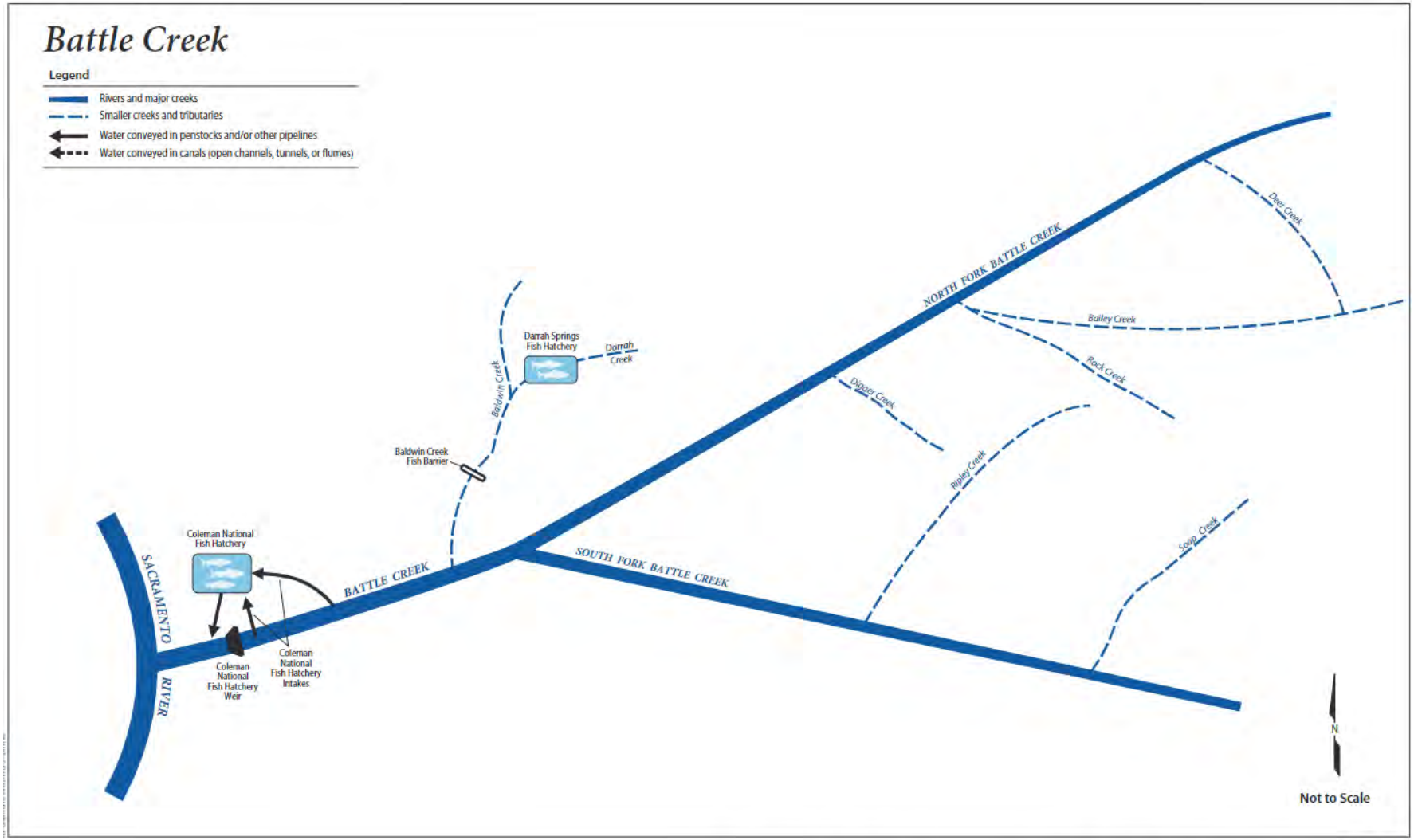
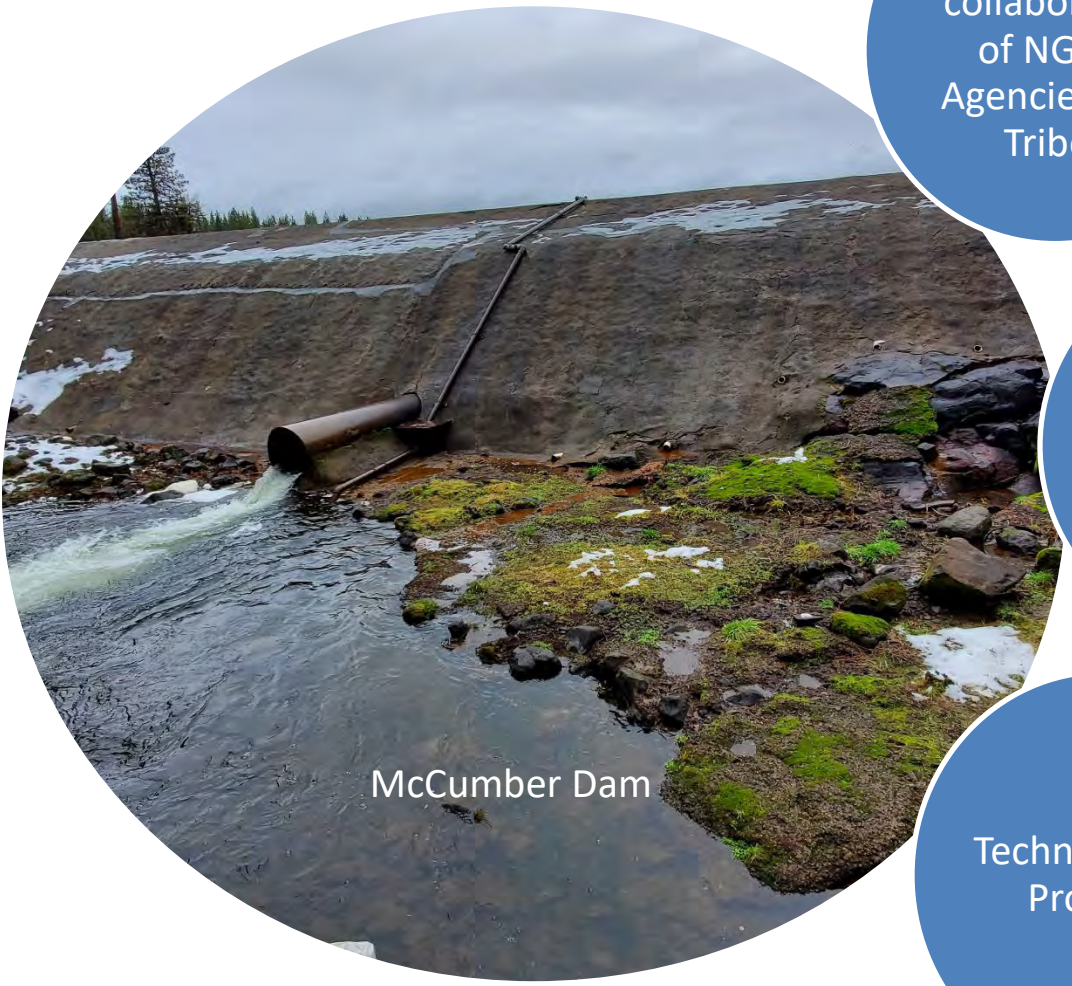


Figure 3B
Alternative 1: Full Decommissioning of Battle Creek Hydroelectric Project (Full Removal)
(After Completion)

Coordination and Collaboration



Build a collaborative of NGOs, Agencies and Tribes

- Meet regularly to provide updates, discucss process and strategy

Community Engagement

- Community Surveys
- Public Meetings
- Identifying and discussing concerns

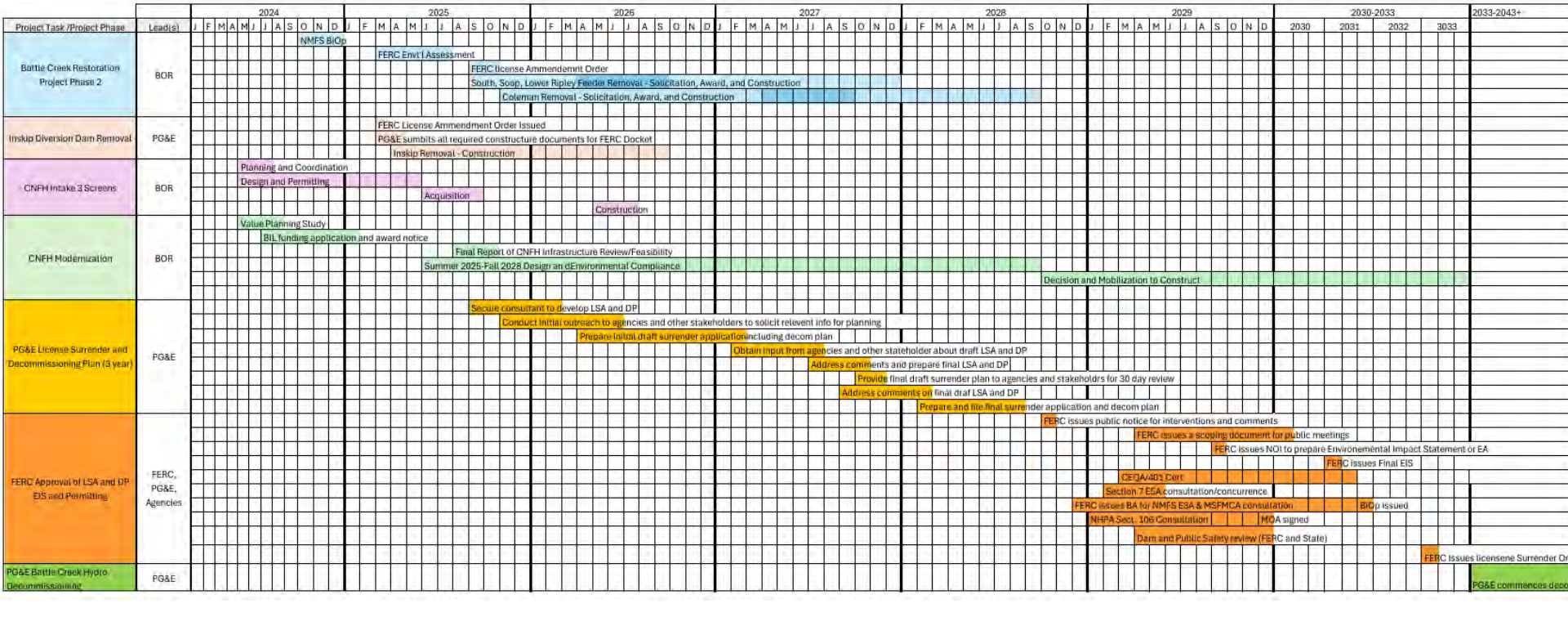
Technical Work Products

- Water temperature model to understand changes with decom
- Water right assessment
- Hydrological modeling

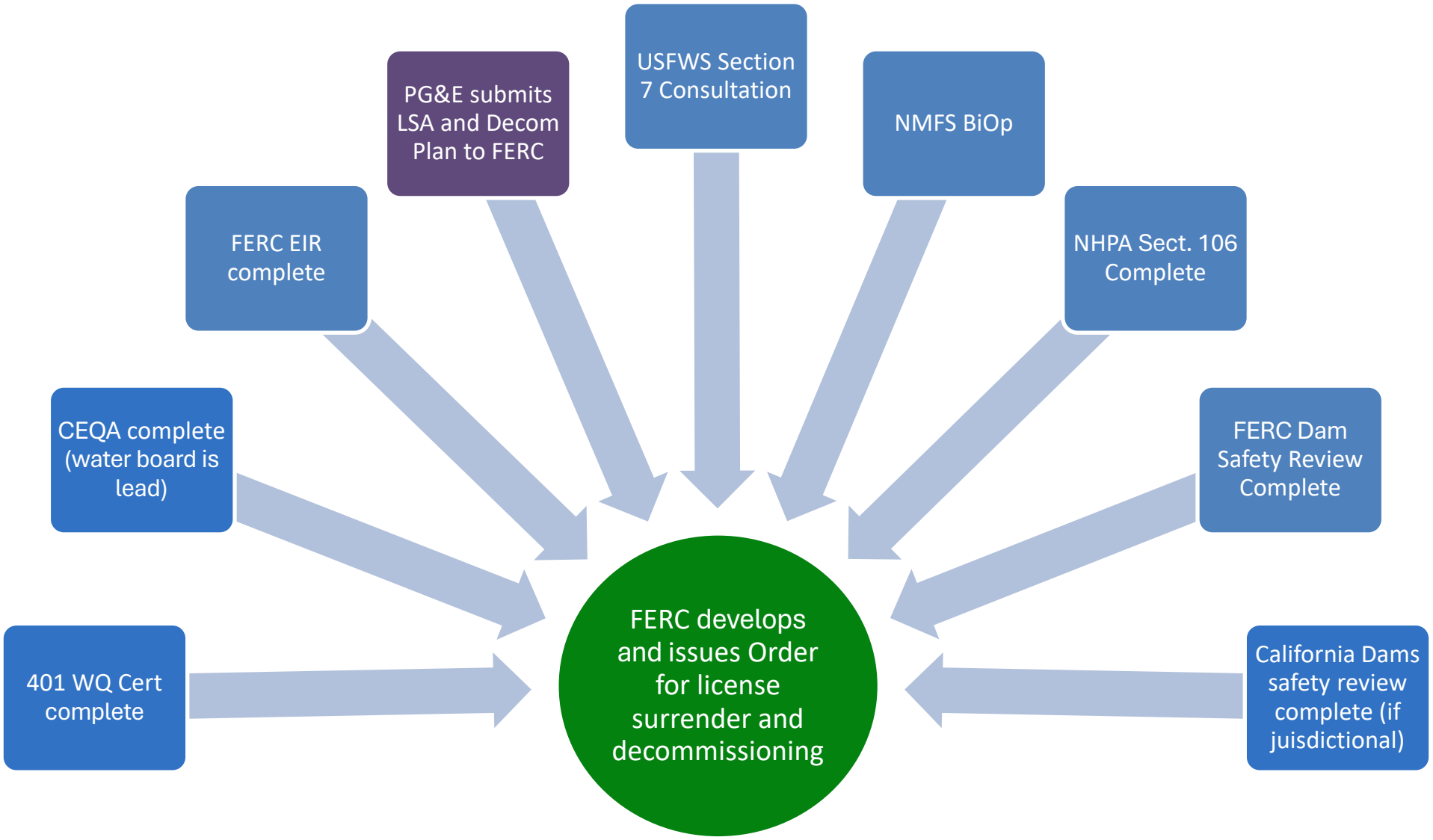
Coalition Partners

Fairs, Field Trips, Manton Corner

Tracking regulatory processes and overlapping projects

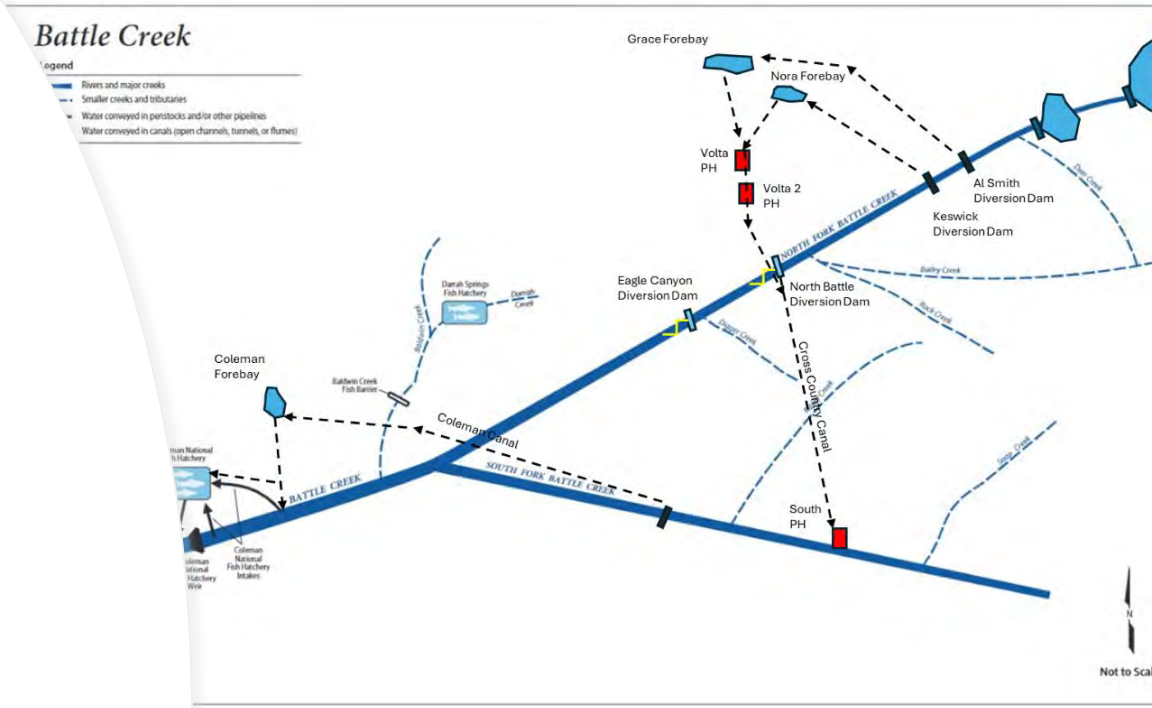


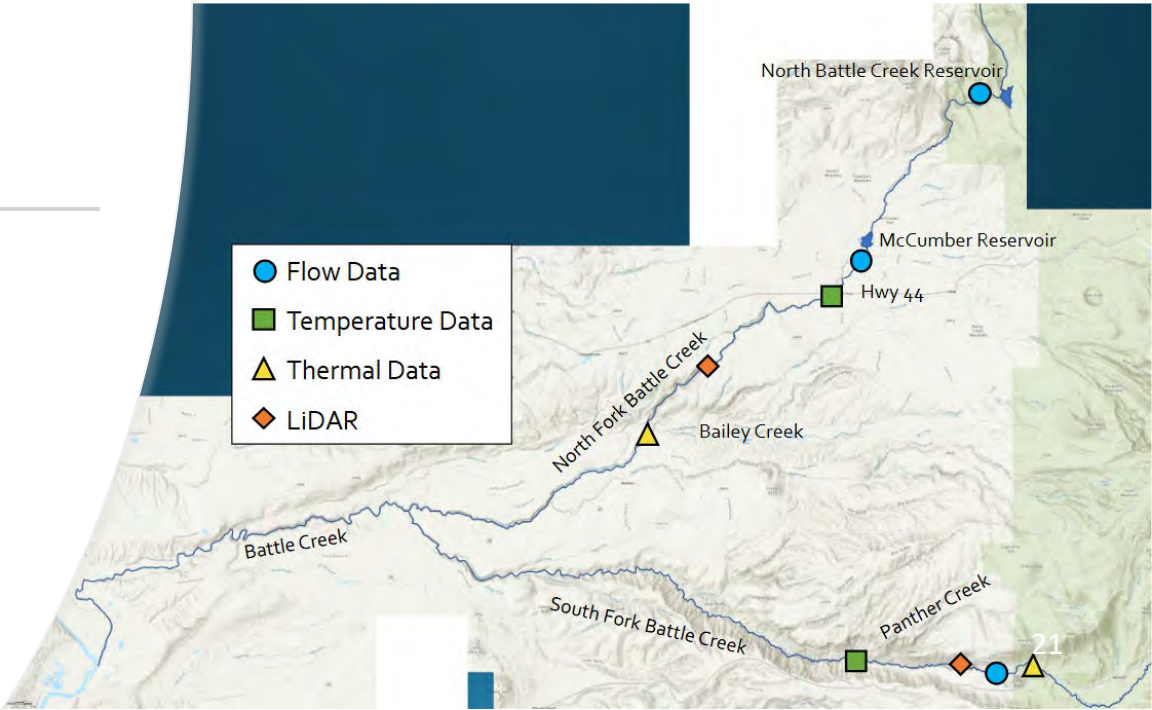
Getting to a FERC Order



Modeling Water Temperature

Battle Creek Water Temperature Model





Thank You!

Angelina Cook – CSPA angelina@shastaheadwaters.com
Emily Moloney- CalTrout emoloney@caltrout.org

Social impact assessment of Klamath dam removal for Tribal community well-being: Recasting dam removal as eco-cultural revitalization

Harmful algal bloom in Iron Gate Reservoir / *High Country News*

Smoking *áama* (salmon) / *Regina Chichizola, Save California Salmon*

Chéemyaach ik'ishyâat… (Hurry Up, Spring Salmon…) / *Lyn Risling*

Sibyl Diver, John R. Oberholzer Dent, Dan Sarna-Wojcicki, Ron Reed

Dedicated to Tom Carlson

Stanford University, Karuk Tribe, https://damremovalsocialimpact.com/

Research Motivation & Methods

Findings: Tribal Community Well-being
Codesign Methodology

Findings: Baseline Assessment

Reflection: Next Steps

Ryan and Ron Reed fishing using a traditional dip-net at Ishi Pishi Falls, Klamath River / *Moore Foundation/BBC Storyw*

Existing relationships: Longstanding collaborations and scoping

Karuk Tribe-UC Berkeley Collaborative (2008)

Indigenous mapping youth training, Karuk Lands Management Historical Timeline / *Sibyl Diver*

Research Scoping Visits (2022)

April 2022 scoping meeting at willow gathering area at dance grounds / *Sibyl Diver*

The Karuk Tribe-UC Berkeley Collaborative builds connections between tribal members and the UC Berkeley community to enhance the ecocultural revitalization of the people and landscapes within Karuk ancestral lands and territories.

https://nature.berkeley.edu/karuk-collaborative/

Research gap: Indigenous knowledges in assessment

Rachel Arsenault, Carrie Bourassa, Sibyl Diver, Deborah McGregor, and Aaron Witham. (2020). Including Indigenous Knowledge Systems in Environmental Assessments: Restructuring the Process. *Global Environmental Politics 19*(3), 120-132.

Project origins:

- Exclusion of Indigenous peoples in assessment
- Requests from scientific/tribal community for social assessment
- Tribal community well-being codesign framework
- Planning grant, scoping, and community engagement for 1 year

Basketweavers working with on *tháxtuuy* (baby baskets) with *páarak* (willow sticks) from the river / *California Indian Basketweavers' Association*

Girls in regalia, including *apxáan* (basket caps) made of willow from the river, prepare for *xáapish* (Brush Dance) / *They All Have Spirits*

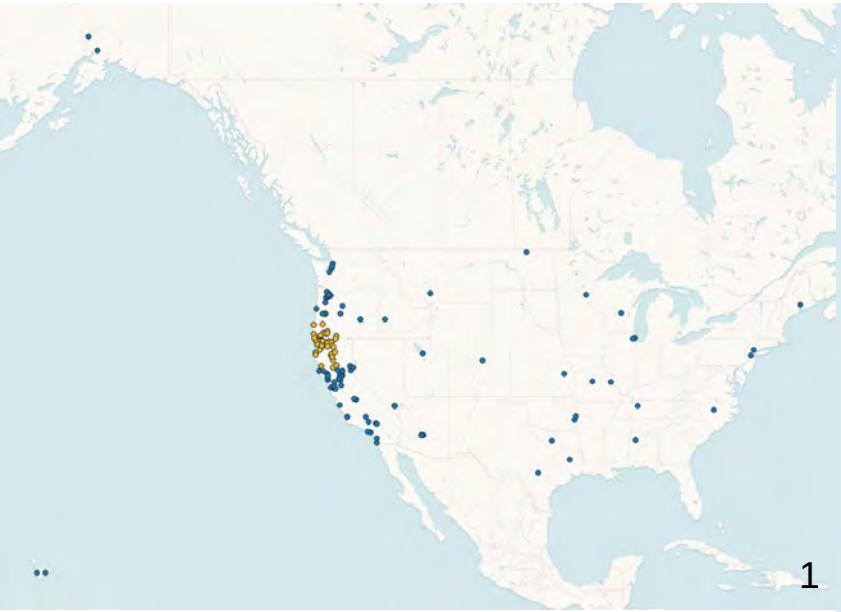
Research approach: Social impact assessment with the Karuk Tribe

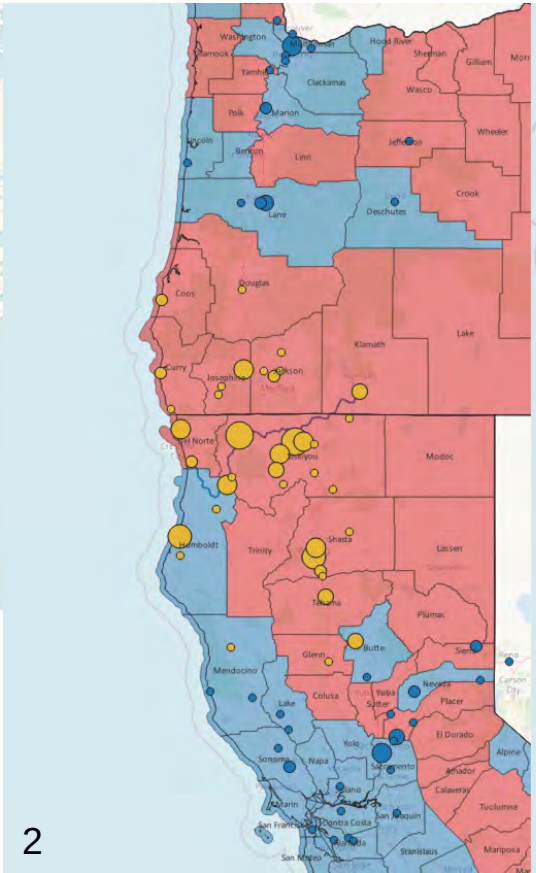
- Gathering a diverse research team - Stanford, UC Berkeley, Karuk Tribe
- Scoping conversations (3 council districts, 2022)
- Focus groups – fisheries, cultural practitioners, basketweavers, Tribal leadership, youth (55 individuals), and selected interviews
- Survey – sent to 7,785 tribal community members (238 high quality response)
- Study timeframe is 6 months before removal (goal of resurvey in 3-5 years)
- Baseline with goal of repeating survey in 5 years

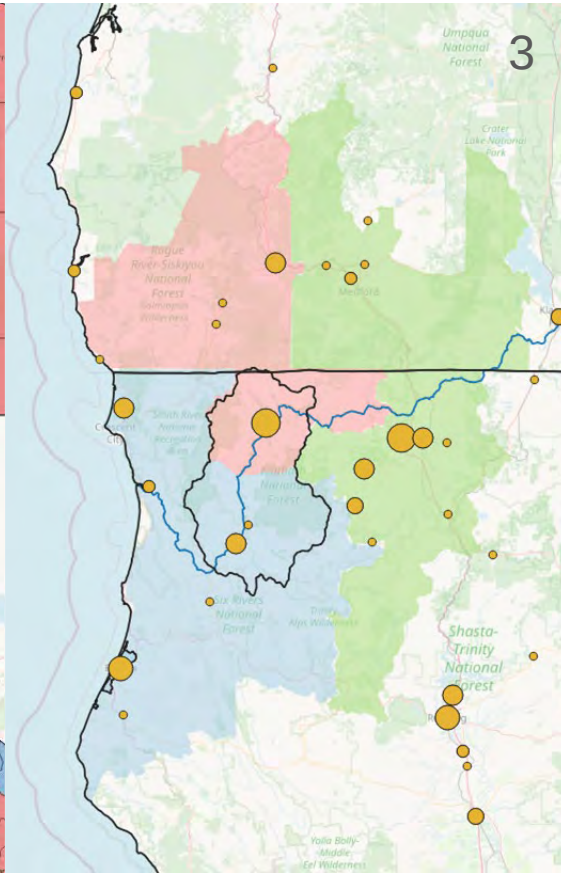
Team members Sibyl Diver, Carolyn Smith, Daniel Sarna-Wojcicki, Ron Reed, John R. Oberholzer Dent, Cole Dill-De Sa, Crystal Liu, Nathaniel Ramos

Survey response: diverse geographies and demographics

Geography, politics, gender, age, household income, education







1. All survey respondents
2. Local (yellow) and nonlocal (blue) respondents with overlaid county politics
3. Tribal Council Districts surrounding Karuk Ancestral Territory

Tribal community well-being framework for social assessment

Social dimensions: assessment & restoration

Well-being: "a state of being with others and the environment, which arises when human needs are met, when individuals and communities can act meaningfully to pursue their goals, and when individuals and communities enjoy a satisfactory quality of life" (Breslow et al. 2016, p. 251)

Indigenous knowledge systems & self-determination

Building on the work of Rachel Donkersloot, Jessica Black, Courtney Carothers, Jamie Donatuto & others:

Donkersloot, R., Black, J. C., Carothers, C., Ringer, D., Justin, W., Clay, P. M., et al. (2020). Assessing the sustainability and equity of Alaska salmon fisheries through a well-being framework. *Ecology and Society 25*(2), 18. [State of Alaska's Salmon & People Social and Cultural Dimensions of Salmon Systems Working Group]

Donatuto, J., Campbell, L. & Trousdale, W. (2020). The "value" of values-driven data in identifying Indigenous health and climate change priorities. *Climatic Change 158*(2), 161–180.

Method contribution: Codesign for Indigenous determinants of well-being with assessment

- Partnering directly with tribal community & staff
- Focus on relationships and diverse community engagement
- Analysis guided by intergenerational knowledge exchange & Indigenous research methods
- Tribal community well-being frameworks for a more holistic reference system (culturally and place specific)

Carolyn Smith gathers willow root on a Klamath River sand bar. Quality willow sticks for weaving require straight, insect-free shoots

Sibyl Diver, John R. Oberholzer Dent, Daniel Sarna-Wojcicki, Nathaniel Ramos, Ron Reed, et al. In prep. Indigenous determinants of well-being, and social impact assessment: redefining restoration success for Klamath dam removal

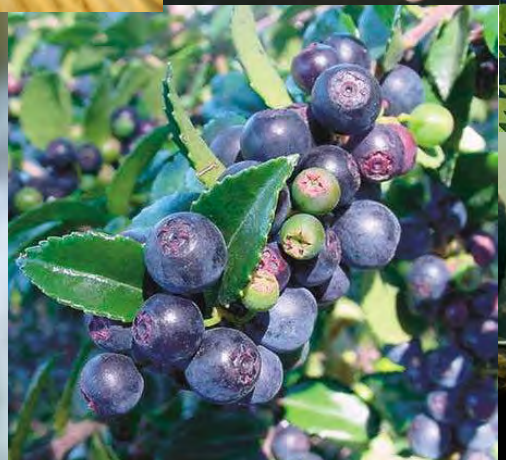
Place & Peoples:
non-human & human interactions

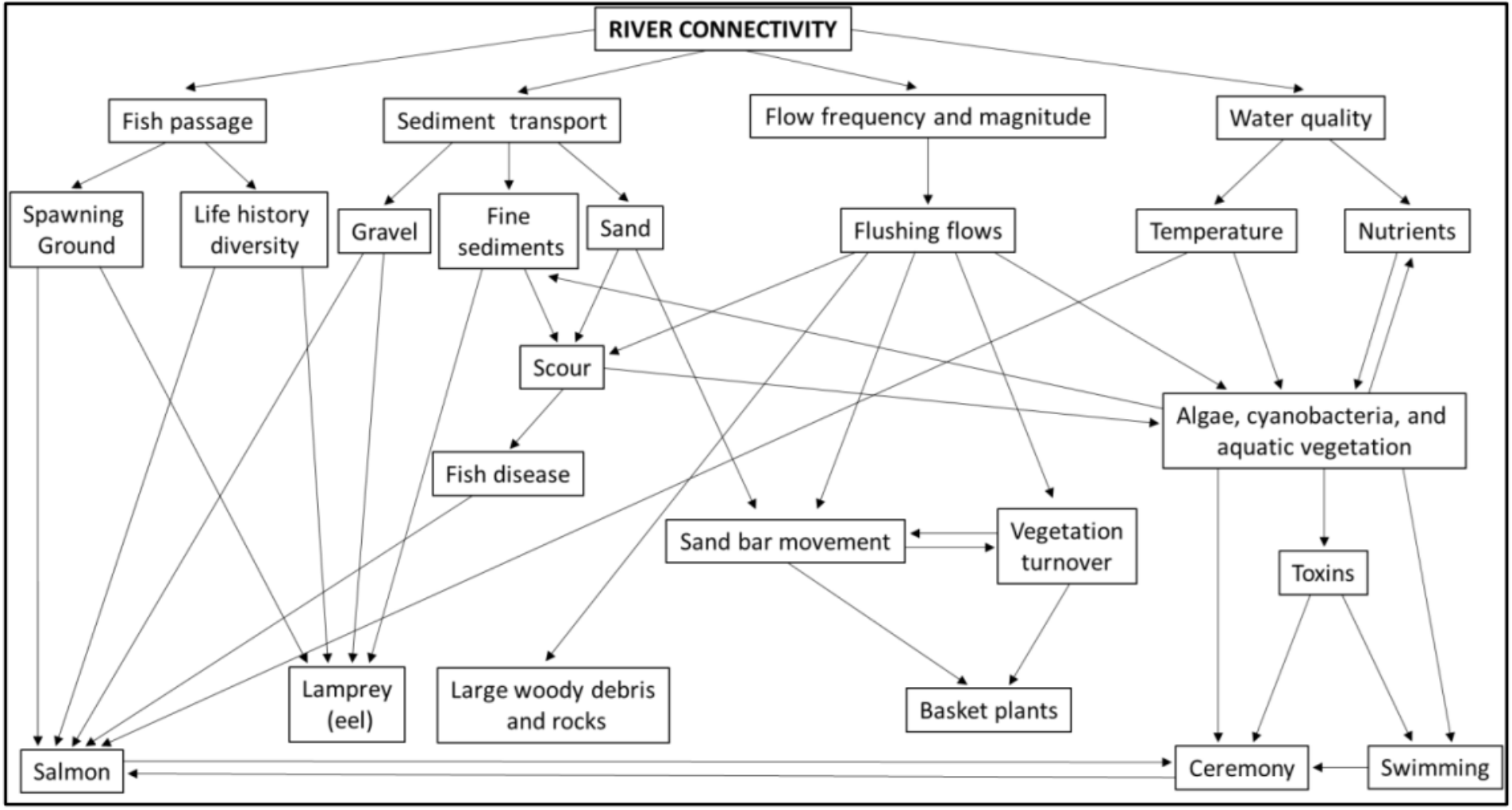











RIVER CONNECTIVITY
Fish passage
Sediment transport
Flow frequency and magnitude
Water quality
Spawning Ground
Life history diversity
Gravel
Fine sediments
Sand
Flushing flows
Temperature
Nutrients
Scour
Algae, cyanobacteria, and aquatic vegetation
Fish disease
Sand bar movement
Vegetation turnover
Toxins
Lamprey (eel)
Large woody debris and rocks
Basket plants
Salmon
Ceremony
Swimming

Baseline assessment: Domains of Tribal community well-being (survey & focus groups)

1) Holistic Health

2) Access to Cultural Resources

3) Education

4) Livelihoods

5) Self-Governance

We Are Still Here, Fix the Earth People
/ Lyn Risling

1) Holistic Health

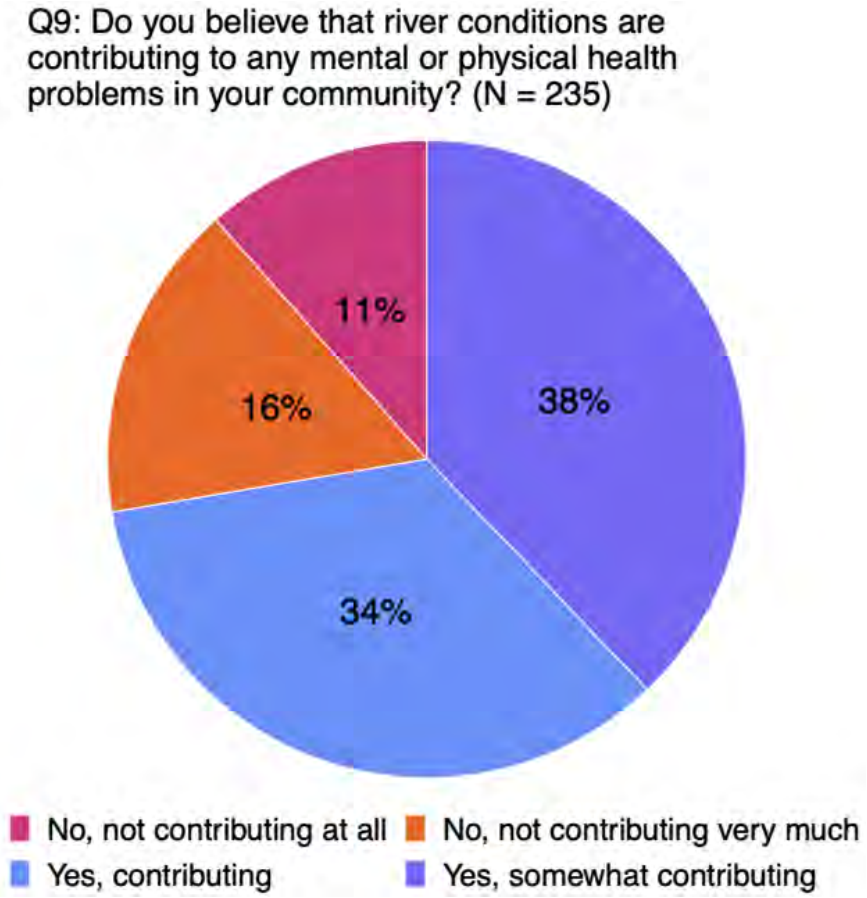
- **I worry about tribal people getting their fish yearly which is healthy—mentally, physically, and spiritually—**the healthy interactions of family catching canning and freezing or smoking their fish bonding with family. – *Survey comment*

- **I had to bathe in the river for ten days [for ceremony]. Well, one year the river was green, like bright green, and that's the year that sometimes when I swim, I get stuff in my ear or whatever. Well, my whole face swelled up** like this and I had to go get a shot while I was still the priest halfway through it, I had to go to the doctor and have him give me a shot of penicillin or whatever because my head is about to explode. I got water stuck in my ear and my whole face swelled up. And so I think somebody asked me not long after that to make some sort of statement regarding the water quality and how it affected the bathing that was taking place, not to mention the rafters I had to hide from. – *Robert "Bob" Attebery, Tribal Enrollment Officer and ceremonial leader*

- **Unfortunately our traditions have reverted to praying for the river** because we are not able to use it. **We look at our river, and we know it is sick.** Our culture is put on the backburner as we spend our time in meetings advocating for dam removal and for the government to hear our cries for help. My hopes and dreams are for my people to have good health by providing a healthy environment for them to live in. – *Poppy Ferris-George*

Holistic Health

- 72% of respondents believed river conditions at least “somewhat” contribute to health problems in their community
- 59% of respondents believed the Klamath River is “not very healthy” or “not healthy at all” (N = 236)
- 55% of respondents reported their mental health and well-being were at least “somewhat” affected by their feelings about the river (N = 238)



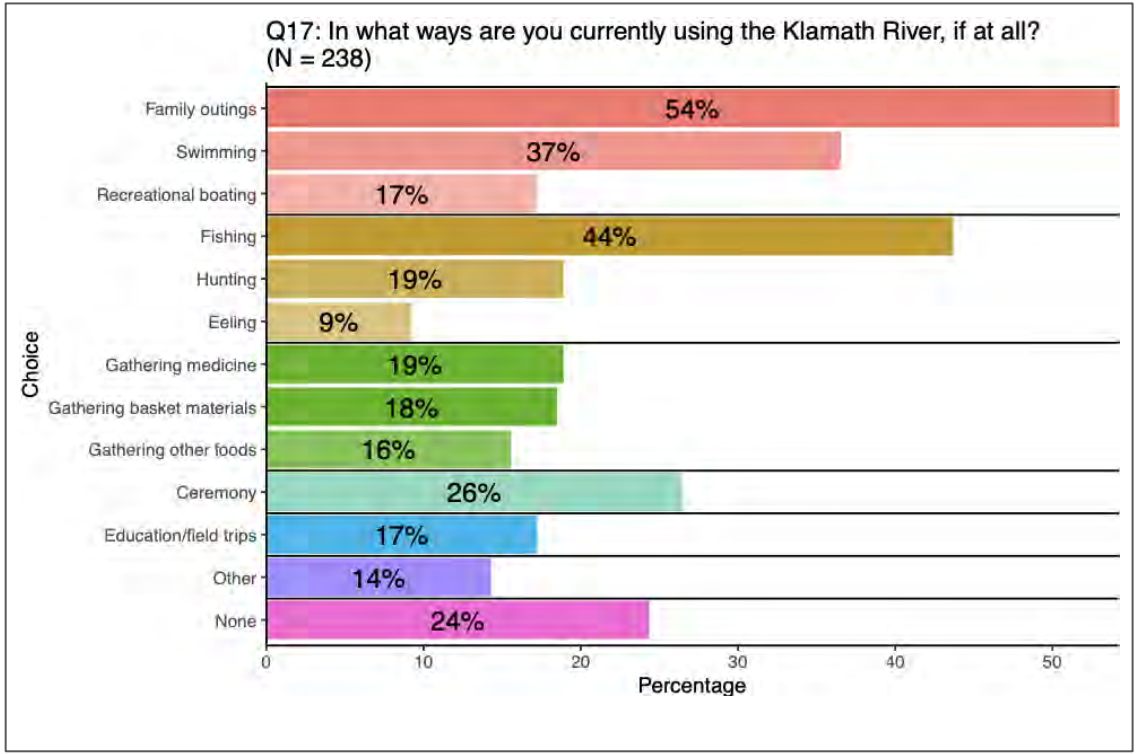
2) Access to cultural resources

- My vision is to see more cultural activities happening along the Klamath River. For many decades our tribal people have not been able to enjoy family and cultural time at the river's edge because of the high levels of toxins in the Klamath River… The river was basically taken away from the tribal people, polluted, and then given back in a manner that is desecrating us. **I want to see the tribal people using the Klamath River and teaching [youth] the cultural and subsistence uses that it has to offer.**" – *Poppy Ferris-George anthropologist, basketweaver, and KRRC Board of Directors*

- I can start off by just saying that **we had a really good year this year. And yet, we still didn't have enough for subsistence needs. We barely had enough for ceremonial needs.** We didn't have enough for my own personal family needs. And that's not even talking about my children... So I think there's a dramatic limitation of our fishery, for one. – *Ron Reed, dipnet fisherman and ceremonial leader*

- I remember as a kid, we would go fishing together all the time. I would always catch many fish. We were together recently for hours and caught only two fish. **So the dam removals will help my relationship to the river, and my dad.** I feel like that will help the cultural aspect by bringing back the ceremonies we used to have. – *Youth participant*

Access to cultural resources

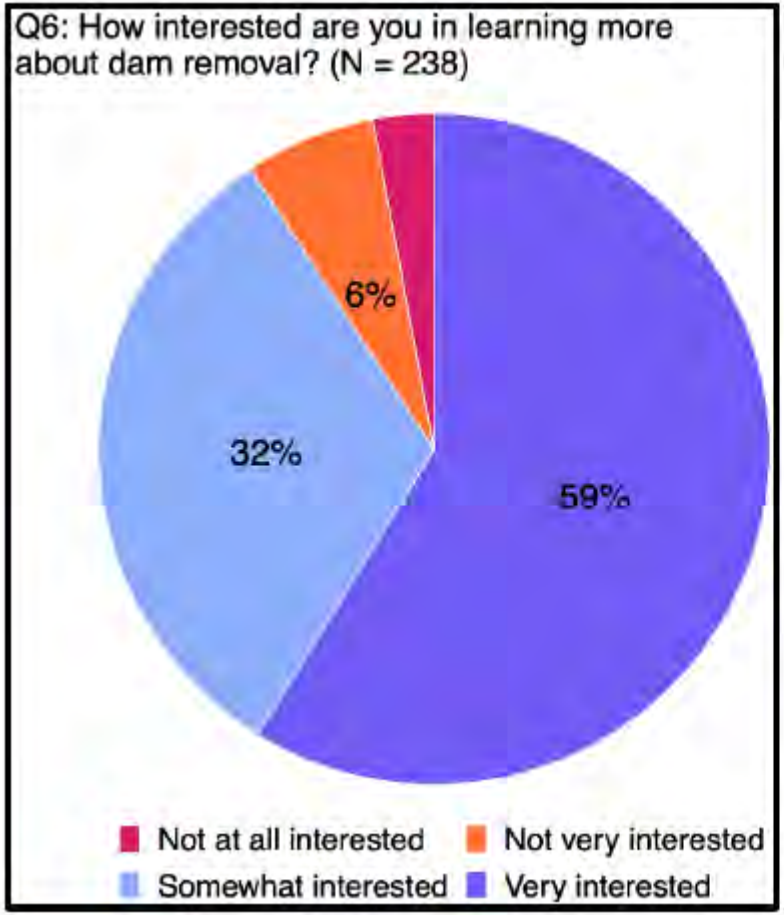


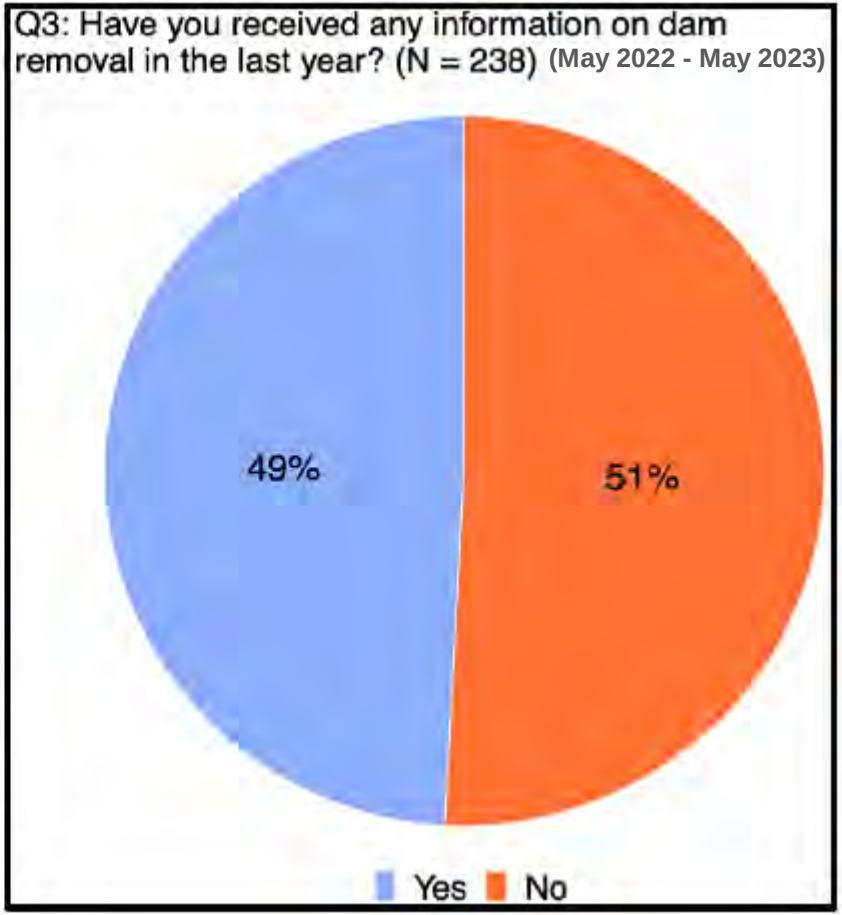
- People are engaging with cultural resources on the river. Yet, **only 22% of local respondents had “enough access to meet [their] needs”** (N = 232)

Karuk youth access to cultural resources

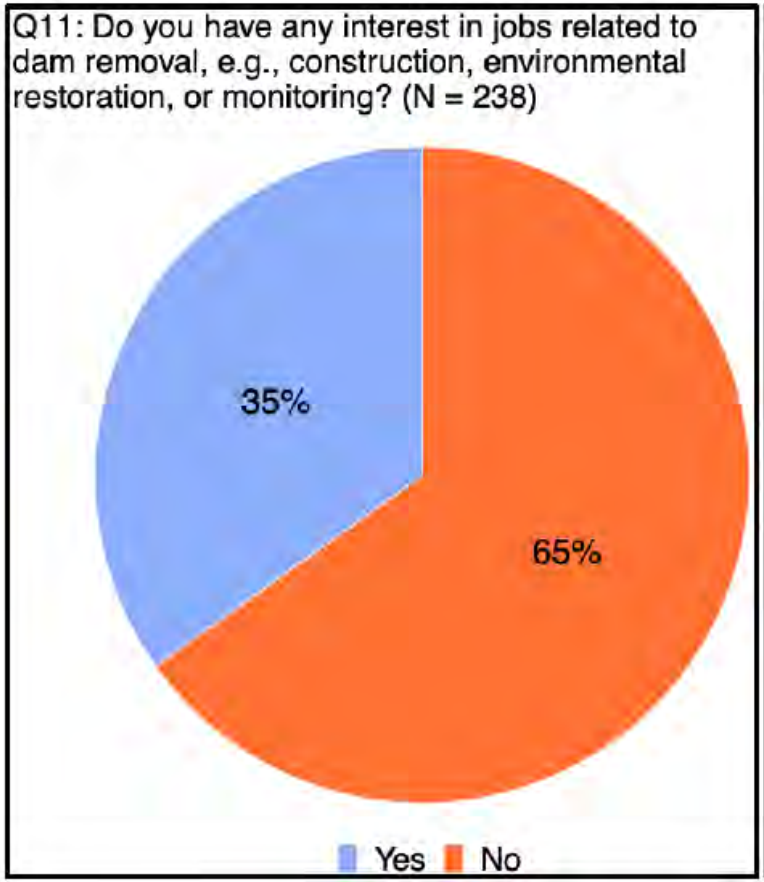
- **I’ve always swam in creeks and rivers my whole life** like this. We go rafting most of the time not in the raft, I just float along the raft in the river. We have this one spot when we go rafting where we jump off. I could spend hours just jumping off that spot.
- **I barely swim in the river.** Now that's been like, really long since I've been in there. Maybe when I was like seven or eight [ten years], that's how long it's been.
- **I want my family, I want my kids and my kids' kids to be able to swim in the Klamath** and go swimming in the clean water and stuff like that. And the medicine people not have to bathe in waters like that, and like the willow root, and stuff like that. And be healthier.”
- With the youth, the Karuk culture is dying out, hopefully the dam removal will **bring youth back and make them more passionate about our culture.**
- **[The Salmon Run] shows people how much it means** and what we’ll do for it. And how many people care about this project.

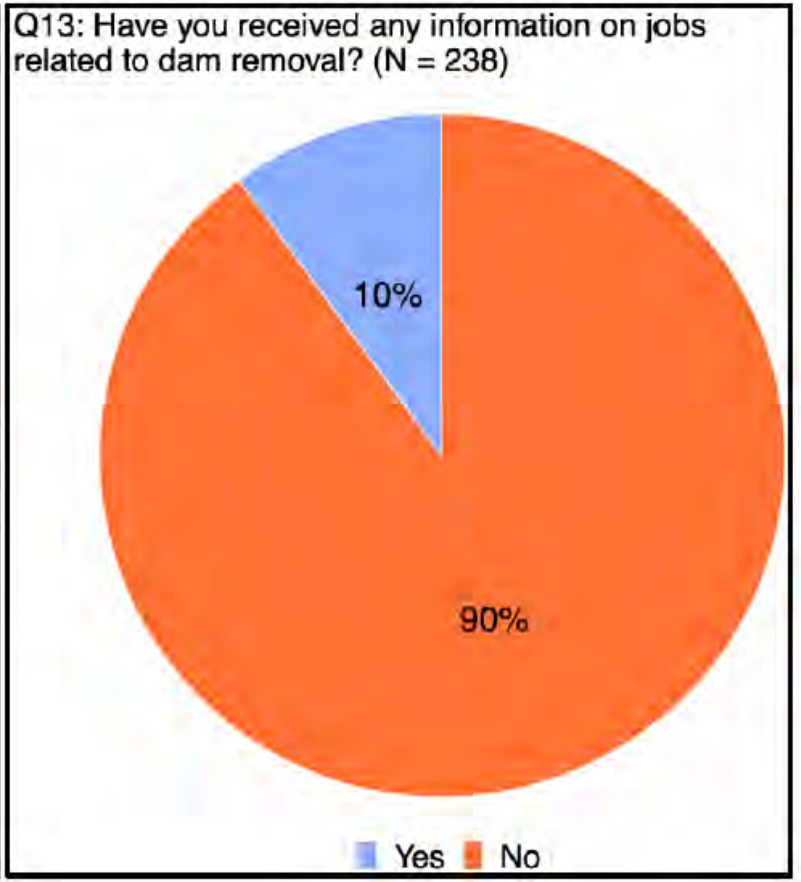
3) Education: Information Access



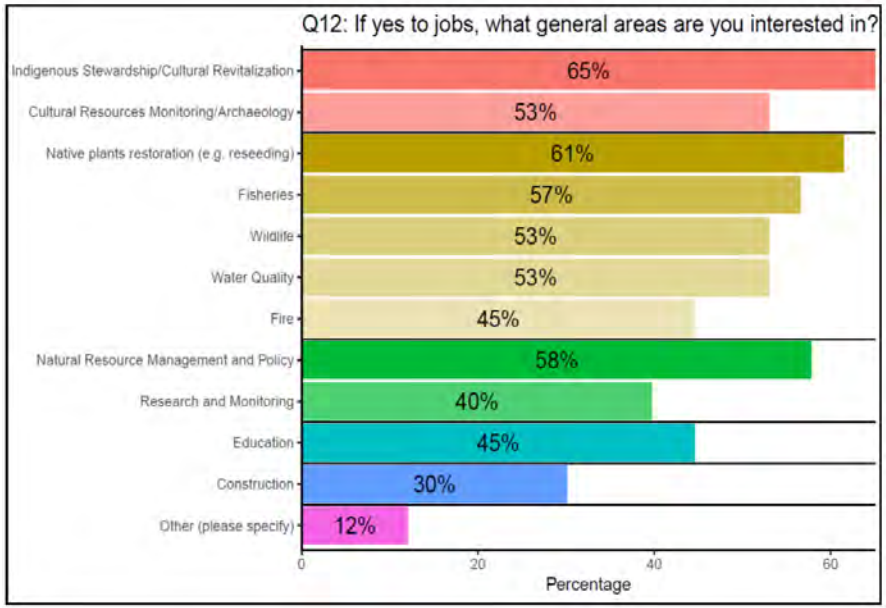


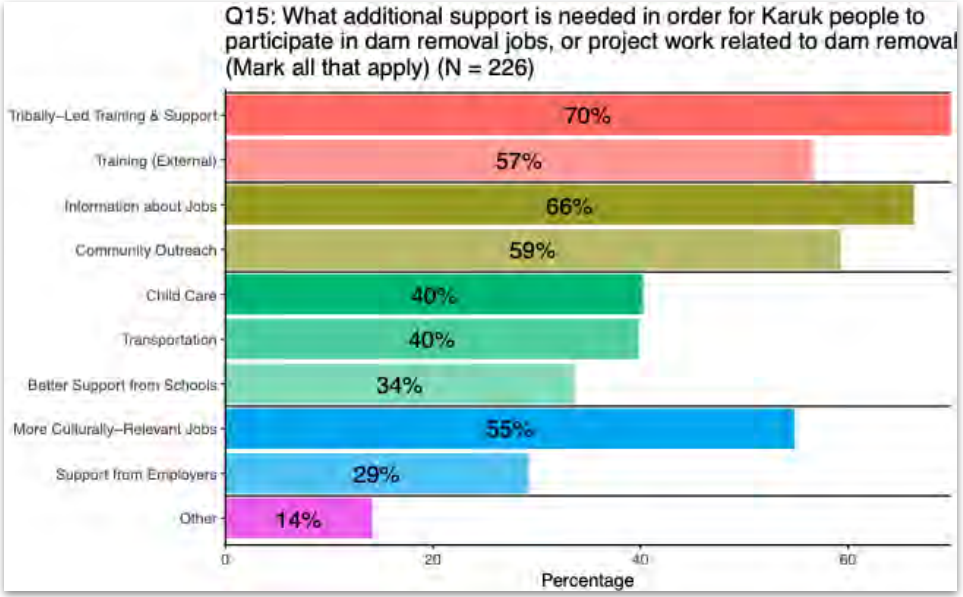
4) Livelihoods: Access to Jobs





4) Livelihoods:Tribal community workforce & stewardship economy





5) Self Governance

- I’m pretty stoked actually on what’s occurring right now. I mean, **it’s an affirmation of what happens when folks, you know, step aside** and leave their egos at the table **and let the Indigenous people on the river take the lead on what needs to get done, how it needs to get done.** – *Earl Crosby, former Karuk DNR Deputy Director, Watersheds Branch*

- We may not gain fully to what it was, but **to right a wrong is a start.** – *Survey comment*

- And it doesn't just start from removal of a dam, it starts with us coming together to say this needs to happen. So, the movement of the dam, **when it comes down, it's going to bring a lot of people together. That's my hope.** – *Sammi Jo Jerry, cultural practitioner*

- Until the river is managed by the same people who had ‘management authority’ prior to the invasion and occupation it will continue to decline and **I need assurances that Tribes will be the voice for Ishkayish** since the Klamath cannot speak in words that are understood by existing management. – *Survey comment*

- **Not all Natives feel comfortable talking about it** or being at a meeting because of what can happen in that outside world. – *Florrine Super, Kahtishraam Wellness Center Director and basketweaver*

Klamath restoration: Toward understanding tribal community well being for a more holistic reference system

- Sociocultural changes are deeply tied to biophysical changes
- Scientific monitoring indicators are not limited to fish counts and sediment load
- Tribal well-being can be used to define & track dam removal progress
- Restoration initiatives should incorporate these indicators to measure the success of dam removal restoration projects

Reservoir footprint blooms with thousands of poppies, April 2024 / *John R. Oberholzer Dent*

Klamath Dam Removal and Karuk Tribal Community Well-Being: Baseline Social Impact Assessment

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Stanford University, University of California - Berkeley, and Karuk Department of Natural Resources Pikyav Field Institute

September 2024

https://damremovalsocialimpact.com/results/

water

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Article

Recasting Klamath Dam Removal as Eco-Cultural Revitalization and Restorative Justice through Karuk Tribal Leadership

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Special Issue

Water Contestations: Socio-Technical Entanglements, Politics and Social Mobilisation

Edited by

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Where do we go from here? How do we change our social view for health and wellness with tribal community? - Ron Reed

White Deer Dance, near Orleans, early 1900s

Yôotva! Thank you!

Ryan Reed processing eels with Ron Reed / *Sibyl Diver*

Social Impact Assessment of Klamath Dam Removal

damremovalsocialimpact.com

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