Trinity River Restoration Program's Adaptive Management Program

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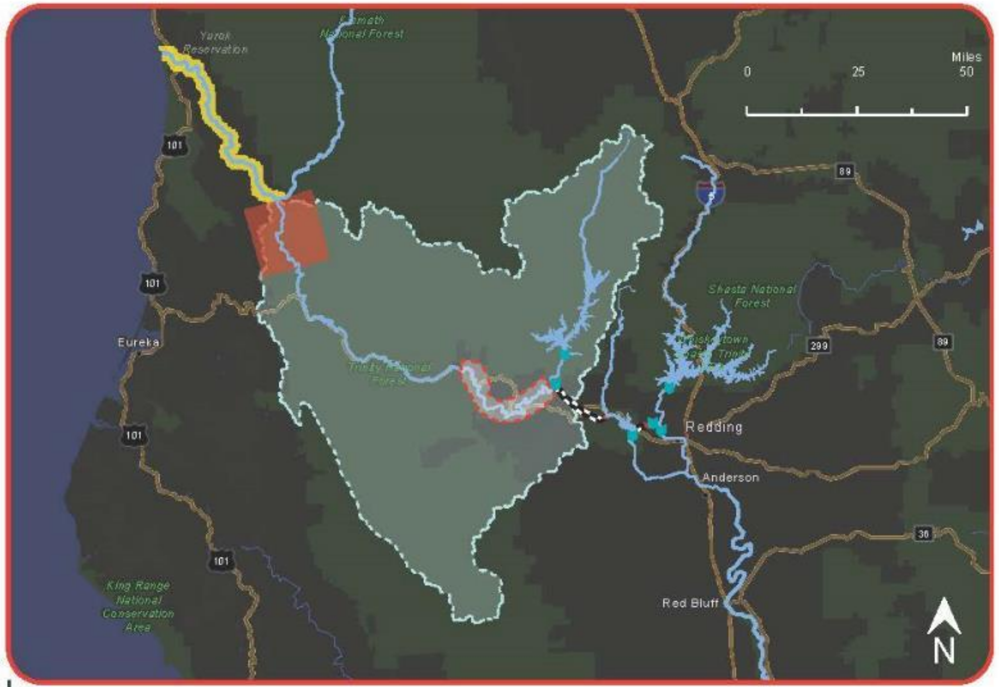
Trinity River Restoration Program
US Bureau of Reclamation

Salinas River Symposium
May 5, 2023

Greater Trinity Watershed



Area Enlarged

Legend

- Greater Trinity Watershed
- Yurok Reservation
- Hoopa Valley Reservation
- Trinity River Restoration Program 40 Mile Restoration Reach
- Private Lands
- Public Lands
- Bureau of Reclamation Dam Infrastructure
- Bureau of Reclamation Tunnel Infrastructure

Date: 1/9/2023

DISCLAIMER: This map and data are provided as-is and are intended for general reference only. None of the parties involved in preparing the map or data contained herein warrant or represent the data to be complete and accurate.

Anadromous Fish

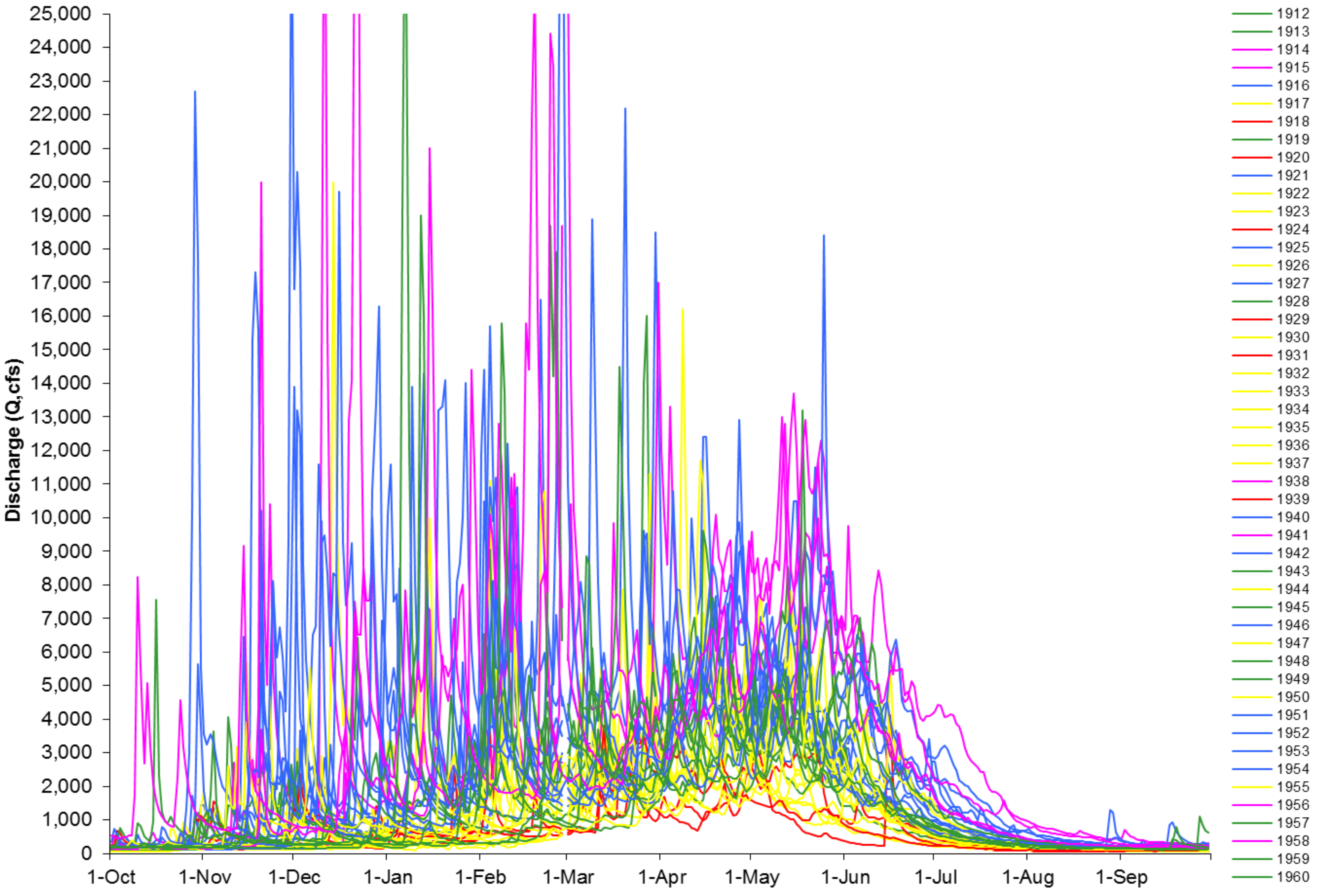
Hydraulic Mining

- 307 hydraulic mines in Trinity County in 1898
- 110 years of hydraulic mining in Trinity County (~1860 to 1970).
  - 3 times as long as in the Sierra Nevada
- La Grange Mine – Largest in the world
- Union Hill Mine – Second largest in the world

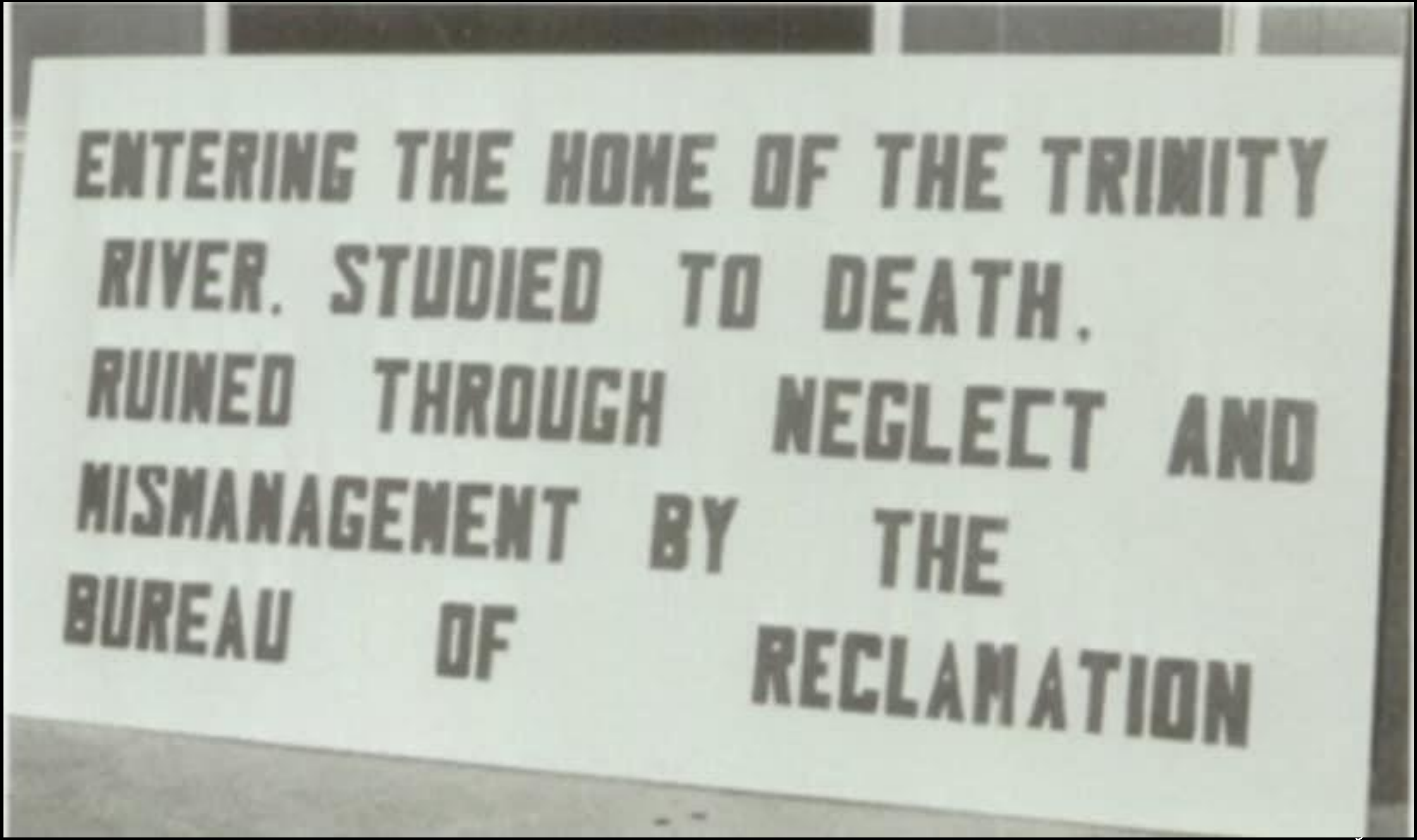
Dredger Mining

Photo Courtesy of Trinity Historical Society

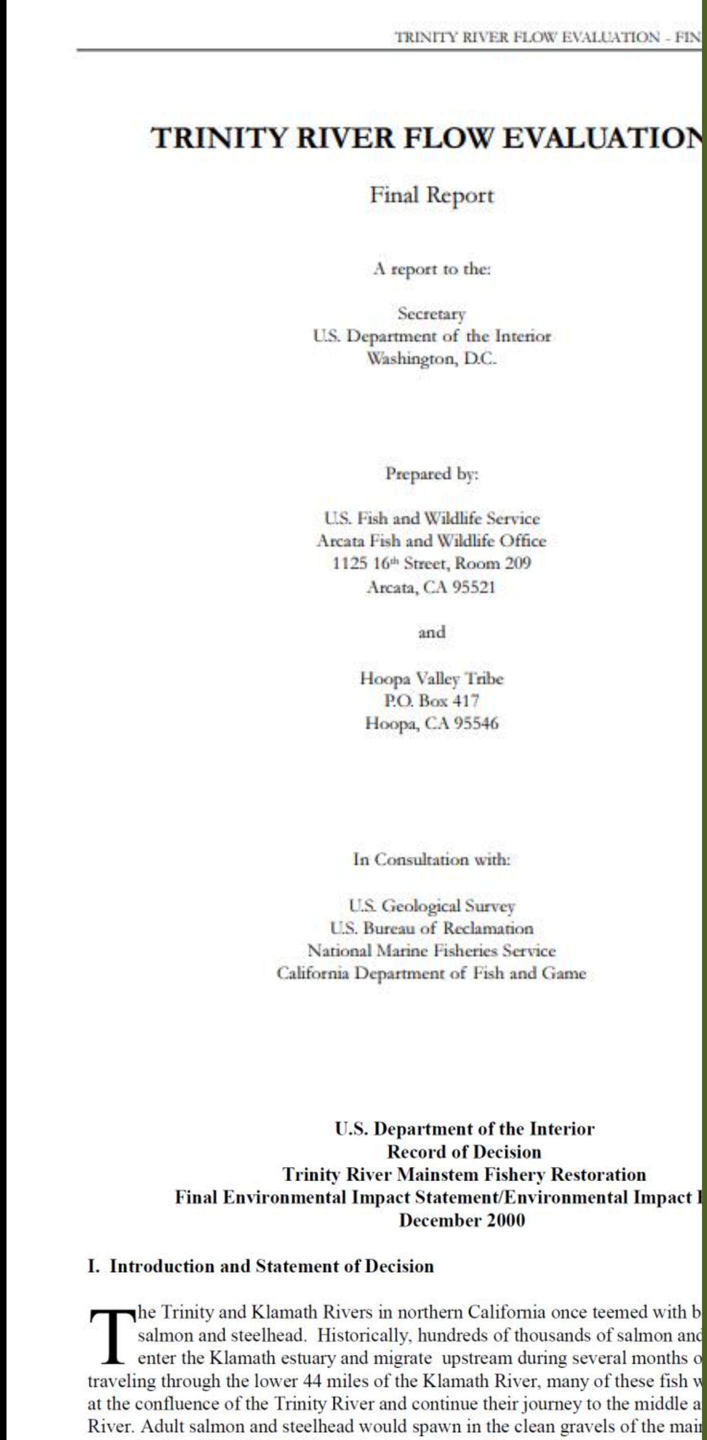
Trinity River at Lewiston Unimpaired Hydrographs WY1912-1960




THE HOME OF THE TRINITY
TO DEATH.
NEGLECT AND
BY THE
RECLAMAT


ENTERING THE HOME OF THE TRINITY
RIVER. STUDIED TO DEATH.
RUINED THROUGH NEGLECT AND
MISMANAGEMENT BY THE
BUREAU OF RECLAMATION

Background of Program


TRINITY RIVER FLOW EVALUATION - FIN

TRINITY RIVER FLOW EVALUATION

Final Report

A report to the:

Secretary
U.S. Department of the Interior
Washington, D.C.

Prepared by:

U.S. Fish and Wildlife Service
Arcata Fish and Wildlife Office
1125 16th Street, Room 209
Arcata, CA 95521

and

Hoopa Valley Tribe
P.O. Box 417
Hoopa, CA 95546

In Consultation with:

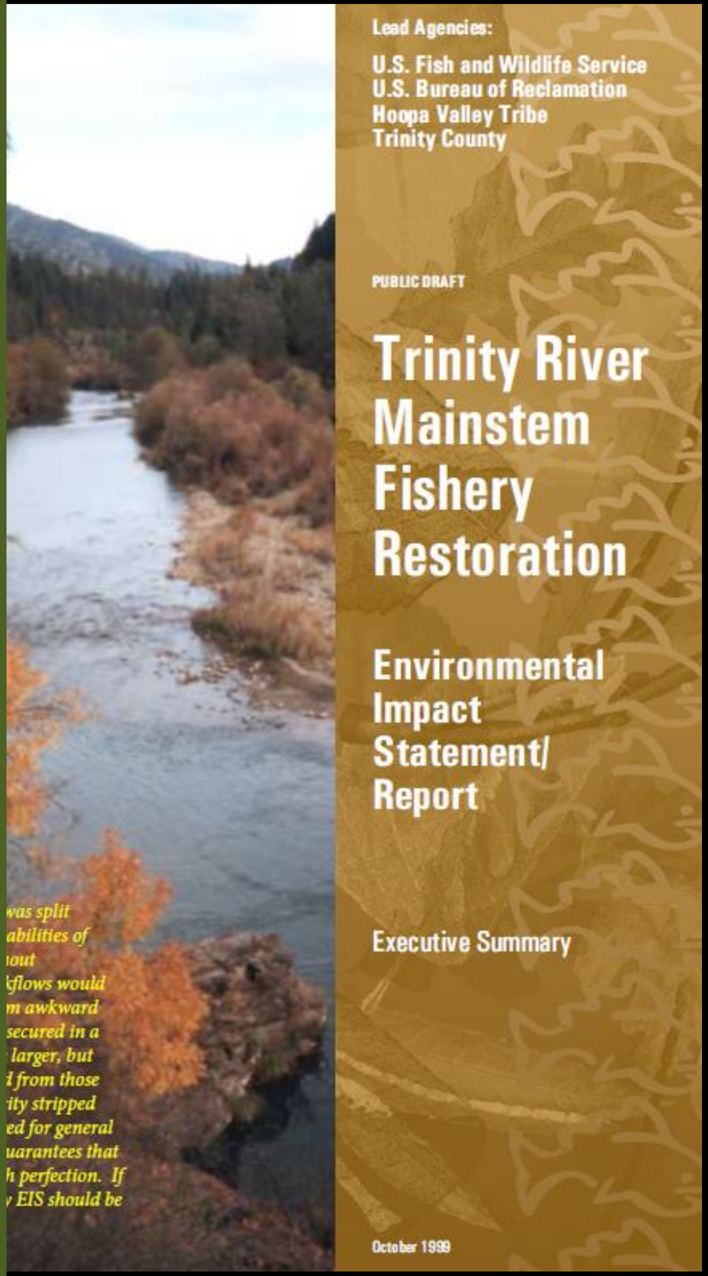
U.S. Geological Survey
U.S. Bureau of Reclamation
National Marine Fisheries Service
California Department of Fish and Game

U.S. Department of the Interior
Record of Decision
Trinity River Mainstem Fishery Restoration
Final Environmental Impact Statement/Environmental Impact I
December 2000

I. Introduction and Statement of Decision

The Trinity and Klamath Rivers in northern California once teemed with b salmon and steelhead. Historically, hundreds of thousands of salmon and enter the Klamath estuary and migrate upstream during several months o traveling through the lower 44 miles of the Klamath River, many of these fish w at the confluence of the Trinity River and continue their journey to the middle a River. Adult salmon and steelhead would spawn in the clean gravels of the mai

- Trinity River Flow Evaluation Report
  - Rearing habitat limited salmonid populations
  - Geomorphic processes were stalled
- Environmental Impact Statement
  - Preferred alternative- combination of increased and seasonally variable flows, channel rehabilitation, sediment augmentation, and watershed (erosion) restoration
  - Actions were to be coupled with adaptive management program
- Record of Decision
  - Affirmed tribal role in restoration
  - Allocated flow volumes and gravel augmentations by water year
  - Identified channel rehabilitation sites



Trinity River Restoration Program

The long-term goals of this Program are to restore the form and function of the Trinity River; restore and sustain natural production of anadromous fish populations in the Trinity River to pre-dam levels; and to facilitate full participation by dependent tribal, commercial, and sport fisheries through enhanced harvest opportunities.

Our toolbox

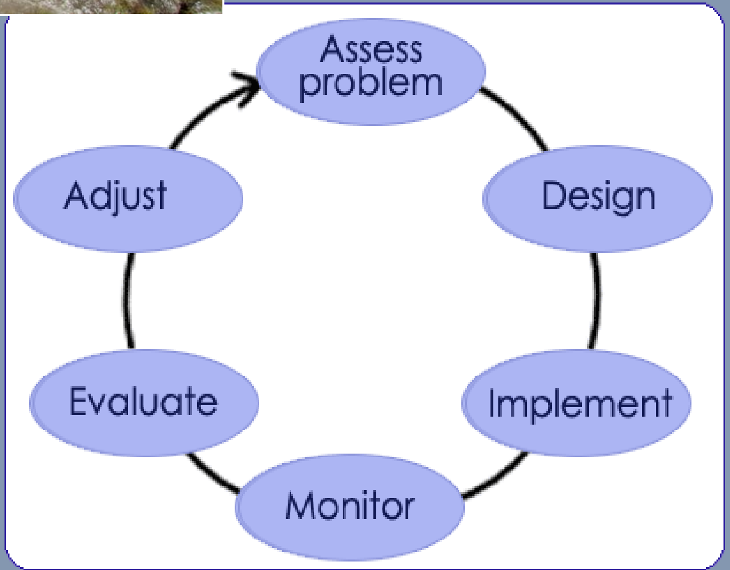
Gravel Augmentation

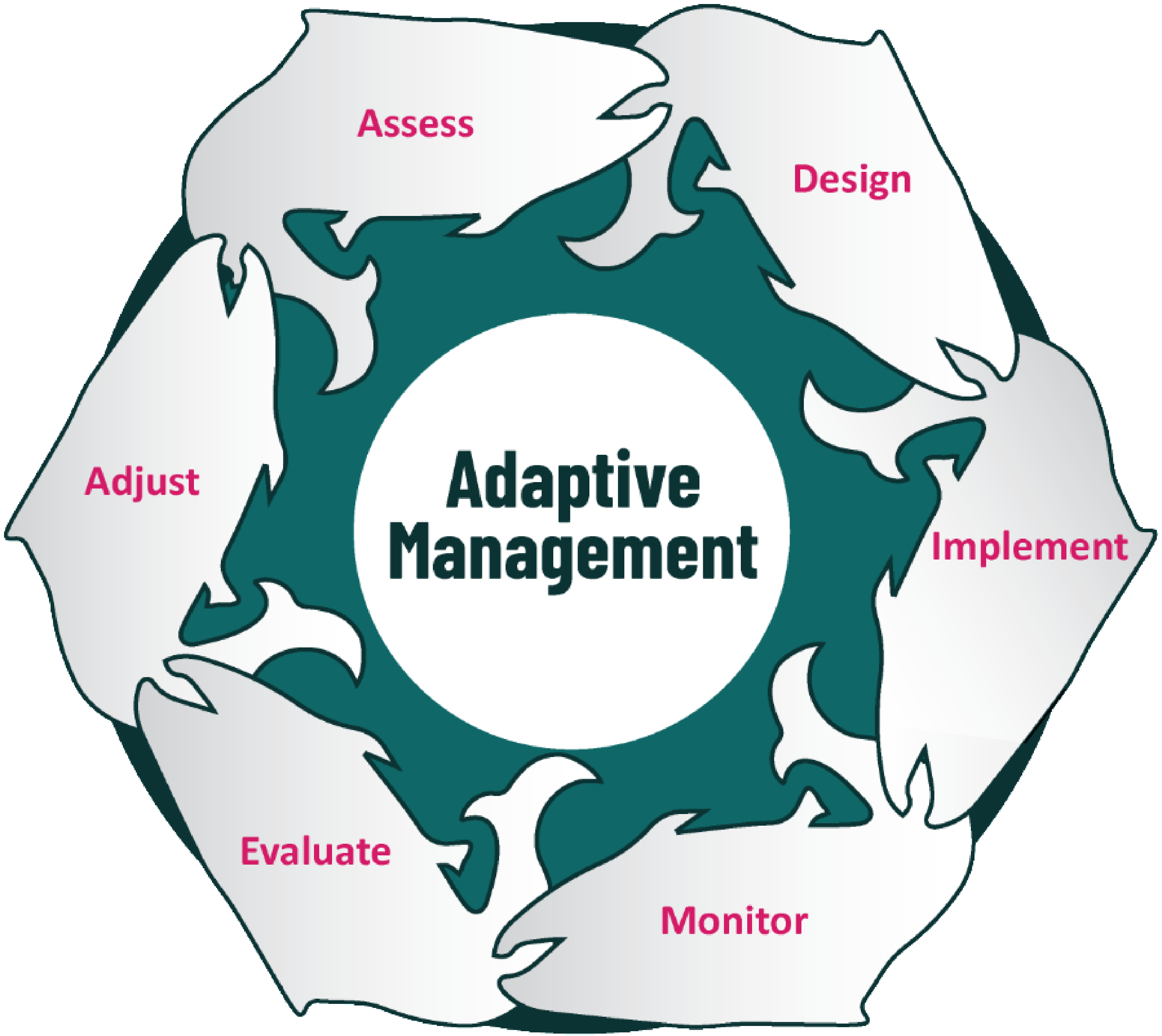
Channel Rehabilitation

Watershed Restoration

Adaptive Management

Restoration Flows

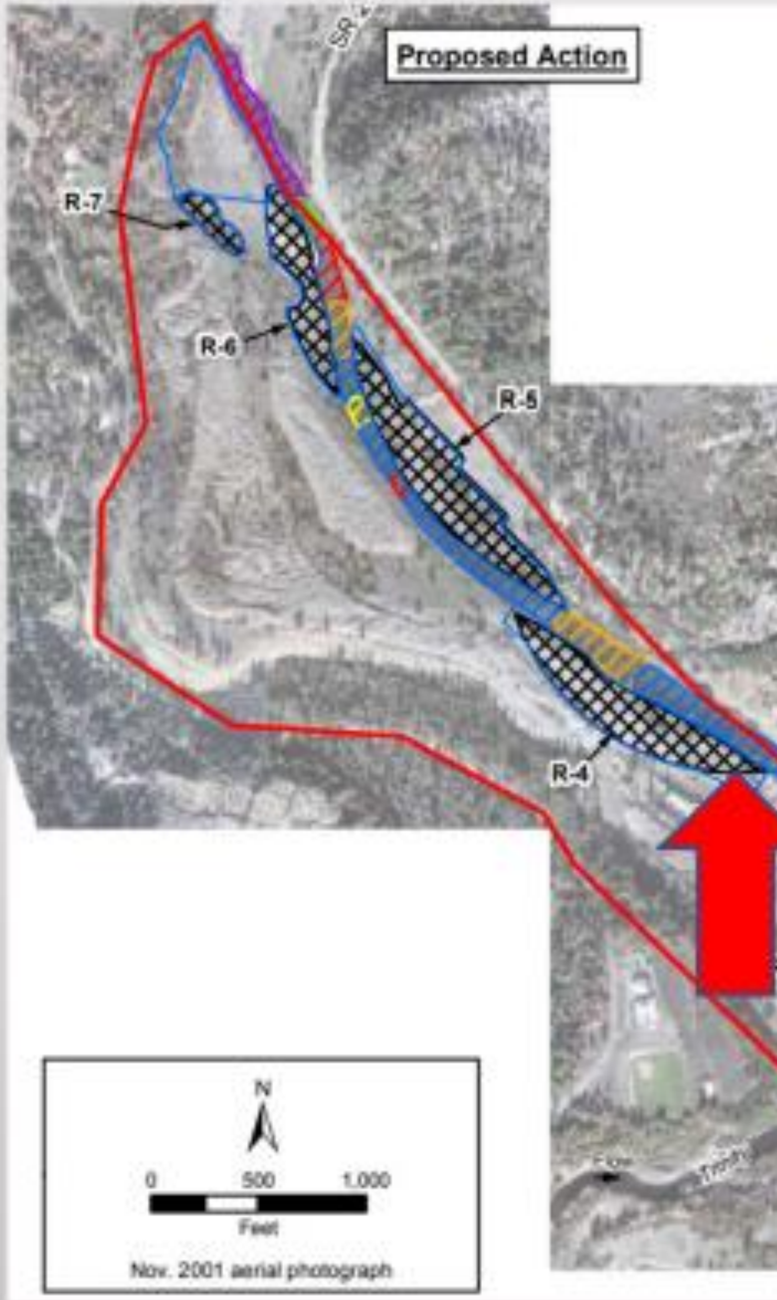



Assess
Design
Implement
Monitor
Evaluate
Adjust
Adaptive Management

Monitoring tools

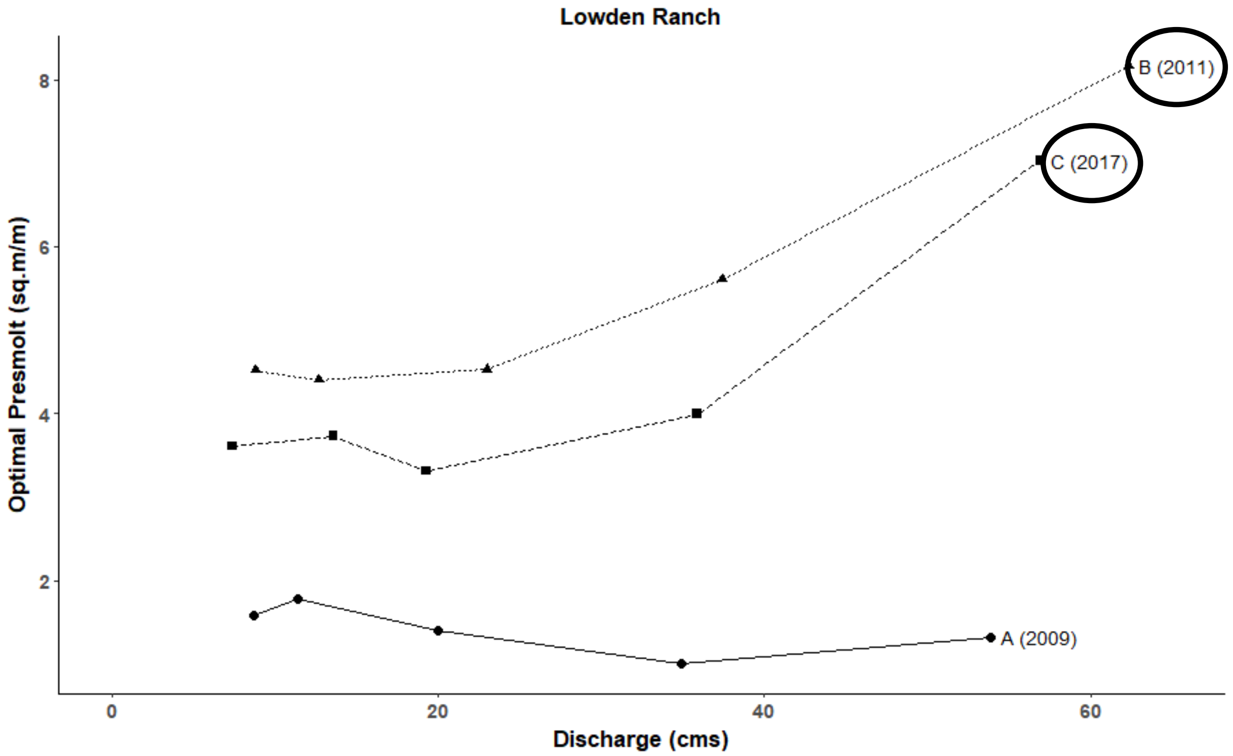
- Stream gaging (flow and temperature; periodic sediment)
- Chinook run-size estimation
- Outmigrant monitoring
- Harvest monitoring
- Redd and carcass surveys
- Hydraulic modeling and associated input (bathymetry and topography) and output (suitable depth and velocity)
- Aerial imagery
- Other biological (riparian recruitment, algae)
- Site-focused post-project surveys
- Hypothesis-driven research

Reporting, Presenting, Publishing, Discussing, Learning

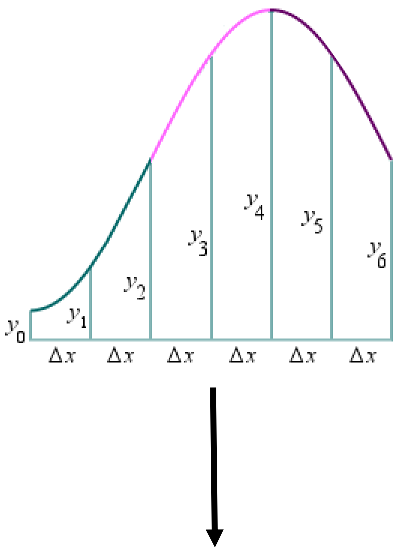

Proposed Action
R-7
R-6
R-5
R-4
N
0
500
1,000
Feet
Nov. 2001 aerial photograph

Boyce, J., D.H. Goodman, J. Alvarez, A. Martin and K. Hopkins. 2020. **Streamflow and Juvenile Salmonid Habitat Availability at Six Rehabilitation Sites on the Trinity River, California 2008-2017.**

(300-2,000 cfs)

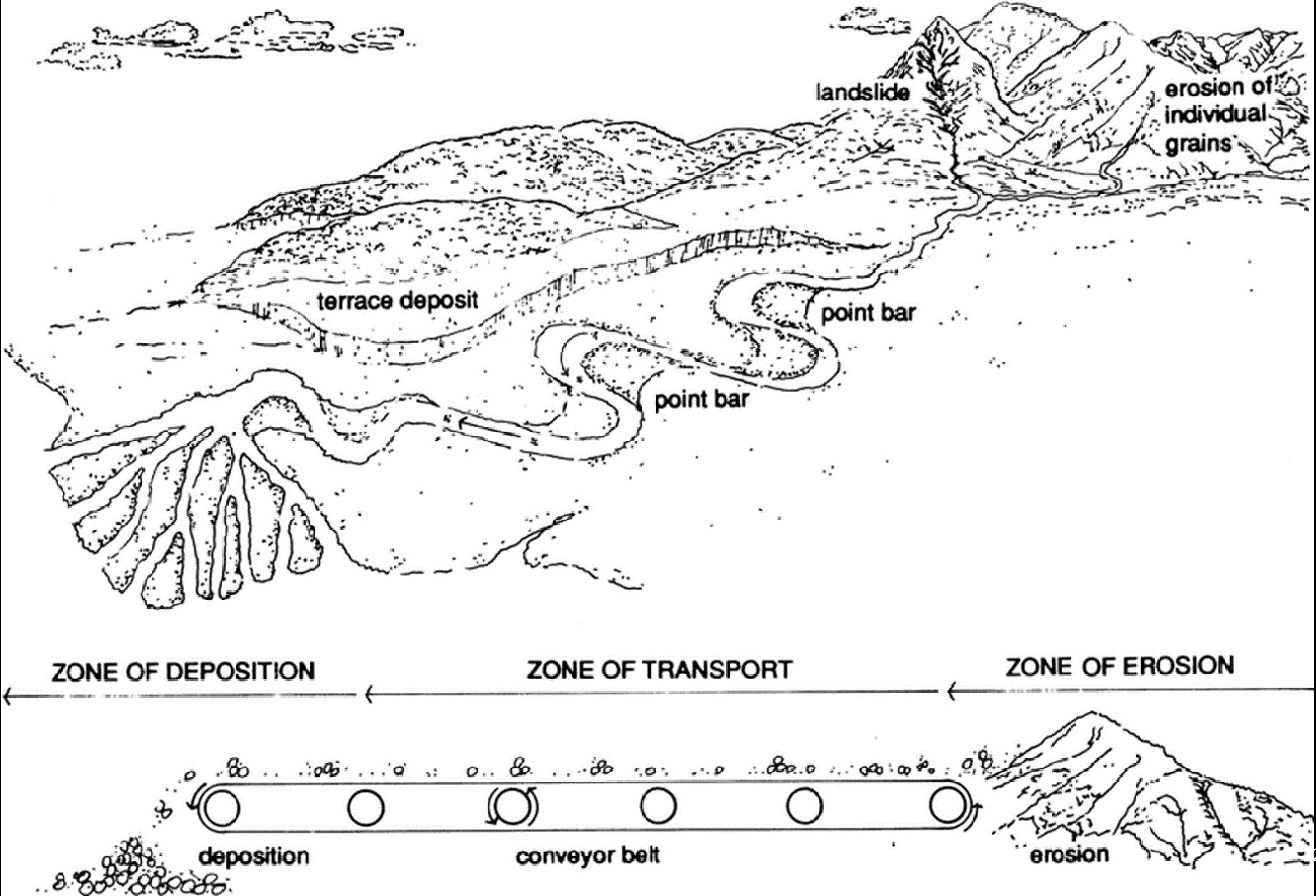


n=6 sites



AUC (cms*sq.m/m)

Figure 8. Photographs documenting the effect of hard points on fluvial processes at two side channels constructed at Lower Steiner Flat. The upper panel documents a side channel with a constructed large wood jam or hard point soon after construction in 2013 and again in 2016 after scouring streamflow events. The lower panel shows a second side channel soon after construction in 2013 and again the following year documenting closure due to sediment deposition.


landslide
erosion of individual grains
terrace deposit
point bar
point bar
ZONE OF DEPOSITION
ZONE OF TRANSPORT
ZONE OF EROSION
deposition
conveyor belt
erosion

Gaeuman and Boyce 2018

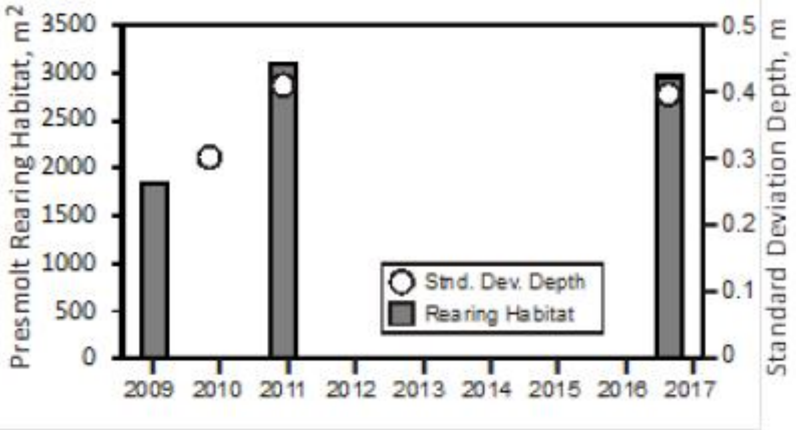


Figure 5. Areas of presmolt rearing habitat mapped at 12.7 m^3/s and standard deviations of depths at three points in time. Habitat mapped in 2009 and depth variability reported for 2010 [16] are assumed to represent similar topographic conditions prior to the 2011 flow release and gravel augmentation.

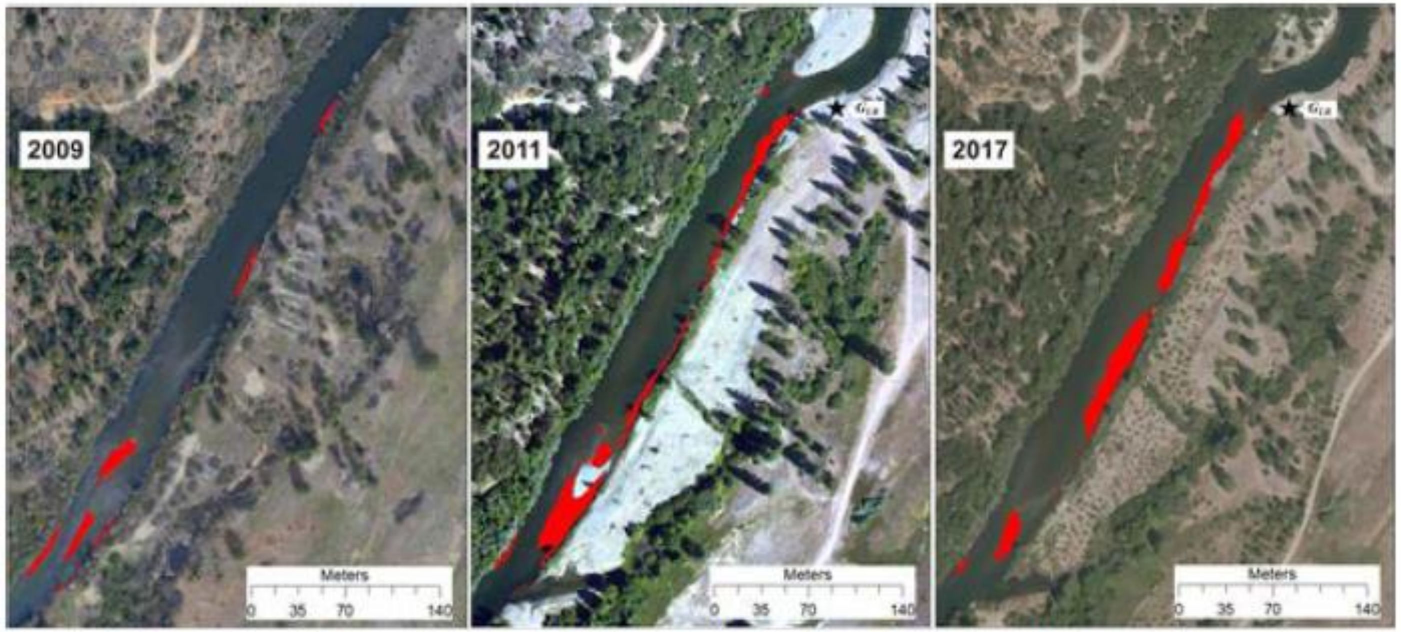
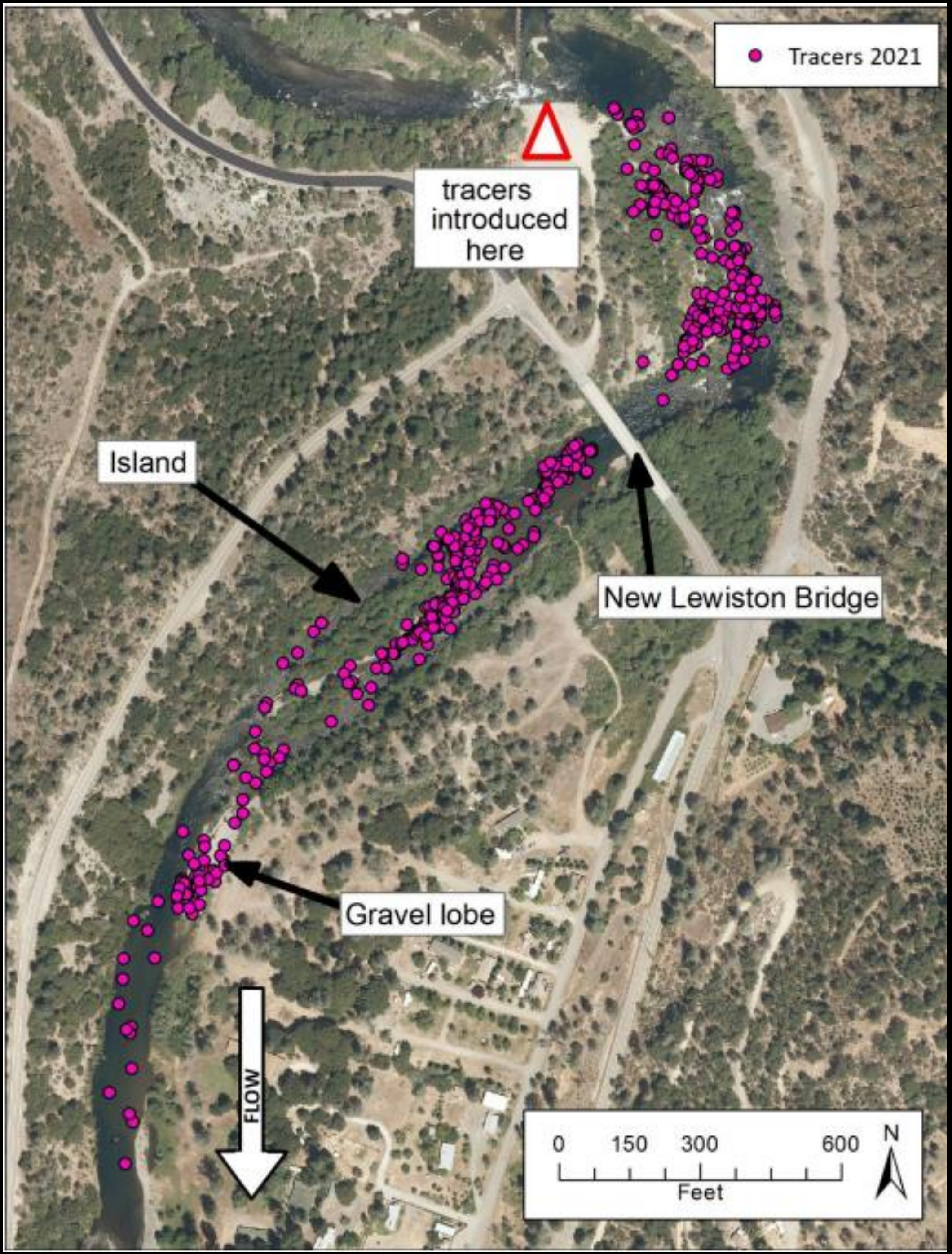
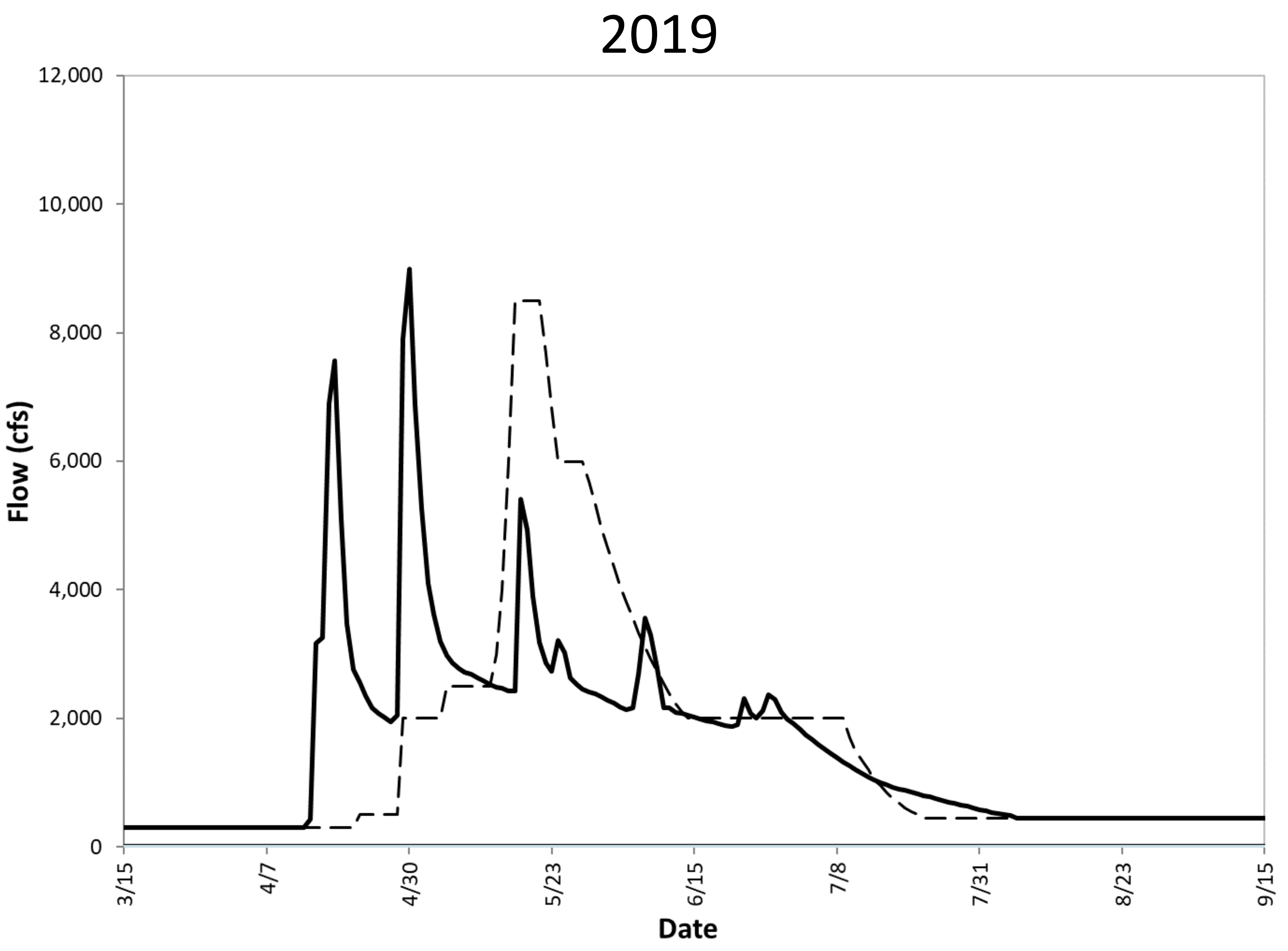


Figure 6. Distributions of presmolt rearing habitat mapped at 12.7 m^3/s in the Lowden Ranch study area in 2009, 2011, and 2017. Flow is toward the bottom of the page.



- RFIDs inserted into injected gravel (‘tracer rocks’)
- Introduced during high flow gravel injections
- Relocated at intervals
- Gravel doesn’t move as rapidly or evenly as originally assumed


2019
Flow (cfs)
12,000
10,000
8,000
6,000
4,000
2,000
0
3/15
4/7
4/30
5/23
6/15
7/8
7/31
8/23
9/15
Date

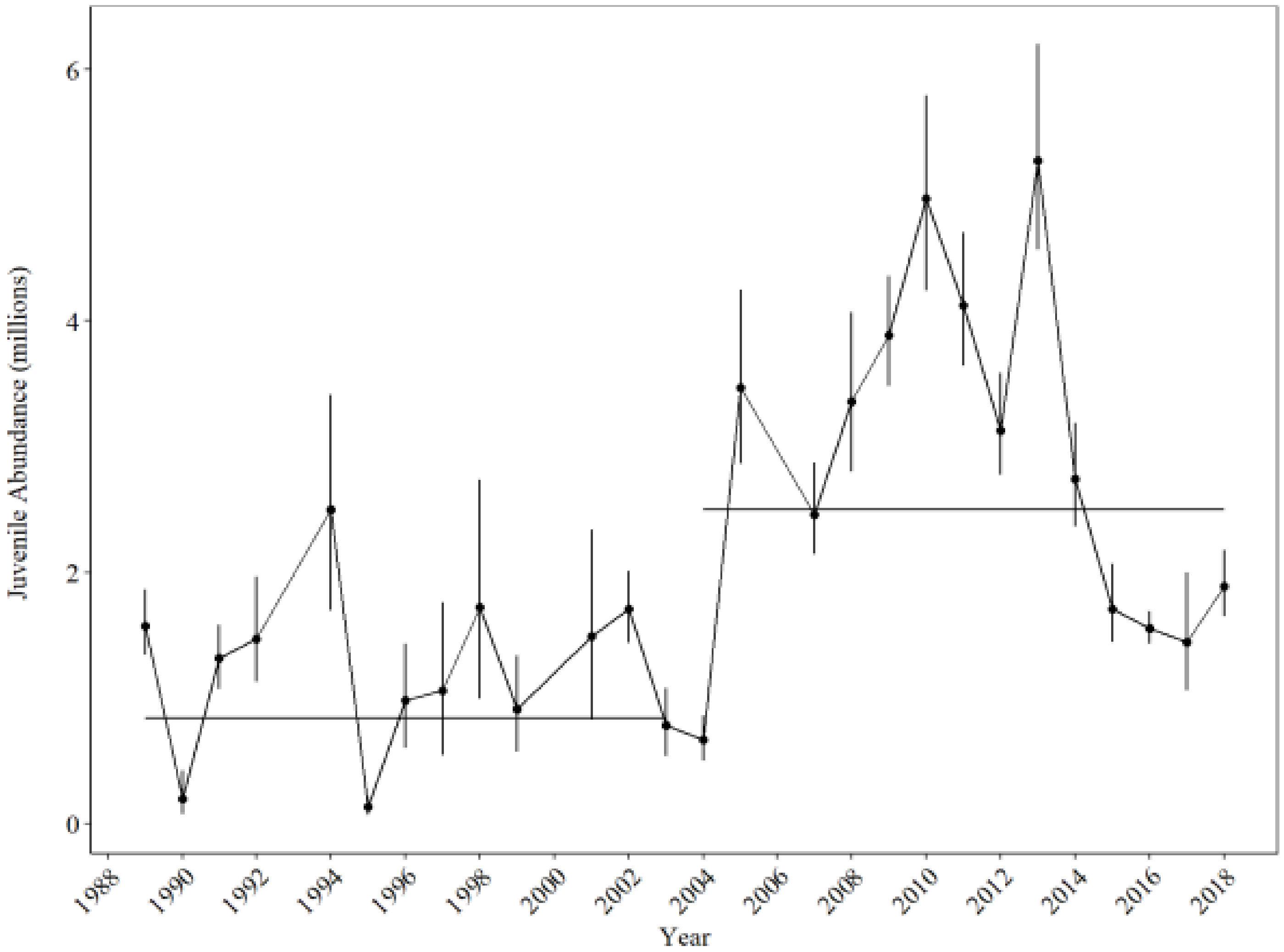


Figure 4. Juvenile Chinook Salmon abundance (in millions) at the Willow Creek trap site from 1989-2018. Horizontal lines indicate mean juvenile abundance (in millions) prior to and following the identified change point of 2004. Error bars indicate 95% credible intervals around juvenile abundance estimates.

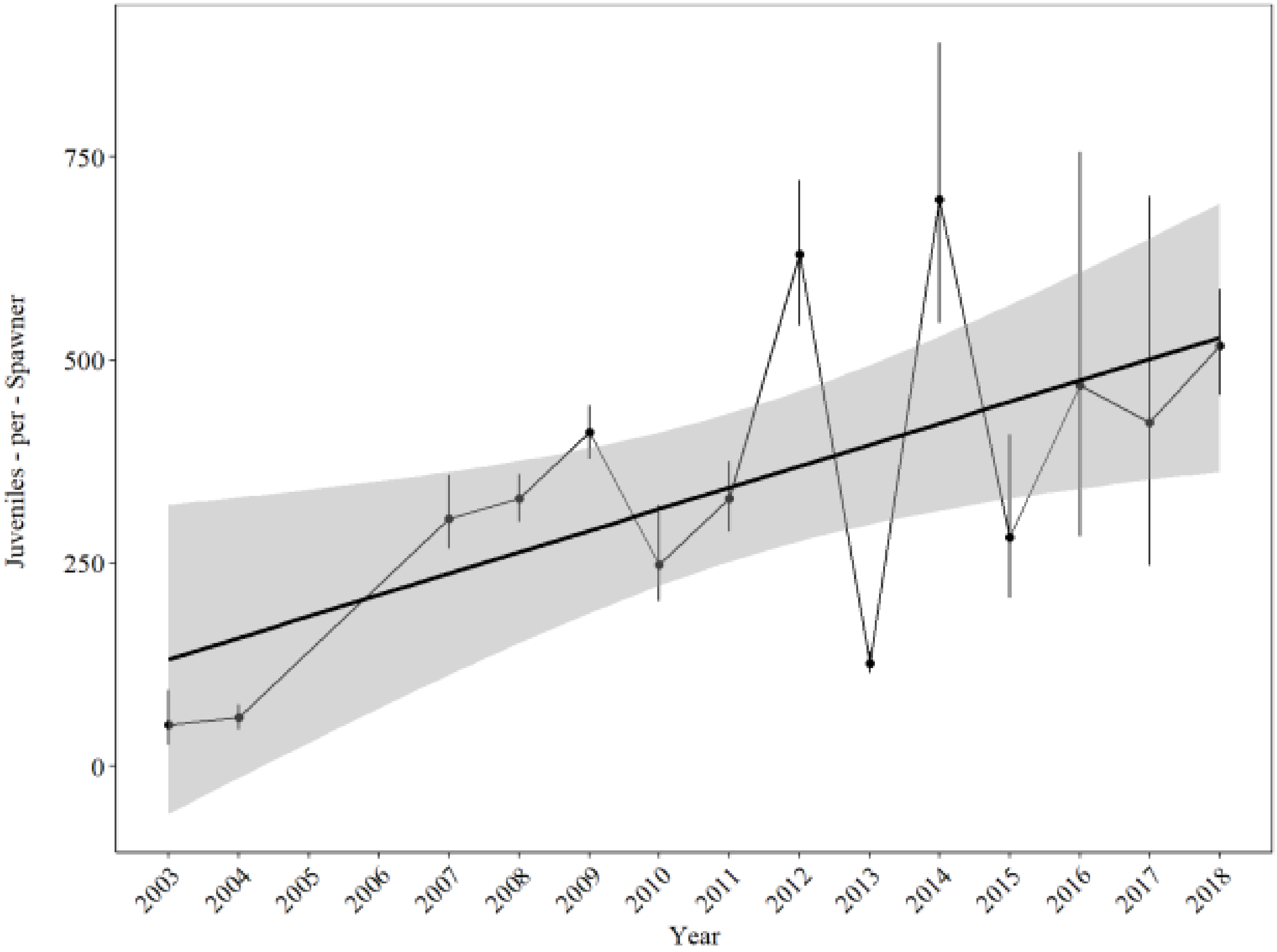
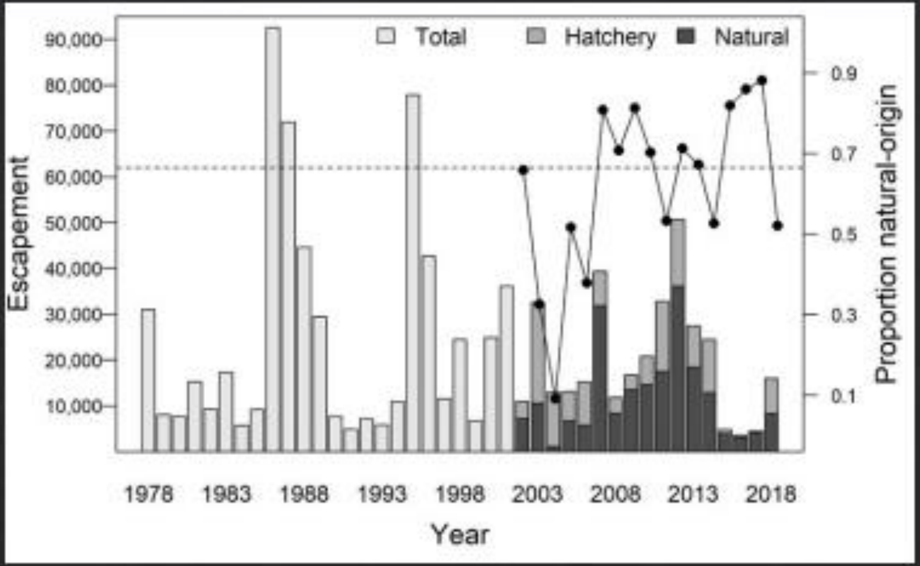


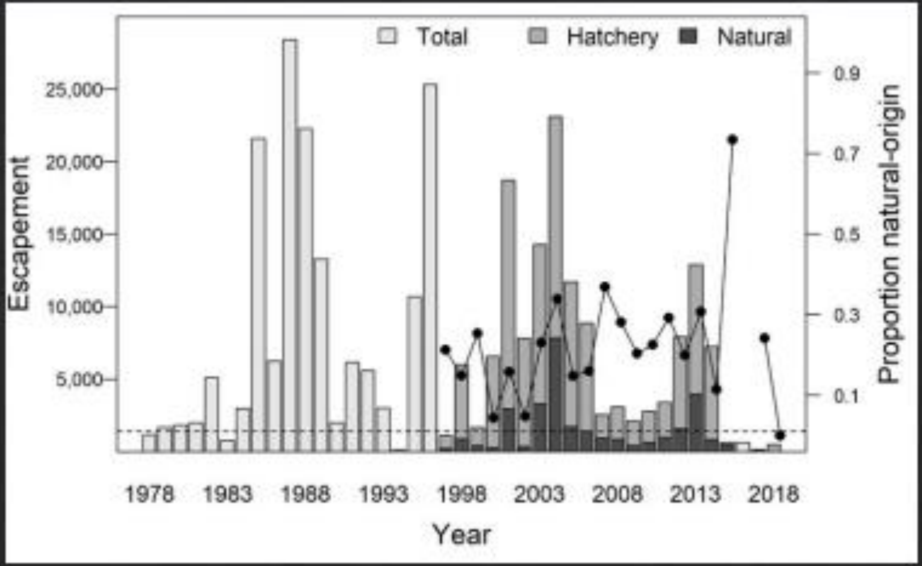
Figure 6. Estimated linear regression trend (thicker black line) of annual juvenile Chinook Salmon production (juveniles-per-spawner) at the Pear Tree trap site on the Trinity River from 2003-2018. Grey bar indicates 95% confidence interval of regression line. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Natural Area Escapement

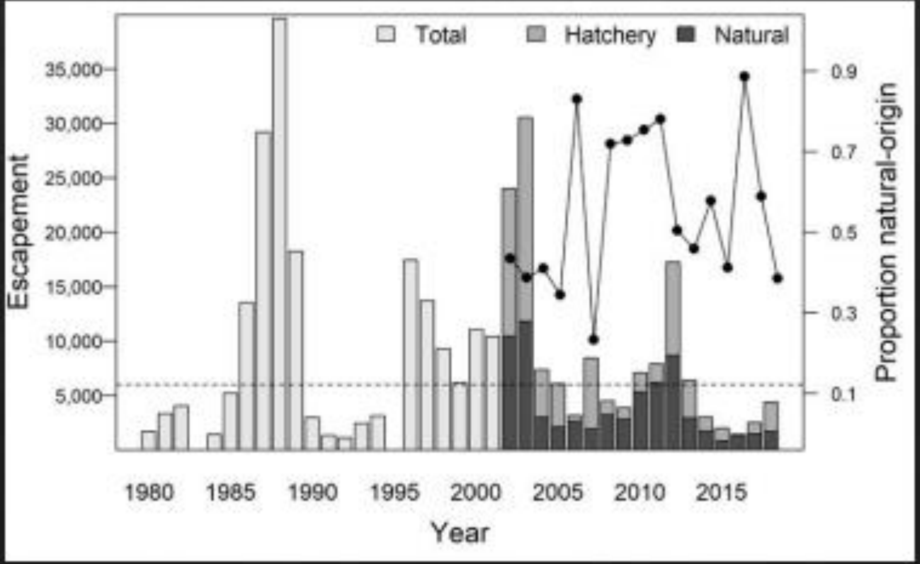
Fall-run Chinook Salmon



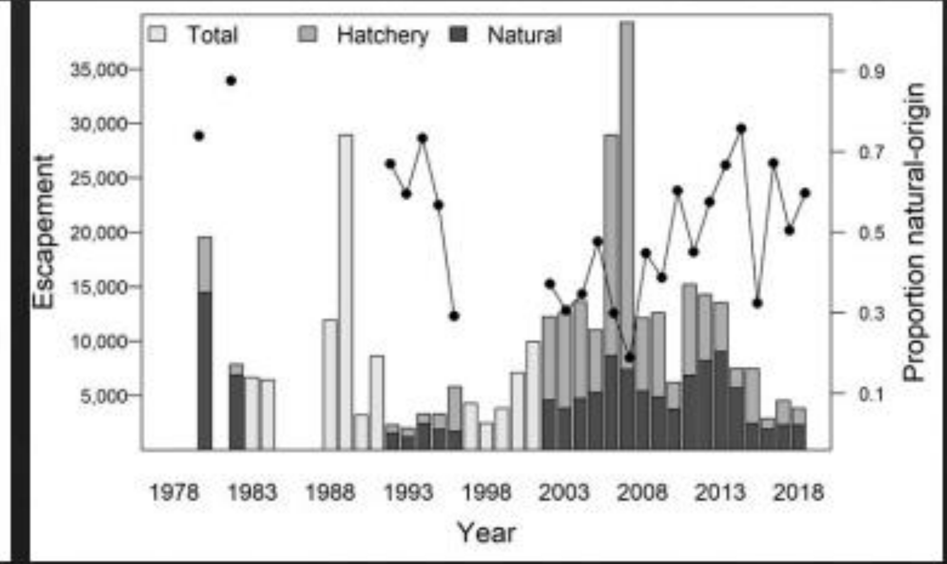
Coho Salmon



Spring-run Chinook Salmon



Steelhead



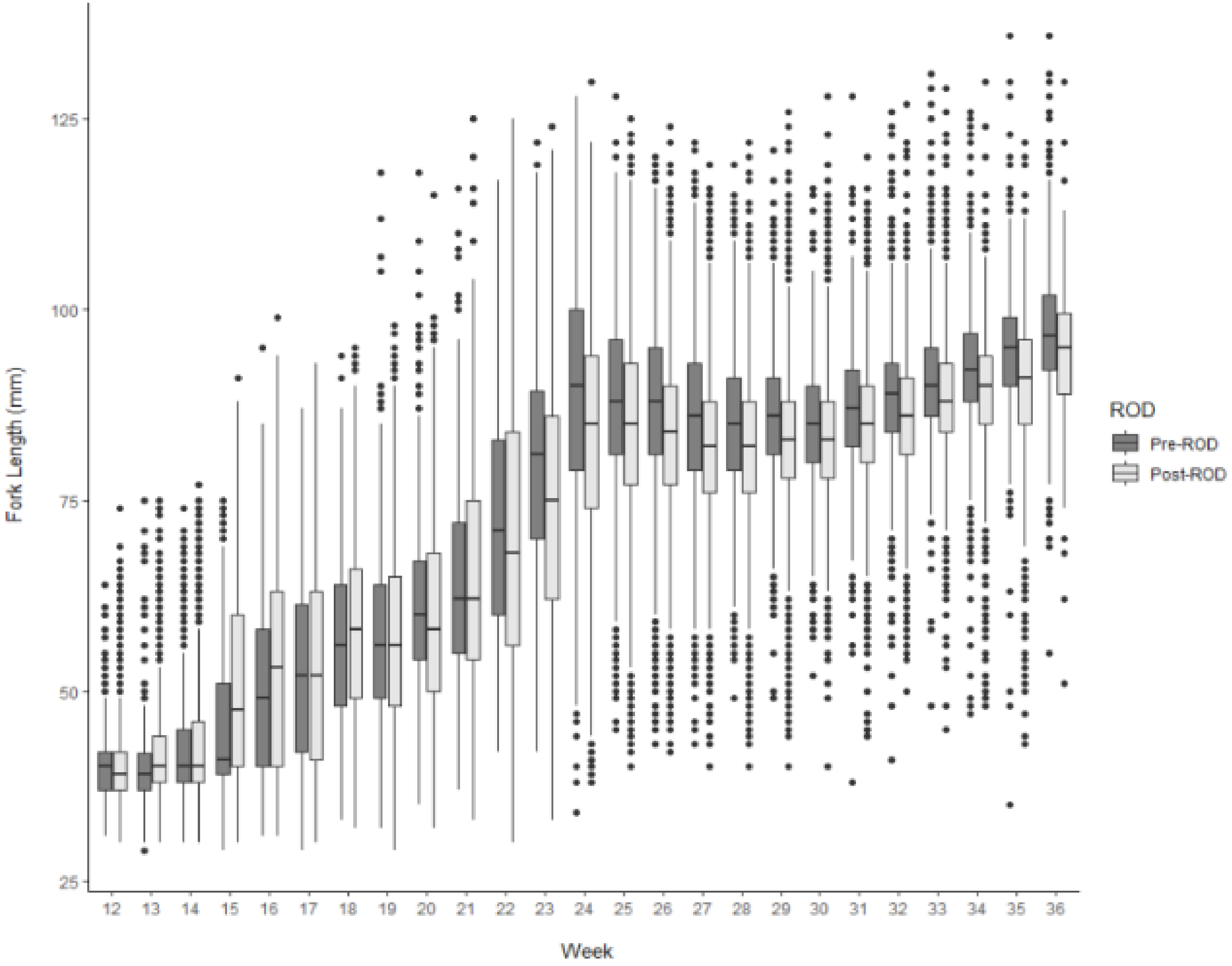
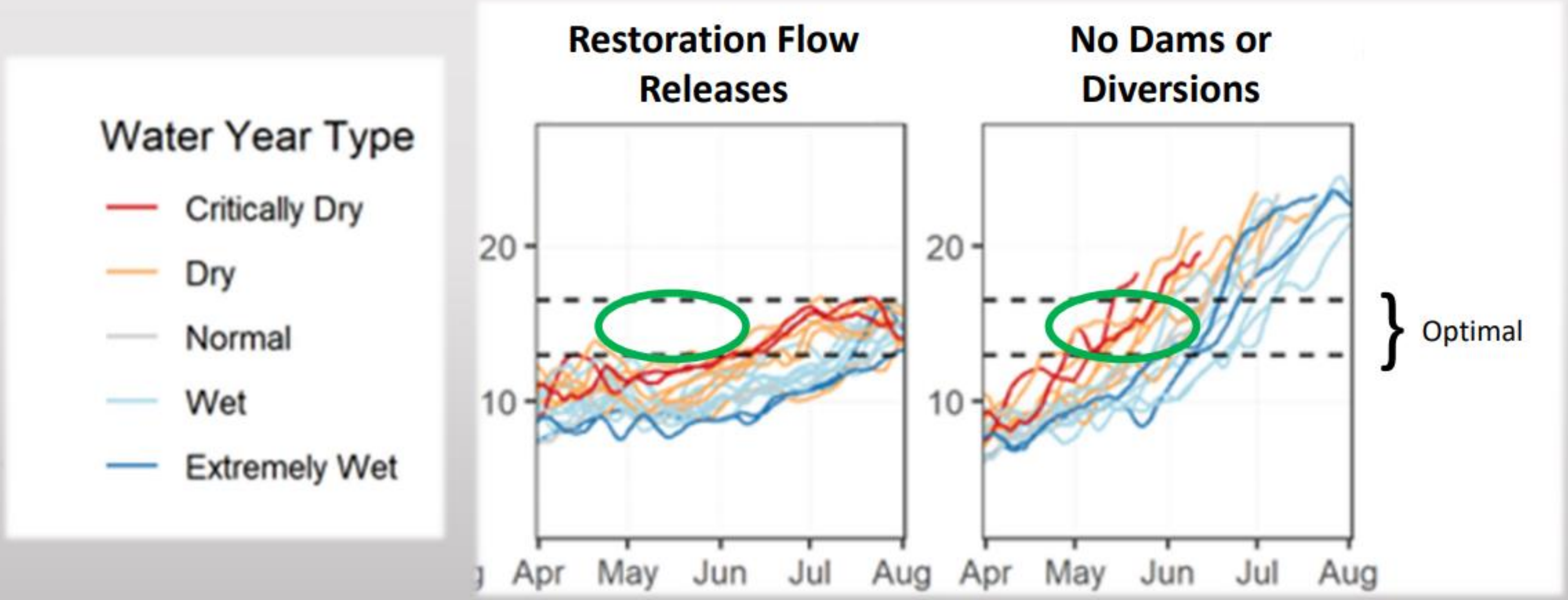
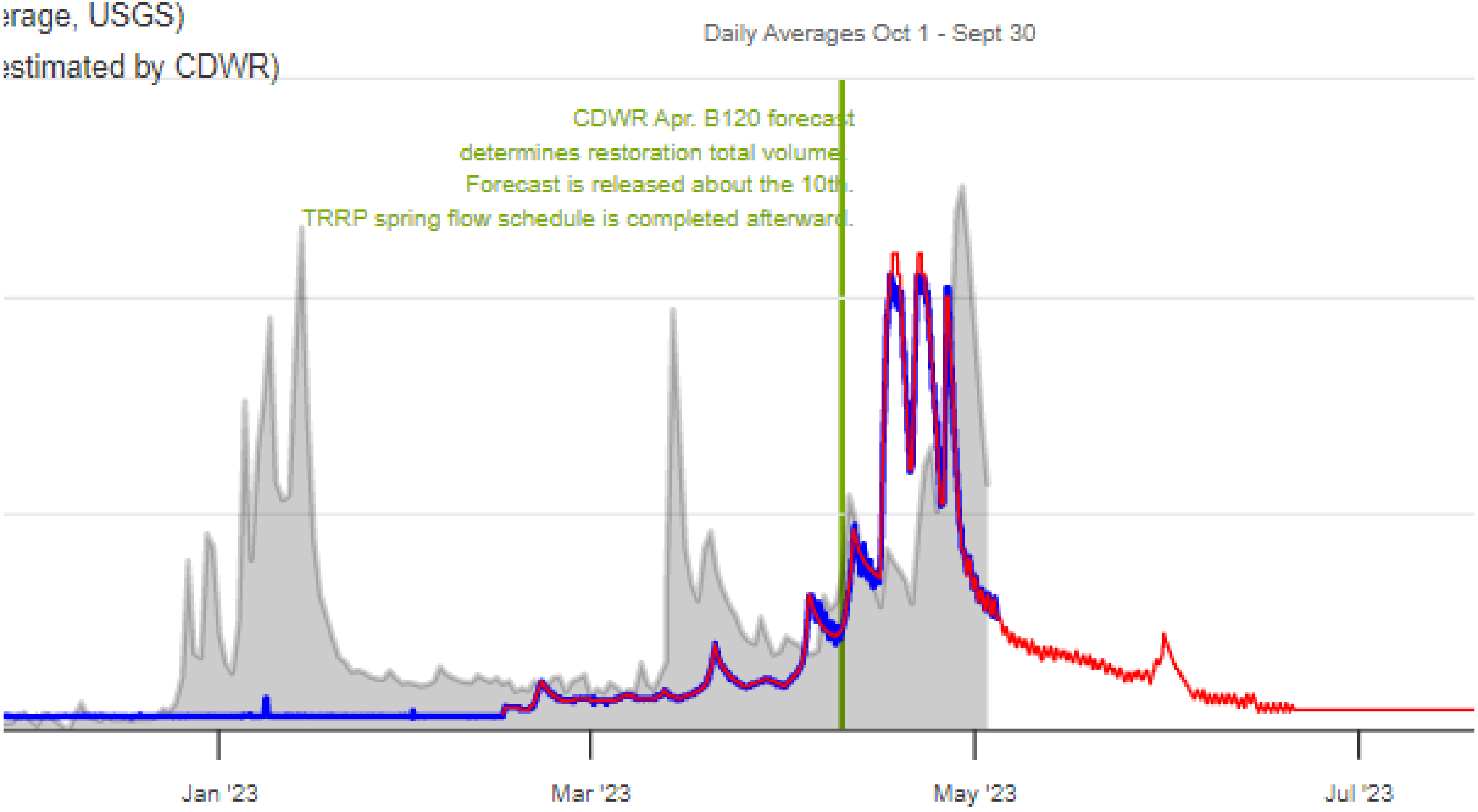


Figure 10. Box-plot of fork length for non-adipose fin-clipped age-0 Chinook Salmon captured at the Willow Creek trap site grouped by week and Record of Decision (ROD) period. Bars indicate standard error (SE) of the mean and points represent outliers beyond SE bars.


Water Year Type
Critically Dry
Dry
Normal
Wet
Extremely Wet
Restoration Flow Releases
No Dams or Diversions
20
10
Apr
May
Jun
Jul
Aug
Optimal

Water Year 2023 Progression

Daily Averages Oct 1 - Sept 30



Lessons learned from practicing adaptive management

- You will never know everything when you start, but you have to start somewhere
- Monitoring is an investment that facilitates learning by doing
- Monitoring should focus on actions under your control and their expected outcomes
- Learning is a communal activity, takes time, and requires patience

Photo courtesy
Yurok Tribal
Fisheries

Questions?