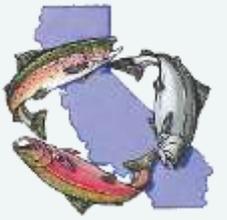


Fish Passage and Other Intriguing Talks



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

Session Coordinator: Shane Scott, *SSA Environmental*



This conference session offered a comprehensive look at aquatic ecosystem restoration and management in North America, focusing on innovative and collaborative approaches. It began with a discussion on Aquatic Organism Passage solutions at culverts and fish barrier management, highlighting novel techniques for aquatic species migration. This was followed by an exploration of the collaborative efforts required for fish passage restoration in the Napa River Watershed. Another presentation details the adventurous and rigorous methods used in reintroducing steelhead into Jalama Creek, involving explosives and helicopters. The session also included a talk on the ecological and social impacts of dam removal on the East Branch Russian River, emphasizing ecosystem revitalization. The challenges posed by abandoned cannabis cultivation sites and their impact on remote landscapes are another key topic. The session concluded with a study on the migration patterns of juvenile Chinook salmon in the Sacramento Valley, underlining the importance of habitat conservation. Each presentation underscores the multifaceted approach needed to address contemporary environmental challenges.

Presentations



- **Aquatic Organism Passage (AOP) Solutions at Culverts and Fish Barrier Management in North America**
Shane Scott, *SSA Environmental*.....slide 4
- **Going slow and going together -- Navigating Project Meanders and Building Consensus to Restore Fish Passage in the Napa River Watershed**
Frances Knapczyk, *Napa County RCD*; Andrew Smith, PE, *WRA*; and Matt Erickson, *CDFW*.....slide 46
- **Explosives, Helicopters and Hard Work: Restoring Steelhead to Jalama Creek,**
Laura Riege, *The Nature Conservancy*.....slide 66
- **Pulling Back the Redwood Curtain: Revealing the Ecological Challenges of Abandoned Cannabis Cultivation Sites in Remote Landscapes**
Drew Barber, *Vollmar Natural Lands Consulting*.....slide 193
- **Assessment of Juvenile Chinook Salmon Migration in the Sacramento Valley**
Alexandra Wampler, *University of California, Davis*.....slide 128
- **Martin Slough: Lessons From the Collaboration to Restore the Aquatic Ecosystem of Martin Slough**
Dagan Short, PE and Steven Allen, PE *GHD*.....slide 147

Aquatic Organism Passage (AOP) and Culvert Asset Management in North America

Shane Scott

SSA Environmental

Vancouver, Washington

Phone: (360) 601-2391

shane@ssaenvironmental.com



Today we are going to discuss...

1. Introduction and Background
2. Flexi Baffle – Flexible Culvert Baffles
3. Flexi Baffle Projects
 - City of Ketchikan, AK
 - City of Surrey, B.C.
4. Culvert Asset Management in NZ

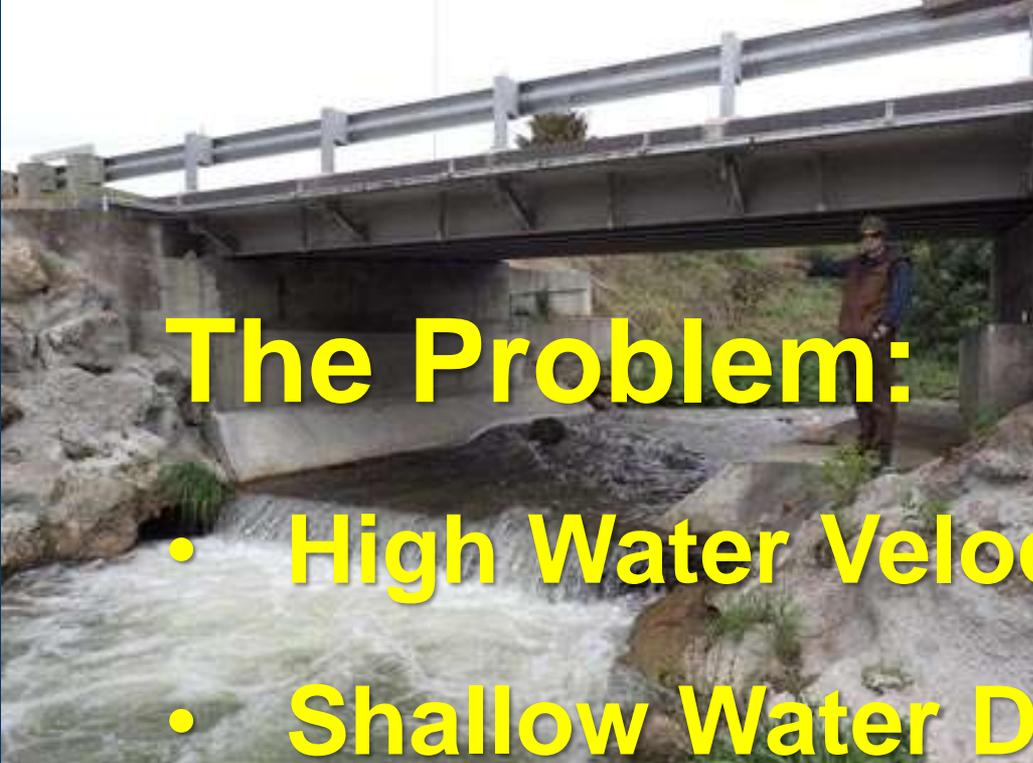
Introduction and Background

Shane Scott – Fisheries Biologist

- **30 years as a Utility Biologist**
 - **Tacoma Power**
 - **Washington Dept. of Fish & Wildlife**
 - **Public Power Council**
 - **Natural Resource Consulting**

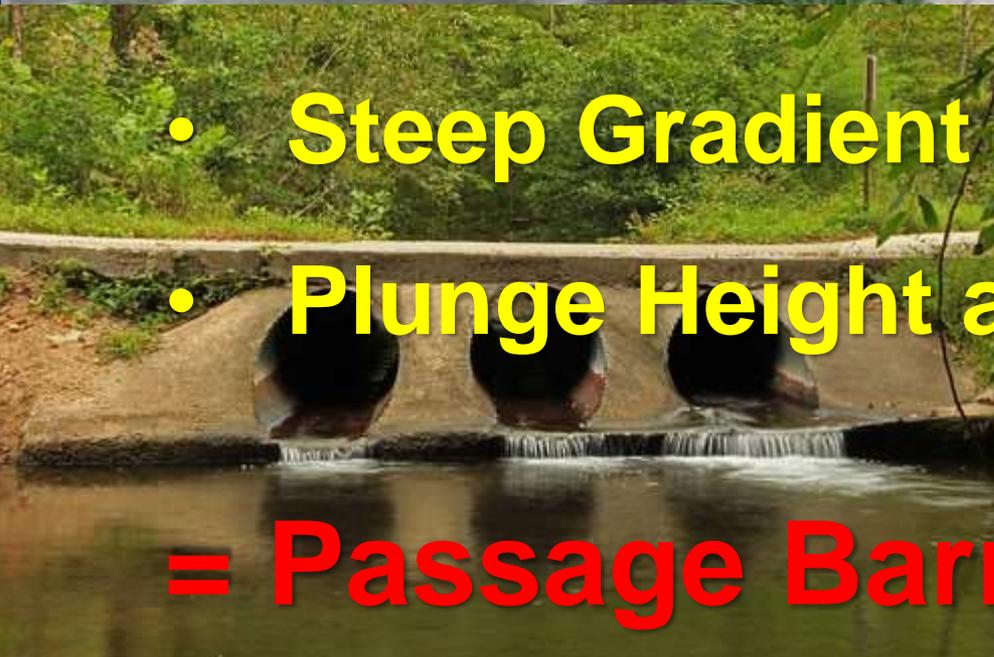
Dam(n) Culverts...





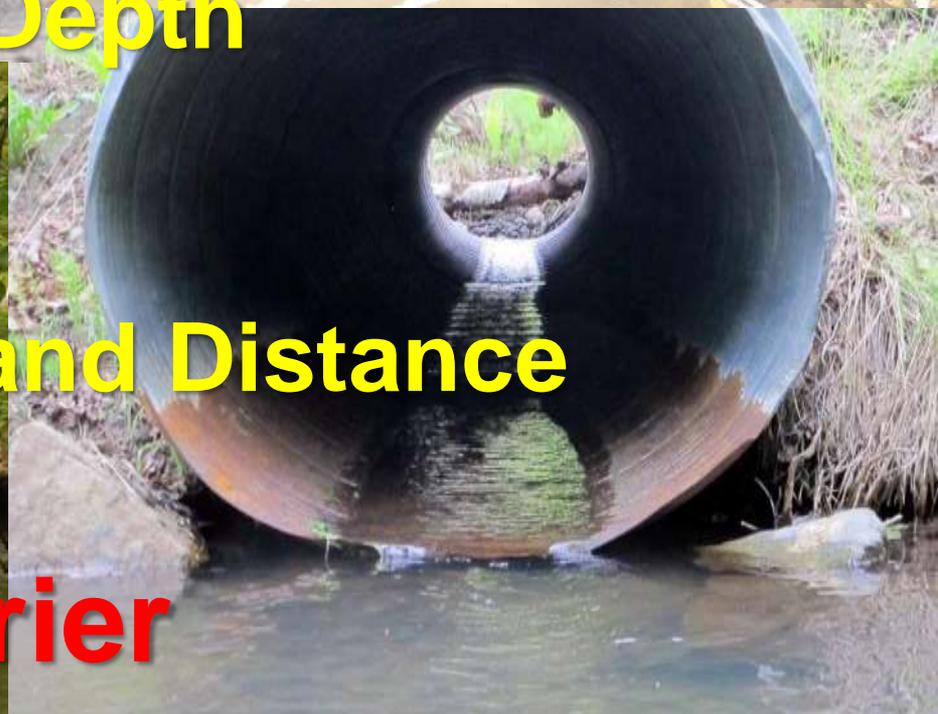
The Problem:

- High Water Velocities
- Shallow Water Depth



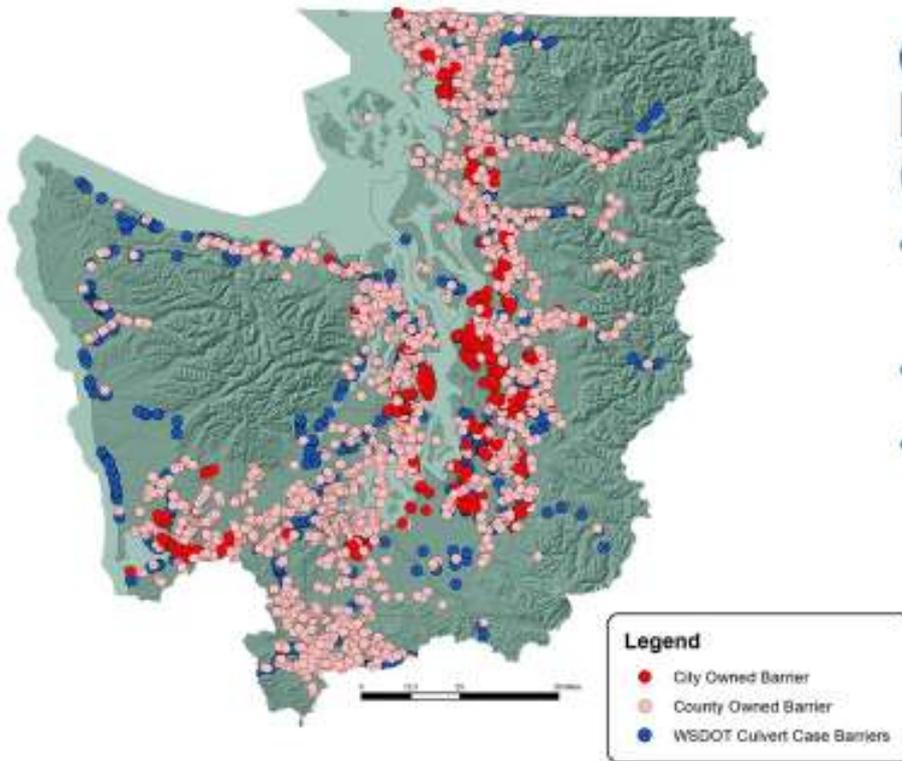
- Steep Gradient
- Plunge Height and Distance

= Passage Barrier



WDFW Fish Passage Barrier Assessment

Magnitude of the Problem



Over 19,000 known barriers statewide
(complete and partial)

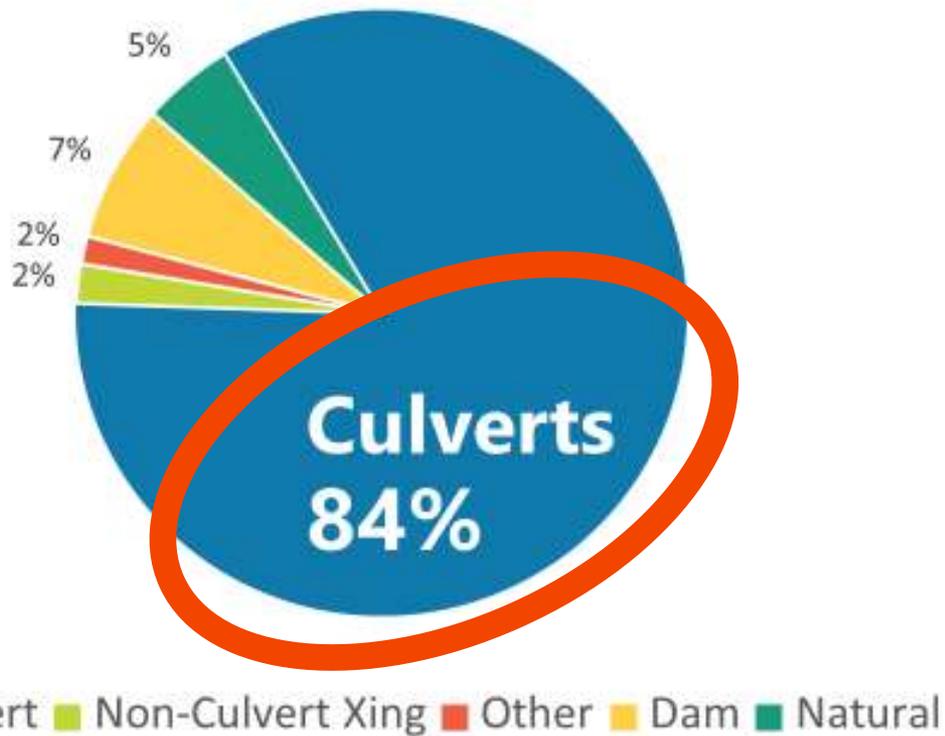
- Barrier inventory is incomplete
- Number increases weekly
- Image snapshot of ownerships

Caltrans has counted 212,181 culverts in its system



WDFW Fish Passage Barrier Assessment

Barrier Feature Types





The Solution?

1. Culvert Replacement



2. Culvert Modification



1. Culvert Replacement

Tualatin Watershed Council - Bateman Creek, OR

1. Culvert Replacement

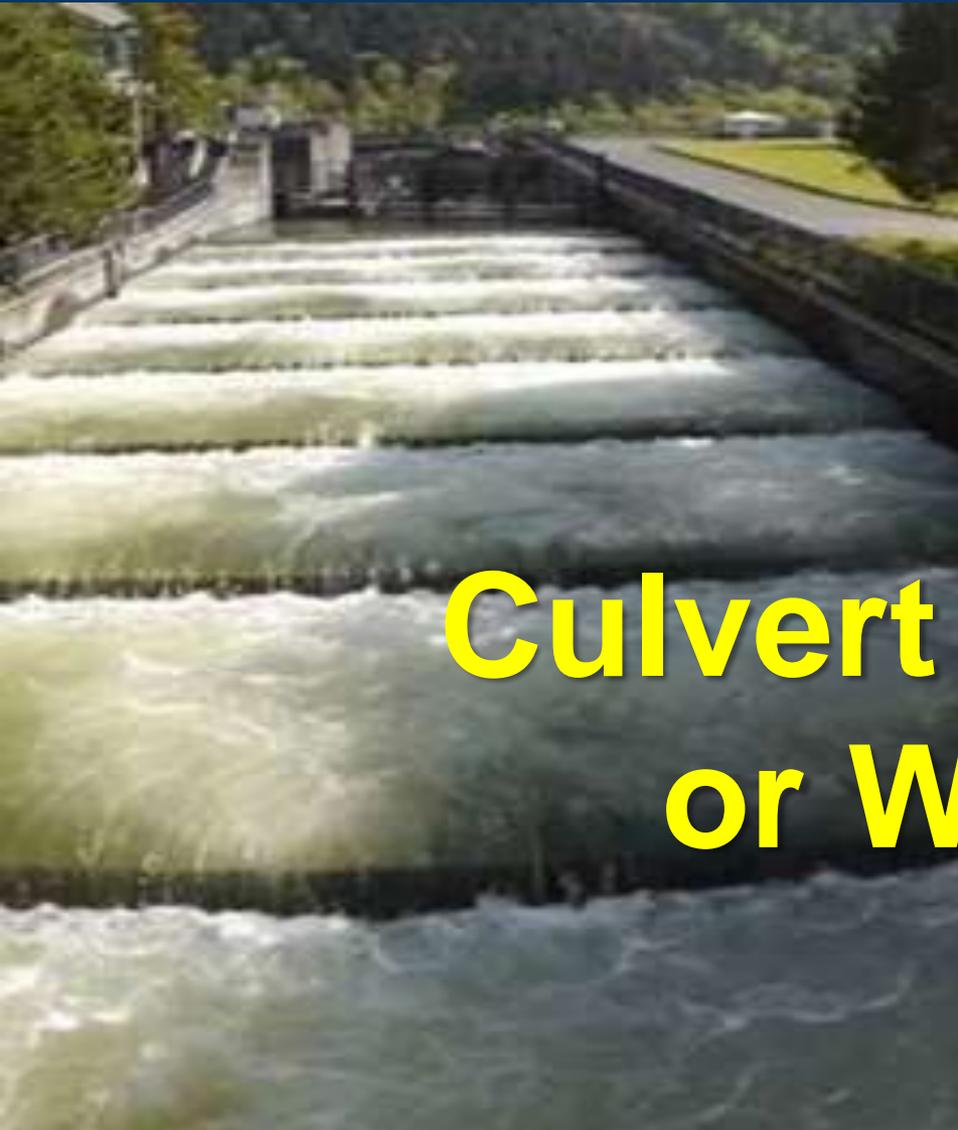


Tualatin Watershed Council - Bateman Creek, OR

2. Culvert Modification



2. Culvert Modification



**Culvert Baffles
or Weirs**

Culvert Baffles or Weirs

- Proven Technology (e.g., fish ladders)
- Disrupt Laminar Flow
- Slows Water Velocities
- Create Resting Pools
- Can Reduce Plunge Pool Size at Exit
- Expands AOP Opportunity
- **SOLID vs FLEXIBLE BAFFLES???**

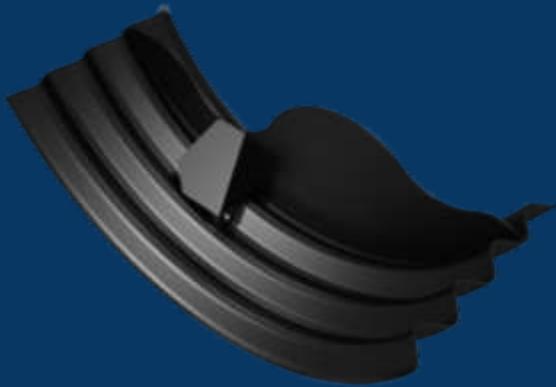
Solid Baffles



Steel



Fiberglass



Plastic



Cuboid Sheet (plastic)

Solid Baffles



Solid Baffles

PROBLEMS

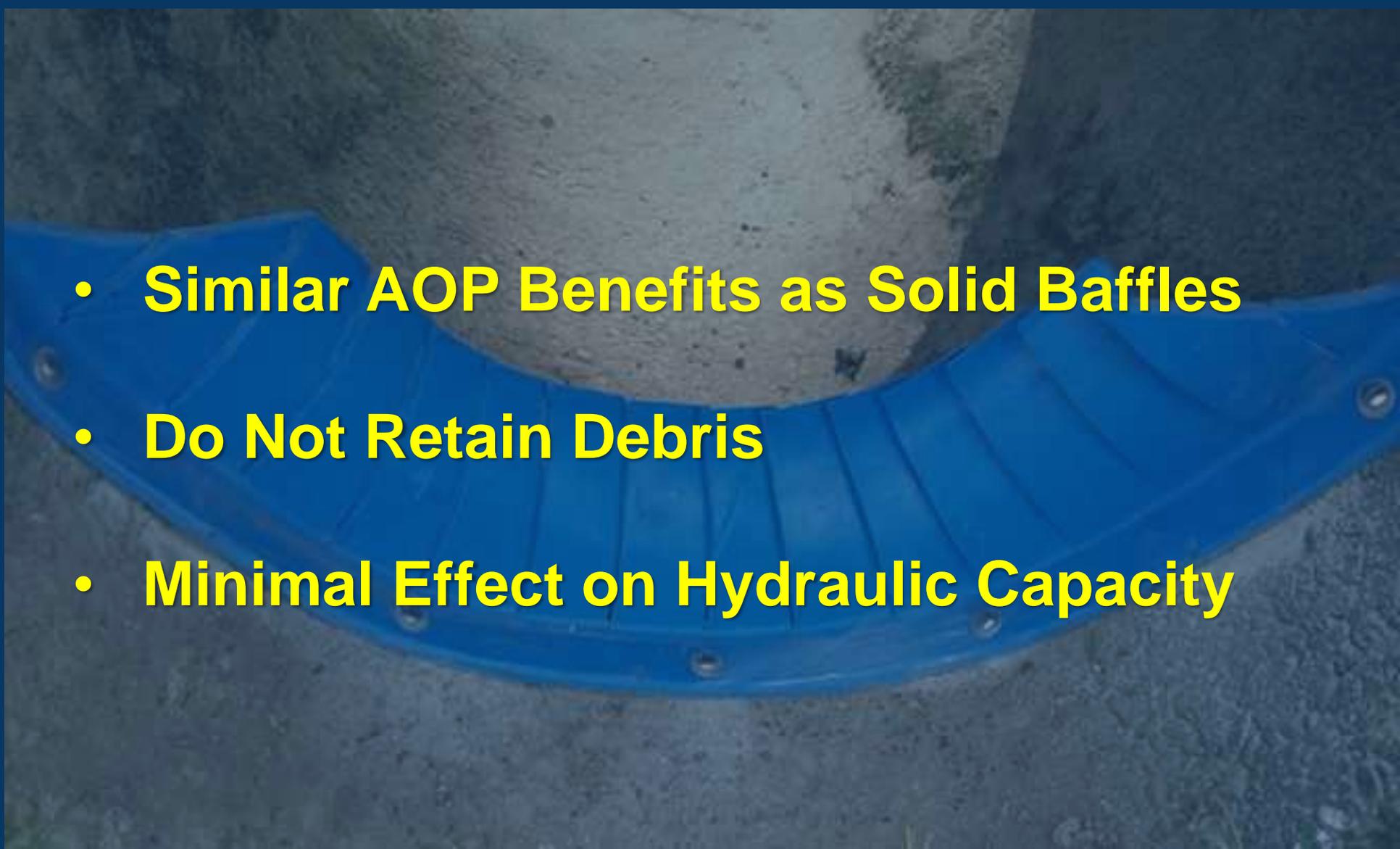
- Retain Debris
- Reduce Hydraulic Capacity
- Expensive
- Difficult to Maintain



Flexible Baffles



Flexible Baffles

- **Similar AOP Benefits as Solid Baffles**
 - **Do Not Retain Debris**
 - **Minimal Effect on Hydraulic Capacity**
- 

Flexi Baffle Installations

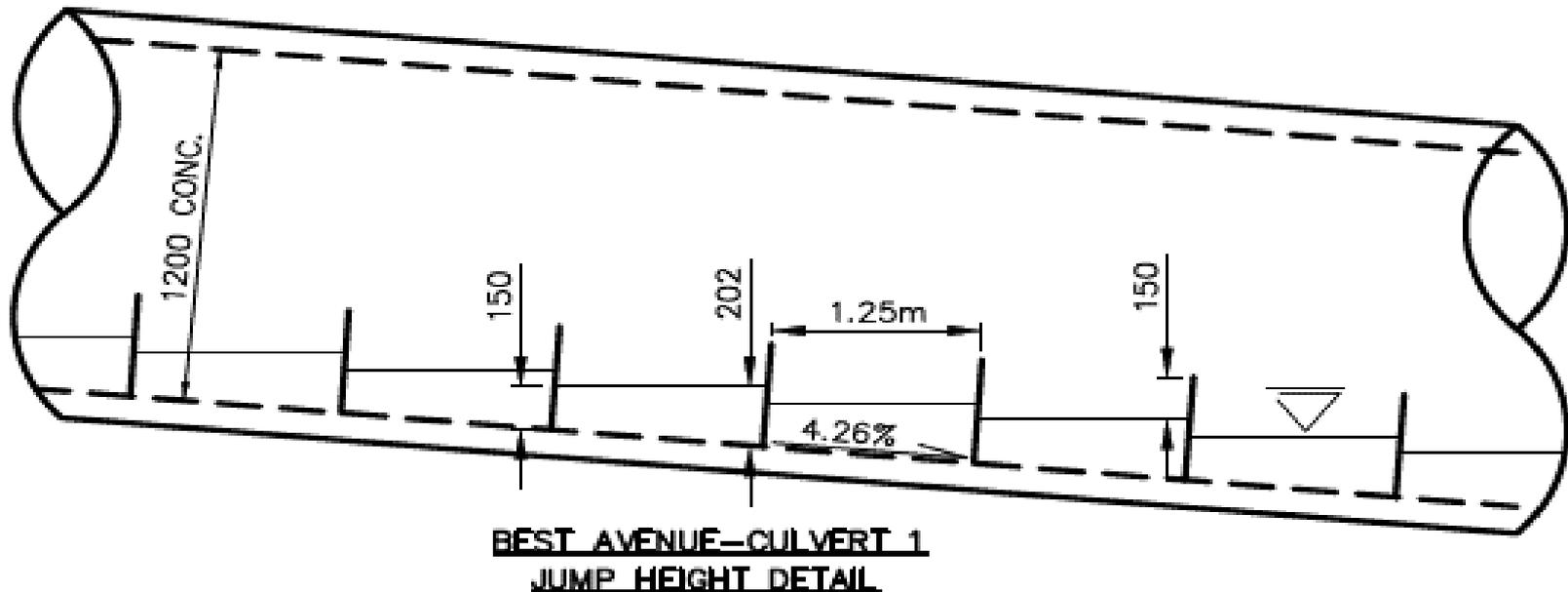
- **North America:**
 - **12 States and 5 Provinces...so far**
- **New Zealand and Australia**
- **Europe**
 - **Sweden, Norway, Great Britian**



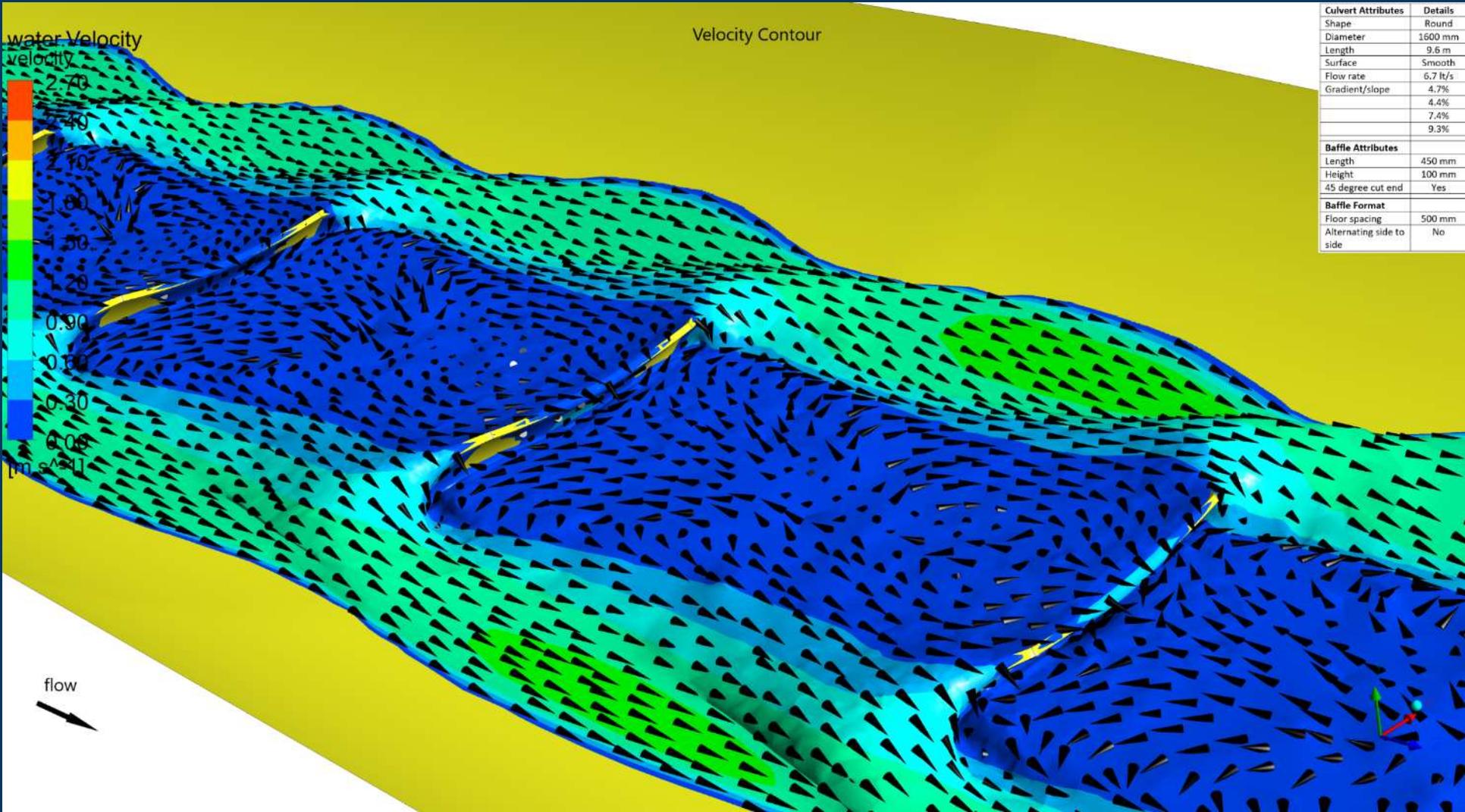
Flexi Baffle

Barrier Prescription:

- Culvert Type and Configuration
- AOP Criteria (i.e., water velocity and depth)
- Prescribe Flexi Baffle size and configuration



CFD Modeling



| Culvert Attributes | | Details | |
|--------------------------|--|----------|--|
| Shape | | Round | |
| Diameter | | 1600 mm | |
| Length | | 9.6 m | |
| Surface | | Smooth | |
| Flow rate | | 6.7 ft/s | |
| Gradient/slope | | 4.7% | |
| | | 4.4% | |
| | | 7.4% | |
| | | 9.3% | |
| Baffle Attributes | | | |
| Length | | 450 mm | |
| Height | | 100 mm | |
| 45 degree cut end | | Yes | |
| Baffle Format | | | |
| Floor spacing | | 500 mm | |
| Alternating side to side | | No | |

Schoenbar Creek

Ketchikan, AK

Culvert Dimension = 8' x 12' x 475' long squashed culvert

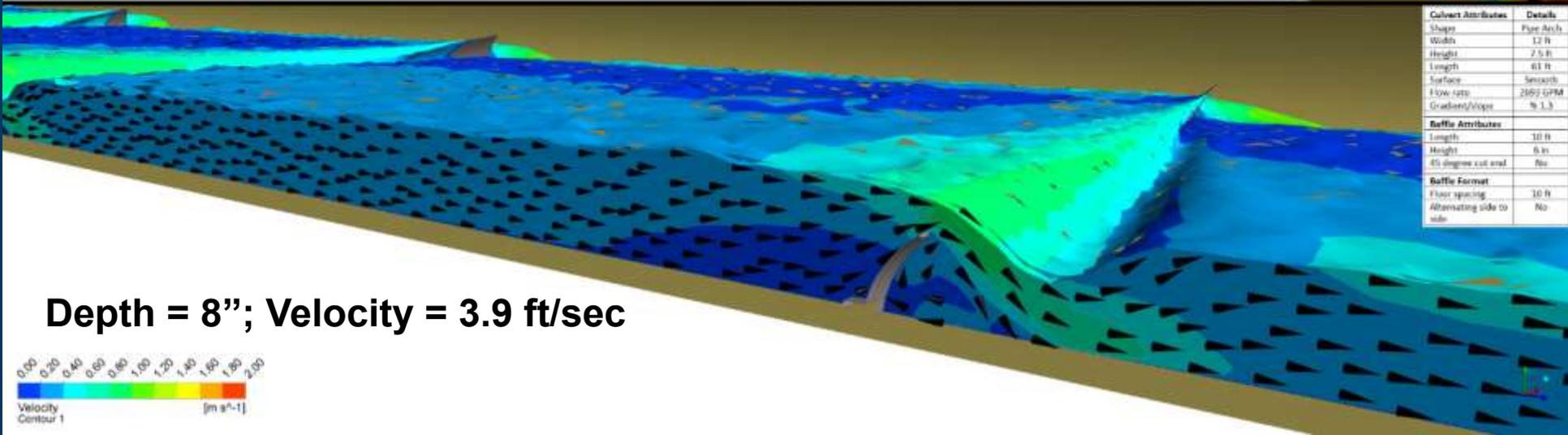
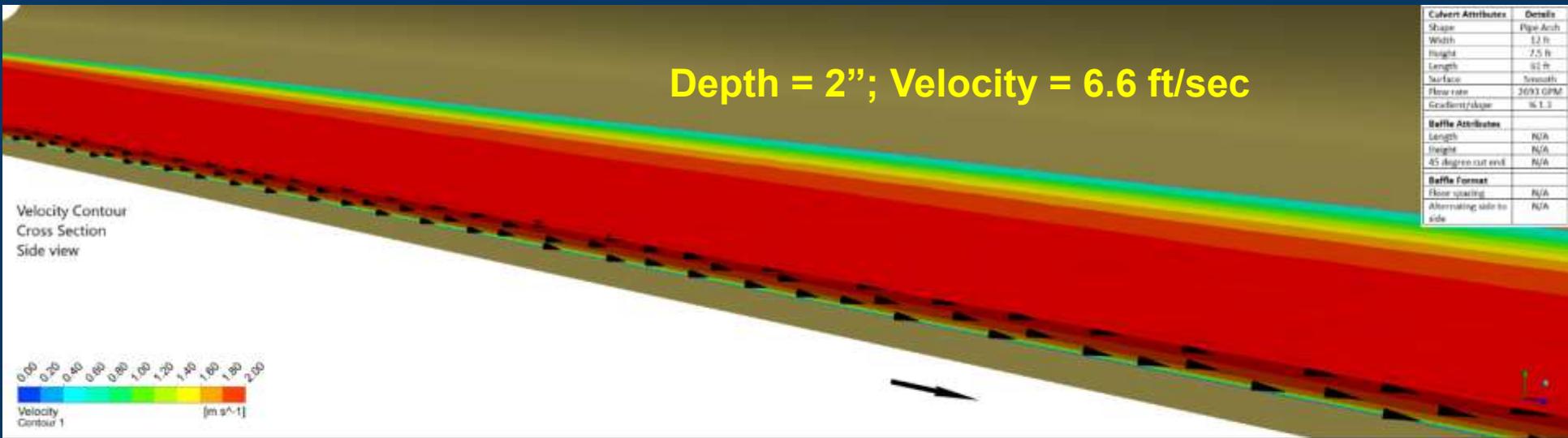
Water Flow = 6.0 to 92.3 cfs

Target Maximum Water Velocity = 4.0 fps (1.2m/s)



Schoenbar Creek, AK

Water Flow = 6.0 cfs (0.17 cm/s)



Schoenbar Creek, AK

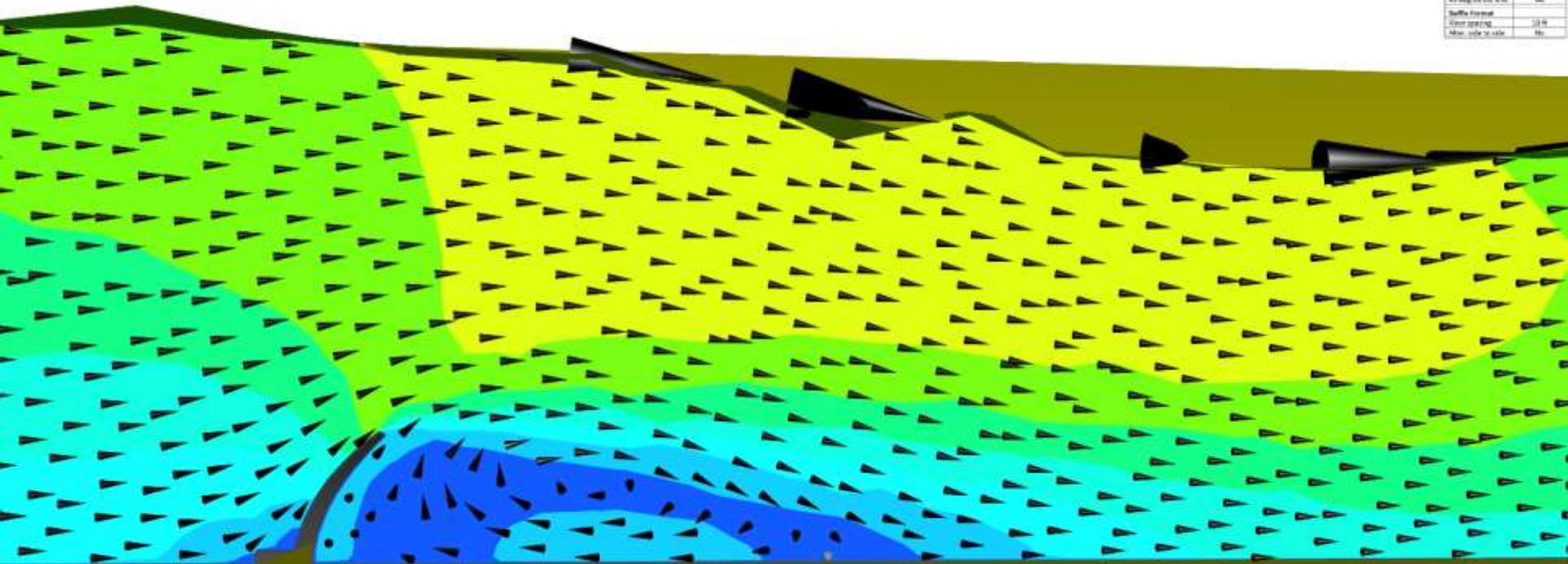
Water Flow = 92.3 cfs (2.6 cm/s)

Velocity Contour
Cross Section
Side view

| Collect Attributes | Details |
|--------------------|-----------|
| Shape | Open Arch |
| Width | 12 ft |
| Depth | 25 ft |
| Length | 81 ft |
| Surface | Smooth |
| Flow rate | 41.07 GPM |
| Coordinate | 0, 1, 2 |

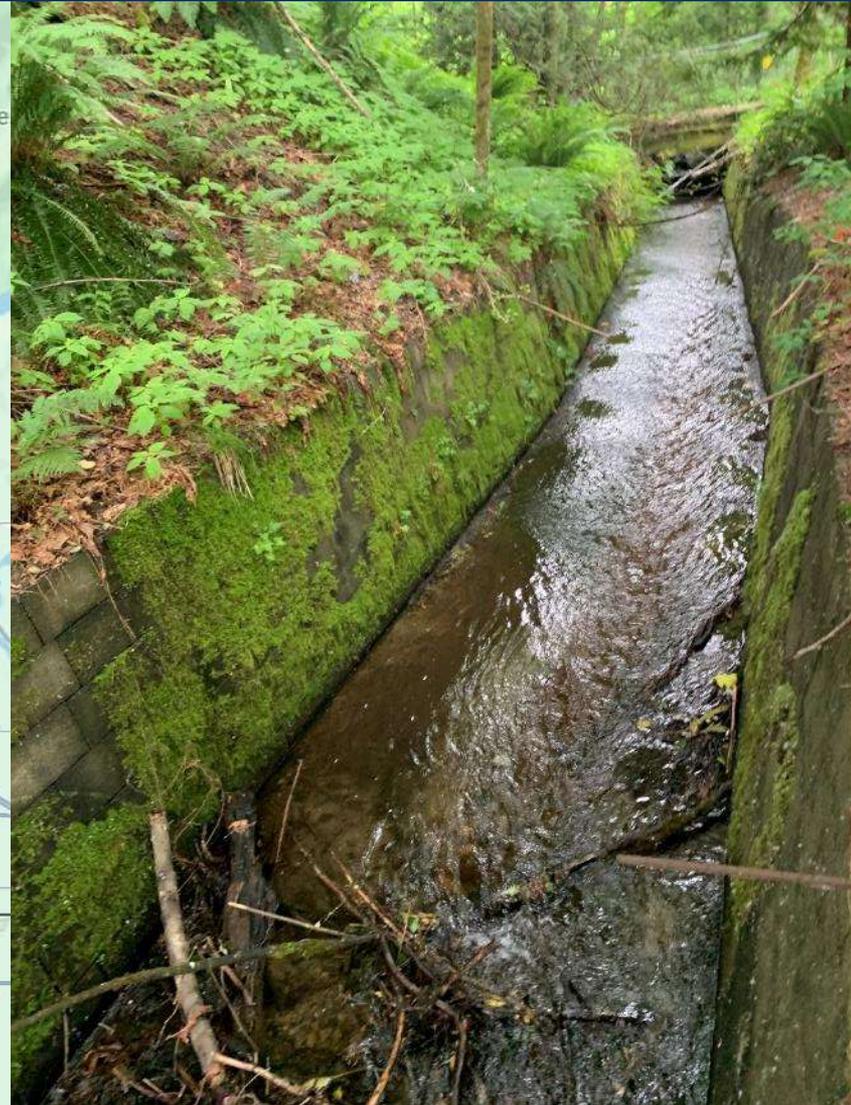
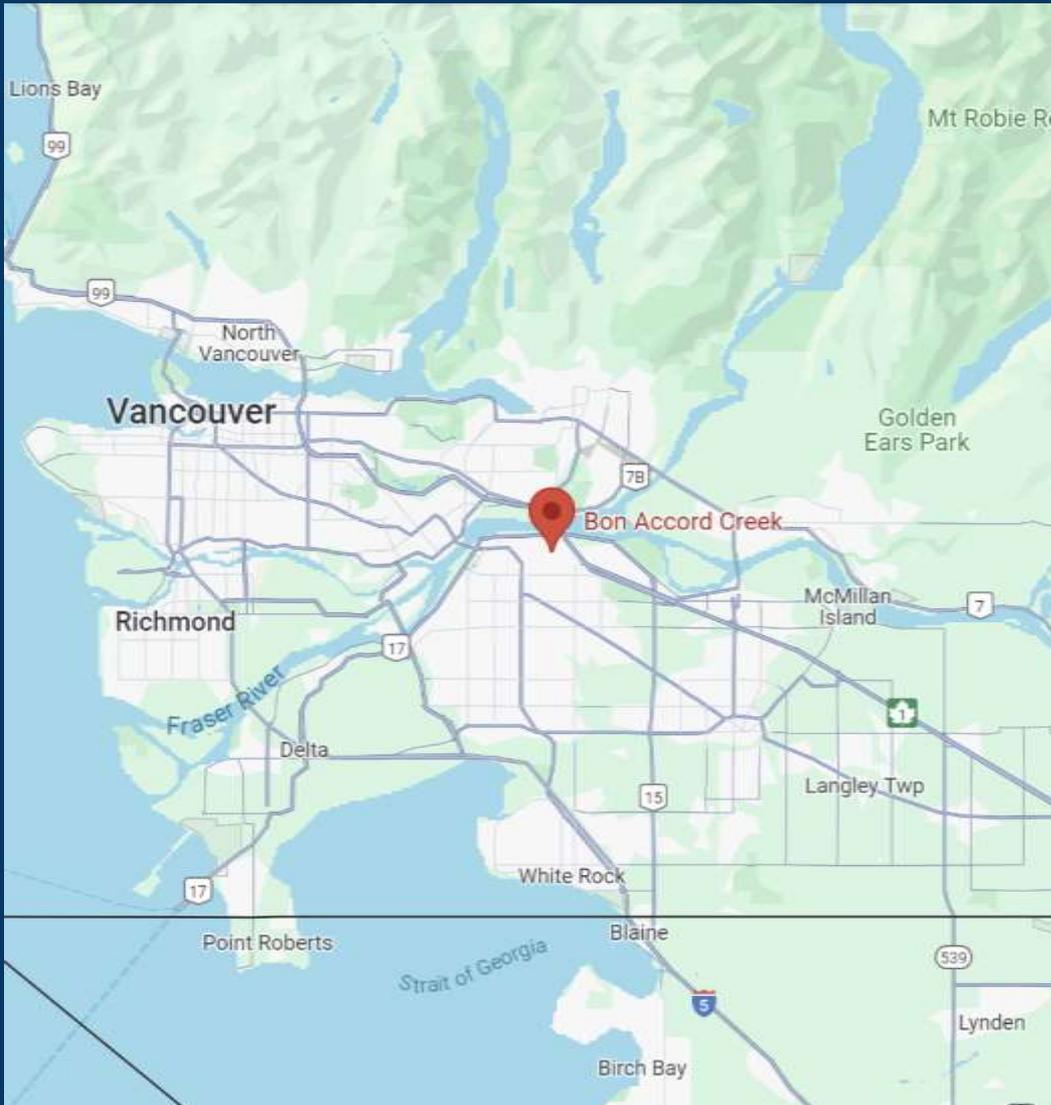
| Buffer Attributes | Details |
|-------------------|---------|
| Length | 10 ft |
| Width | 6 ft |
| At design cut and | No |

| Buffer Format | Details |
|-------------------|---------|
| Flow direction | 10 ft |
| Min. side to side | No |



Bon Accord Creek

Surrey, B.C.



Bon Accord Creek

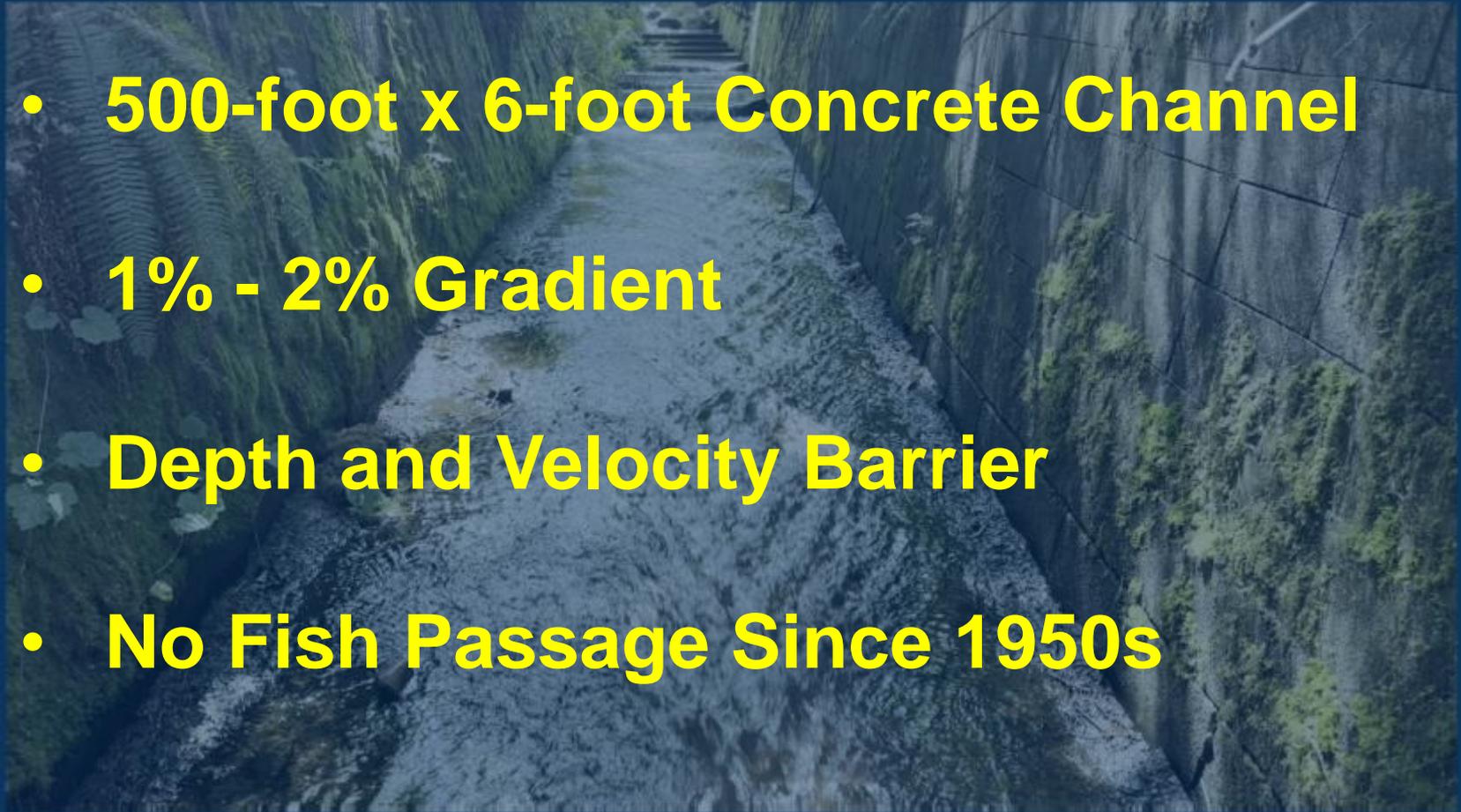
Surrey, B.C.



Bon Accord Creek

Surrey, B.C.

- **500-foot x 6-foot Concrete Channel**
- **1% - 2% Gradient**
- **Depth and Velocity Barrier**
- **No Fish Passage Since 1950s**



Bon Accord Creek

Surrey, B.C.
August 2023



Bon Accord Creek

Surrey, B.C.
August 2023

- Sixty x 2M Flexi Baffles Every 3M
- Installed by City of Surrey's Salmon Habitat Restoration Program (SHaRP)



Bon Accord Creek

Surrey, B.C.
August 2023



Bon Accord Creek

Surrey B.C.
October 2023



Bon Accord Creek

Surrey B.C.
November 2023



Bon Accord Creek

Surrey, B.C.
November 2023



Office of the Mayor
@SurreyMayor · Follow

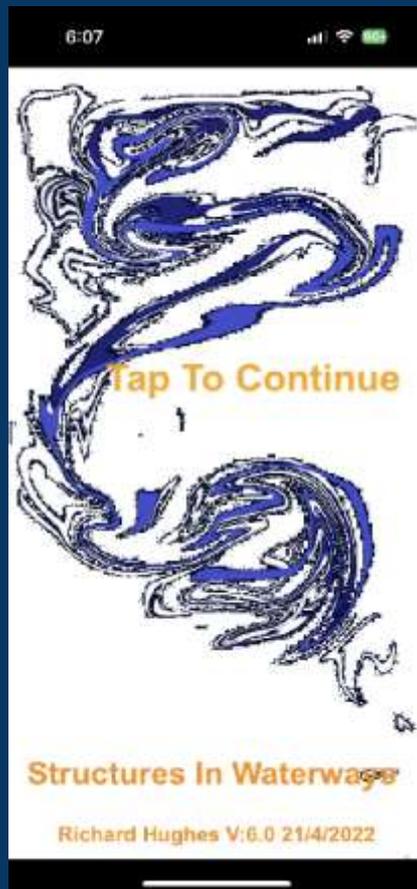


It was so exciting to celebrate the completion of an innovative project at Bon Accord Creek this week. For the first time in 70 years, salmon are able to swim through this channel thanks to 'flexi-baffles' being installed.



Structures in Waterways Management

Field Application



Desktop Application

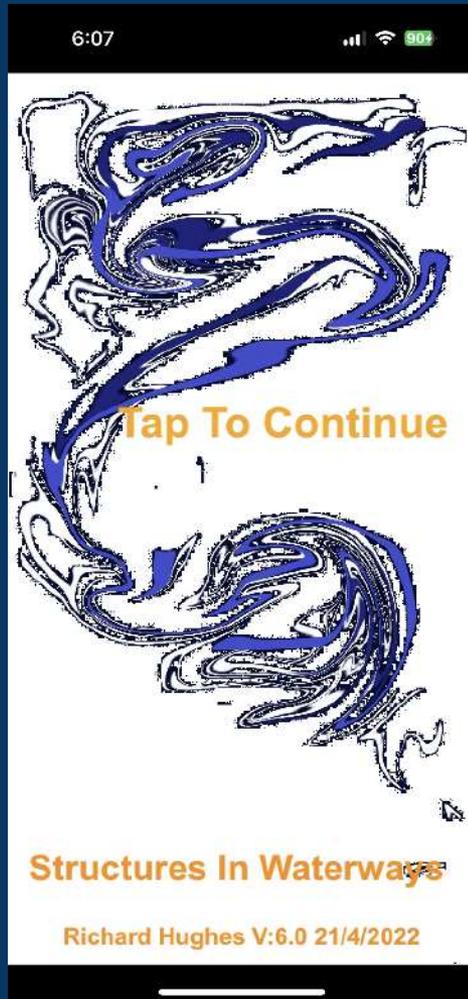


Structures in Waterways Management

1. A web-based tool to identify, classify and manage fish passage barriers
2. Composed of Field Assessment and Desktop Applications
3. Based on ArcGIS or similar .csv data
4. Can filter (i.e., prioritize) fish passage barriers based on your criteria

Structures in Waterways Database

Field Application

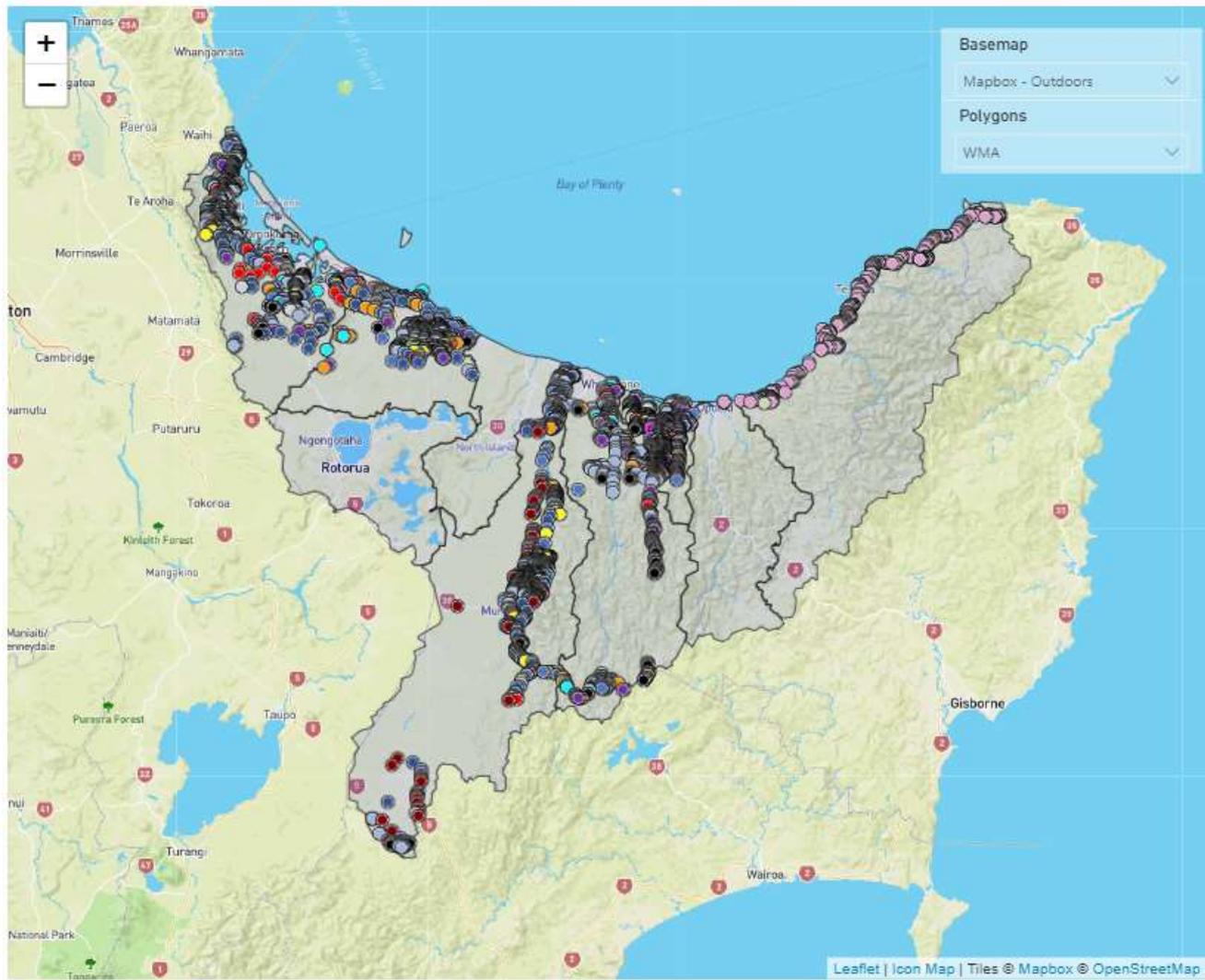


New Zealand – Bay of Plenty

Desktop Application

- Dashboard
- Map**
- Sankey

- All
 - Current only
 - History only
- Status**
- Select all
 - Assessments
 - 1 Not currently a barrier
 - 2 Fish passage remediation fitted
 - 3 Structure requires maintenance
 - 4 Barriers
 - 5 Physical
 - 6 Requires further investigation
 - 7 Natural Feature
 - 8 Dry and/or little or no upstream aquatic habitat
 - Desktop data
 - 0 Not assessed - From desk-top
- Water Management Area**
- Select all
 - East Coast
 - Kaituna, Maketu and Pongakawa
 - Ohiwa Harbour and Waiotahi
 - Rangitāiki
 - Tauranga Harbour
 - Unknown
 - Wairoa and Otara
 - Whakatane and Tauranga
- Catchment**
- Select all
 - Kaituna
 - Mōtū
 - Ōhiwa
 - Pongakawa
 - Rangitāiki
 - Tauranga Harbour
 - Unknown
 - Waitahanui
 - Whakatāne



New Zealand – Bay of Plenty

Desktop Application

- Dashboard
- Map
- Sankey

Status

- Select all
- Assessments
 - 1 Not currently a barrier
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Catchment

- Select all
- Kaituna
- Mōtū
- Ōhiwa
- Pongakawa
- Rangitāiki
- Tauranga Harbour
- Unknown
- Waitahanui
- Whakatāne

Date

- Select all
- (Blank)
- 2008
- 2013
- 2014
- 2015
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023

3,489

Total Sites

908

Barriers Identified

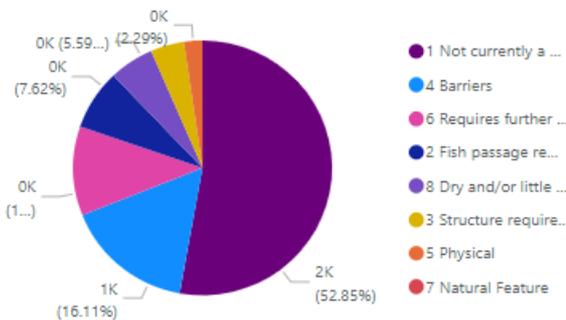
266

Barriers Remediated

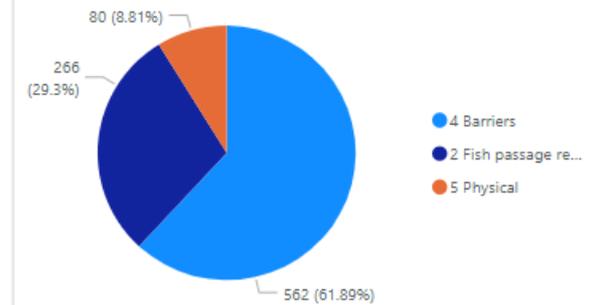
642

Barriers to be Remediated

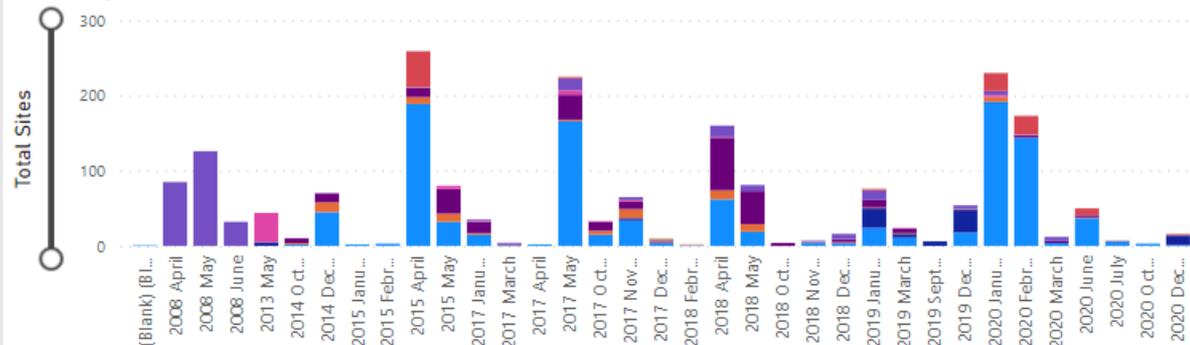
Total Sites



Barriers



Status by Month



New Zealand – Bay of Plenty

Desktop Application

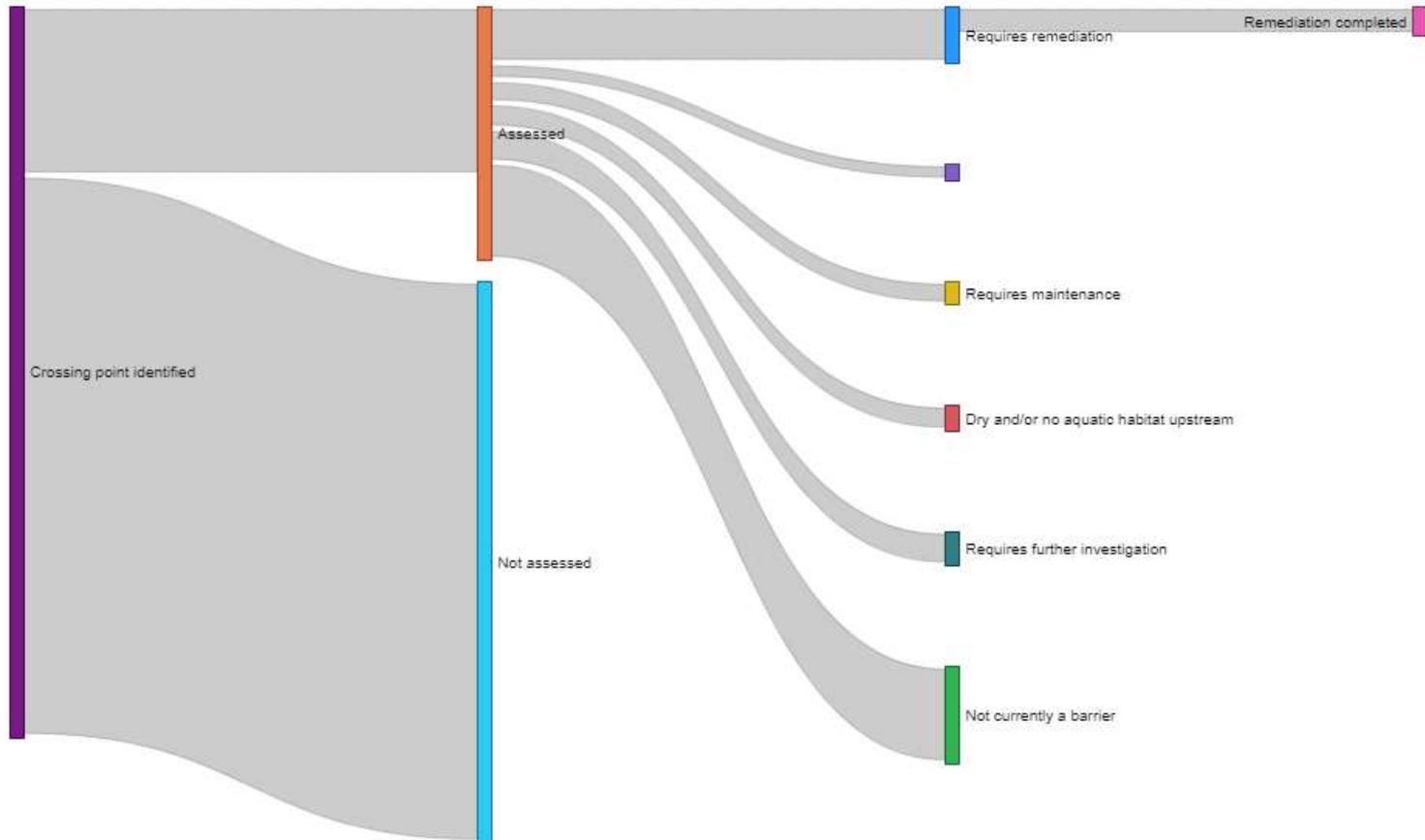
Dashboard

Map

Sankey

ManagementZone

All

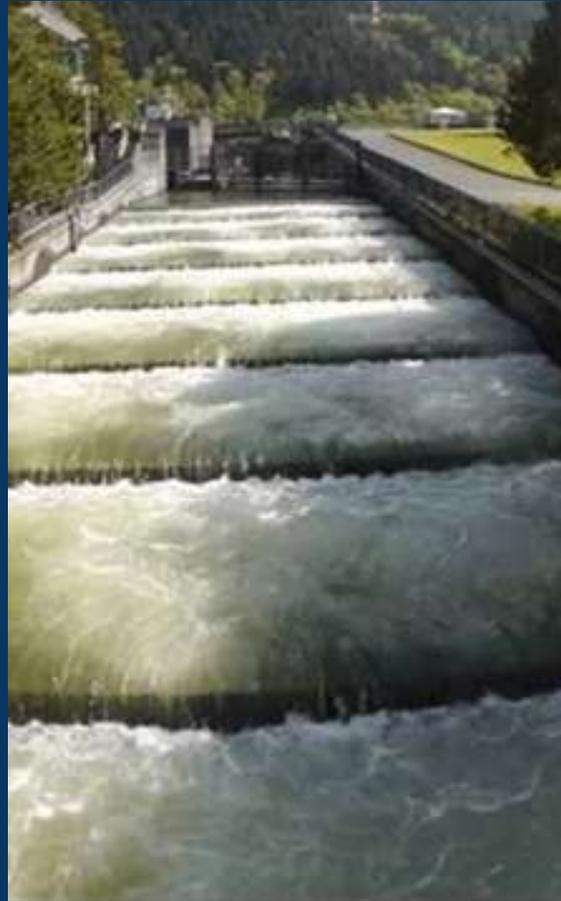


Thank You!

Shane Scott – SSA Environmental

shane@ssaenvironmental.com

(360) 601-2391



Thank You!

Shane Scott – SSA Environmental

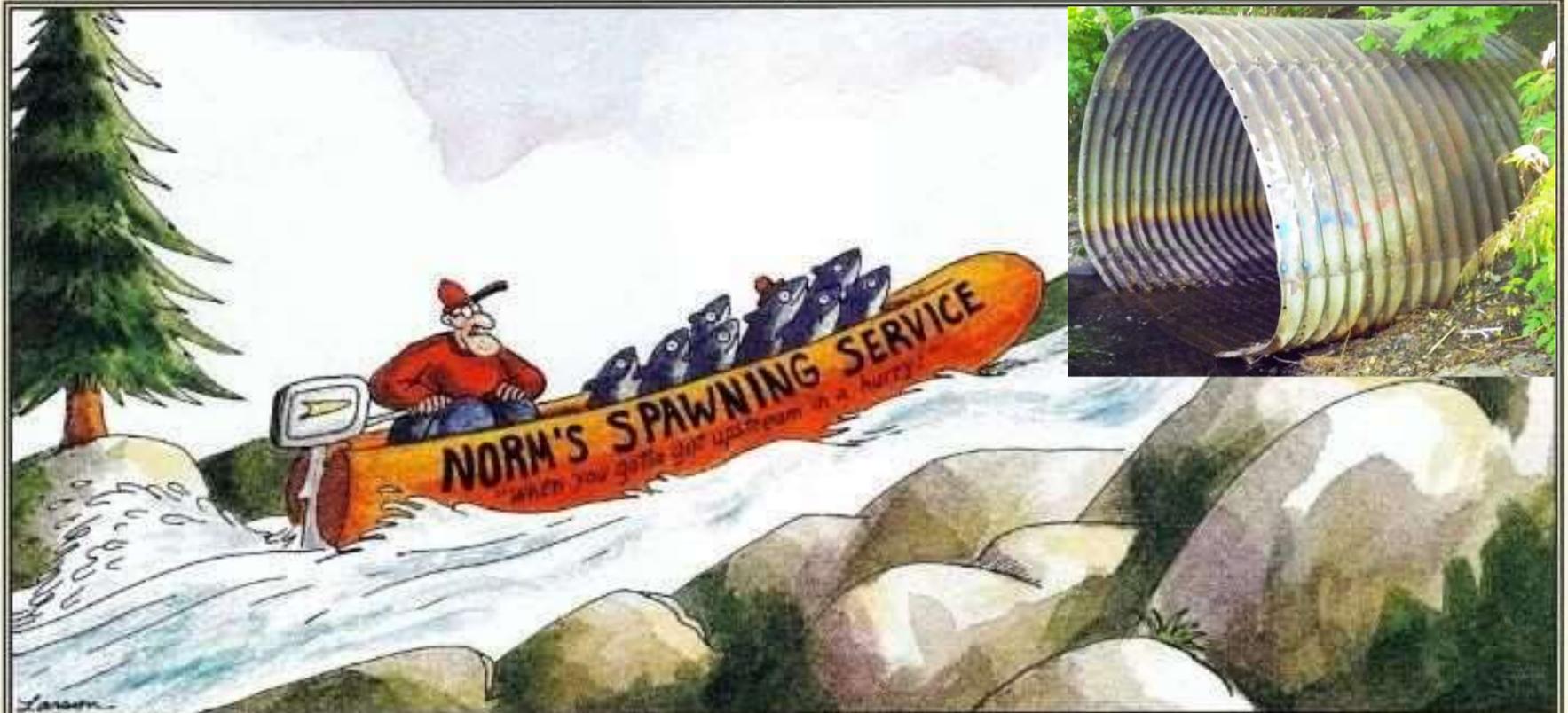
shane@ssaenvironmental.com

(360) 601-2391



SSA Environmental

12/21/86



Sulphur Creek Fish Passage Restoration Project

Napa River Watershed, CA

SRF Conference
March 2024



Background



- Sulphur Creek supports threatened CCC steelhead, Chinook salmon, lamprey
- Sulphur Creek has ~3.2 mi. of perennial spawning, rearing habitat upstream of the project
- Bridge built 1916
- 1916-1950s: Restricted high flows, channel and footing scour



Background (cont.)



- 1950s-2000s: Further scour → armoring of bank & footing, rock revetment, wingwalls
- 2003: Downtcutting → CDFW funded Alaska steeppass fishway using best information available
- 2005: Deemed inoperable during most passage flows by CDFW

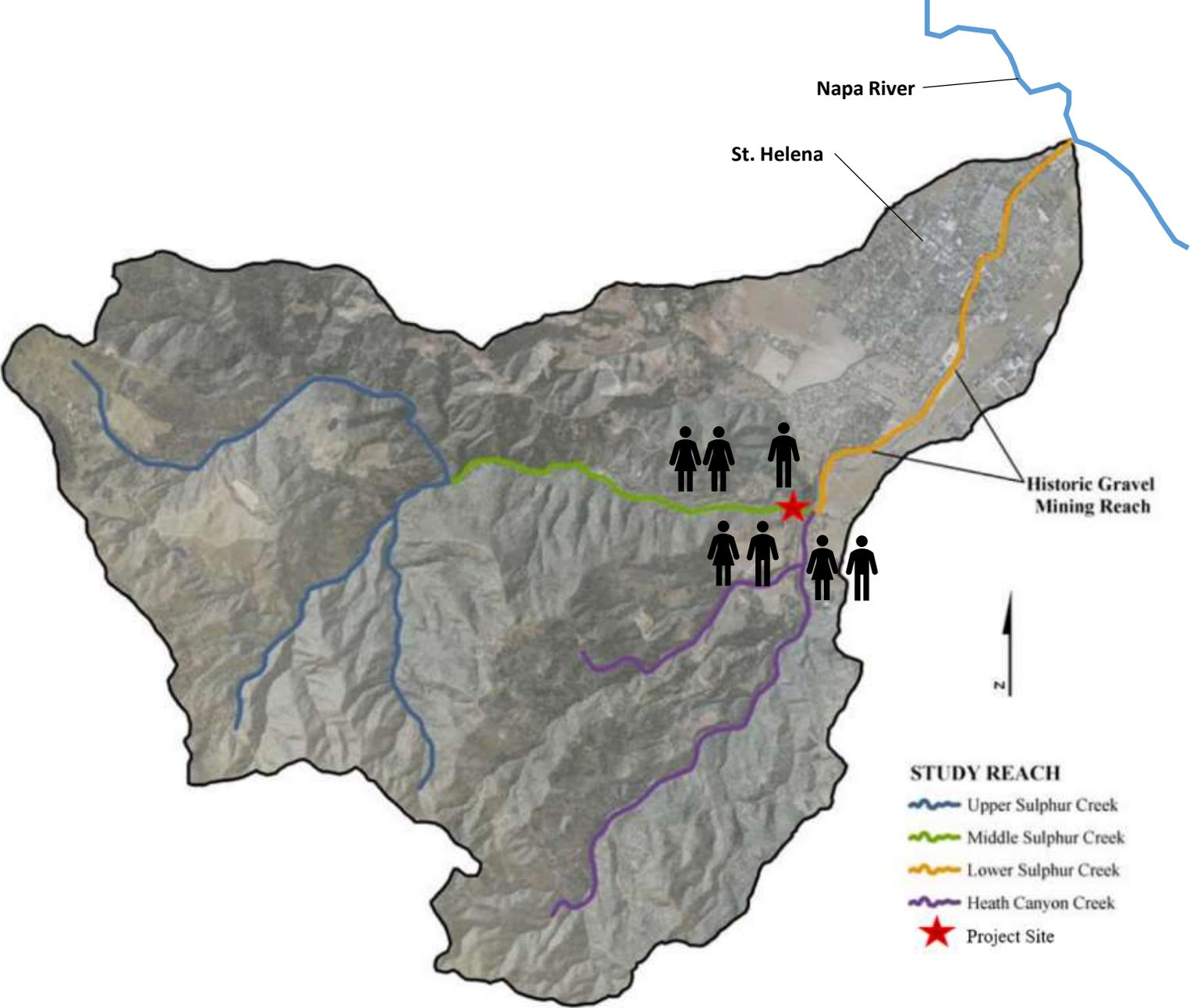


Path Forward

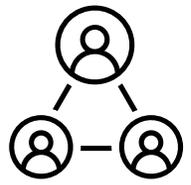
- 2010s - CEMAR, RCD assess priority barrier
- 2013 - Residents request help
- 2018 - RCD invites CalTrout to join
- 2019 – FRGP (RCD)
- 2020 - Coastal Conservancy Prop 1 (CalTrout); CDFW Prop 68 (CalTrout)
- Goals: Access, passage, keep bridge



Project Site Context



- Project upstream of Heath Canyon Creek and Sulphur Creek confluence
- Property privately owned among 4 landowners
- Vineyards on other side use bridge for access
- Different perspectives:
Privacy, access, safety, least cost and effort to keep bridge



Team Approach

Collaborative bi-weekly team meetings
(**zoom**)

Redundancy in agency, consultant
attendance - resilient project
development

Landowners, agency staff part of
decision making



Design Objectives and Constraints

- Objective: Fish Passage for all life stages
- Constraints:
 - Protect Existing Bridge
 - Road Traffic
 - Privacy
 - Erosion
 - Flooding
 - Fire
 - Construction Staging
 - Flows

Table 7. Minimum Stream and Reach Lengths for Selected Life Stages

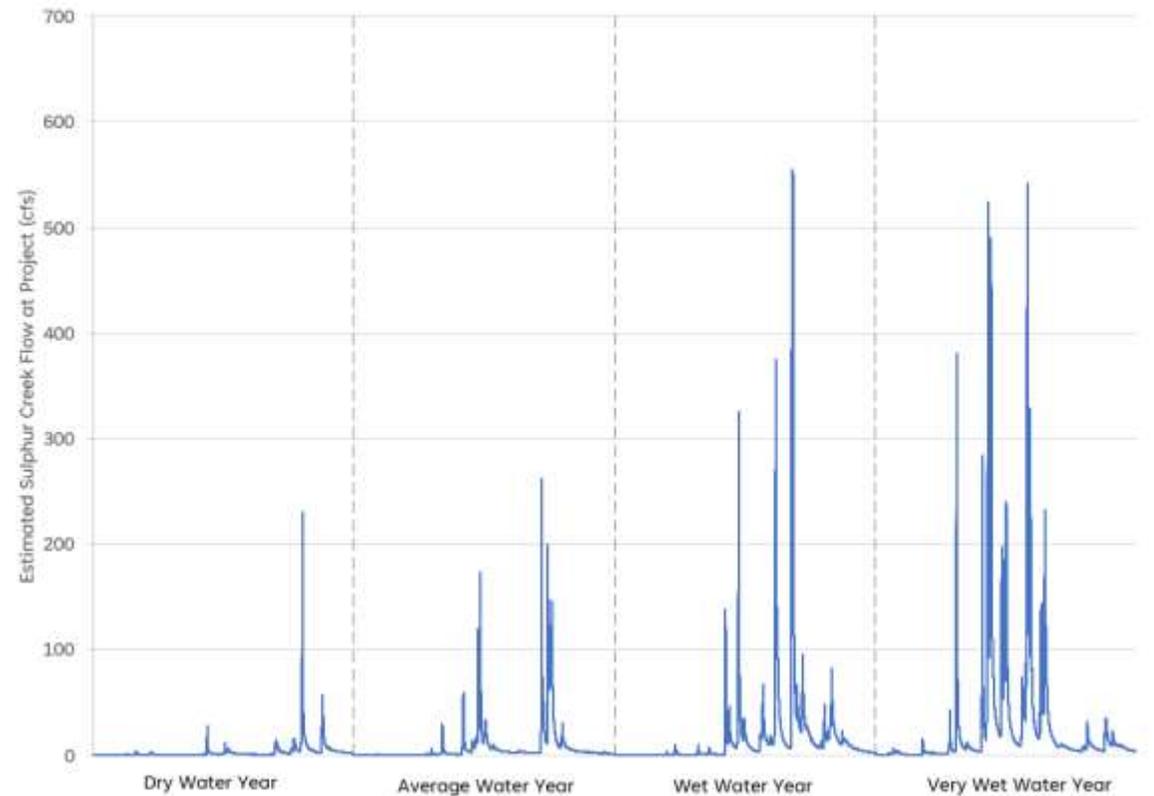
| Species or Life Stage | Minimum Stream Length (ft) | Minimum Reach Length (ft) |
|---|----------------------------|---------------------------|
| Adult anadromous salmonids | 0.8 | 100 |
| Resident trout and juvenile steelhead trout >6" | 0.5 | 100 |
| Juvenile salmonids <6" | 0.3 | 100 |

Stability Thresholds
Fischenich, 2001



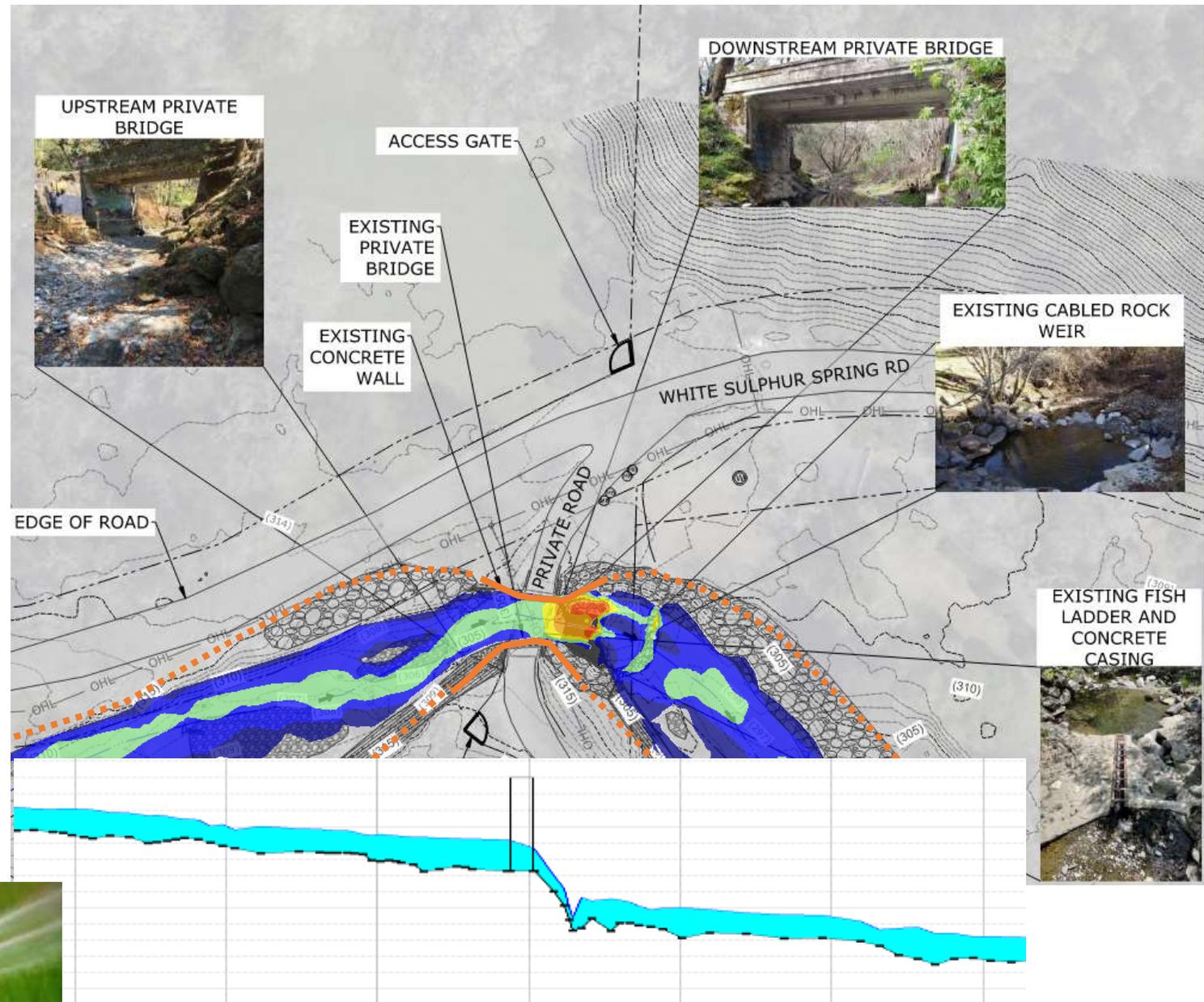
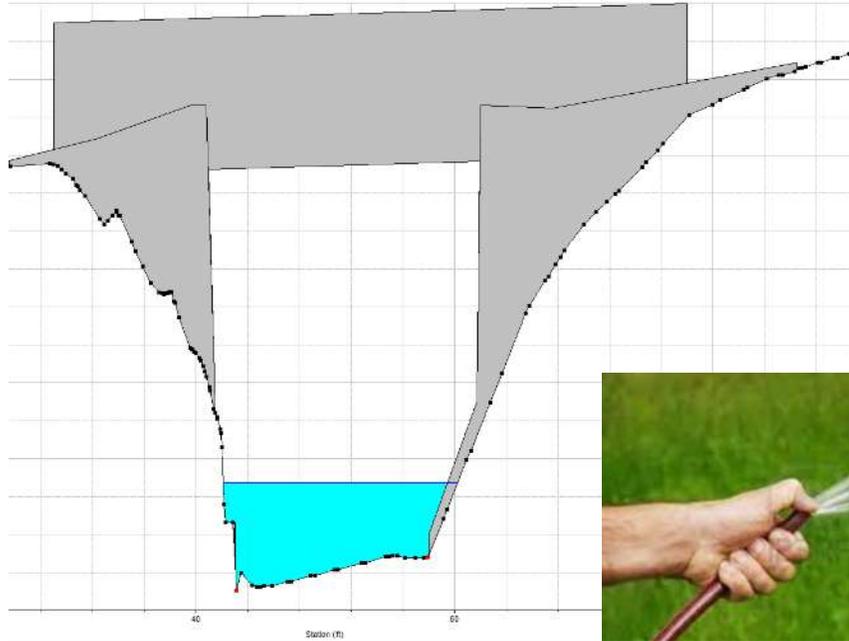
Napa County Fire Code

| Species or Life Stage | Minimum Water Depth | Prolonged Swimming Mode | | Burst Swimming Mode | | |
|---|---------------------|-------------------------|--------------------|---------------------|--------------------|--------------------|
| | | Maximum Swim Speed | Time to Exhaustion | Maximum Swim Speed | Time to Exhaustion | Maximum Leap Speed |
| Adult anadromous salmonids | 0.8 feet | 6.0 ft/sec | 30 minutes | 10.0 ft/sec | 5.0 sec | 15.0 ft/sec |
| Resident trout and juvenile steelhead trout >6" | 0.5 feet | 4.0 ft/sec | 30 minutes | 5.0 ft/sec | 5.0 sec | 6.0 ft/sec |
| Juvenile salmonids <6" | 0.3 feet | 1.5 ft/sec | 30 minutes | 3.0 ft/sec | 5.0 sec | 4.0 ft/sec |

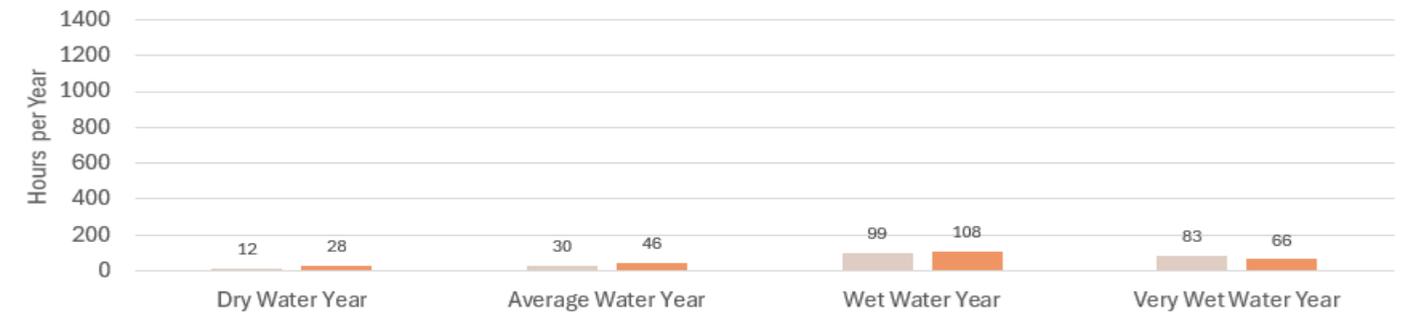
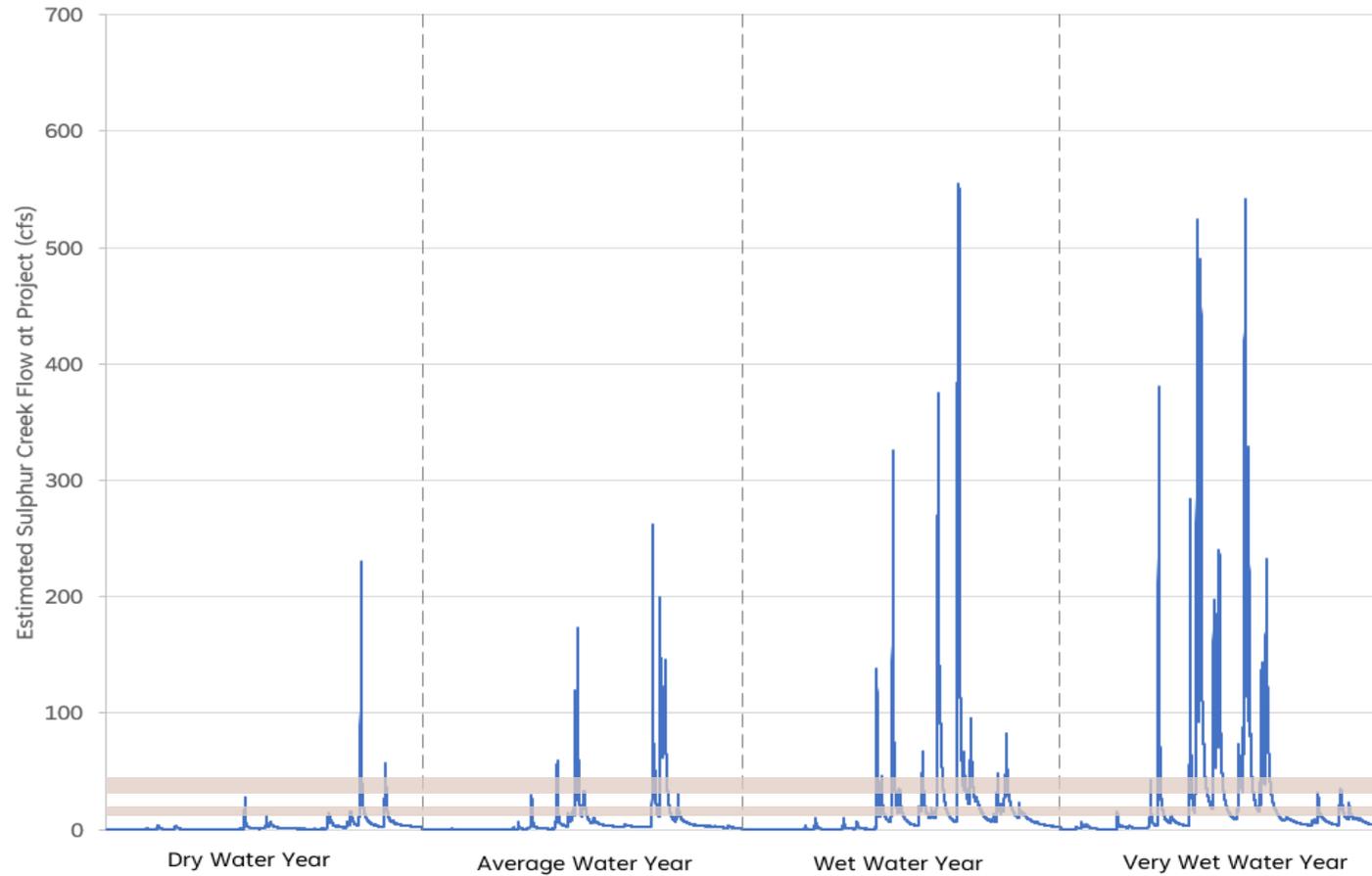


Existing Conditions

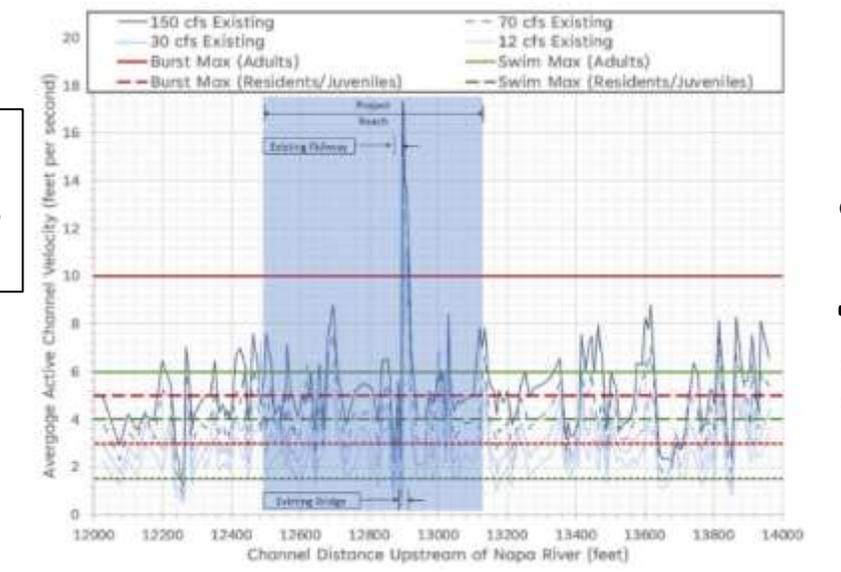
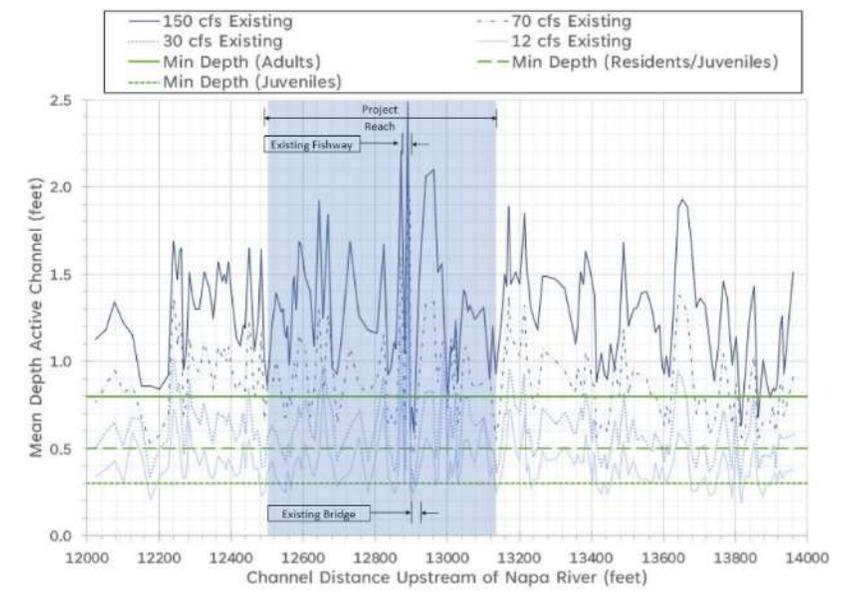
- Channel
 - Avg 2.5% slope
 - Mix of large boulders, cobbles, gravels
 - Bankfull width = 25 to 30 feet
- Bridge
 - Confining Channel = **15 feet wide**
 - Considered historical
 - 5-foot drop at 25% slope
- Existing Concrete and Rock Revetments



Existing Conditions Fish Passage



Existing fish passage flows



■ Adult Existing Passage (30 to 35 cfs)
 ■ Juvenile Existing Passage (12 to 13 cfs)

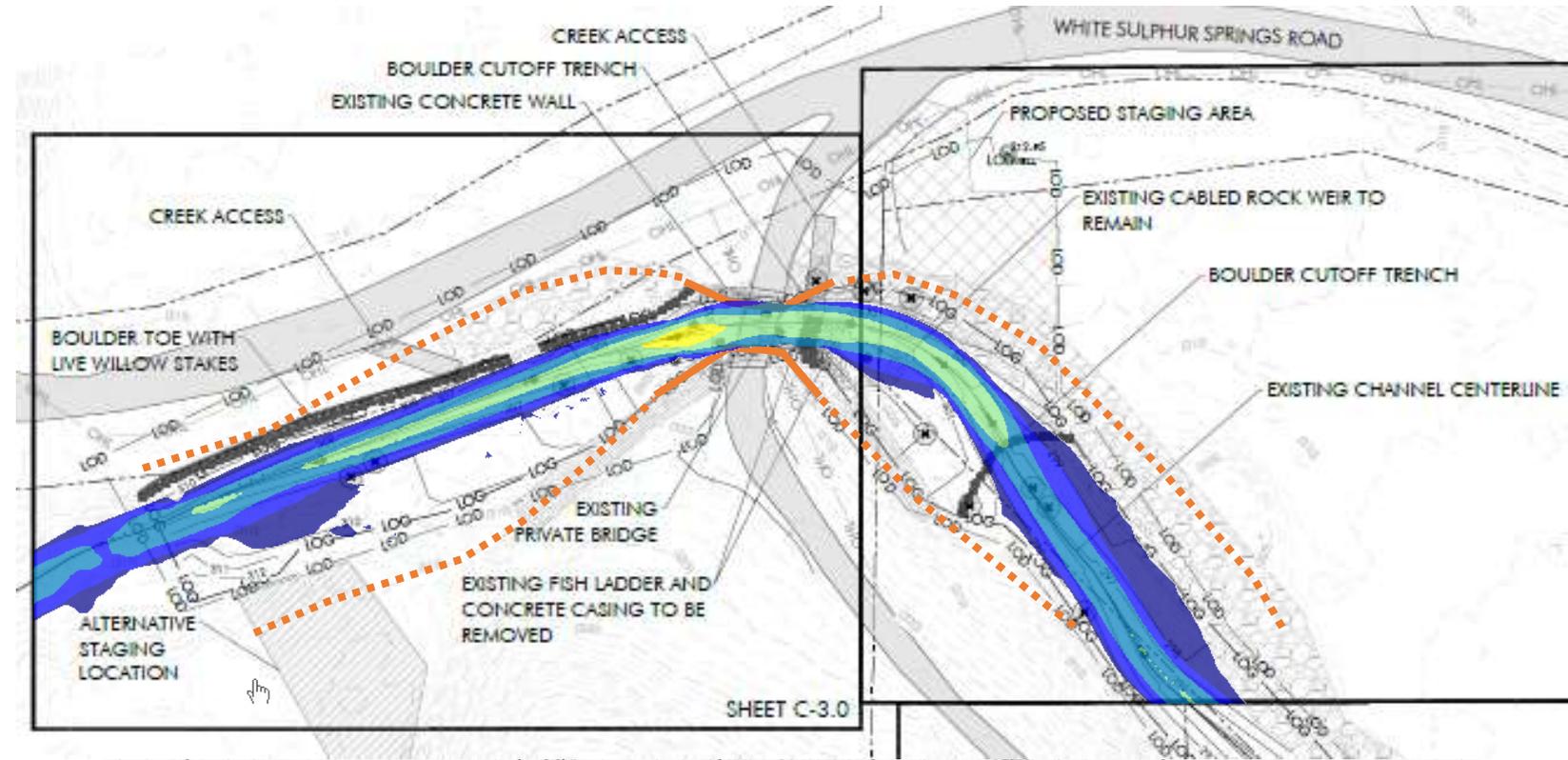
Depth

Velocity

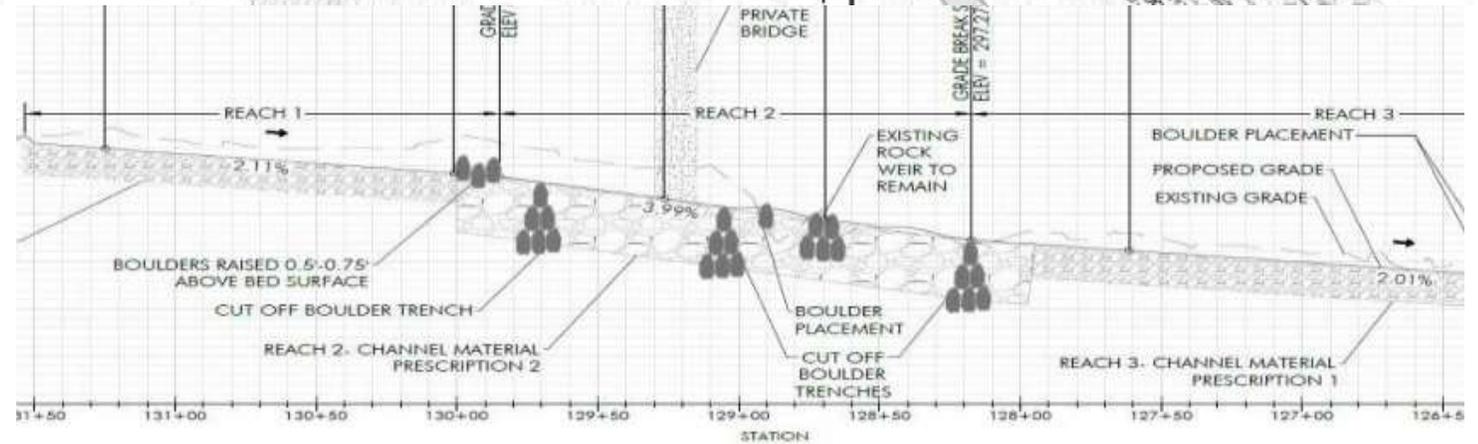
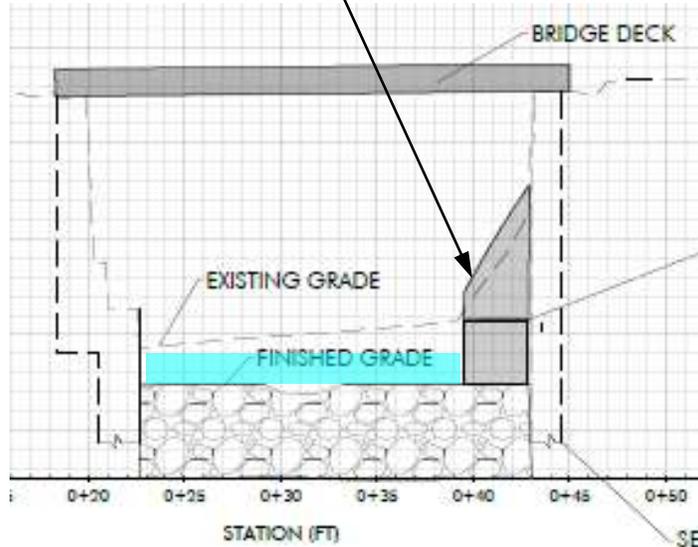


Early Design Prior to CDFW Review

- Narrow Span
- Fish Passage Moderately Improved
- Requires 4' Rock Armoring
- Limits Wildlife Movement along Creek
- Potential for Flooding

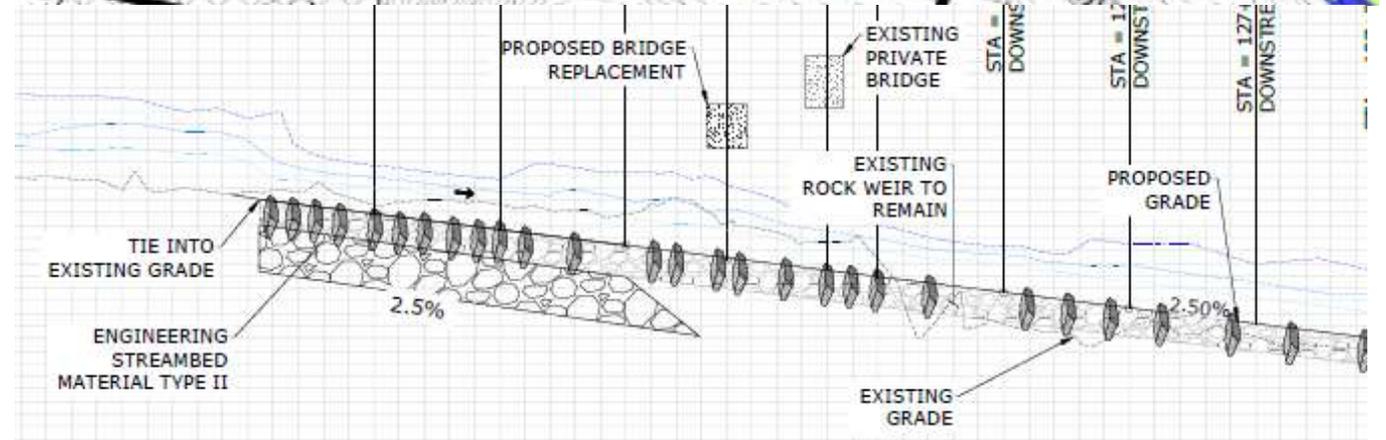
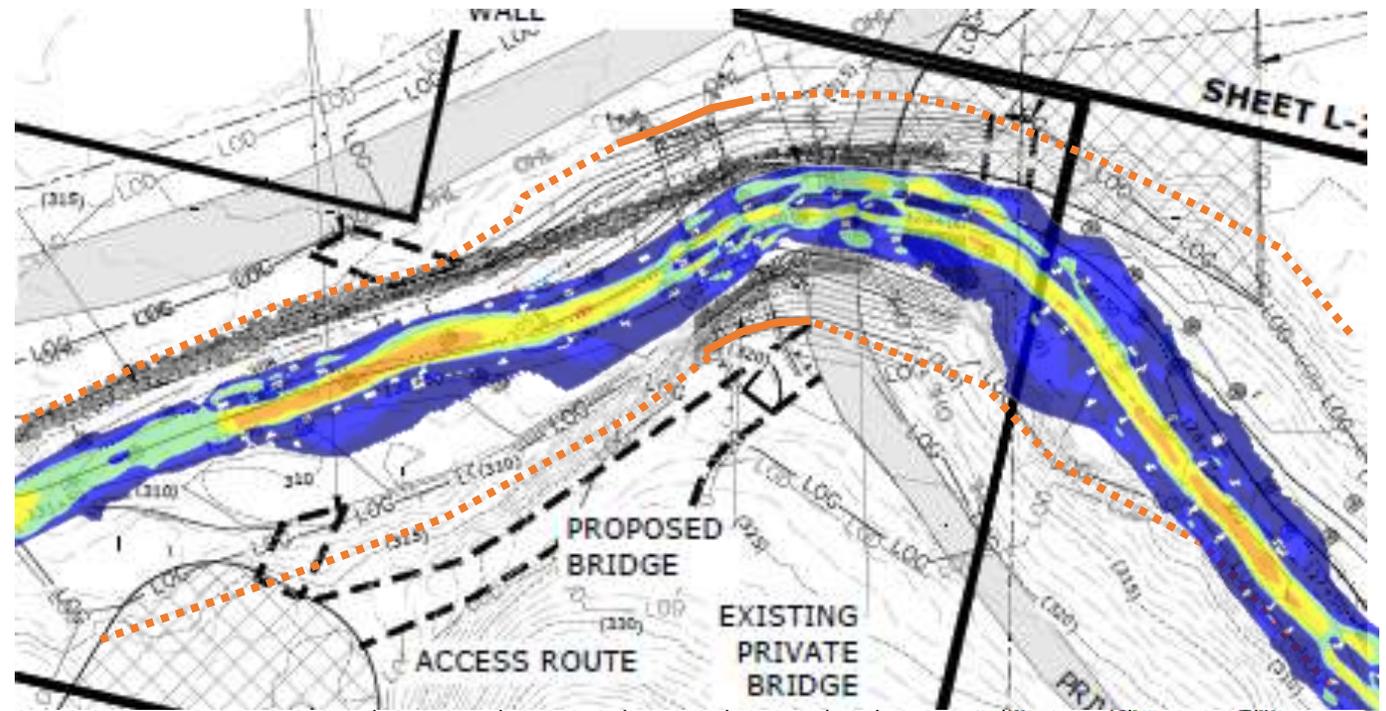
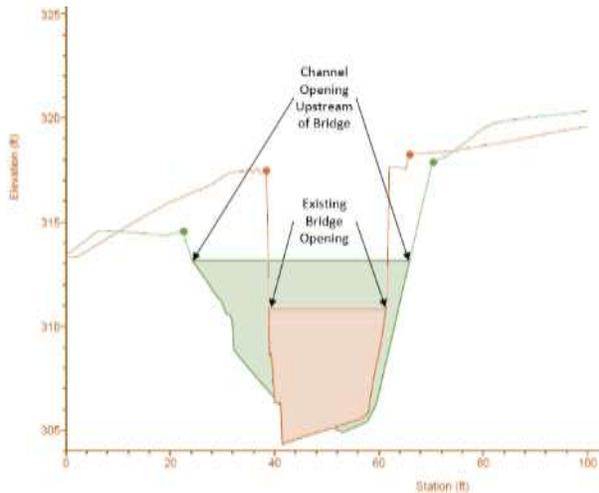
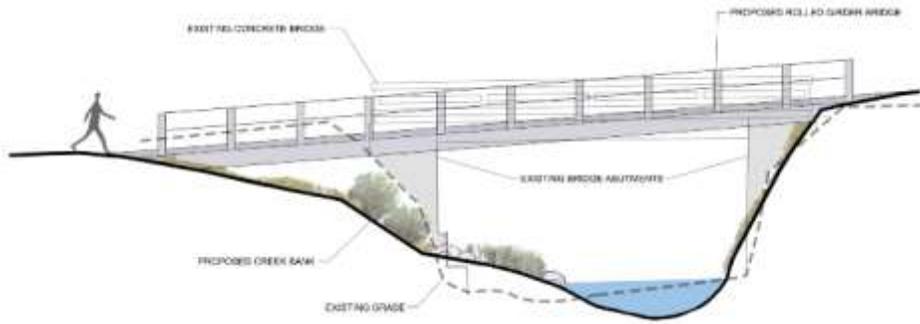


Bridge Retrofit Reduces the Flow Width

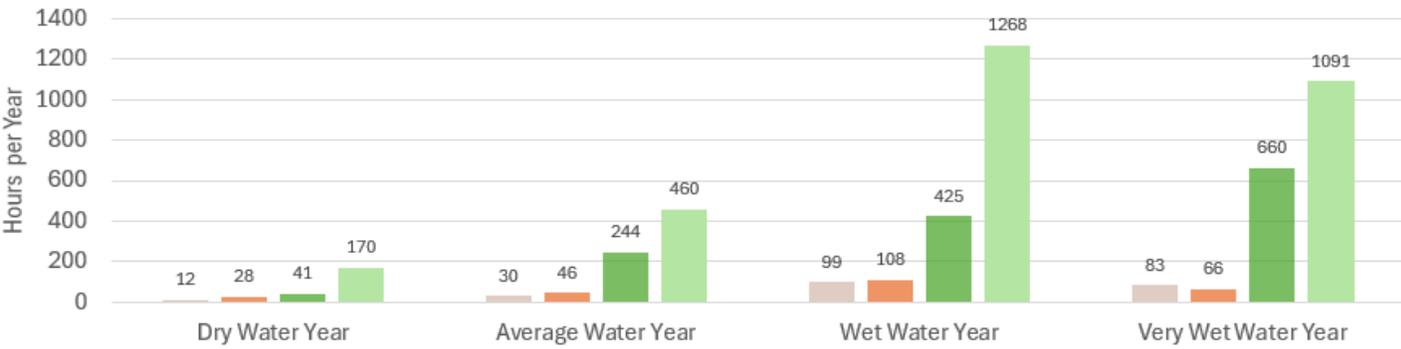
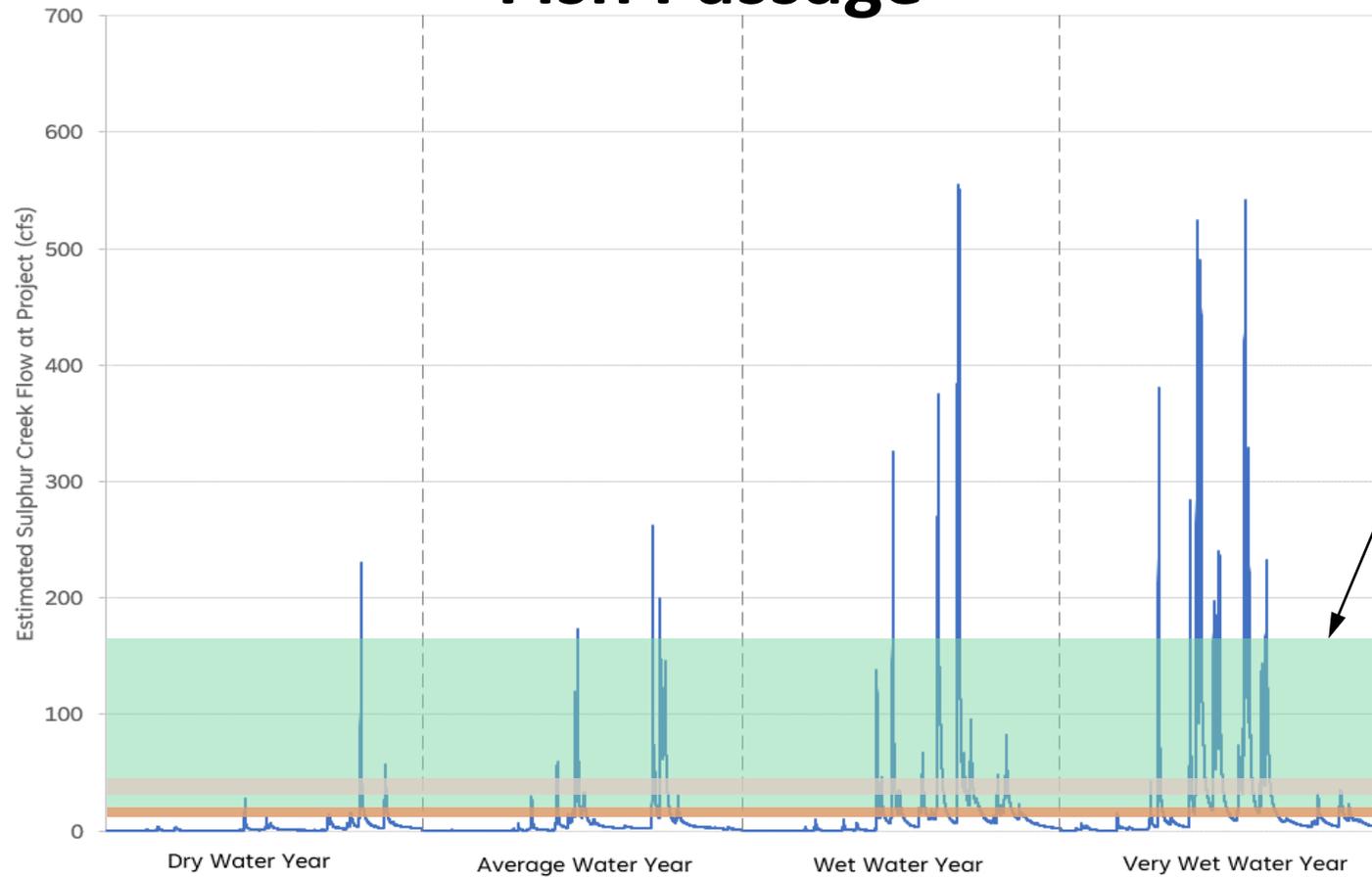


Current Design

- Larger Span
- Fish Passage Greatly Improved
- “Natural” Channel
- Allows for Wildlife Movement along Creek
- Minimal Risk of Flooding

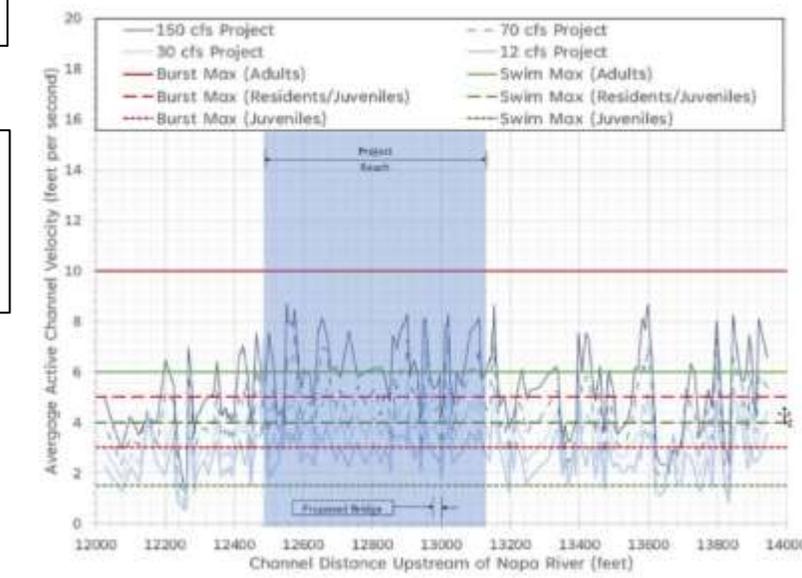
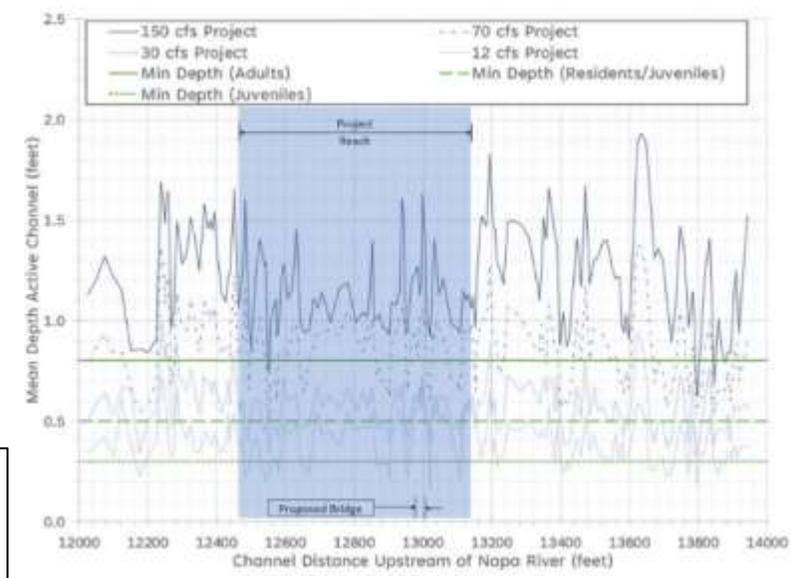


Existing and Project Conditions Fish Passage



Project fish passage flows

Existing fish passage flows



Depth

Velocity

- Adult Existing Passage (30 to 35 cfs)
- Juvenile Existing Passage (12 to 13 cfs)
- Adult Project Passage (30 to 150 cfs)
- Juvenile Project Passage (12 to 70 cfs)



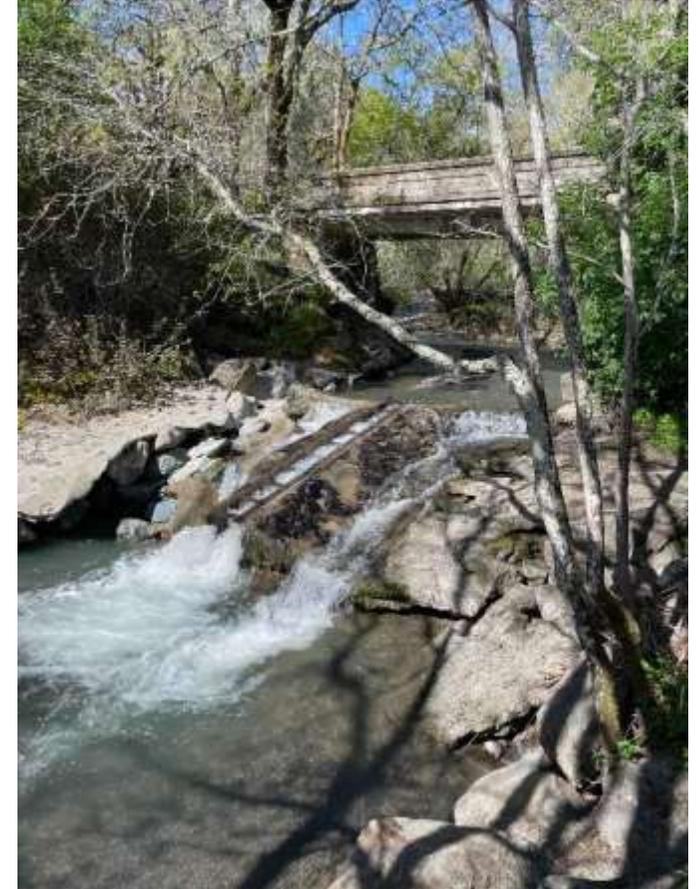
Regulatory Permitting and Environmental Review Process - Overview

- CEQA Environmental Review - **SERP**
- Corps 404 with Sec. 106/SHPO, Tribal Consultations
- Sec. 7 consultation with USFWS & NMFS **PBO**
- RWQCB 401 WQ Certification - **SRGO**
- CDFW 1602 LSAA
- Local permits (County and City)



CEQA – Statutory Exemption for Restoration Projects (SERP)

- Napa RCD (lead agency) determination – SERP qualified
 - Replacing bridge was considered restoration
- Application to concurrence - 60 days
- Time saved: 3 months (IS/MND), 6 months (EIR)
- Money saved: \$18,000 (IS/MND), \$40,000 (EIR)
- Collaborative process w/CDFW



Regulatory Permitting – Corps Sec. 404 & Section 7 Consultation

- NWP 27 – Aquatic Habitat Restoration
- Sec. 106 & SHPO – Historic Bridge (almost)
- NMFS Santa Rosa Office Programmatic BO
 - ✓ Incorporated conservation measures
 - ✓ NOAA Restoration Center
- USFWS Informal Consultation - Northern spotted owl



Regulatory Permitting – RWQCB

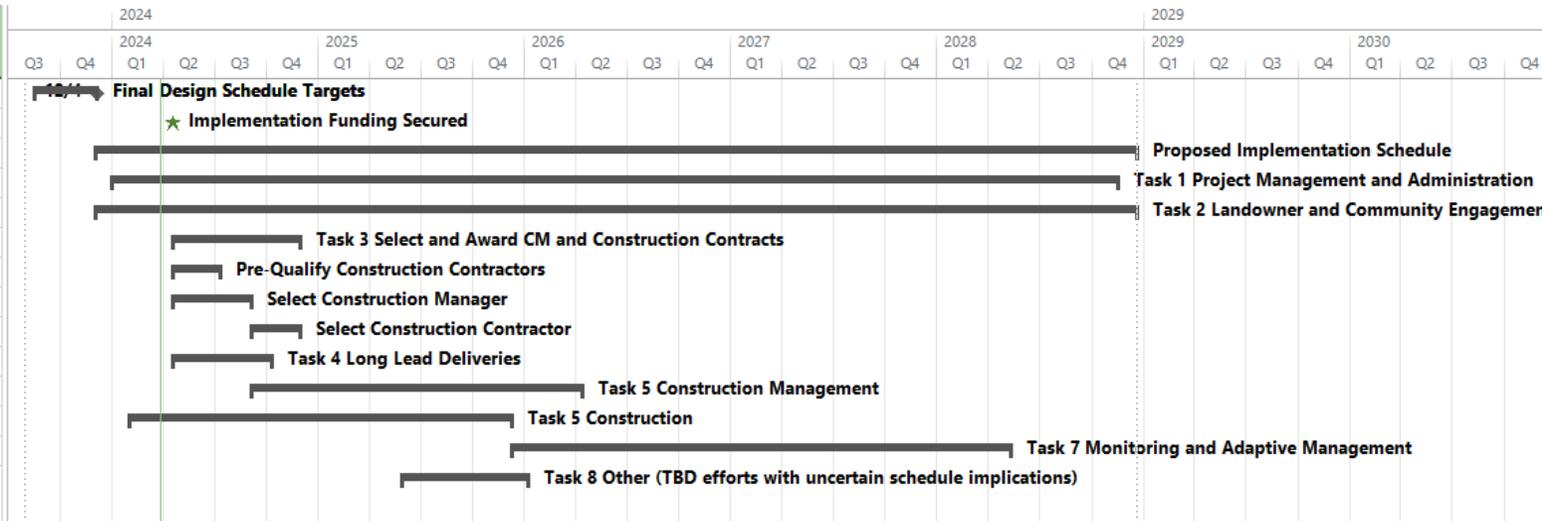
- 401 Statewide Restoration General Order (SRGO)
- Alternative pathway for efficient permitting
- Lengthy back-and-forth w/ RWQCB
 - Channel and rock slope protection designs
 - Bridge design
 - Stormwater management
 - Native plant success, invasive plant cover standards
 - Vegetation and channel morphology monitoring
 - Monitoring period



Implementation Timeline

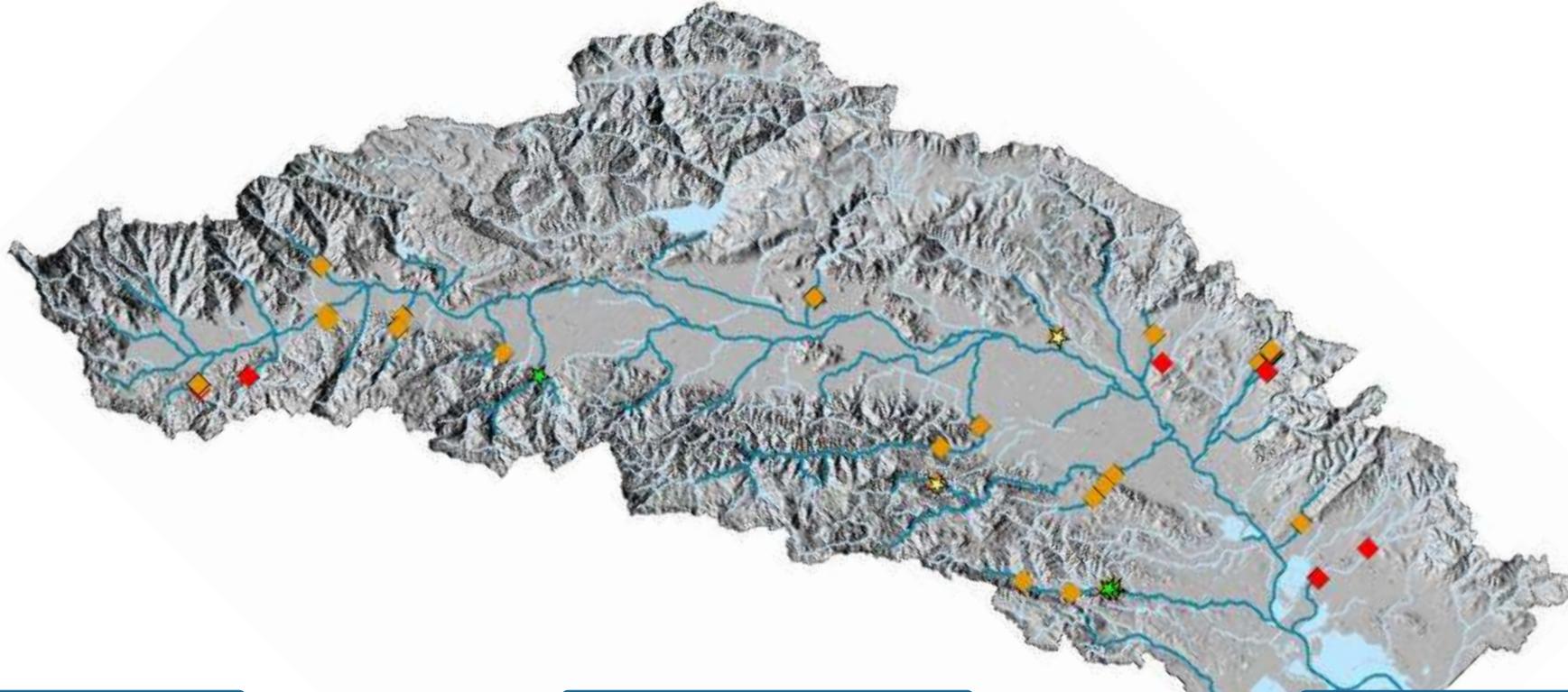
- Reasonable timeline
 - Construction support contracting, long lead material procurement, local permit submission, and contractor selection ~2024
- Tentative Construction Start ~ 6/1/2025

| Task Name | Duration | Start | Finish |
|--|-----------|--------------|--------------|
| 1 ▸ Final Design Schedule Targets | 77 days | Fri 8/18/23 | Mon 12/4/23 |
| 15 Implementation Funding Secured | 1 day | Wed 4/17/24 | Wed 4/17/24 |
| 16 ▸ Proposed Implementation Schedule | 1321 days | Mon 12/4/23 | Tue 12/19/28 |
| 17 ▸ Task 1 Project Management and Administration | 1277 days | Mon 1/1/24 | Thu 11/16/28 |
| 21 ▸ Task 2 Landowner and Community Engagement | 1321 days | Mon 12/4/23 | Tue 12/19/28 |
| 29 ▸ Task 3 Select and Award CM and Construction Contracts | 162 days | Thu 4/18/24 | Thu 11/28/24 |
| 30 ▸ Pre-Qualify Construction Contractors | 60 days | Thu 4/18/24 | Tue 7/9/24 |
| 33 ▸ Select Construction Manager | 101 days | Thu 4/18/24 | Wed 9/4/24 |
| 37 ▸ Select Construction Contractor | 61 days | Thu 9/5/24 | Thu 11/28/24 |
| 41 ▸ Task 4 Long Lead Deliveries | 126 days | Thu 4/18/24 | Wed 10/9/24 |
| 44 ▸ Task 5 Construction Management | 420 days | Thu 9/5/24 | Mon 4/13/26 |
| 48 ▸ Task 5 Construction | 487 days | Thu 2/1/24 | Tue 12/9/25 |
| 80 ▸ Task 7 Monitoring and Adaptive Management | 630 days | Wed 12/10/23 | Tue 5/9/28 |
| 88 ▸ Task 8 Other (TBD efforts with uncertain schedule implications) | 160 days | Thu 5/29/25 | Tue 1/6/26 |



Next Step - Fundraising

- Complete bridge replacement and channel regrading construction
- Napa River Watershed Fish Barrier Project Pipeline + Community Engagement



Assessment &
prioritization
~35 barriers



Designs &
Permits
5 barriers



Future
Implementation



Key Lessons

- Teamwork and communication lead to trust and resiliency
- Going slow may be needed to get to a solution that lasts
- Let's work together to refine new tools for streamlined permitting



Thank you

Landowners, Residents, Project Partners, and Funders



The Nature
Conservancy

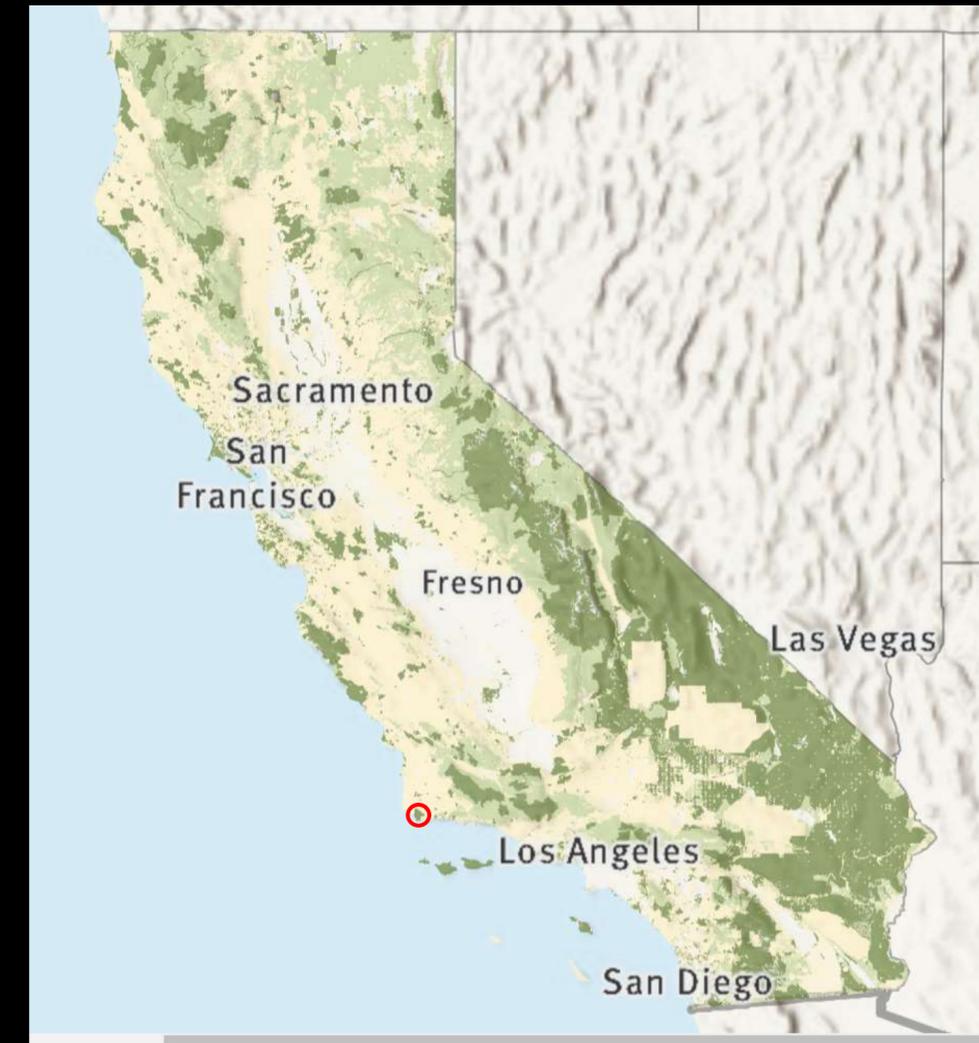


Explosives, Helicopters and Hard Work: Restoring Steelhead to Jalama Creek

Salmonid Restoration Federation – March 29, 2024

LAURA RIEGE, JEFF KOZLOWSKI, MEREDITH HARDY, BRENDAN BELBY, DAVID KAPLUS, RACHEL ROBIN, WALTER HEADY, JEANETTE HOWARD, BEN HERBERT, KEITH MILLER, TESSA ARTRUC

Jack & Laura Dangermond Preserve





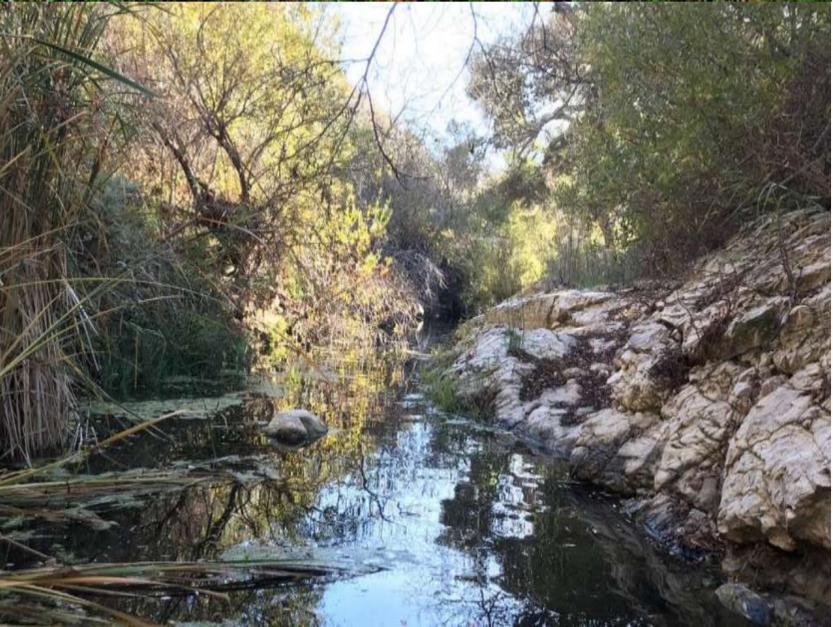


We respectfully acknowledge the preserve is located on the ancestral lands of the Chumash people who stewarded the land for generations and who continue to live and work in the area.



By the Numbers

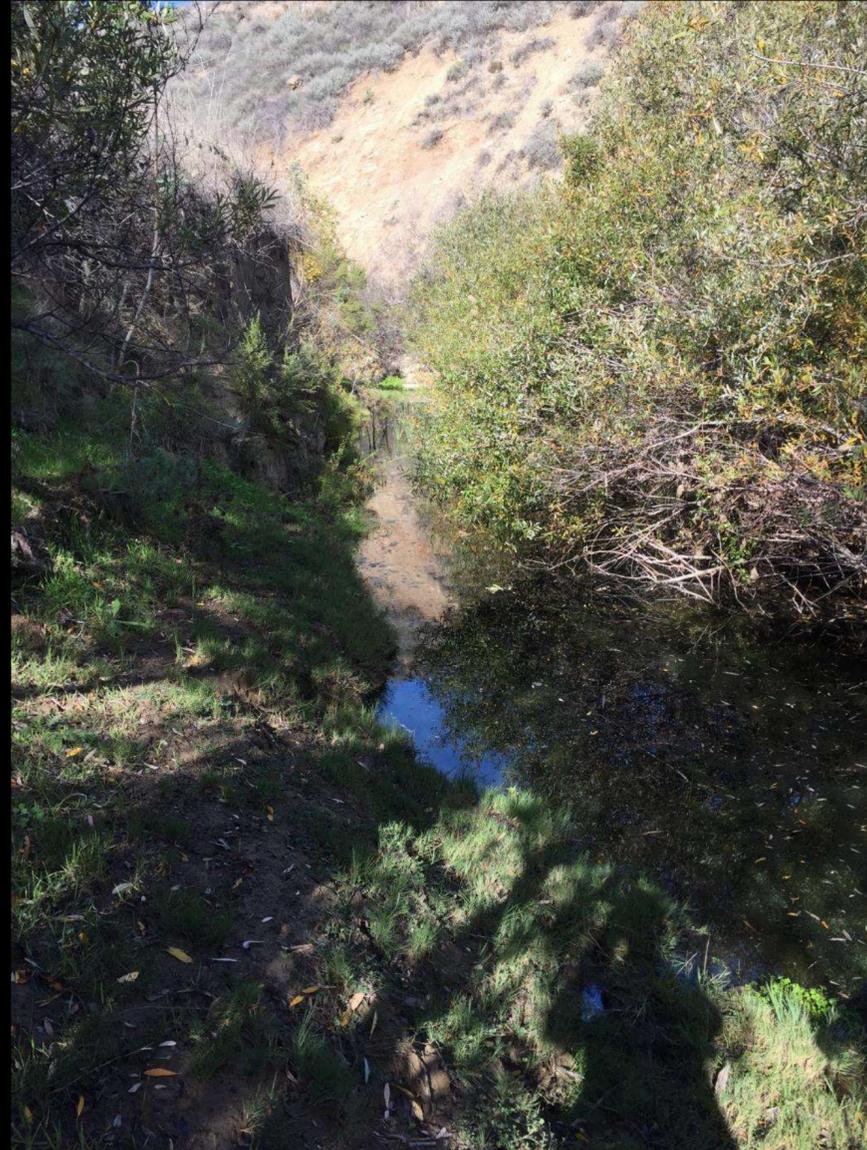
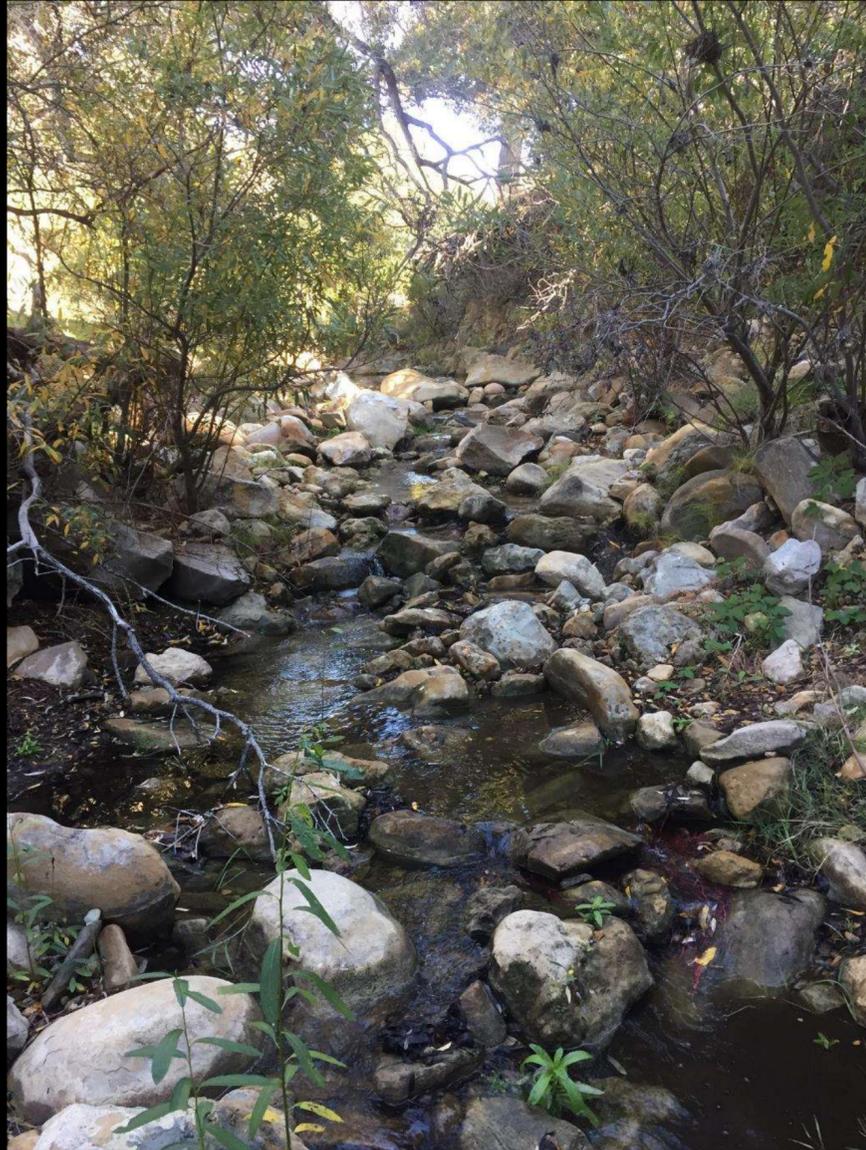
- Nearly 25,000 acres
- Land-sea protection – Pt Conception State Marine Reserve (22 mi²)
- 8 miles of coastline
- 78 miles of streams
- 300 acres of wetlands
- 50 natural communities
- 700 species
- 60 species of concern
- 14 threatened & endangered species
- 94% of the Jalama Creek Watershed



Jalama Creek Watershed Uses



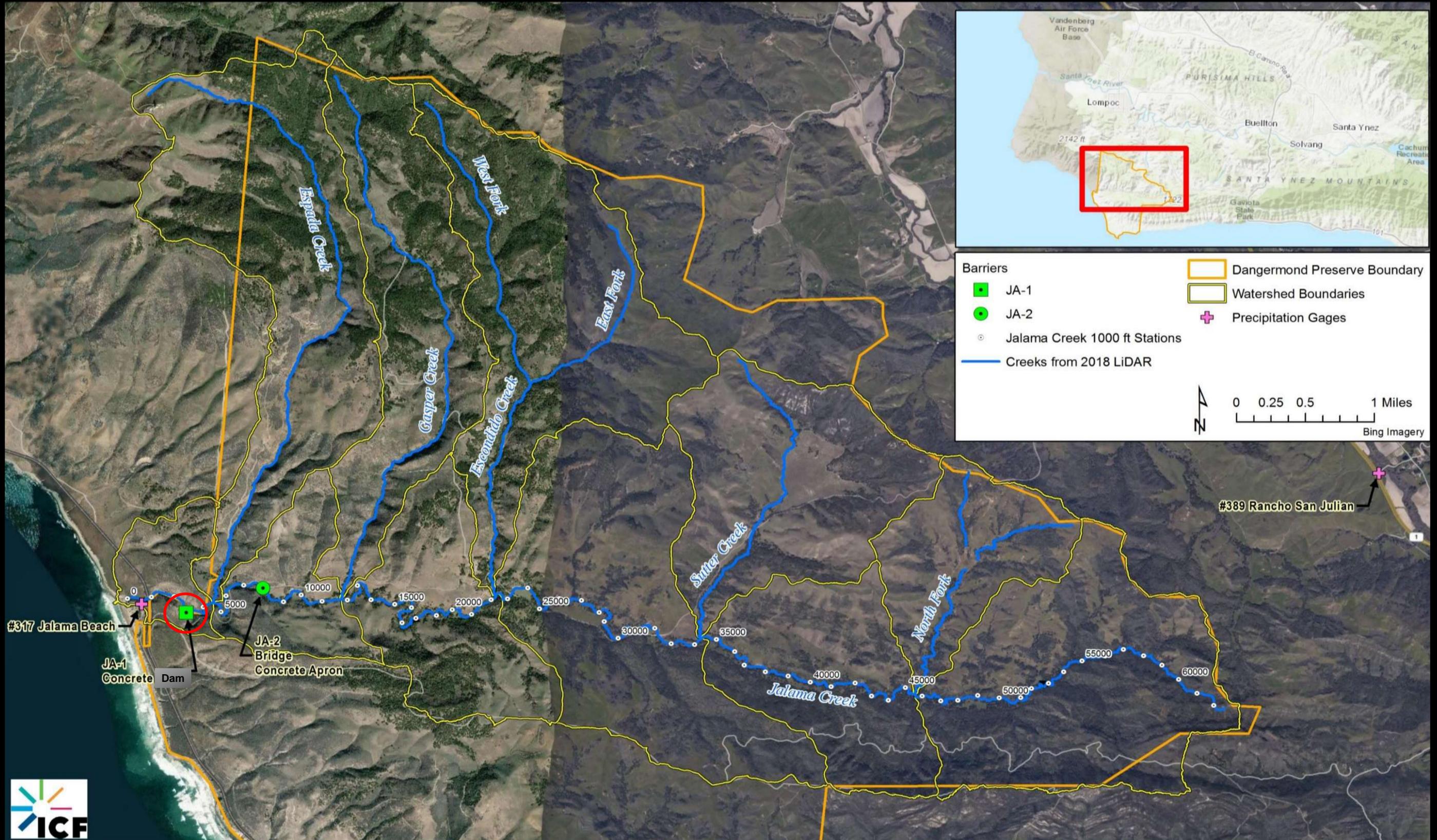
Habitat Opportunities and Challenges



Multi-species Benefits



Jalama Creek Watershed



Barrier JA-1

Built in 1968

38' channel spanning concrete dam for agricultural irrigation

1-foot above bed

4.5-foot-long (stream length)

Blocks steelhead passage under most flow conditions



Location, location, location



Helicopters



Removal Approach



- CCC access on foot via VSFB
- Dewater the creek to protect CA red-legged frogs, fish/steelhead, pond turtles
- Break up concrete
- Load concrete into megabags
- Helicopter lift megabags to staging area
- CCC digs a starter channel
- Winter storms will reset the creek
- September 1 – November 1

What is environmentally best way to break up concrete?



Image © Warner Bros



Photo Credit: Keith Miller

Explosives



Photo Credit: David Karplus

Hard Work



Success!





Photo Credit: Walter Heady

Science: how will stream condition respond to dam removal?

- Before After Control Impact (BACI)
- Surface Water Ambient Monitoring (SWAMP)
- Stream condition
- Benthic macroinvertebrates
- Stream response to removal
- Recovery time

- Snorkel Surveys for fishes



Photo Credit: Walter Heady

Redd Surveys

- Collaboration with CDFW
- Before and After



Results

SWAMP BACI – only before collected

Visual differences between before and after

Redd Surveys – none so far



Photo Credit: Walter Heady



Photo Credit: Walter Heady

- Snorkel Surveys:
- Before: Stickleback were found only below JA-1
- After: found further upstream
- No *O. mykiss* observed... yet...

Stay tuned for more!

Up Next: Barrier JA-2



Santa Barbara County's Jalama Road crossing
2-foot-high, 13-foot-long (stream length) concrete apron
spans creek width



Upstream



Downstream

Jalama Creek Uses



Conclusions

- Southern CA Steelhead are tough & resilient
- Evolved with fire and climate extremes
- Jalama Creek is strategically located for regional recovery
- Under TNC's management, Jalama Creek is open for business



© Sesame Street

JA-1 Team



Laura Riege, TNC



Walter Heady, TNC



Keith Miller, TNC
Meredith Hardy, CCC



Ben Herbert, CCC



David Karplus
Foothill Blasting



Rachel Robin, ICF



California Conservation Corps
Santa Maria Center



Jeff Kozlowski, ICF
Brendan Belby, Stantec
Kevin McKay, ICF



Tessa Artruc, ICF



Chanse Adams-Zavalla
Santa Ynez Band Chumash
Indians



Aspen Helicopter

Thank you to our funders, partners, and supporters

Project Funding:

Project design: *CDFW - Fisheries Restoration Grant Program*

Implementation: *Infrastructure Investment Jobs Act/NOAA Fisheries*



Funding, Engineering Review
Habitat, Spawner & Snorkel Surveys



Funding, Engineering Review,
Permit Streamlining
NOAA Veteran's Program



Santa Barbara Co Public Works
Engineering Review



Engineering Design,
Implementation, Monitoring



Implementation &
Monitoring



Foothill Blasting
Design & Implementation



Design Review
Permit Streamlining



Design Review
Permit Streamlining



Vandenberg Space Force Base
Design Review
Site Access

Thank You

The Nature
Conservancy 

Pulling Back the Redwood Curtain

Revealing the Ecological Challenges of Abandoned Cannabis Cultivation Sites in Remote Landscapes

41st Annual Salmonid Restoration Conference
Santa Rosa, CA - March 29, 2024



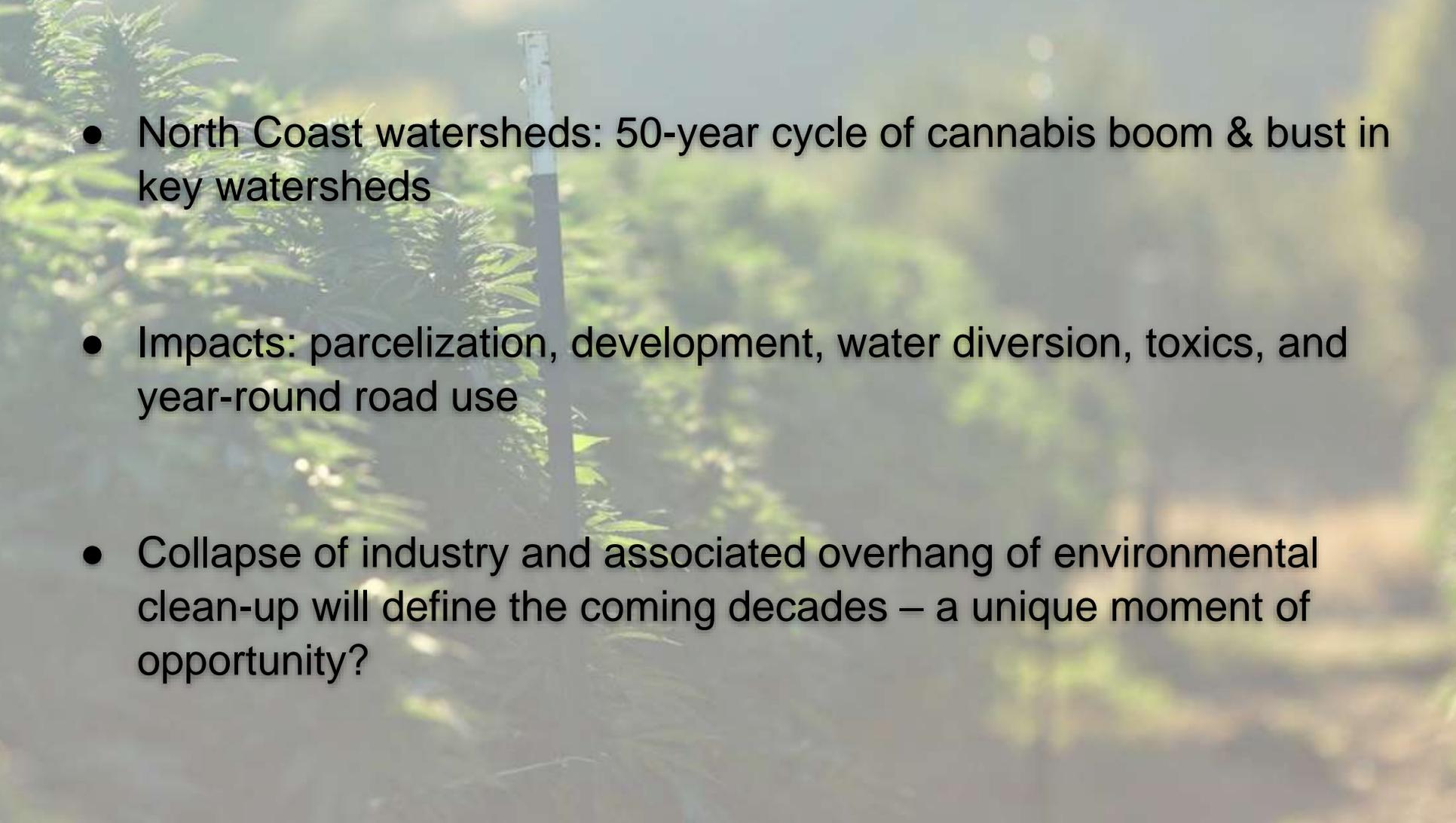
Drew Barber, Senior Ecologist
drew@vollmarconsulting.com



Chris Larson, Managing Director
chris@alderpoint.com



Mason London, Principle
naiadbiological@gmail.com

- 
- North Coast watersheds: 50-year cycle of cannabis boom & bust in key watersheds
 - Impacts: parcelization, development, water diversion, toxics, and year-round road use
 - Collapse of industry and associated overhang of environmental clean-up will define the coming decades – a unique moment of opportunity?

How did we get here?

Cannabis gained value and became popular to cultivate in the 1970's, centered on the remote "Emerald Triangle"

1970s-1990s: Underground cannabis economy

- drove parcelization of timber & ranch lands with accompanying watershed impacts
- cannabis operations mostly 'light touch'





CAMP (Campaign Against Marijuana Planting) began in 1983. The use of helicopter and aerial surveillance drove grows into the cover of the trees.



Source: California Department of Justice-Campaign Against Marijuana Planting | GAO-19-9

The Green Rush ensues between 1996 and 2018 Cannabis cultivation Grey Area

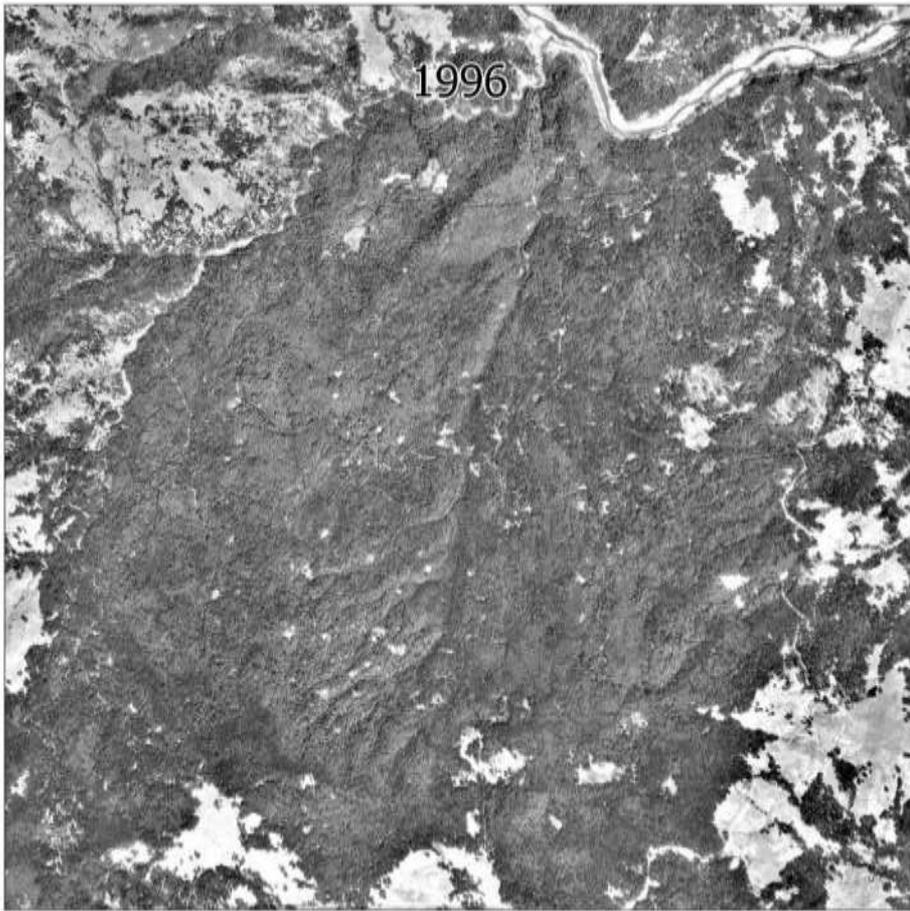


In 2016, Prop 64 the “Adult Use of Marijuana Act” gets passed by 57% of CA voters

2016-2024: Full legalization

- Permitting & tax regime that funds robust regulatory oversight of land-use & environmental laws...
- Followed by rapid decline in North Coast cannabis economy as lower-cost production consolidates into other regions







North Coast Regional Water Quality Control Board

June 11, 2020

Certified Mail 7016 [REDACTED] 824

[REDACTED]
Santa Rosa, CA 95405

NOV

Subject: Notice of Violation and Transmittal of Inspection Report for
May 13, 2021 Inspection of Mendocino County Assessor's
Parcel Number (APN) [REDACTED]

File: Cannabis Program Inspections, Mendocino County, May 2021 Inspections,
CIWQS Place ID: 8 [REDACTED]

This letter is to notify you of observed violations of the requirements listed below for
unauthorized discharges to waters of the state from the above-referenced parcel
(Property):

1. Water Quality Control Plan for the North Coast Region (Basin Plan) Section 4.2.1
at locations WQ1, WQ2, WQ3, WQ4 and WQ9.
2. California Water Code (Water Code) sections 13260 and 13264

What is a NOV - A “Notice of Violation” issues from state agencies often the Water Board and sometimes DFW. This are often related to unpermitted stream modifications, and hazardous waste discharges.

What is an Abatement - An order from the county to stop an action in this case the action of cultivation or appearing to cultivate cannabis.



Photo: Naiad Biological Consulting



Photo: Humboldt County Sheriff's Office June 7-8, 2023



Photo: Humboldt County Sheriff's Office June 7-8, 2023



Photo: Humboldt County Sheriff's Office June 7-8, 2023

Three cultivation strategies around compliance

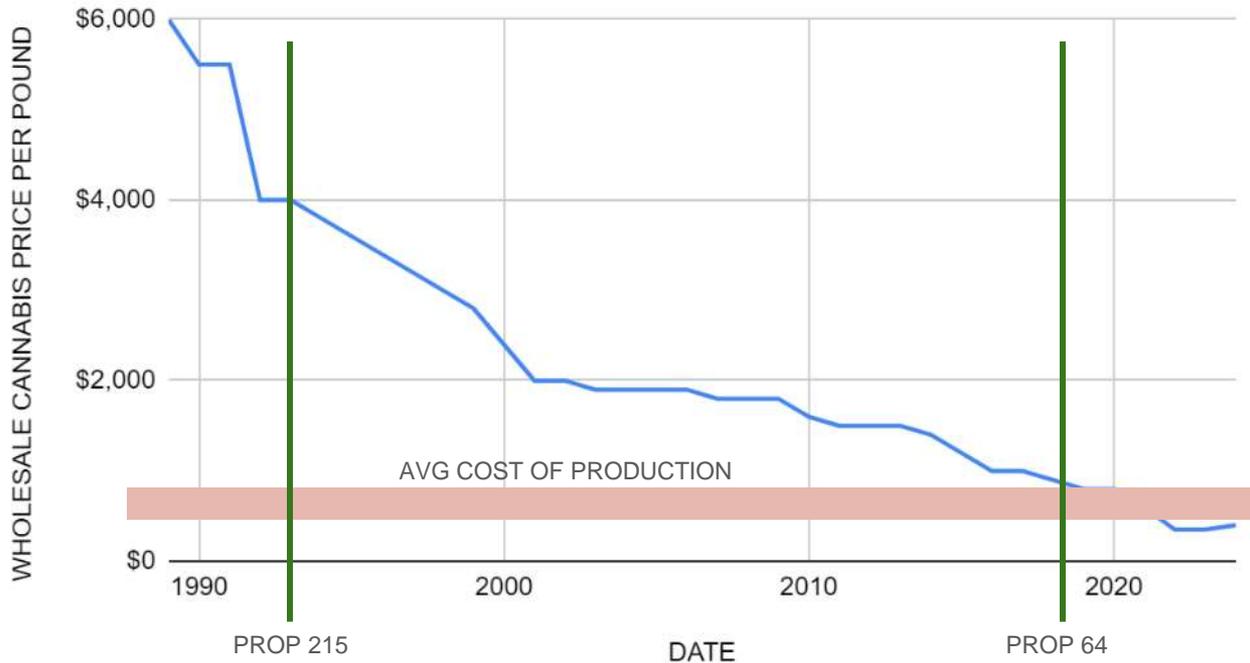
Cultivators who have completed their license and are fully compliant

Cultivators who have never intended to be compliant or licensed

Cultivators in partial compliance with incomplete licenses

The cannabis boom made remote and difficult-to-access parcels an asset for cannabis production. During cannabis boom times, timber companies and other landowners found it viable to subdivide and sell off parcels as there were cannabis buyers willing to pay more than the timber value for remote parcels.

WHOLESALE CANNABIS PRICE PER POUND vs. DATE



The NOV (Notice of Violations) Nose Dive

Are NOV's getting resolved?

Are the environmental issues being remediated? Why not?

- **No profit motivation:** limited property marketability + no expected future cannabis revenues
- **No capacity:** low capacity for complex permitting, project management
- **No money:** incumbent landowners have gone 'bust'
- **No reach:** agencies unable to chase defaulting owners, often now out-of-area
- **No transfer:** inability to obtain title insurance, and risks are scaring off buyers

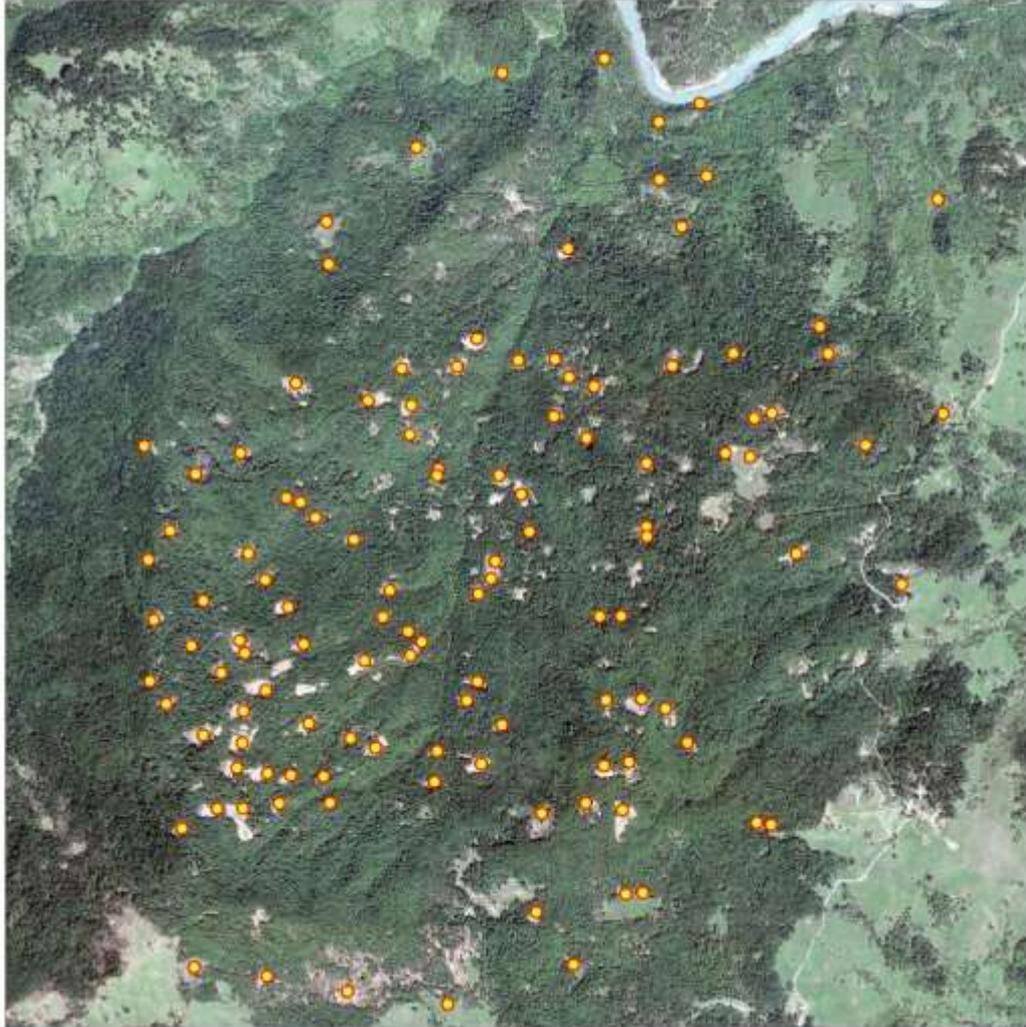
- Nine water diversion/stream alteration violations (up to \$8,000 fine per day, per violation);
 - Two water pollution violations (up to \$20,000 fine per day, per violation);
 - Three depositing trash in or near a waterway violations (up to \$20,000 fine per day, per violation);
 - Failure to establish a Hazardous Materials Business Plan (HMBP) (up to \$5,000 per day, per violation);
 - Failure to report a release or threatened release of a hazardous material (up to \$5,000 per day, per violation);
 - Failure to acquire an EPA ID number (up to \$70,000 per day, per violation);
 - Failure to prevent a hazardous waste release (up to \$70,000 per day, per violation);
 - Failure to properly dispose of universal waste batteries (up to \$70,000 per day, per violation);
 - Failure to make a hazardous waste determination (up to \$70,000 per day, per violation);
 - Failure to properly label hazardous waste (up to \$70,000 per day, per violation);
 - Hazardous waste accumulation storage time exceeded (up to \$70,000 per day, per violation);
-

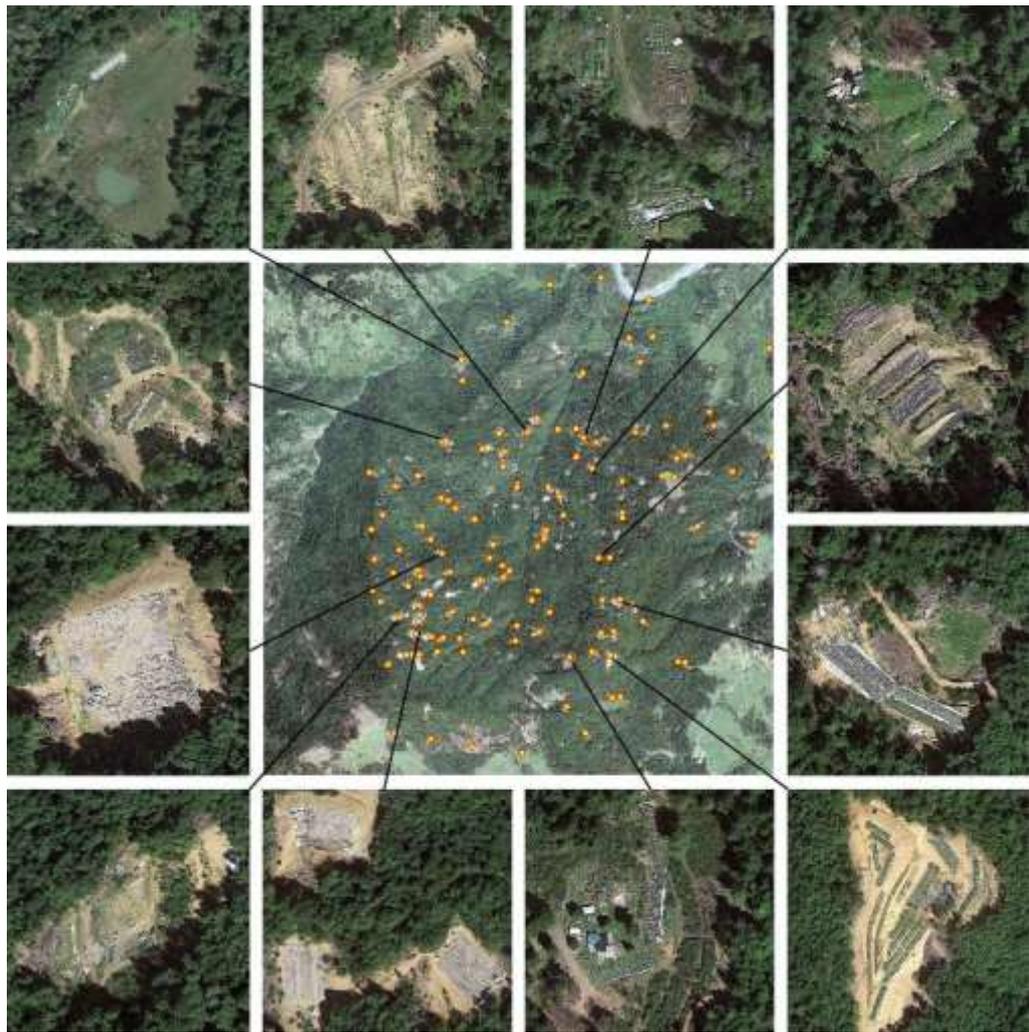
MAX DAILY FINE:

\$518,000

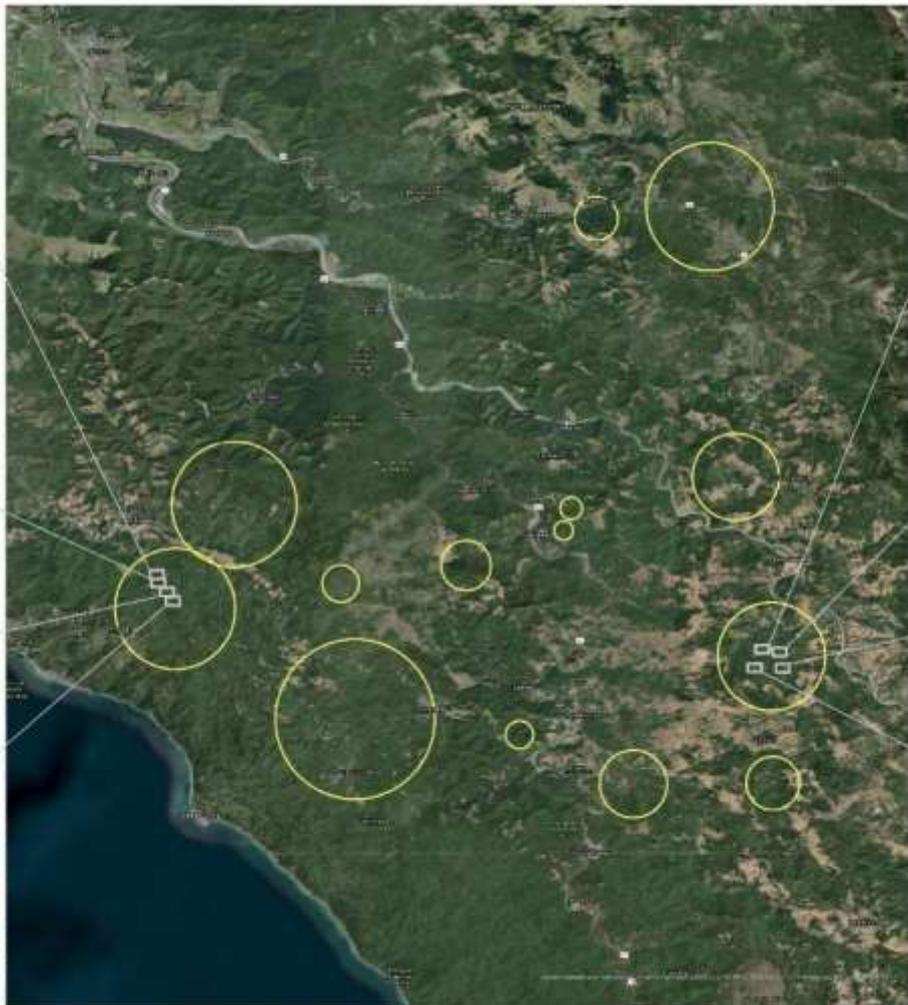
Penalties can quickly exceed property value!

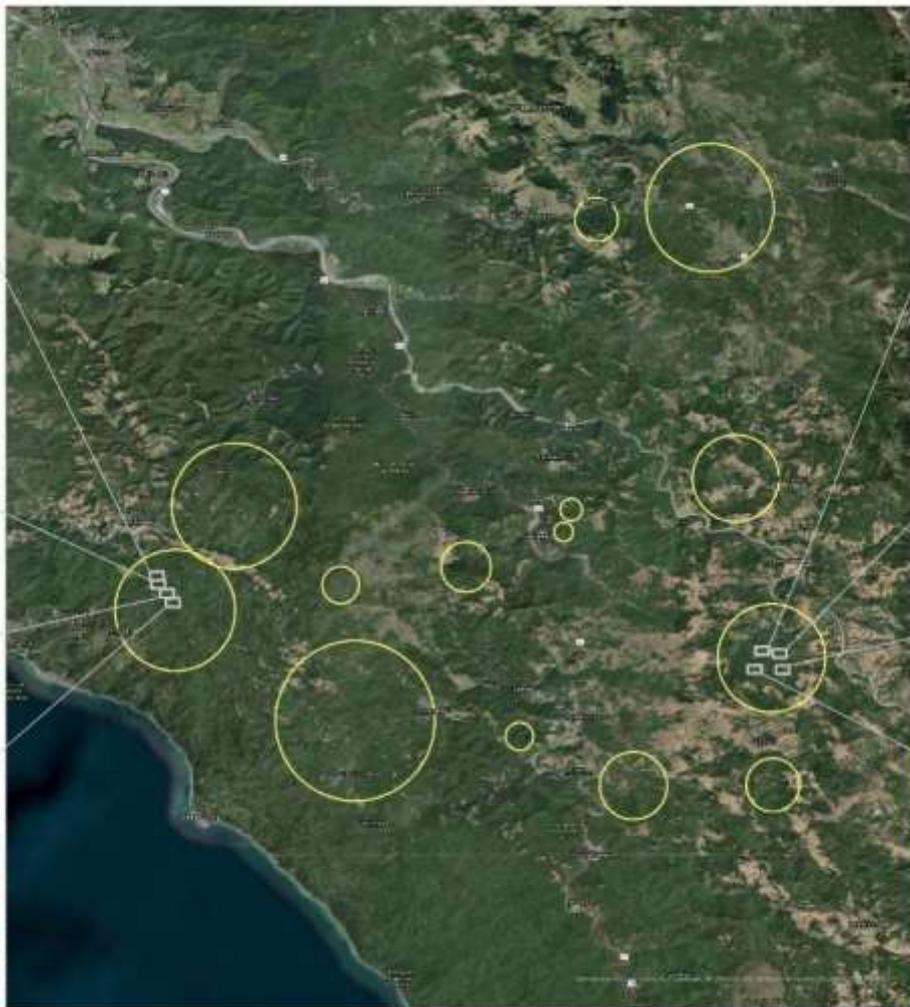
**In this image, there are
111 identifiable active
and remnant cannabis
grows**

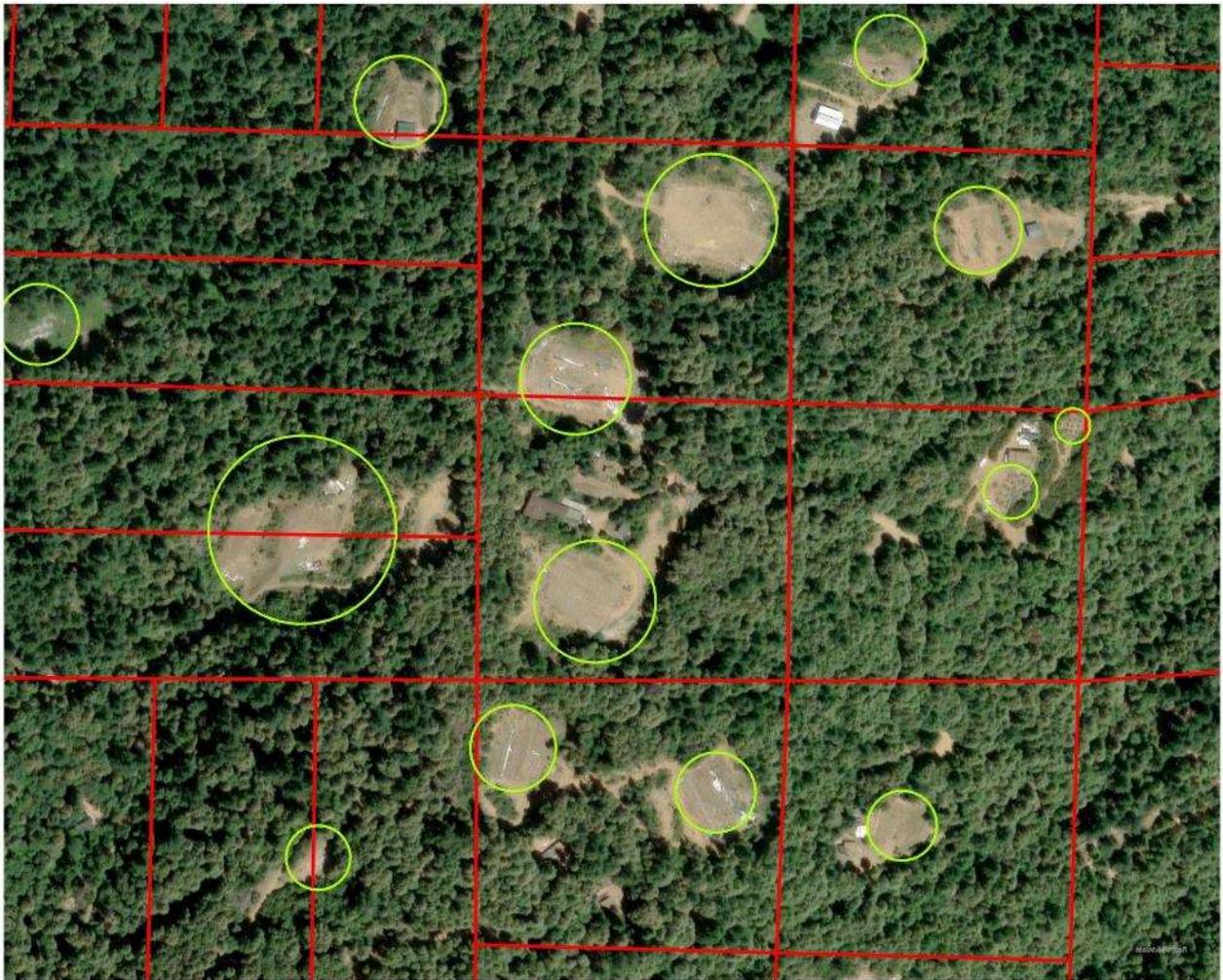












In summary...

- There are over 50,000 parcels in Humboldt County.
- There are 1,578 cannabis licenses on parcels in Humboldt County*
- There are 1,200 parcels that the County has charged with Cannabis-related code violations**
- We estimate that there are over **1,000** abandoned cannabis production parcels in Humboldt County (40,000-80,000+ acres)

*([Humboldt Supervisors Scrap Proposed Cannabis Initiative Following 'Rushed' Process | Lost Coast Outpost](#))

** (<https://ij.org/case/humboldt-abatements/>)



What's the solution to this tangle?

1. Our team will build a GIS-based tool for Humboldt, Mendocino and Trinity Counties to identify likely abandoned parcels suitable for rehabilitation and acquisition/aggregation for conservation, cultural, or resource management uses.
2. We will work with the counties and state agencies to explore permit streamlining, incentives, and safe harbor programs to incentivize potential acquirers to pursue acquisition and restoration of these lands

-
1. Propose model restoration plans/standards for such programs
 2. Funding support will be acquired for implementing the restoration plan
 3. Title transfer / easement put in place

GIS based tool

- A GIS-based tool to score parcel attributes relevant to different buyer types:
 - Cultural investors
 - Private conservation investors
 - Public land acquisition (state and federal)
 - Light touch forestry & carbon investors
- The tool will cover Humboldt, Mendocino, and Trinity Counties
- The tool and training will be made available for qualified practitioners to use in support of identifying relevant parcels for acquisition and restoration.

Critical role for North Coast counties and state agencies: reducing costs, barriers, and risks for parcel clean-up

- Key issue: *economic value of parcels less than clean-up costs & risks*
- North Coast counties and state agencies (e.g., NCRWQCB, CDFW) can significantly accelerate parcel clean-up and acquisition by conservation interests:
 - **Permit streamlining, fee reductions** for resolution of NOVs & abatement orders
 - **Waivers of fines affecting future landowners** undertaking transition to conservation management
 - **Regulatory forbearance + safe harbor** agreements for buyers undertaking clean-up and restoration actions
 - Relaxation of demands to remove infrastructure with possible non-cannabis value

Possible outcomes for 'post-cannabis' lands

Cannabis prices recover, current owners achieve compliance?

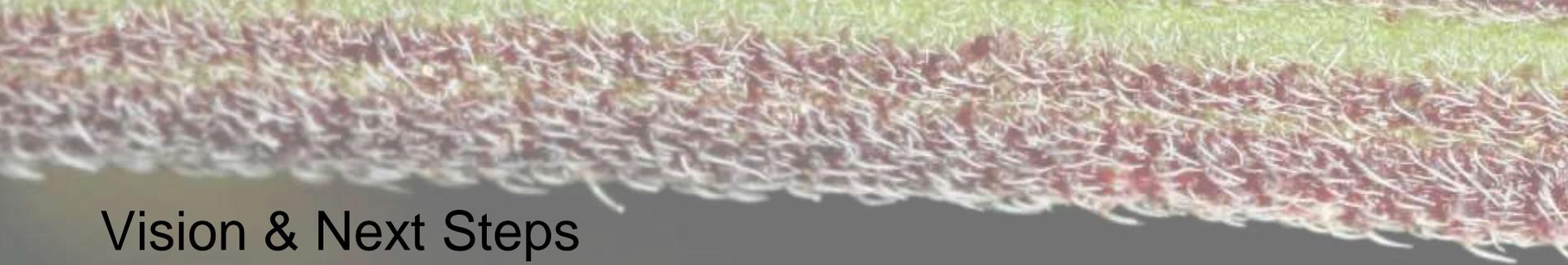
Move from regulation of industry to incentives to clean up defunct industry?

NOVs & abatement orders remain, driving properties to property tax auction? (can counties successfully recover value on impacted parcels?)

Safe harbor & permit streamlining to lower cost of rehabilitating these lands?

Harvest of second/third growth timber now maturing?

Status quo seems unlikely given widespread property tax defaults, parcel abandonment, inability to transfer properties, etc.



Vision & Next Steps

The *entirety* of North Coast watershed restoration and lands conservation has been in the context of pressure to parcelize resource lands, rising prices for small parcels, and accelerating impacts to those lands.

We now awaken to a new and uncertain era where these factors have rapidly disappeared, leaving new possibilities for heavily impacted watersheds.

Let's work together to chart a new course: a robust restoration economy that is operating within a landscape that is slowly become less fragmented!



Cannabis has, in the six years since regulation, reflected our larger story of american agriculture. A story of a marketplace that promotes scale over quality and production over ecology. Boom bust cycles have often been left unmitigated and society and ecology eventually pays the price. It is up to us to not let that happen with Cannabis.

Project Partners

Vollmar Natural Lands Consulting

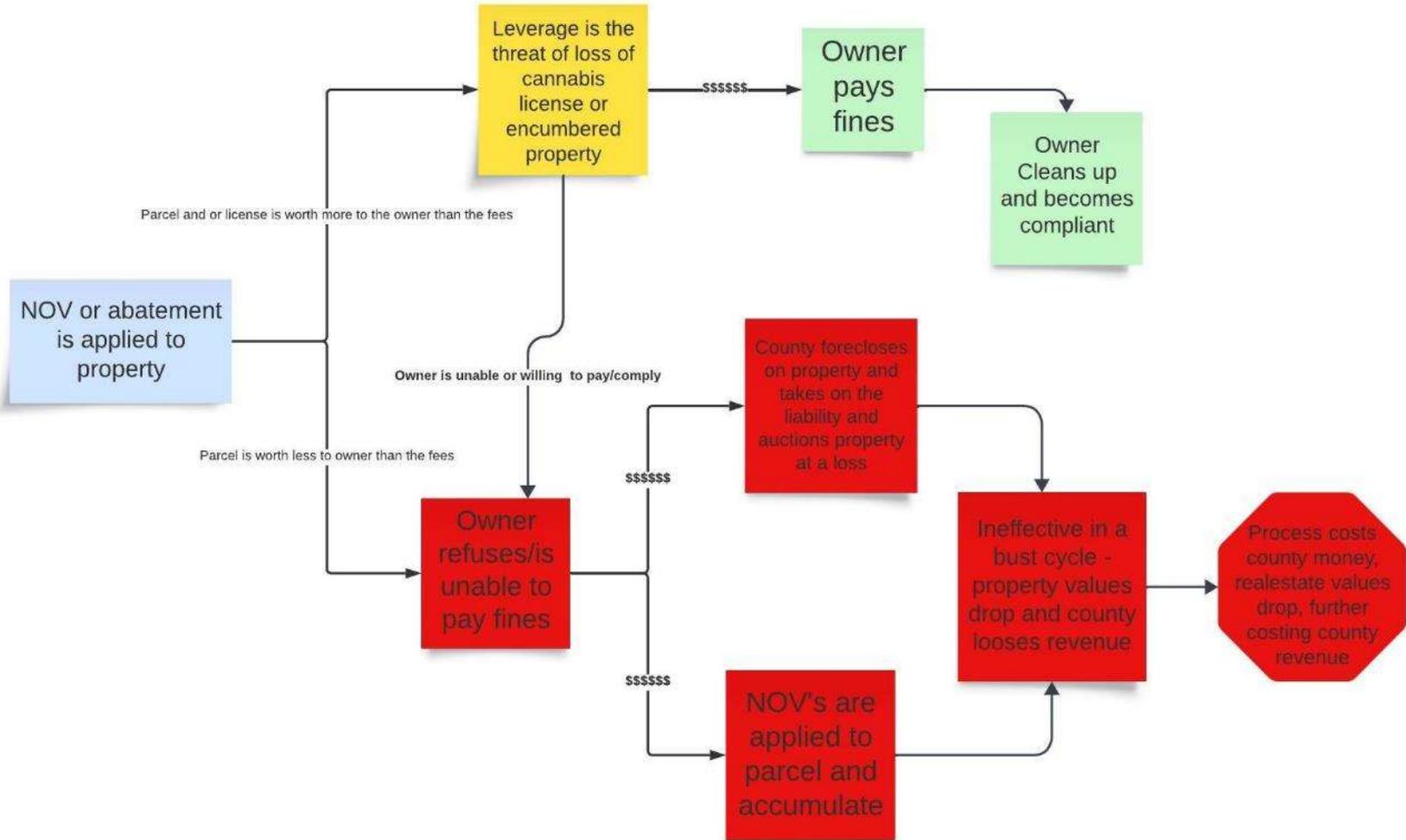
VNLC is a natural resources consulting company providing expertise on the technical and regulatory aspects of natural resource assessment, impact analysis, mitigation, conservation, restoration, and land stewardship. Since 1997, we have completed more than 500 projects ranging from small site assessments to large-scale conservation, mitigation, and development projects throughout California. The company has twenty employees between our Arcata, Berkeley, and Sacramento offices. This project will be managed through our North Coast office in Arcata, California, with supporting staff, if needed, from our other offices. In addition to our permanent staff, VNLC has multiple on-call contract biologists with specialized skill sets and permits.

Naiad Biological Consulting

Naiad Biological Consulting (NBC) is a certified California State Small Business (Certification ID: 2029970) based out of Arcata, California, focused on ensuring clients maintain appropriate compliance with environmental regulations. NBC's team, including skilled wildlife biologists, expert botanists, proficient wetland scientists, and dynamic geospatial specialists, possesses a comprehensive understanding of ecological and regulatory aspects. This knowledge allows for quality guidance tailored to project-specific needs. Since 2018, NBC has assisted numerous cannabis businesses in navigating the permitting process by providing a comprehensive suite of studies to ensure California Environmental Quality Act (CEQA) compliance. In recent years, NBC has witnessed a growing number of properties and farms with stacked compliance violations, leading to abandonment or further breaches due to escalating permitting challenges, rising fines, and industry declines. NBC is passionately committed to finding viable solutions to address this issue and contribute to the preservation and restoration of the North Coast landscape.

Alder Point Capital Management

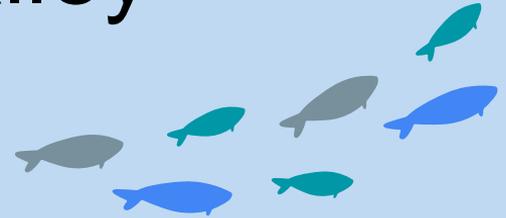
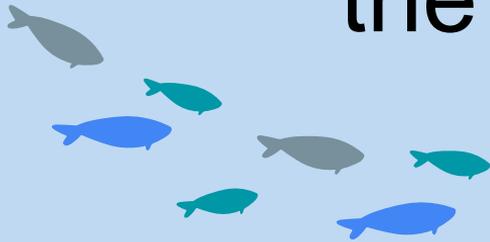
Alder Point Capital Management is an investment manager focused on acquisition and management of U.S. farmland and timberland to generate financial returns alongside positive impact across climate, biodiversity, water, and rural prosperity. Alder Point primarily operates in the Pacific Coast states, the Upper Midwest/Great Lakes region, and the Northeast/Mid-Atlantic. Alder Point works with local operating partners (farmers & foresters) to improve property operations and sustainability via organic conversion, conservation easement transactions, resource efficiency & electrification, habitat restoration, and on-site workforce housing & renewables. Alder Point was founded by a three-person team (Chris Larson, Jessamine Fitzpatrick, and Spenser Shadle) that has worked together for a decade-plus, deploying approximately \$600M into similar investments globally.



We will create one sample project

1. Our team will work with an investor to use the GIS tool and process to create funding-ready project to show concept proof and to improve the GIS tool.
2. This project will be in Humboldt County
3. We will build a Parcel(s) site assessment, and restoration plan
4. We will work with fine holder to reduce fines and fees
5. We will acquire funding for the restoration plan and implement title transfer and restoration work.

Assessment of juvenile Chinook salmon migration from floodplains in the Sacramento Valley



Alexandra N. Wampler^{1,2}

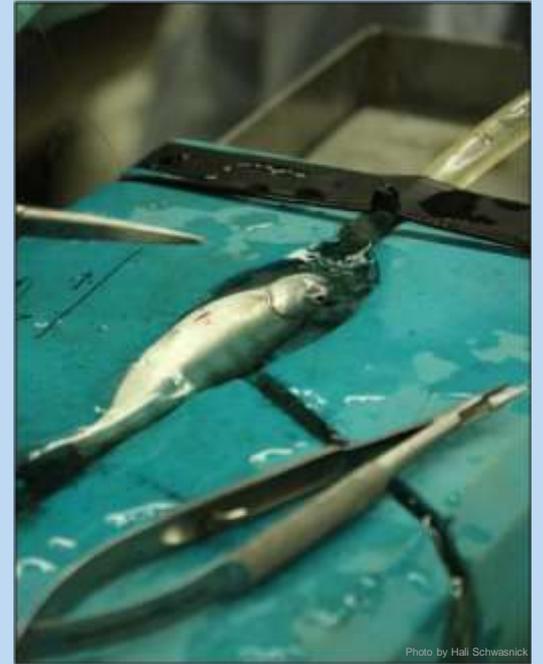
Derrick J. Alcott^{1,2}, Carson A. Jeffres¹, Paul Buttner³, Nann A. Fangué^{1,2}, Andrew L. Rypel^{1,2}

1. University of California, Davis Center for Watershed Sciences

2. University of California, Davis Department of Wildlife, Fish, and Conservation Biology

3. California Rice Commission

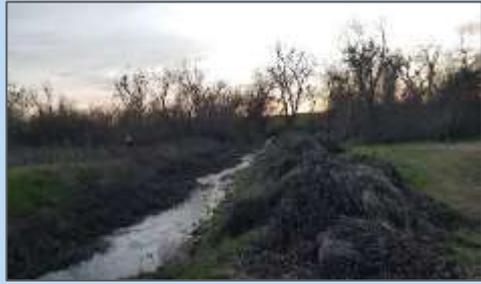




Chinook Salmon *Oncorhynchus tshawytscha*

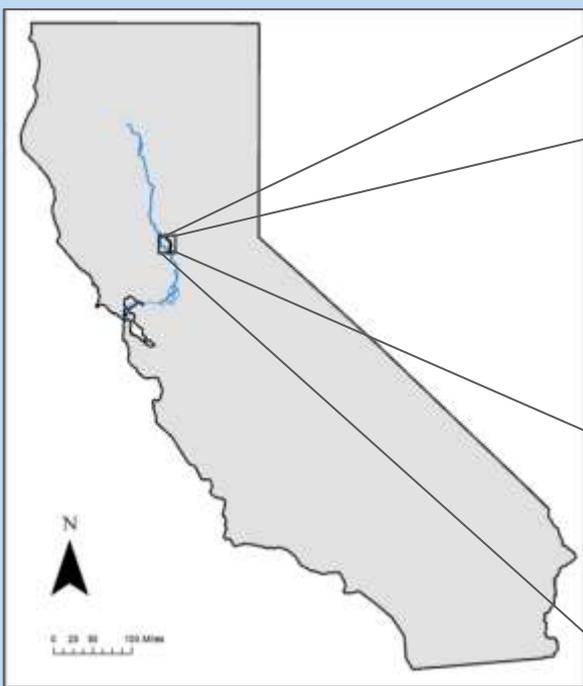


Levees and Drought exclude fish from off-channel habitat



Floods provide access to off-channel habitat





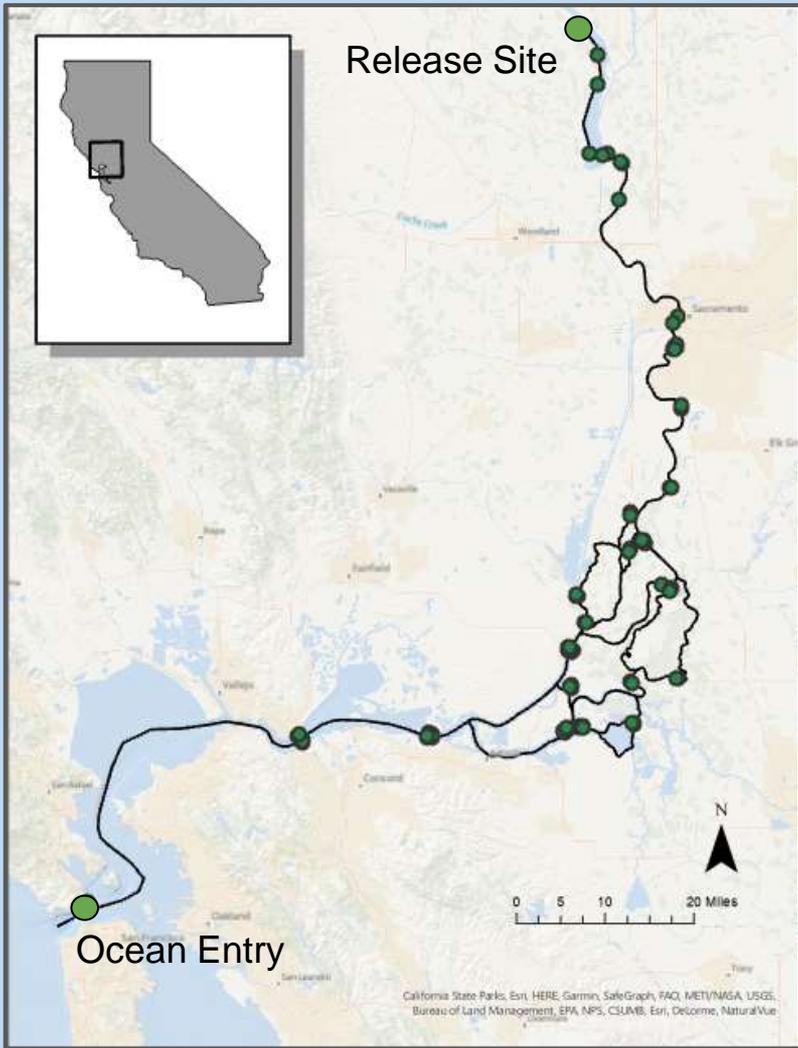
Drought:



Flood:



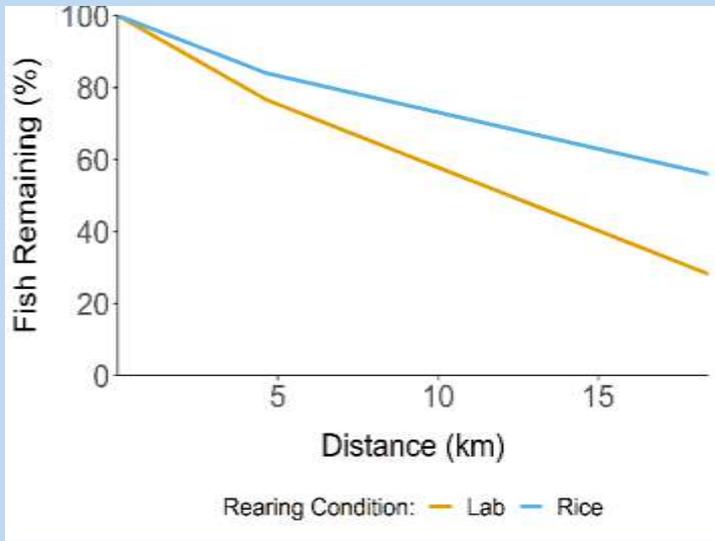




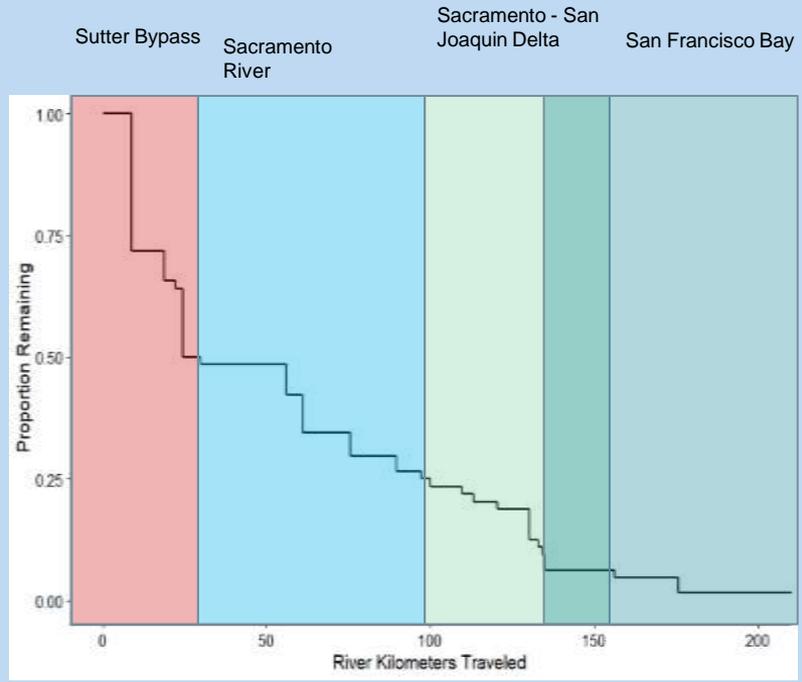
Out-Migration Survival Results: 2022 (Drought)



A. Bypass Survival



B. Overall Survival



Reach Speed (Hrs/RKM)

3
2
1
0

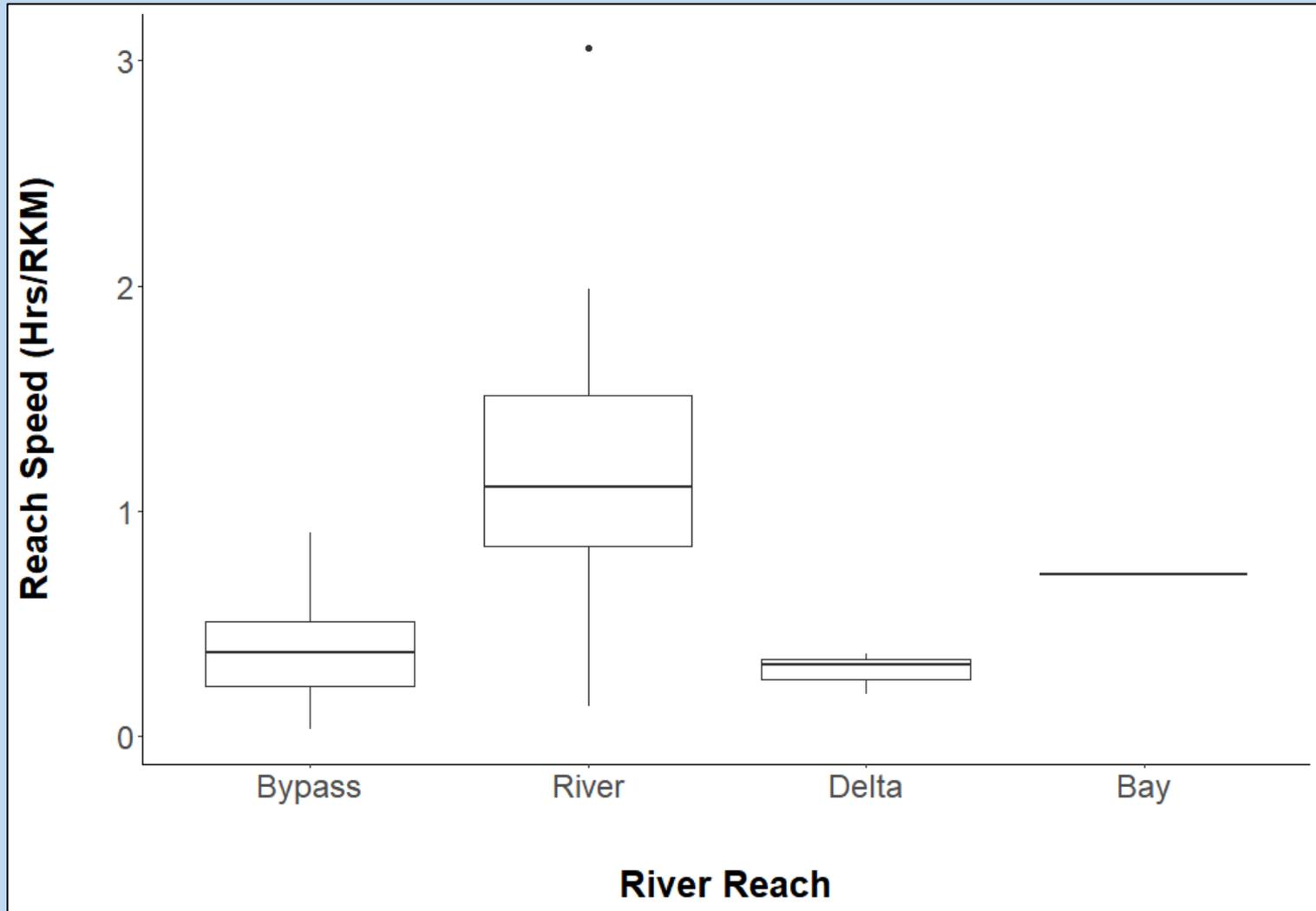
Bypass

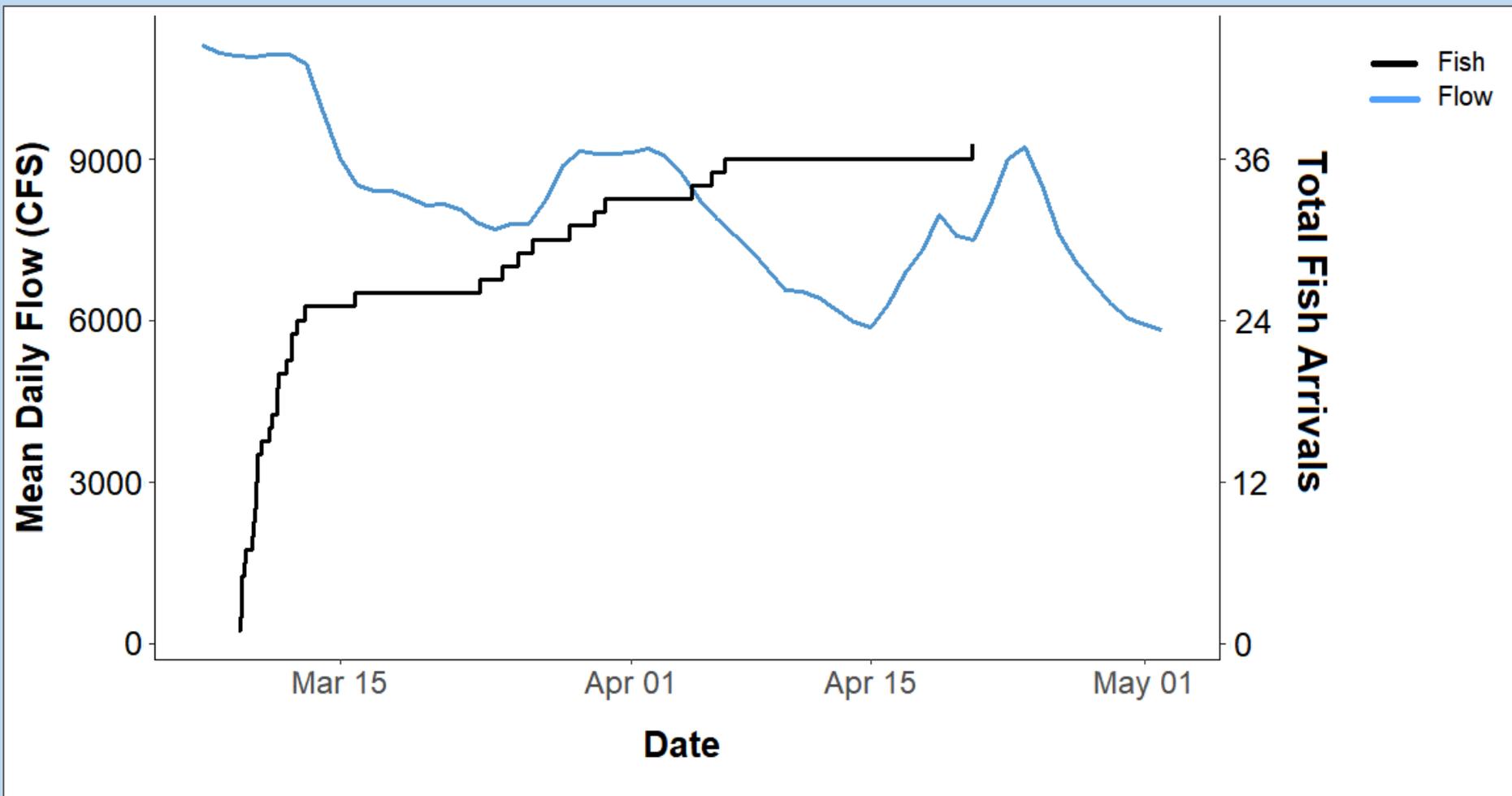
River

Delta

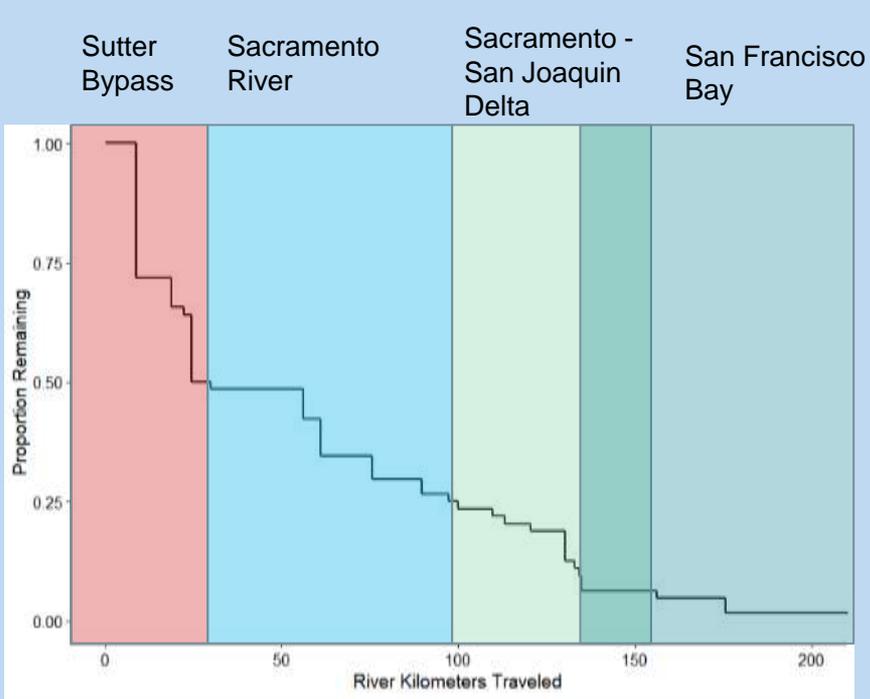
Bay

River Reach

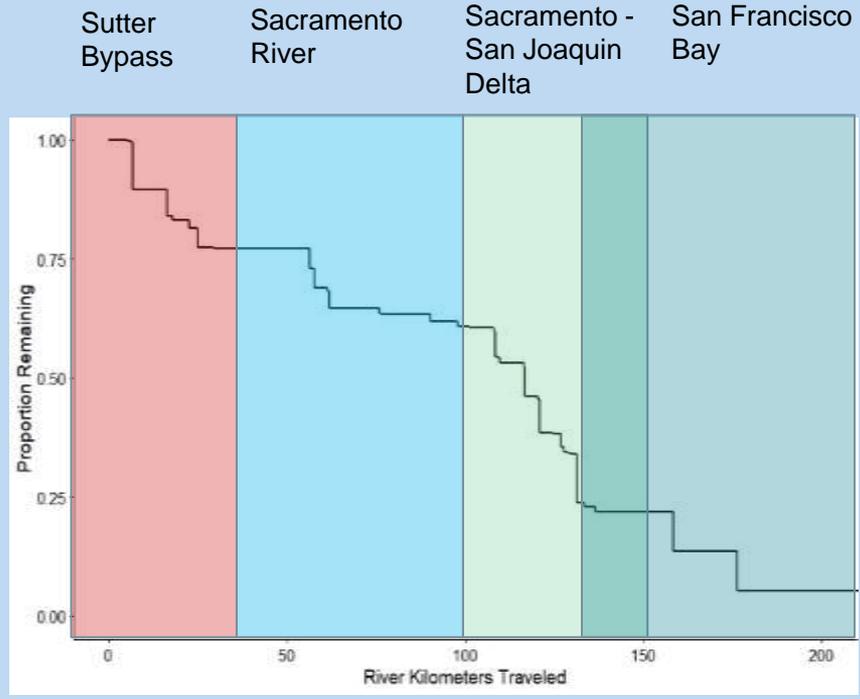




Drought Vs Flood:



2022: Drought Year



2023: Flood Year

Coming Soon!

Young of the Year



VS

Yearlings



Lab Reared



VS

Floodplain Reared



Volitional Release



VS

Bypass Release



VS

River Release



Conclusions:

We learned:

- Mortality within the bypass canal was not correlated with time spent in the bypass canal
- Some fish appear to rear in the bypass canal for extended periods
- River pulse flows cue fish to exit the bypass and may influence migration timing
- During a drought, the Sutter Bypass canal may serve as a suitable habitat and migration corridor for juvenile salmon

Management Take Away:

- Providing flows and fish access to the off-channel Sutter Bypass canals may improve juvenile fish recruitment during drought years



Thank you

Special Thanks to our Funders and Collaborators

Personal Acknowledgements:

Steve Neader
Dennis Cocherell
Rachelle Tallman
Peter Aronson
Jordan Colby
Anne Boyd
Emily Patterson



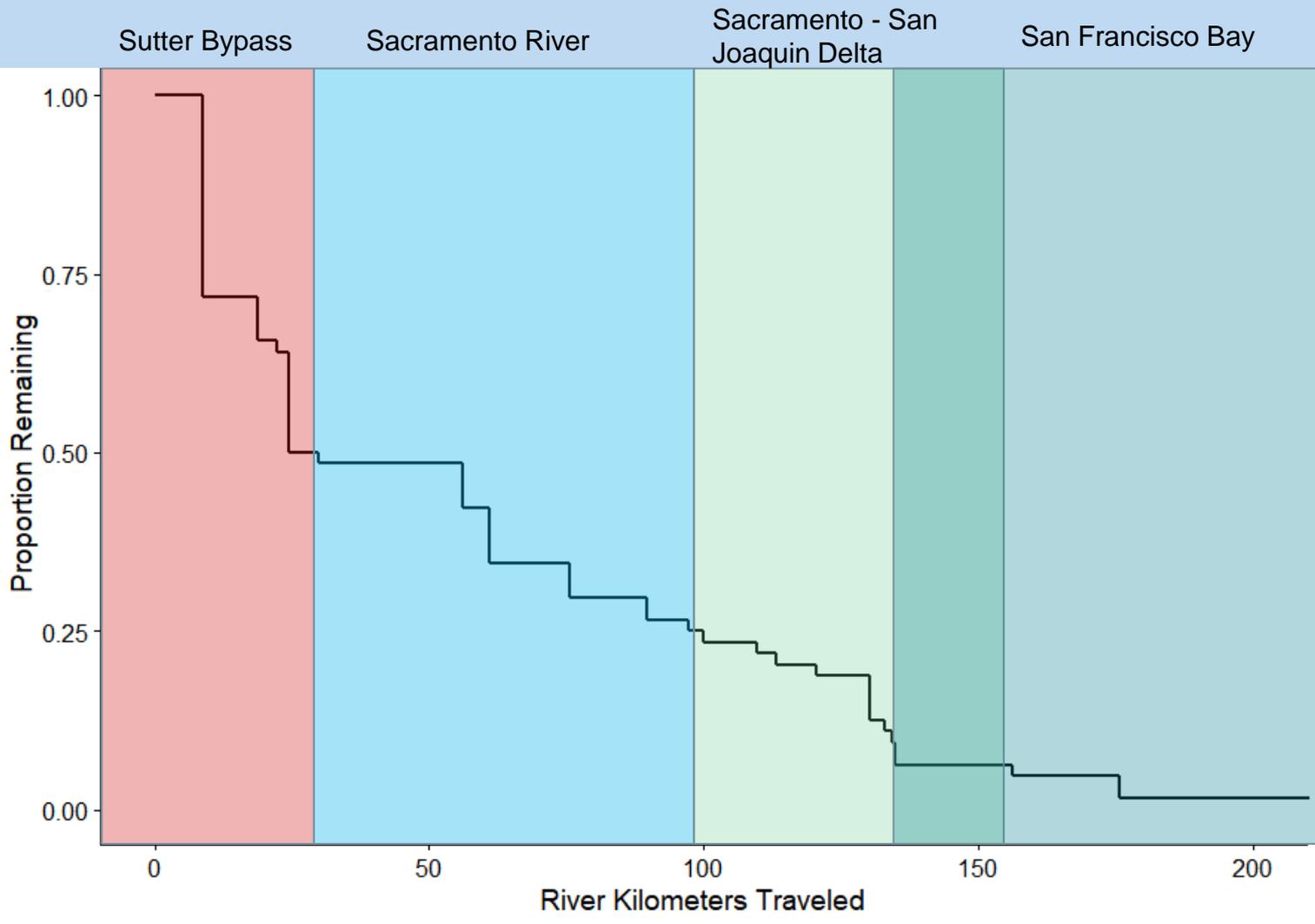
Major Project Funders



Sustaining Project Contributors



For further information or questions please contact Alexandra Wampler: anwampler@ucdavis.edu



Kaplan- Meier survival curve showing proportional survival over distance from release. The distinct regions of migration are displayed in colored and labeled columns.

Out-Migration Survival: 2023 (Flood)

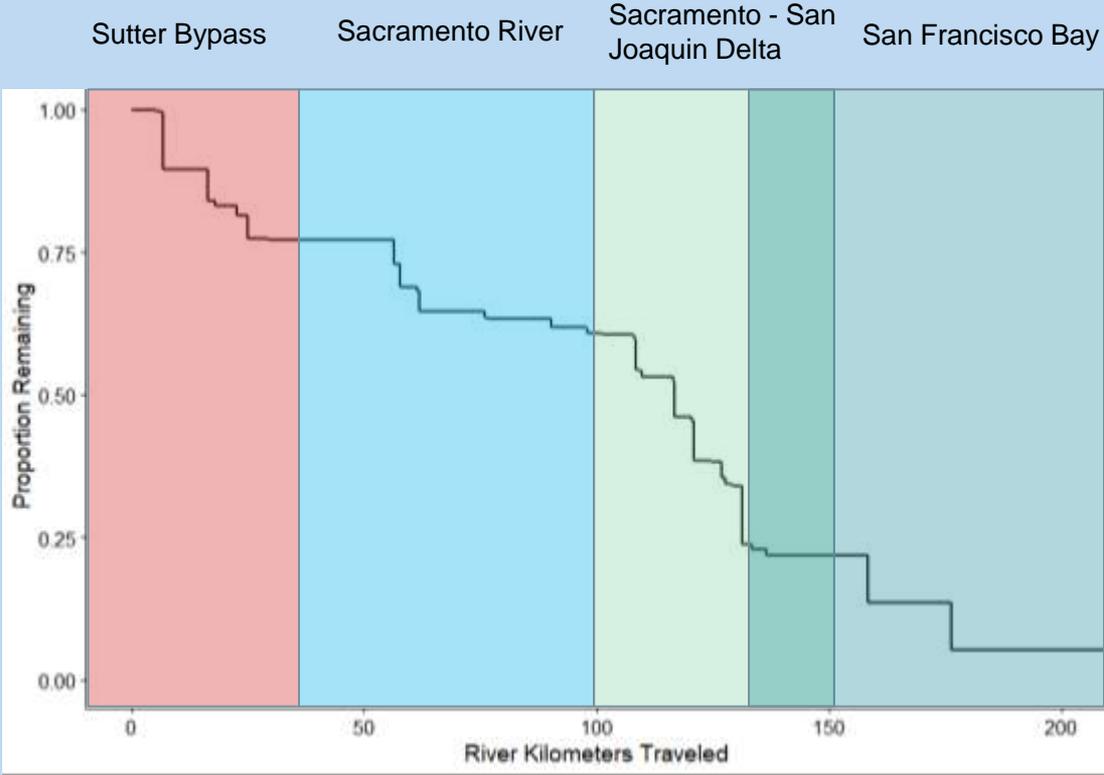
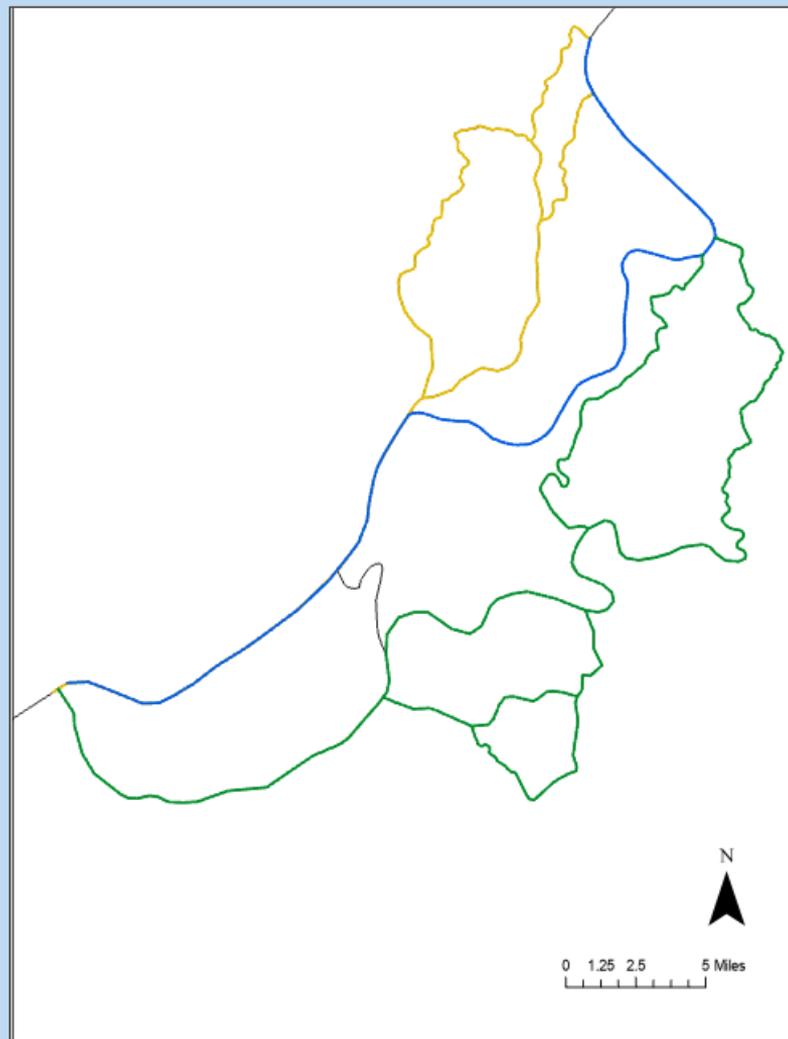
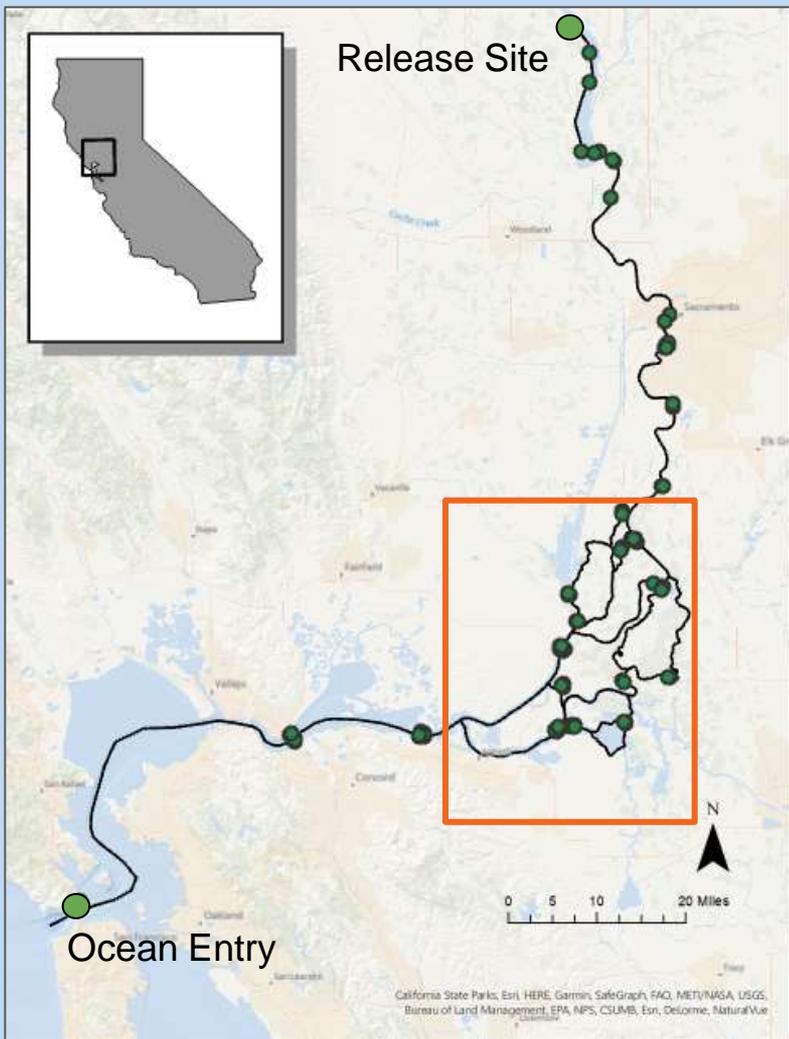
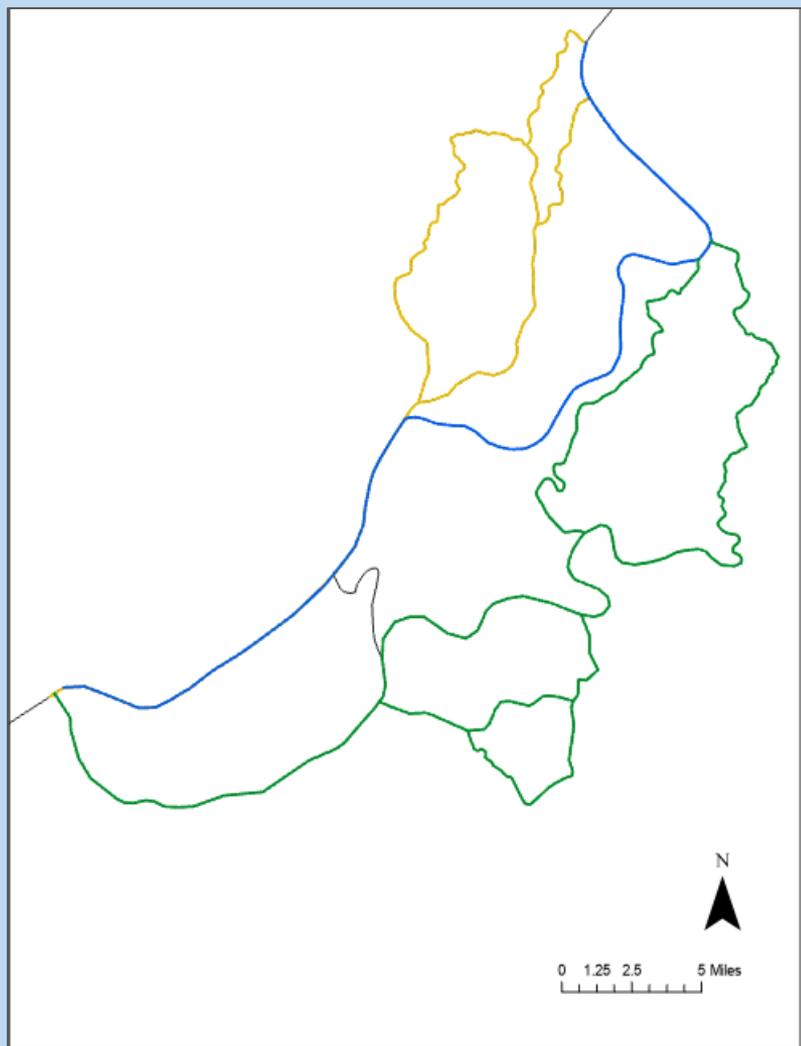
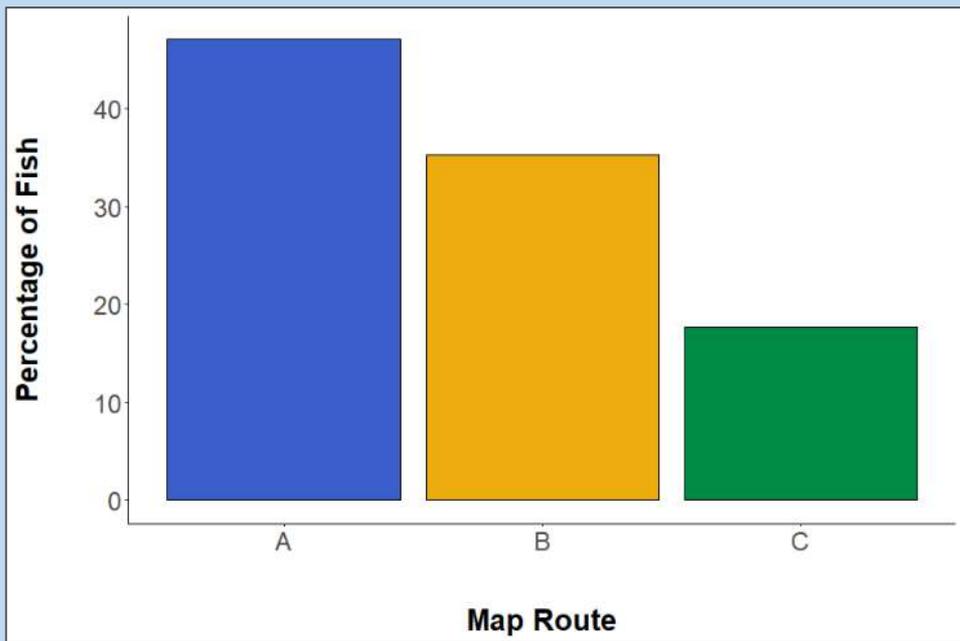


Figure 3: Kaplan- Meier survival curve showing proportional survival over distance from release. Overall survival of all tagged Chinook migrating from the Sutter Bypass to the Pacific Ocean. The distinct regions of migration are displayed in colored and labeled columns.







**2024 Salmonid Restoration
Federation Annual Conference**

Martin Slough

Lessons From the

**→ Successful Collaboration to
Restore the Aquatic
Ecosystem of Martin Slough**

Dagan Short, PE

Steven Allen, PE





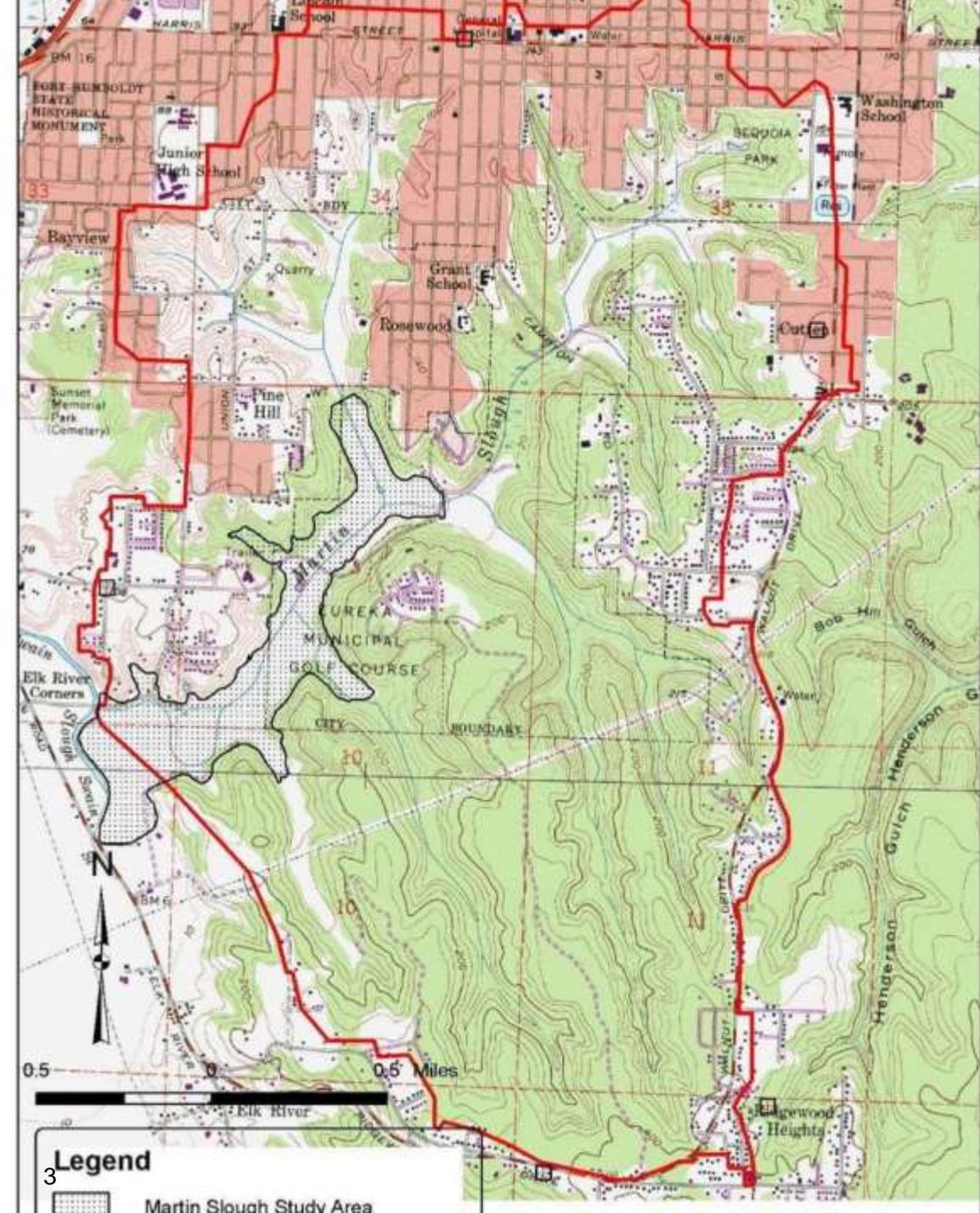
Collaboration is Key

Project Partners

- Redwood Community Action Agency
- City of Eureka
- North Coast Regional Land Trust
- Michael Love & Associates
- Ross Taylor & Associates
- California Coastal Conservancy
- California Dept. of Fish & Wildlife
- Water Resources Control Board
- Department of Water Resources
- Pacific Gas & Electric

Project Location

- Northern California
- South end of Eureka
- Humboldt Bay





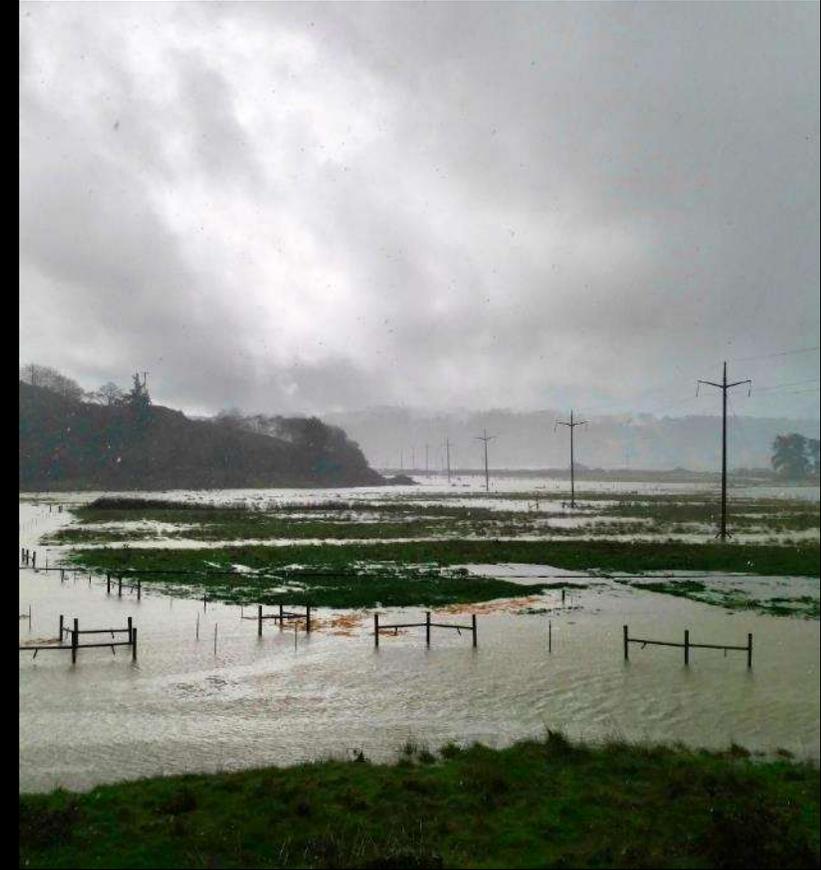
What Was the Problem?



**Flooding After Rains
Eureka Municipal Golf
Course**



**Old CMP pipes with Cast
Iron Flap Gates – a
Typical Tide Gate System**



**King Tides 2019
Downstream Near Old
Tide Gates**



Project Objectives

Reduce duration of overbank flooding

Maintain and protect existing land-uses

Reintroduce tidal action into Martin Slough

Create tidal wetland habitat

Improve fish access

Increase diversity and amount of over-wintering freshwater rearing habitat for salmonids

Increase the amount of riparian corridor



Summary of Martin Slough Enhancement Design Project Components

6,200 feet of Channel

4.7 Acres of Salt Marsh

2.1 Acres of Brackish Wetlands

Freshwater Wetlands and Riparian Areas



- Description**
- New tide gates to increase conveyance and restore limited tidal influence, construction and enlargement of tidal and freshwater wetlands to increase floodwater storage and provide enhanced fisheries and waterfowl habitat, and enlarged channel to increase floodwater and tide water conveyance through project area.
 - A & B** (2.75 acres) - salt marsh plain 50 ft wide paralleling slough channel and 70 ft wide along abandoned meander.
 - C** (1.72 acres) - Salt marsh with low elevation pond connected to springs.
 - D & E** (0.64 acres & 1.17 acres) - Expanded brackish wetlands, containing deep open water, littoral benches and elevated outlet sill that minimizes salinity intrusion during wet season.
 - F** (1.04 acres) - Backwater slough with island and deep open water and littoral bench on inside of bend.
 - G** (0.5 acres) - Predominantly freshwater alcove pond. Deep open water with emergent vegetation along banks.
 - North Fork** (0.74 acres) - Restored channel with marsh plan and side channel.
 - South East Tributary** (0.3 acres) - Restored channel with small freshwater pond connected to existing tributary.
- New channel dimensions** - Trapezoidal shape with 1.5:1 (H:V) side slopes and bottom elevation ranges from -1.0 to 2.8 ft. Stable tidal channel geometry based on published relationships of diurnal tidal prism and slough channel dimensions.

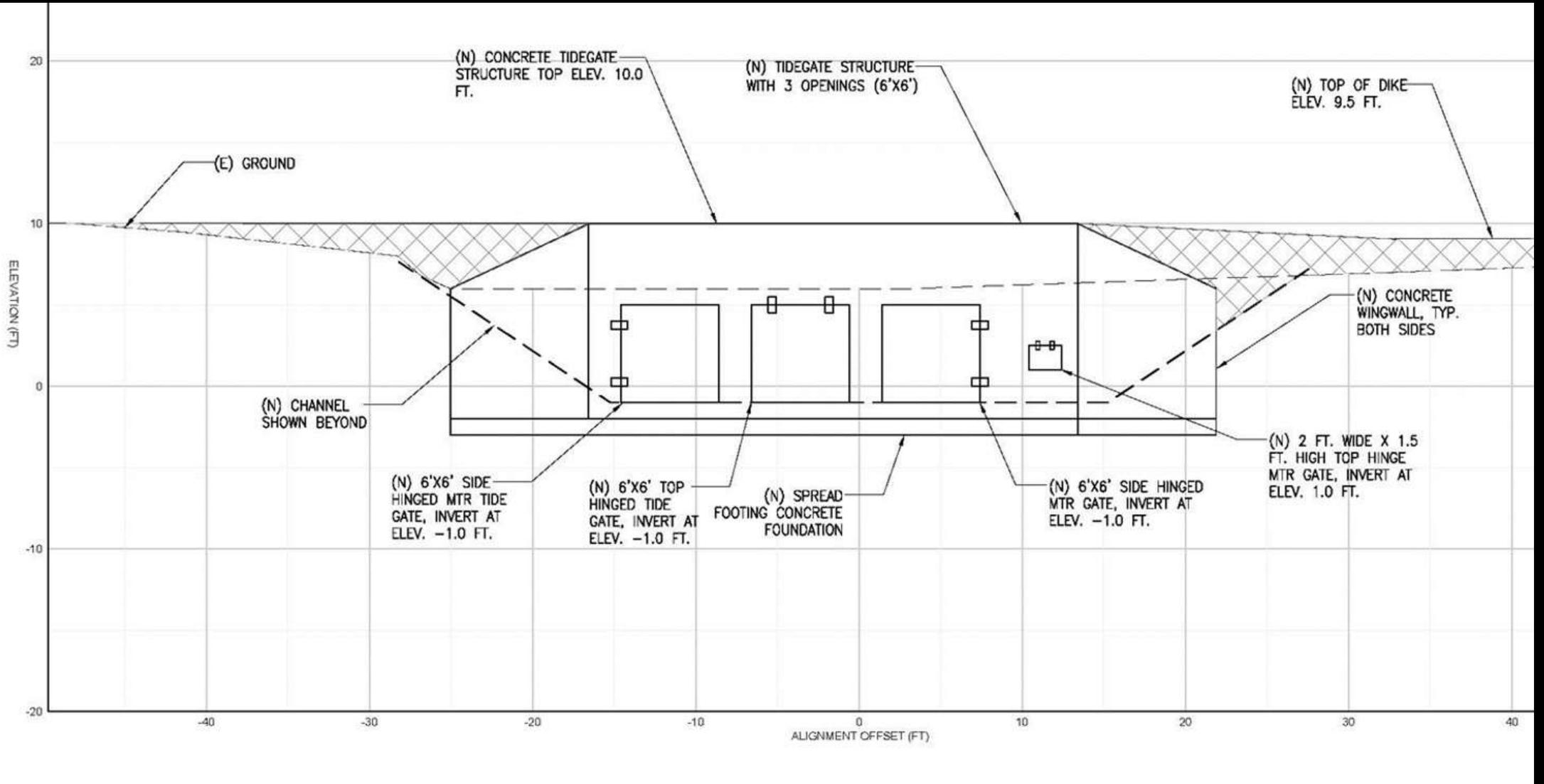
| Reach | Top Width (ft) | Length (ft) |
|-------|----------------|-------------|
| 1 | 39 | 1,050 |
| 2 | 41 | 600 |
| 3 | 34 | 1,400 |
| 4 | 33 | 650 |
| 5 | 31 | 750 |
| 6 | 29 | 650 |
| 7 | 24 | 1,140 |

MARTIN SLOUGH ENHANCEMENT PROJECT

Figure 2-1. Summary of Martin Slough Enhancement Project Components. Reach Number and Pond Name are Circled.

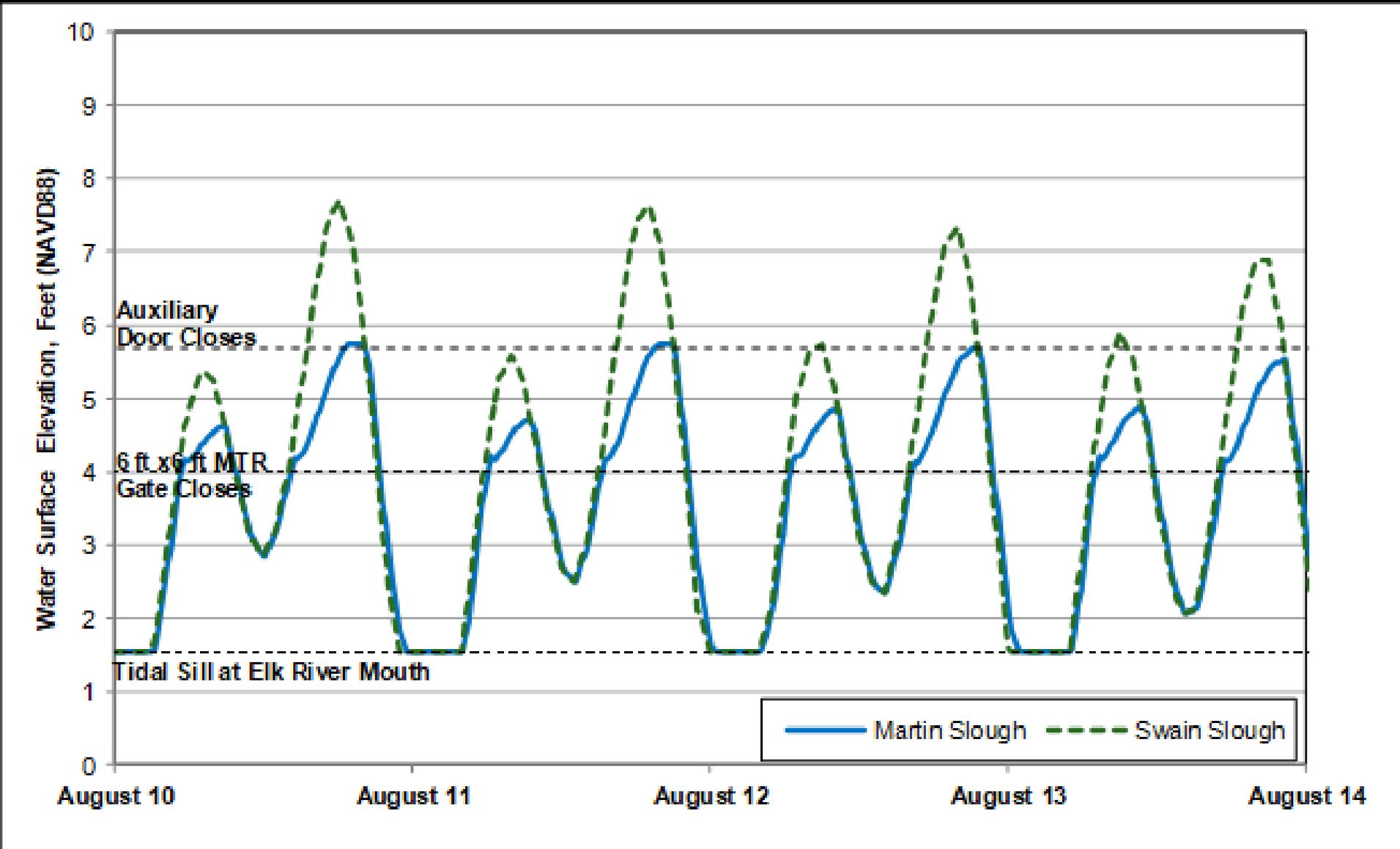


New Muted Tide Regulator (MTR) Gates Design





New Muted Tide Regulator (MTR) Gates Design





New Tide Gates at Swain Slough



Tide Gate Looking Downstream



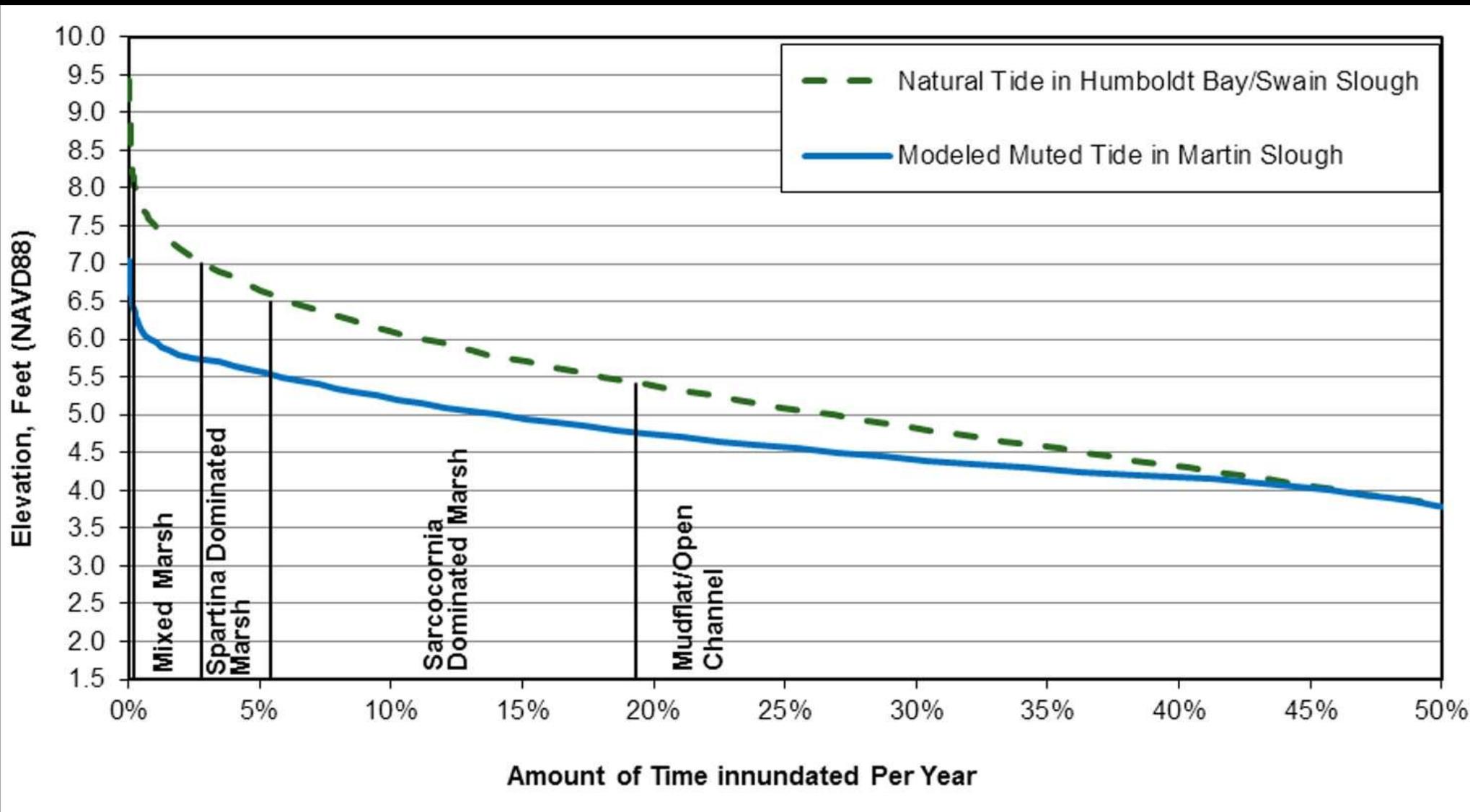
Tide Gate at High Tide looking Upstream



Tide Gate at Mid Tide with Gates Exposed

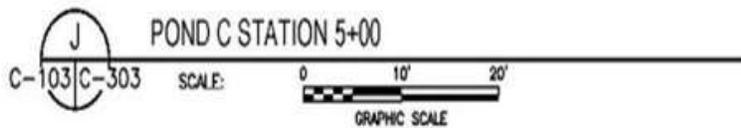
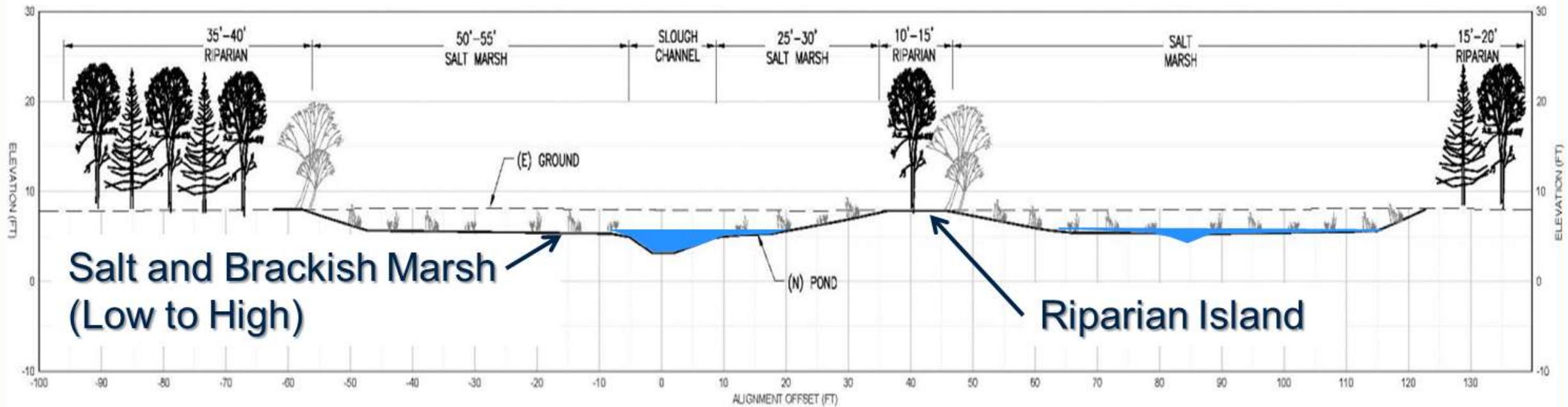


Muted Tide Design – Marsh Plains





Muted Tide Design – Marsh Plains



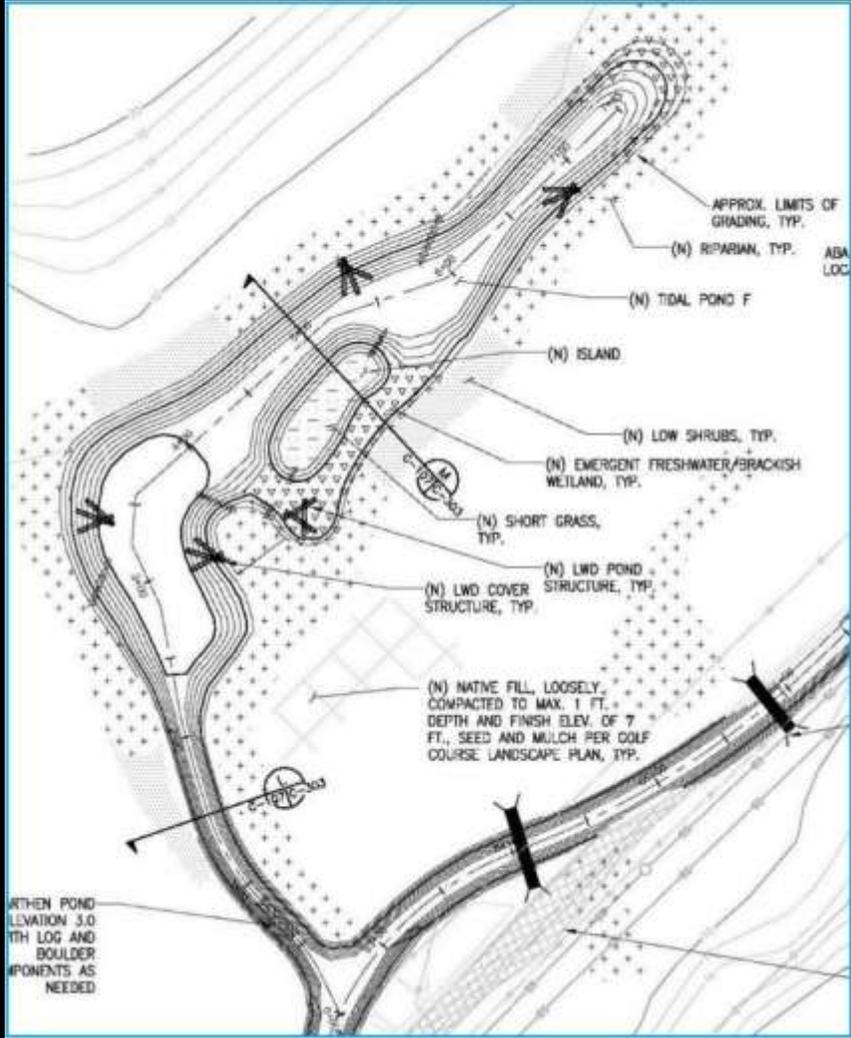


Muted Tide Design – Marsh Plains





Off Channel Pond Design Elements





Fish Relocation





Design And Construction Components



**Rock Grade Control of
Tributary Draining Into
Pond D**



Clay Salinity Sill at Pond E



**Reusing Old Railroad Car
Bridge for Golf Cart
Crossing over North Fork**



Design And Construction Components



Log Step Weirs Under Construction



Completed Log Step Weirs Connecting Pond D to Mainstem



Log Step Weirs Under Construction



Design And Construction Components



Irrigation Water Line Replacement Under Widened Channel



Sheet Pile Installation Near Narrowed Channel and Barn Crossing



Temporary Rock Grade Control Between Phases of Work



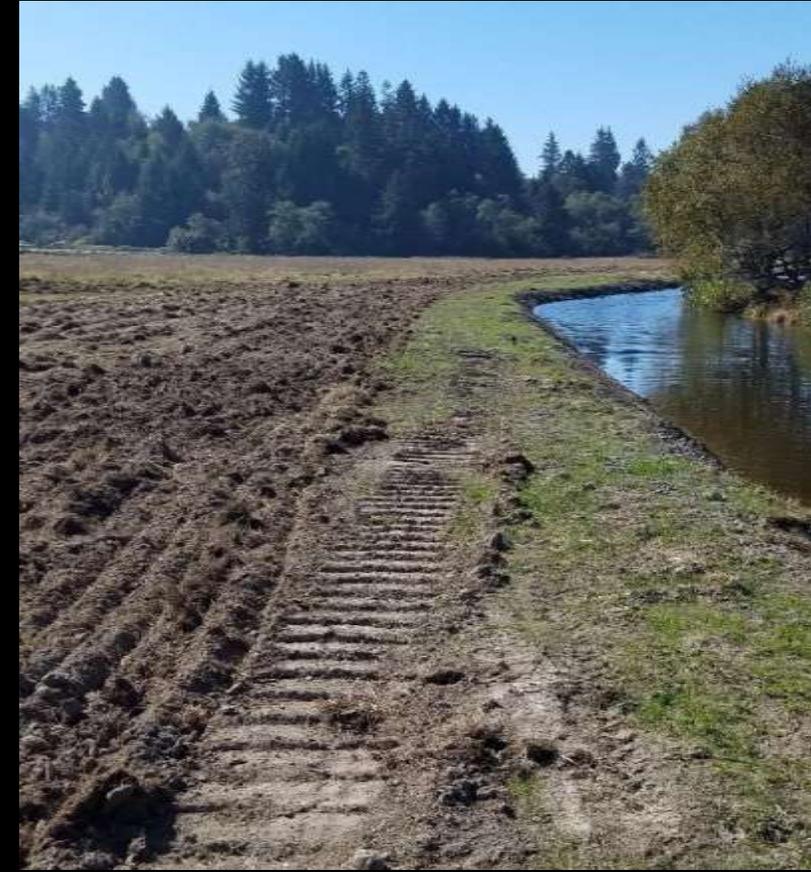
Design And Construction Components



Martin Slough Erosion Control and Marsh Plains



Maintaining Existing Riparian Corridor on One Side of Channel



Ripping and Decompacting Temporary Construction Access



Project Response

No Net Rise

Reduced Flood Inundation

Greater Use of Golf Course

Improved Ag Production

**Public Engagement about
Restoration Project**

**Compliments from Golfers
About Project and
Changes on Golf Course**





Biological Response

Avian Species:

Osprey, Redwing
Blackbirds, Egrets, and
Wood Duck nest in Pond G





Biological Response

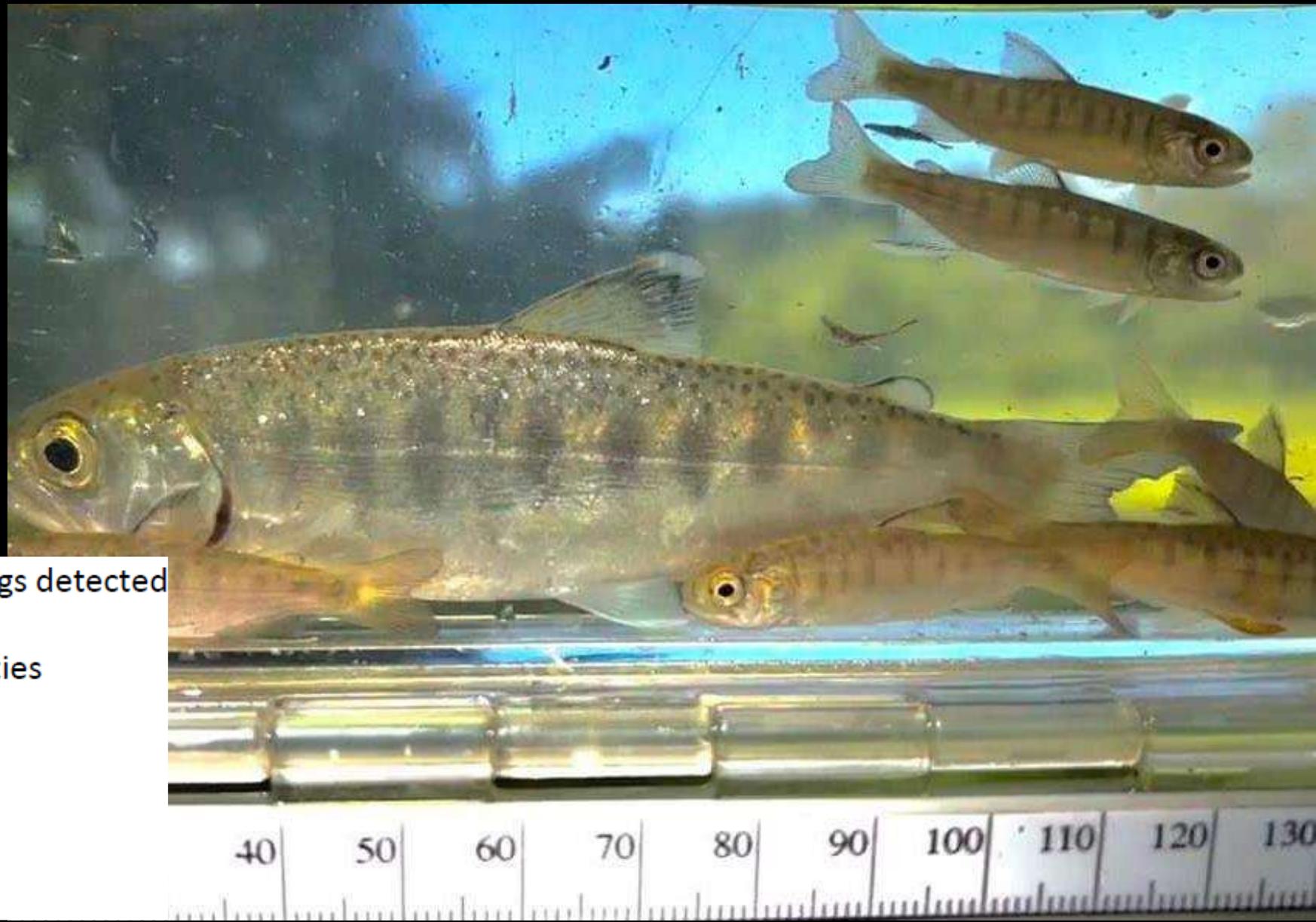
May 21, 2022

722 Coho Fry!

Pacific lamprey

June 23, 2020 Report

Juvenile Coho Salmon = 2 fish – no PIT tags detected
Coastal Cutthroat Trout = 1 fish.
Tidewater Goby = 699 fish – two mortalities
Sculpin spp. (Prickly) = 58 fish.
Pacific Staghorn Sculpin = 4 fish.
Threespine Stickleback = 2,325 fish.
Starry Flounder = 2 fish.
Red-legged Frog = 4 tadpoles.



Thank You



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