Welcome to the Conservation Lecture Series

https://www.wildlife.ca.gov/Conservation/Lectures

Questions? Contact Margaret.Mantor@wildlife.ca.gov

CDFW Conservation Lecture Series

The Conservation Lecture Series is organized by CDFW's Habitat Conservation Planning Branch. The lecture series is designed to deliver that most current scientific information about species that are of conservation concern.

Below is a list of lectures and speakers for the Conservation Lecture Series. Lectures are open to anyone who is interested in participating. Participants may attend in-person or remotely via WebEx. Please be sure to register for each class. Lectures are recorded and posted for those unable to attend the day of the event. Visit the archive page to see recordings of past lectures.

Subscribe to receive email updates and invitations to upcoming lectures.

Upcoming Lectures

Invasive Watersnakes – March 12, 2015, 1:00-3:00 pm. Presented by Dr. Brian Todd

Non-native watersnakes are among the newest threats to California's native freshwater biodiversity. Dr. Brian Todd, an Associate Professor at UC Davis, will describe his work with these species over the past several years. Dr. Todd will present an overview of the ecology and invasion history of watersnakes in California and will describe the potential risk these non-native species pose to many of California's amphibian and fish species of conservation concern. He will discuss his ongoing research and efforts to facilitate management and eradication of these non-native species.

The Wildlife Society (TWS) Upcoming Events

Videos and Past Lectures

- Tricolored Blackbird (Dr. Meese)
- Bighorn Sheep (Dr. Villepique)
- Vegetation and Flora of a Biodiversity Hotspot (Dr. Ayres)
- FoothillYellow-legged Frog (Dr. Kupferberg)
- Spartina and California Clapper Rails (Dr. Strong)
- Townsend's Big-eared Bat (Dr. Johnston)
- California Red-Legged Frog (Alvarez)
- Salmon in the Yolo Bypass (Jeffres)
- White Abalone (Dr. Aquilino)
- Amargosa Vole (Dr. Foley)
- Desert Tortoise (Jones)
- Shasta Crayfish (Dr. Ellis)
- California Tiger Salamander (Dr. Searcy)
- Alameda Striped Racer (Dr. Swaim)
- Cactus Wren (Dr. Preston)

Lecture Schedule

Badgers in California **Dr. Jessie Quinn**	**August 6, 1:00-3:00, Sacramento**
Metrics and Approaches for Quantifying Ecosystem Impacts and Restoration Success **Dr. Zan Rubin**	**September 24, 1:00-3:00, Sacramento**
San Joaquin Kit Fox **Dr. Brian Cypher**	**October 6, 1:00-3:00, Fresno**
Process-based Stream Restoration to Help Farmers and Fish: Why California Needs 10,000 More Dams **Dr. Michael Pollock**	**October 13, 1:00-3:00, Sacramento**
Development of Multi-Threaded Wetland Channels and the Implications for Salmonids and Ecosystem Rehabilitation **Lauren Hammack**	**November 19, 1:00-3:00, Sacramento**

Round-Table Discussion

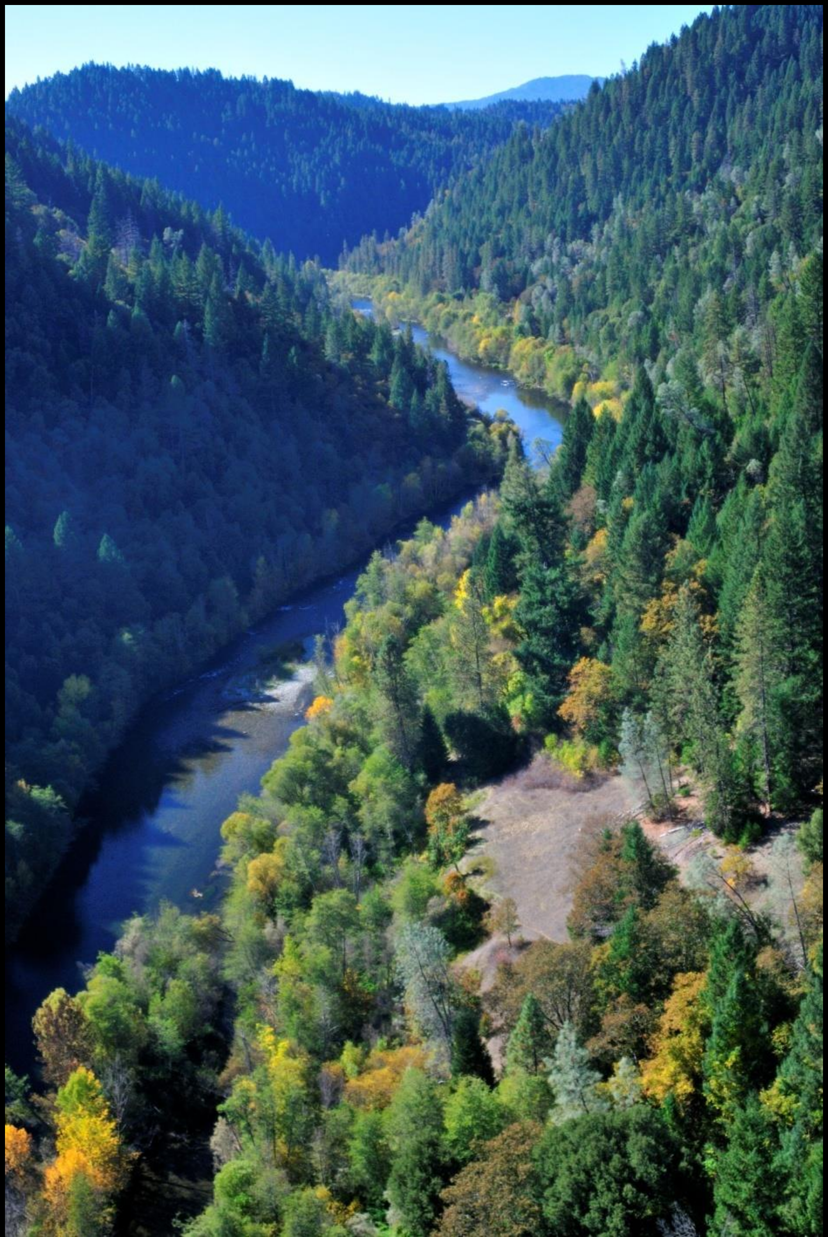
- Today, 12:30
- 1700 9thStreet (corner of Q an 9th)
  – Third floor conference room
- Call-in: 1-877-336-1831, Participant #940704

Processed-Based Restoration Design and Implementation at the Upper Junction City Channel Rehabilitation Site, Trinity River, Ca - Embracing Uncertainty And Learning From Progress

California Department of Fish and Wildlife (DFW) – Conservation Lecture Series – June 15th, 2015

David (DJ) Bandrowski P.E. - Yurok Tribe

KLAMATH RIVER WATERSHED – NORTHERN CALIFORNIA

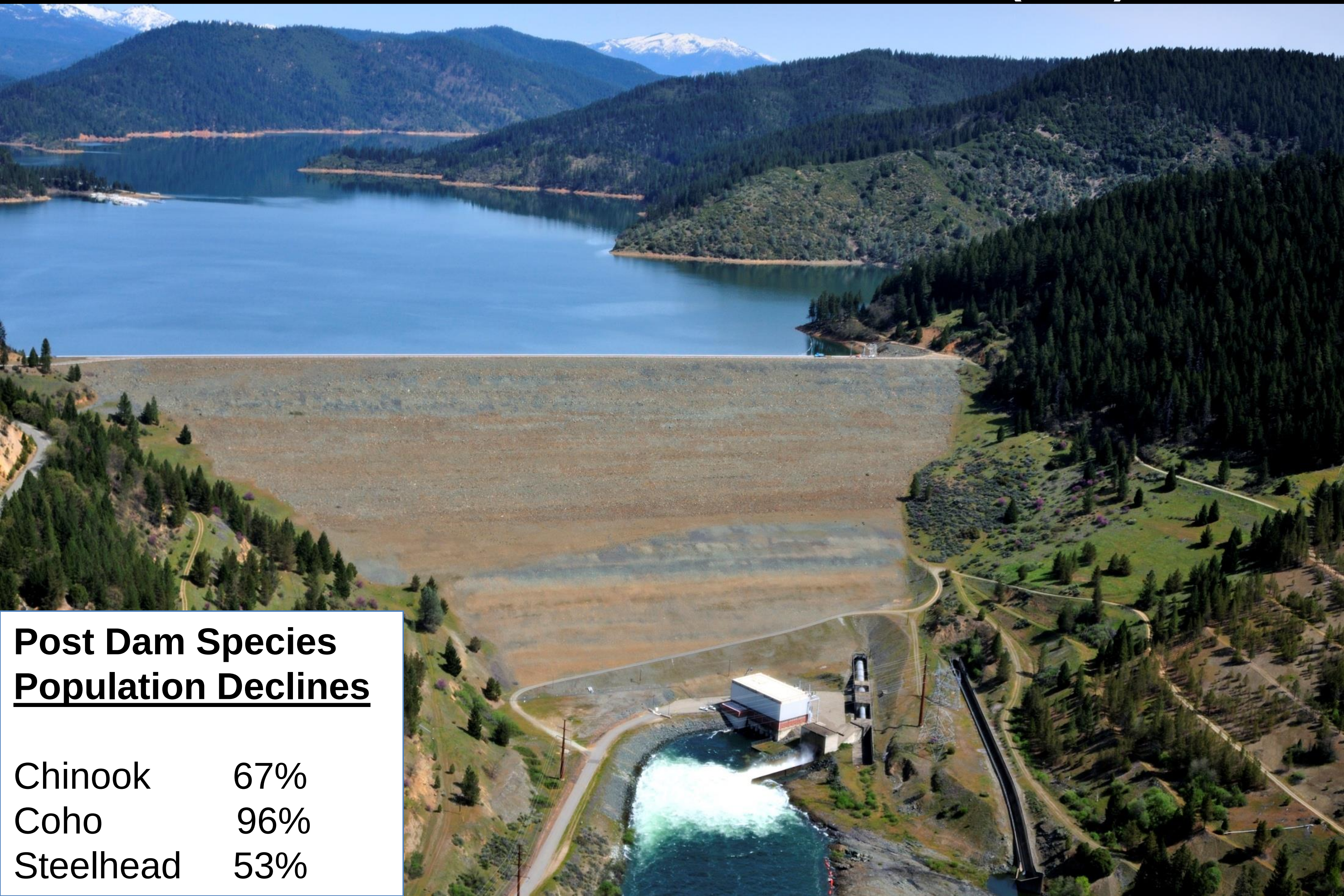


Can We Actually Undo the Effects of What We Have Put on Our Landscape?... A Call for Restoration

Discussion Topics:

- Overview of the Trinity
- Design Process
- Implementation Sequence
- Asbuilt Data Collection
- Design Validation Monitoring

Recent History - The Trinity River Dam – Completed in 1964
Part of the Central Valley Project (CVP)



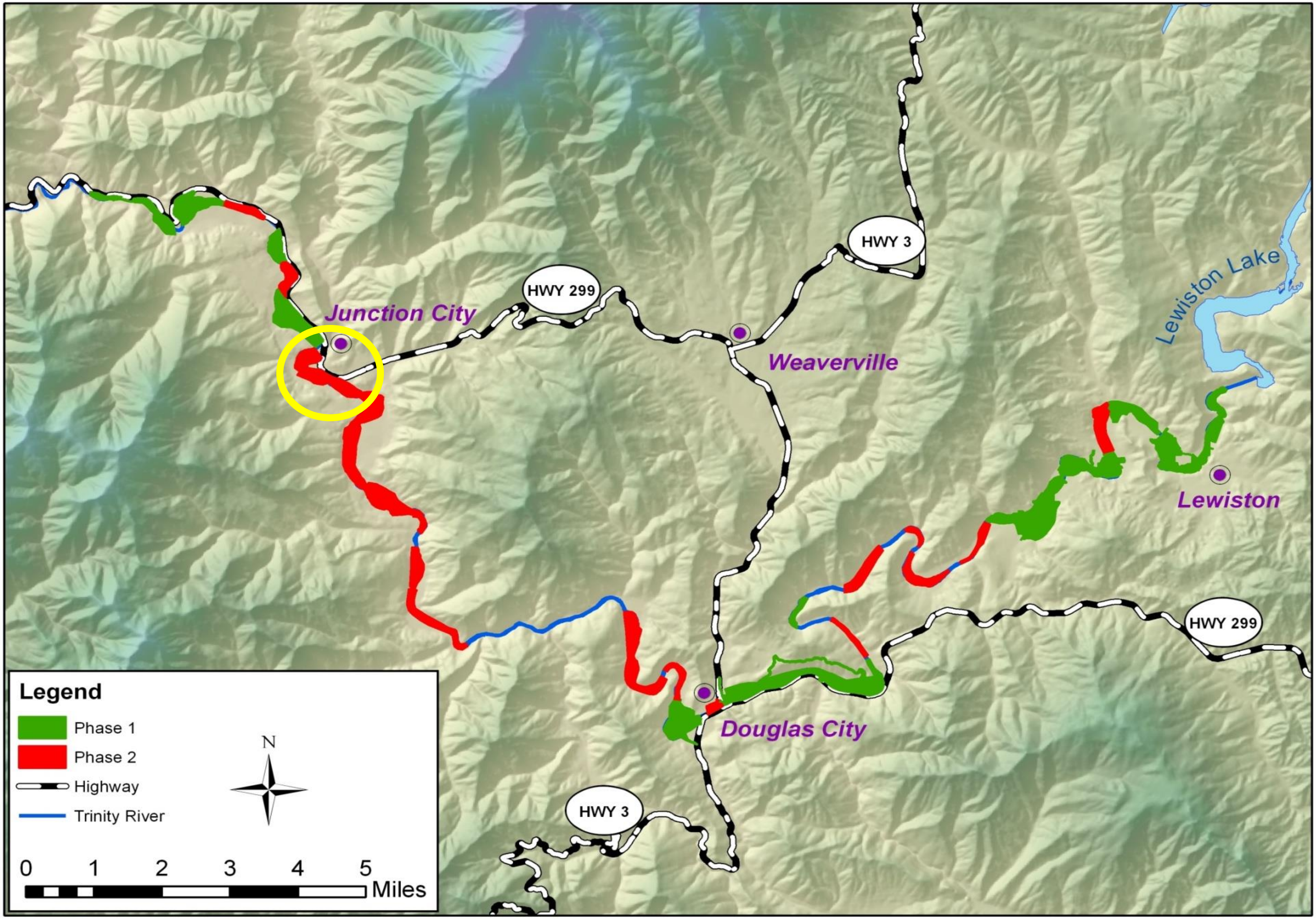
Post Dam Species
Population Declines

Chinook	67%
Coho	96%
Steelhead	53%

The Mining and Gold Legacy
Historical Context of the Trinity

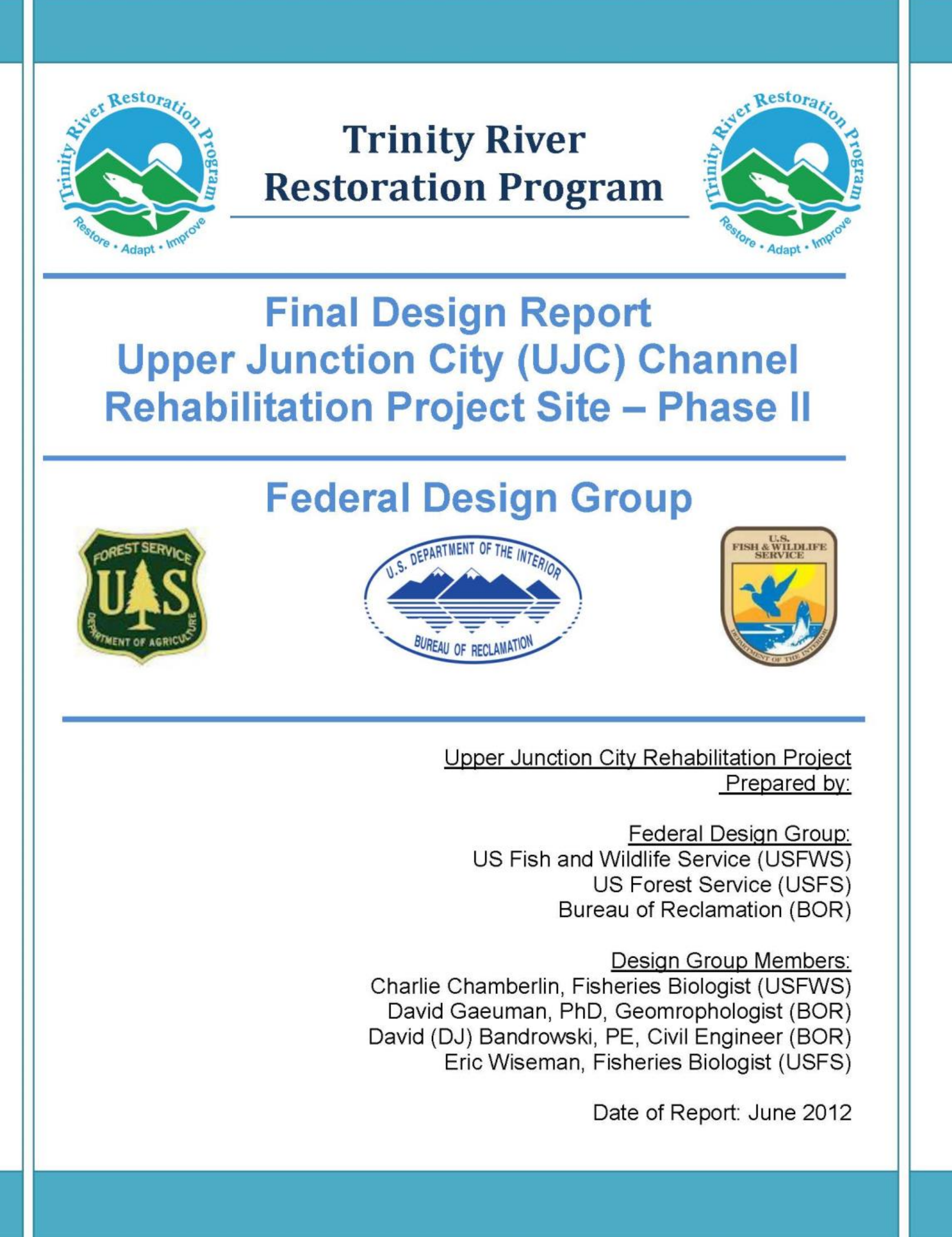
Photos Courtesy of Trinity County Historical Society

42 Mile Reach-Scale Approach - Projects Begin in 2005



Pre and Post Construction (2011 and 2012)
Low Flow (300 cfs)

Upper Junction City Project – Post Construction (~4500cfs)



Trinity River Restoration Program

Final Design Report
Upper Junction City (UJC) Channel Rehabilitation Project Site – Phase II

Federal Design Group

Upper Junction City Rehabilitation Project
Prepared by:

Federal Design Group:
US Fish and Wildlife Service (USFWS)
US Forest Service (USFS)
Bureau of Reclamation (BOR)

Design Group Members:
Charlie Chamberlin, Fisheries Biologist (USFWS)
David Gaeuman, PhD, Geomrophologist (BOR)
David (DJ) Bandrowski, PE, Civil Engineer (BOR)
Eric Wiseman, Fisheries Biologist (USFS)

Date of Report: June 2012

Upper Junction City Design Report 2012

Federal Design Group:

- Bureau of Reclamation
- US Fish and Wildlife
- US Forest Service

Designers:

DJ Bandrowski
Charlie Chamberlin
Dave Gaeuman
Eric Wiseman

Disciplines:

Civil / Hyd. Engineer
Fisheries Biologists
Geomorphologist

Refined Design Process – Example Goals/Objectives

No.	Design Goal	Design Objective	Measurement (metric)
1.	Increase fry and juvenile salmonid rearing habitat	Increase area of shallow/slow habitat with cover in project reach	% change in habitat area-days. Each square meter of habitat gets credit for 1 habitat area-day for each day from January 1 through April 30 (critical rearing period).
2.	Increase or maintain adult salmonid holding habitat	Increase area of deep water in project reach	% change in pool area of 8 feet or greater in depth.
3.	Increase adult salmonid spawning habitat	Increase available riffle spawning habitat in project reach	% change in transition riffles or thalweg crossovers (features where spawning typically occurs)
4.	Increase and enhance wildlife habitat	Increase available habitat (nesting /breeding/rearing) for target species of pond turtle & yellow frogs	% change pond turtle nesting and 1-3 year old habitat area. Increase yellow legged frog breeding and tadpole rearing area
5.	Increase & enhance riparian, wetland, & enhance upland habitats	Promote development of diverse riparian & upland communities; Reduce invasive plant species; Preserve riparian corridor & large trees where possible; etc.	% change in riparian vegetation area (include areas planted and areas designed for natural recruitment).

Example Design Alternative Analysis - Stream Project
Multi-Criteria Decision Analysis (MCDA) - Design Guidance
Developed by Peter Wilcock and others

ICRRR
Intermountain Center for River Rehabilitation and Restoration

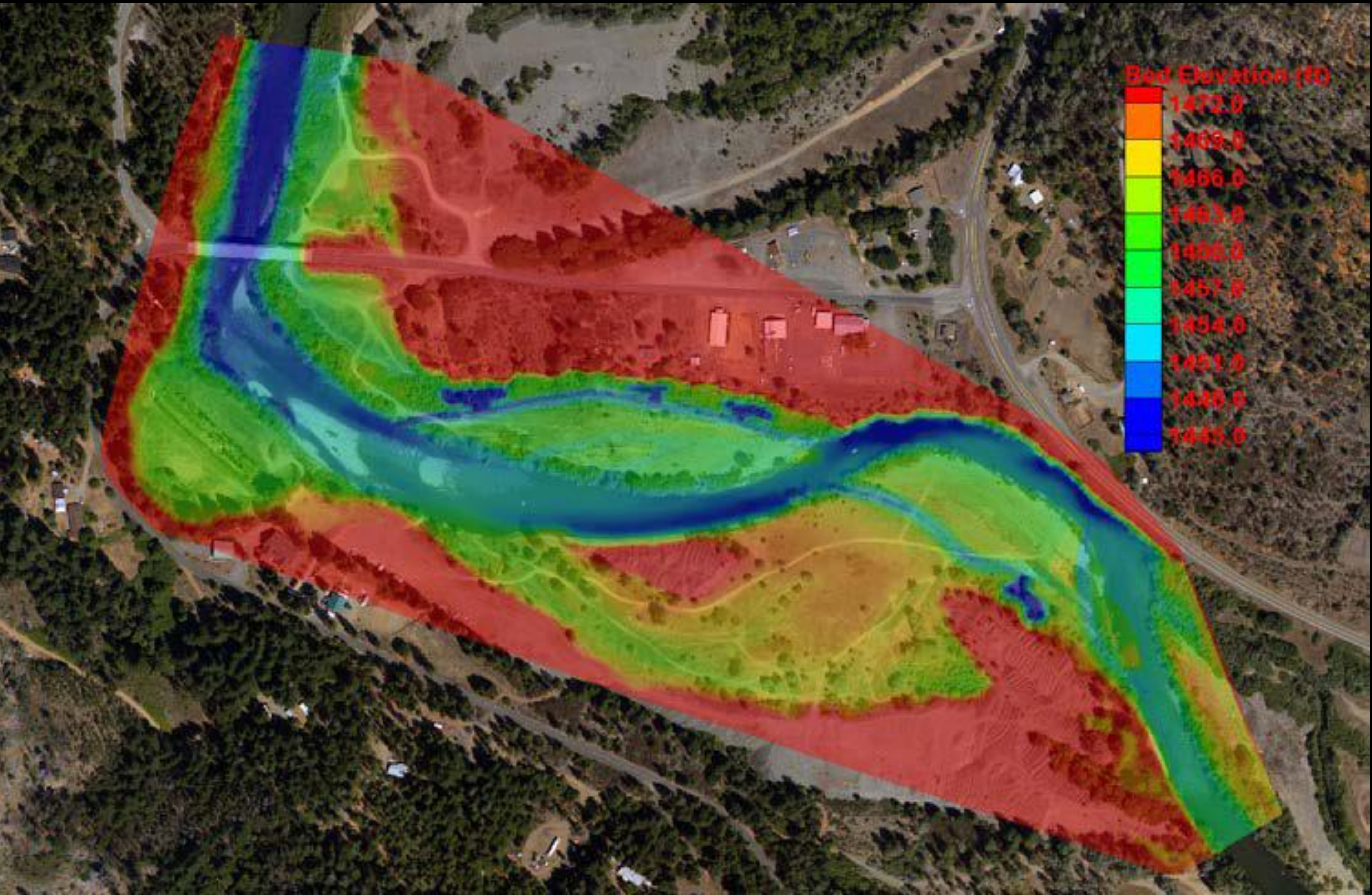
NCED
Earth · Water · Life

US Army Corps of Engineers®
Engineer Research and Development Center

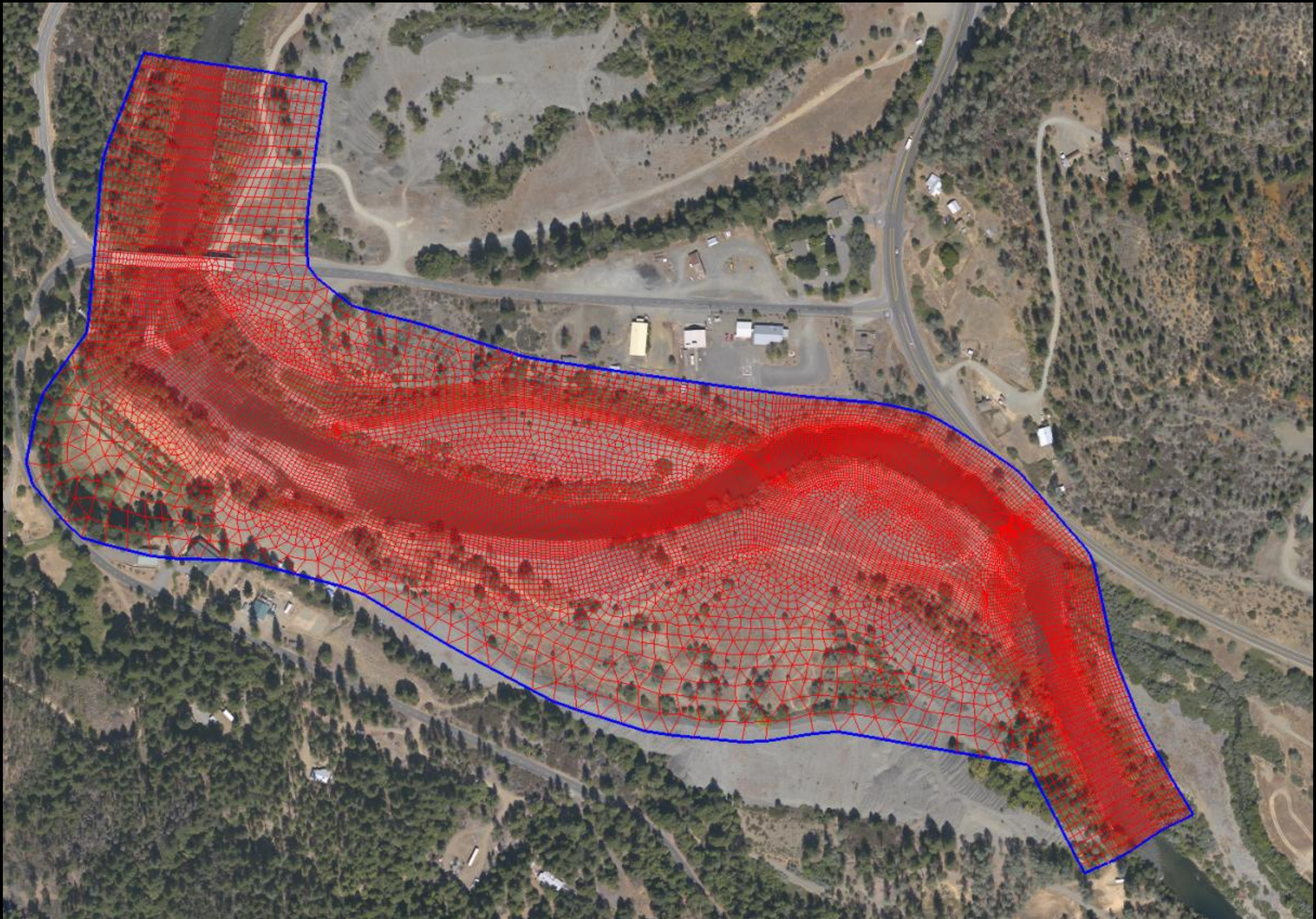
			Score performance of each alternative for all objecti												Set performance measure range		
			Alt 1.			Alt 2.			Alt 3.			Existing Cond					
	Local Objective	Metric for each objective	(-)	Mean	(+)	(-)	Mean	(+)	(-)	Mean	(+)	(-)	Mean	(+)	Min	Max	Opt
1	Fry rearing habitat	Change in habitat area-days (%)	12	**61**	12	20	**101**	20	3	**15**	3	0	**0**	0	0	121	121
2	Adult holding habitat	Change in pool area > 8ft depth	64	**320**	64	71	**353**	71	72	**361**	72	0	**0**	0	0	433	433
3	Spawning habitat	Change in transition riffles (%)	3	**16**	3	5	**23**	5	1	**5**	1	0	**0**	0	0	28	28
4	Wildlife habitat	Change in area turtle/frog habitat	20	**100**	20	28	**139**	28	14	**68**	14	0	**0**	0	0	167	167
5	Riparian habitat	Change in vegetation area (%)	2	**10**	2	3	**17**	3	1	**1**	1	0	**0**	0	0	20	20
6	Channel complexity	Change in flow directions at	7	**33**	7	17	**67**	17	17	**67**	17	0	**0**	0	0	84	84
7	Fluvial processes	Change in channel stream power	2	**11**	2	3	**16**	3	3	**16**	3	0	**0**	0	0	19	19
8	Mitigate infrastructure	Rank 1-5 [5 most benefit]	1	**3**	1	1	**2**	1	1	**4**	1	0	**0**	0	0	5	5
9	Mitigate uncertainity	Rank 1-5 [5 most benefit]	1	**4**	1	1	**3**	1	1	**4**	1	0	**0**	0	0	5	5
10	Public Benefit	Rank 1-5 [5 most benefit]	1	**3**	1	1	**2**	1	1	**3**	1	0	**0**	0	0	4	4
11	Cost consideration	Total implementation cost	0.45	**1.8**	0.45	0.78	**3.1**	0.78	0.17	**0.67**	0.17	0	**0**	0	0	3.88	0

Upper Junction City Project Reach
Digital Terrain Modeling (DTM) – Alternative Analysis

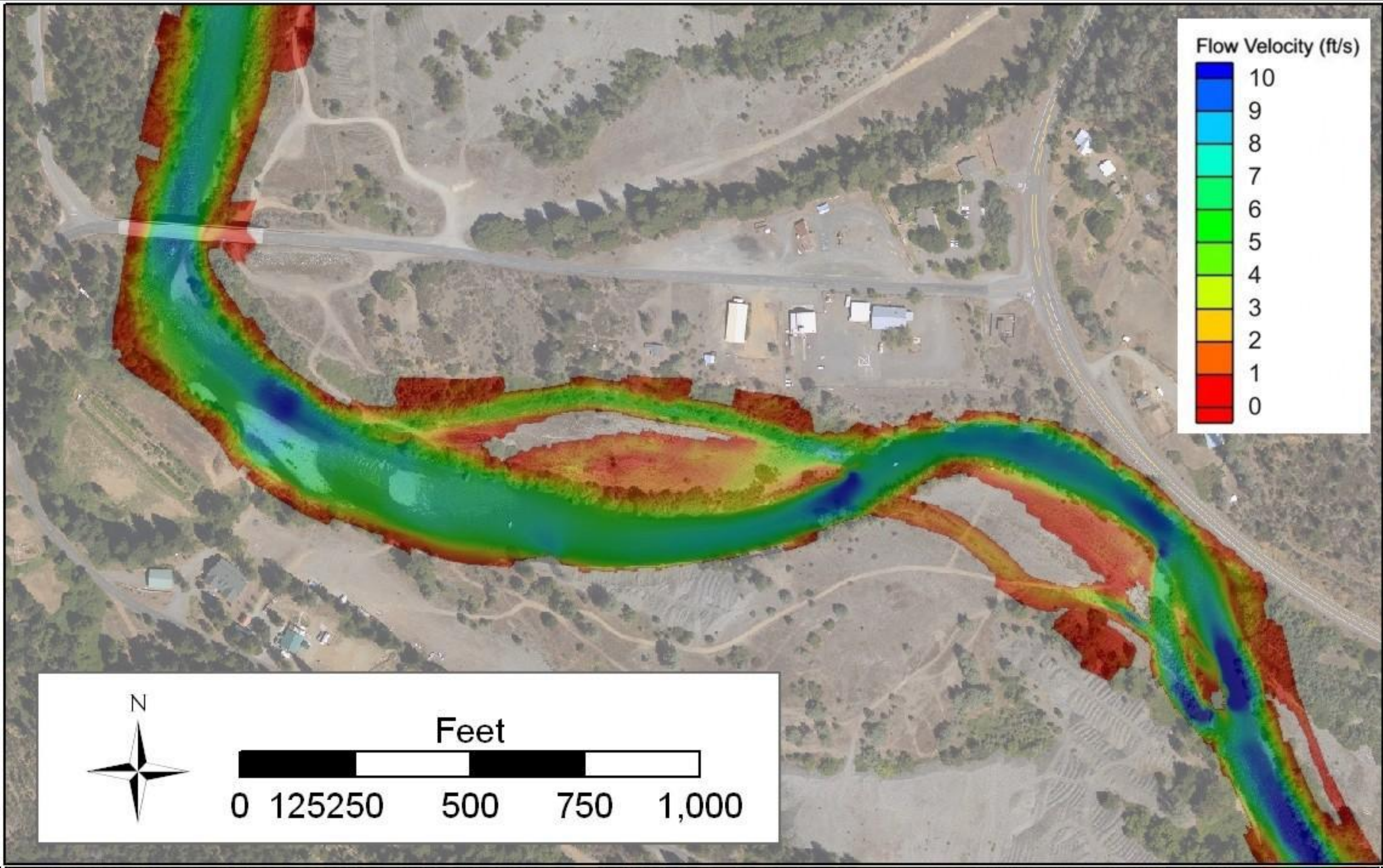
REPEAT DIGITAL TERRAIN MODELS (DTM'S)



2D Hydraulic Modeling – UJC Model Framework
SRH-2D Software – Predictive Based Design Approach



2D Hydraulic Modeling – Design Conditions
Flows = 450, 2700, 7500 cfs

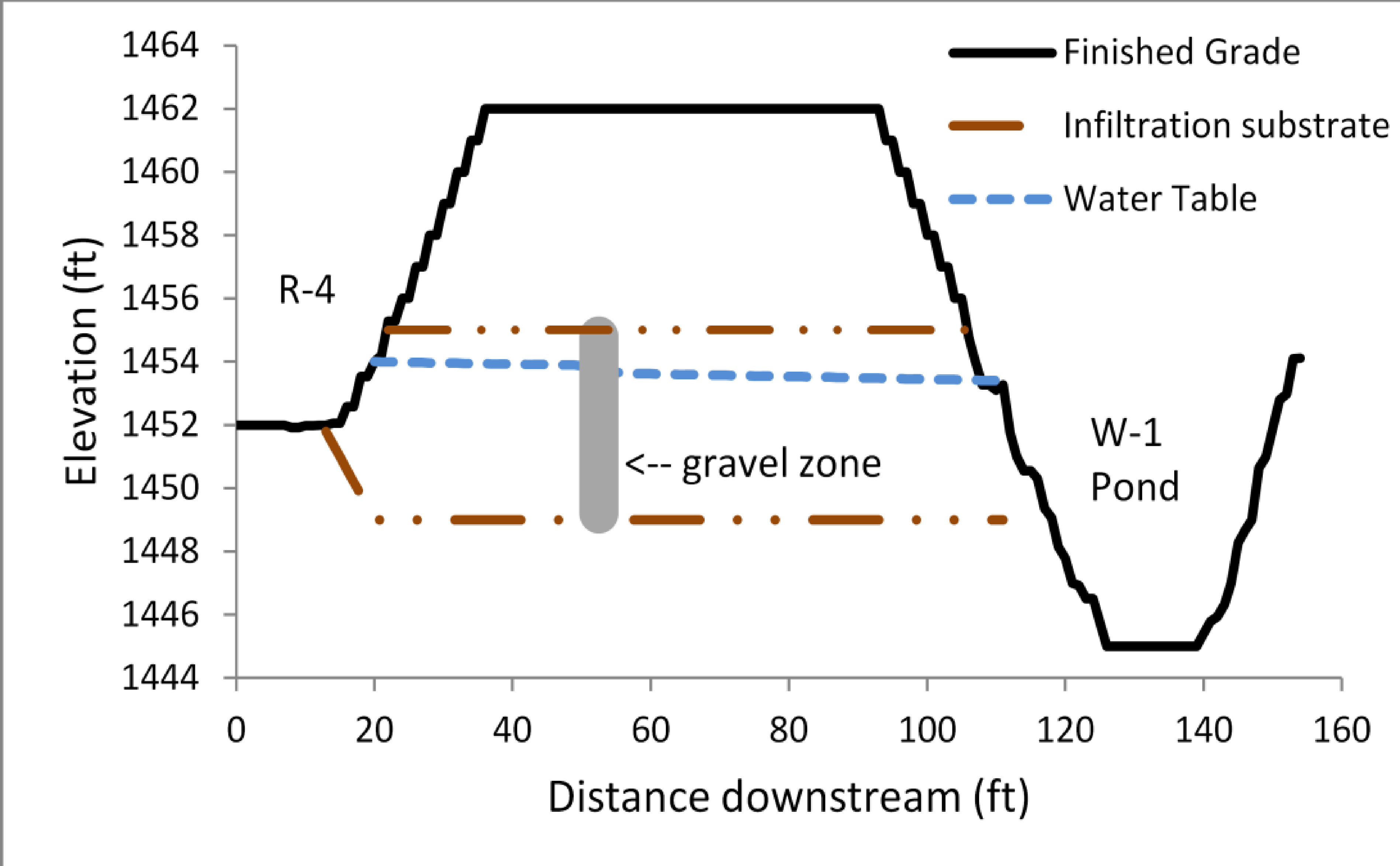


Eco-Hydraulic Modeling– Juvenile Rearing Habitat

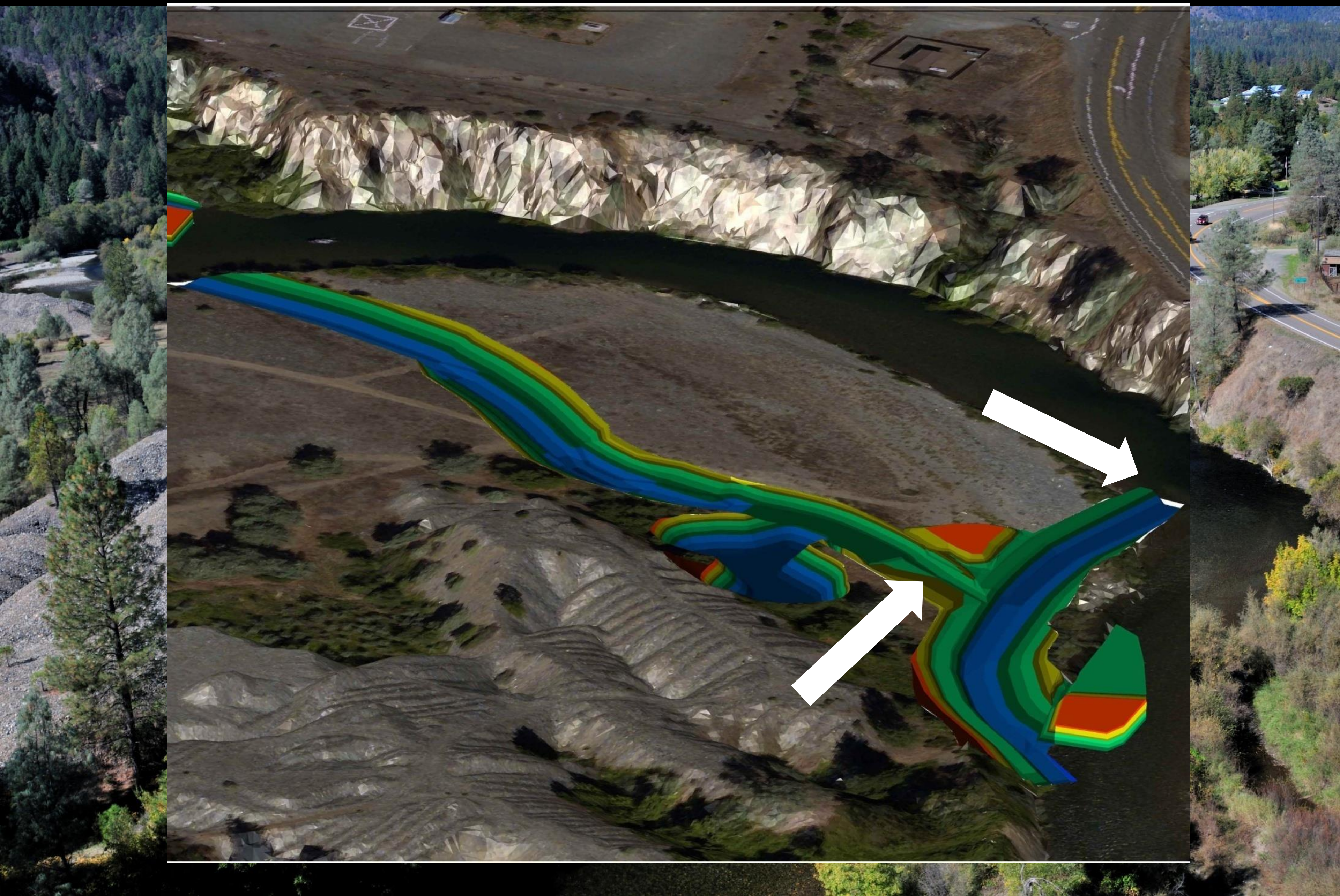
Criteria met for total area (ft2)
Depth, velocity, and cover = 16,785
Depth and velocity only = 43,146
Cover only = 12,900
Total = 72,831

Designing of Off Channel Ponds Through Hyporheic Connections

"Infiltration Gallery" - Hyporheic Inlet to Pond Reduces Loss of Conveyance and Risk of Inlet Filling



Geomorphic Design Modeling – Understanding the Physical Response



RECLAMATION

Managing Water in the West

Technical Report No. SRH-2013-09

Coupled 2D Morpho-Dynamic and Bank Erosion Modeling at the Upper Junction City Channel Rehabilitation Project Site, Trinity River, CA

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

March 2013

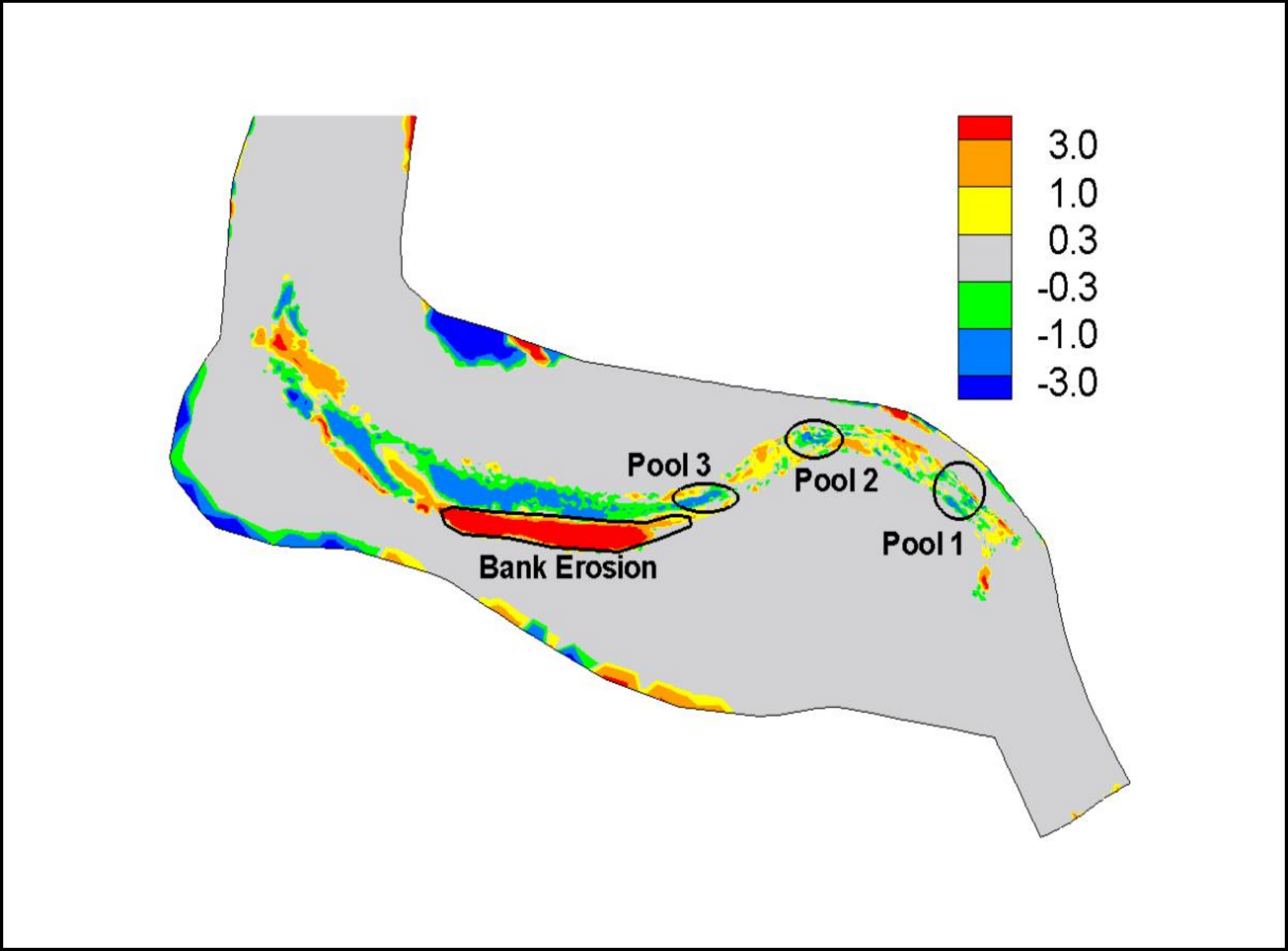
UPPER JUNCTION CITY MORPHODYNAMIC MODELING

SEDIMENT TRANSPORT AND EROSION/DEPOSITION EVOLUTION MODELING

DEVELOPED BY BUREAU OF RECLAMATION – TECHNICAL SERVICE CENTER (TSC)

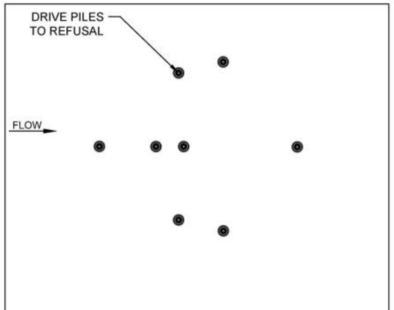
YONG LAI

Morphodynamic Modeling - Results



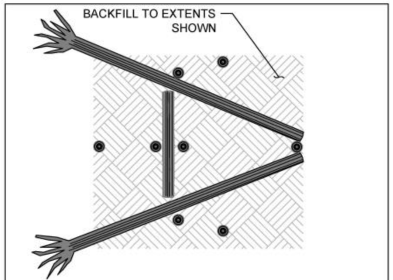
Large Wood Design Elements – Geomorphic and Habitat Purposes

Large Wood Design Drawings



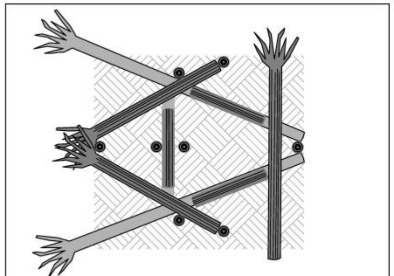
CUT AND DRIVE PILES (8) TO REFUSAL.

LAYER 1



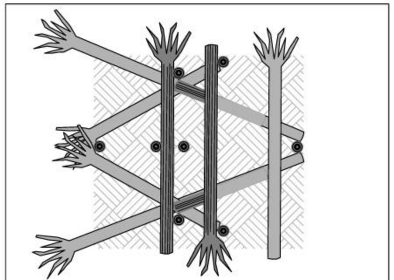
ADD TWO HORIZONTAL LOGS PARALLEL TO FLOW ANGLED TOWARDS THE CENTER OF THE ELJ AND ONE FILLER LOG PERPENDICULAR TO FLOW AS SHOWN. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF LAYER.

LAYER 2



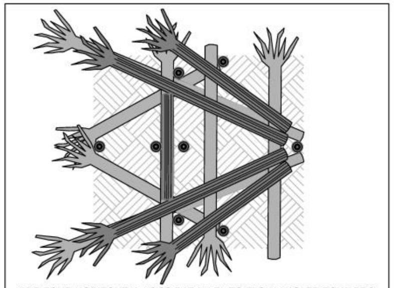
ADD ONE HORIZONTAL LOG PERPENDICULAR TO FLOW. ADD TWO HORIZONTAL LOGS PARALLEL TO FLOW ANGLED DOWNSTREAM AWAY FROM CENTER OF ELJ AS SHOWN. ADD 3 SHORT FILLER LOGS AS SHOWN. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF LAYER.

LAYER 3



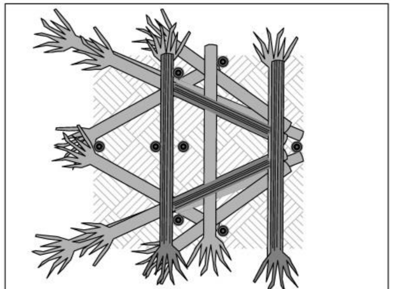
ADD TWO LOGS PERPENDICULAR TO FLOW. ADD 2 SHORT FILLER LOGS AS SHOWN. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF LAYER.

LAYER 4



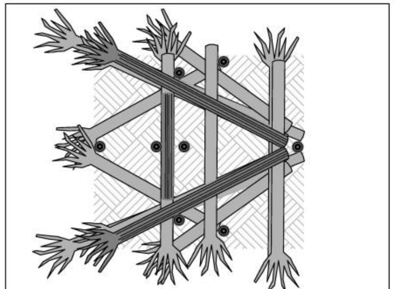
ADD FOUR HORIZONTAL LOGS PARALLEL TO FLOW ANGLED TOWARDS THE CENTER OF THE ELJ AS SHOWN. ADD ONE FILLER LOG PERPENDICULAR TO FLOW AS SHOWN. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF LAYER.

LAYER 5



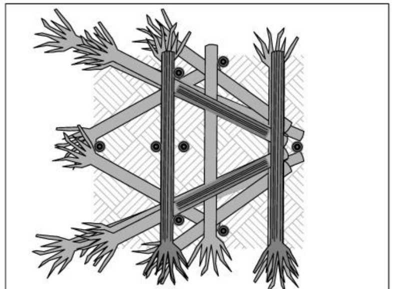
ADD TWO HORIZONTAL LOGS PERPENDICULAR TO FLOW. ADD 2 SHORT FILLER LOGS AS SHOWN. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF LAYER.

LAYER 6



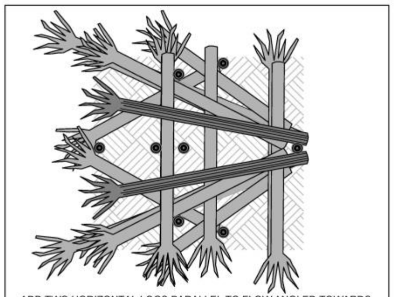
ADD TWO HORIZONTAL LOGS PARALLEL TO FLOW ANGLED TOWARDS THE CENTER OF THE ELJ AS SHOWN. ADD 1 SHORT FILLER LOG AS SHOWN. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF LAYER.

LAYER 7



ADD ONE HORIZONTAL LOG PERPENDICULAR TO FLOW. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF LAYER.

LAYER 8



ADD TWO HORIZONTAL LOGS PARALLEL TO FLOW ANGLED TOWARDS THE CENTER OF THE ELJ AS SHOWN. PLACE SLASH AND NATIVE ALLUVIUM AROUND LOGS TO TOP OF PROPOSED FINISH GRADE, ELEV. 1465.0'

LAYER 9

LOG SCHEDULE (ELJ)

LAYER	TYPE	DIAMETER	LENGTH	ROOTWAD	NUMBER
LAYER 1	VERTICAL POST	24"	32'	NO	8
LAYER 2	HORIZT. LOG	24"	50'	YES	2
	FILLER LOG	24"	~20'	YES	1
LAYER 3	HORIZT. LOG	24"	40'	YES	1
	HORIZT. LOG	24"	32'	YES	2
	FILLER LOG	24"	~15'	NO	3
LAYER 4	HORIZT. LOG	24"	40'	YES	2
	FILLER LOG	24"	~5'	NO	2
LAYER 5	HORIZT. LOG	24"	32'	YES	2
	HORIZT. LOG	24"	40'	YES	2
	FILLER LOG	24"	~20'	NO	1
LAYER 6	HORIZT. LOG	24"	40'	YES	2
	FILLER LOG	24"	~20'	NO	2
LAYER 7	HORIZT. LOG	24"	32'	YES	2
	FILLER LOG	24"	~20'	NO	1
LAYER 8	HORIZT. LOG	24"	40'	YES	2
	FILLER LOG	24"	~20'	NO	1
LAYER 9	HORIZT. LOG	24"	40'	YES	1
				TOTAL:	37

NOTES:

1. SEE SHEETS 04, 05, 06 FOR PLAN AND PROFILE INFORMATION.
2. THE FIRST HORIZONTAL LOG LAYER (LAYER 2) SHALL BE PLACED 8.0' BELOW EXISTING BED SURFACE.
3. BACKFILL CONSISTING OF NATIVE ALLUVIUM AND SLASH SHALL BE PLACED AT LAYERS 2-9 TO EXTENTS SHOWN BY GRAY HATCHING.
4. TOPOGRAPHIC INFORMATION WAS GENERATED FROM A DIGITAL TERRAIN MODEL (DTM) DEVELOPED BY TRRP.
5. PILES REFER TO VERTICAL STRUCTURAL MEMBERS.

Cardno ENTRIX
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STATELINE, NV 89449
TEL: (775) 588-9069
WWW.CARDNOENTRIX.COM

Trinity River Restoration Program
Restore • Adapt • Improve

REGISTERED PROFESSIONAL ENGINEER
R. CHARLES MILLER
C 72531
EXP. 6.30.2014
CIVIL
STATE OF CALIFORNIA
6.22.12

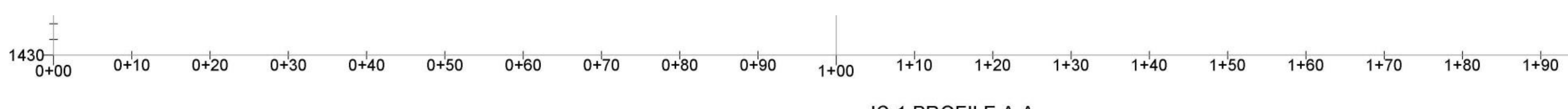
UPPER JUNCTION CITY IC-1
SEQUENCING

TRINITY RIVER RESTORATION PROGRAM

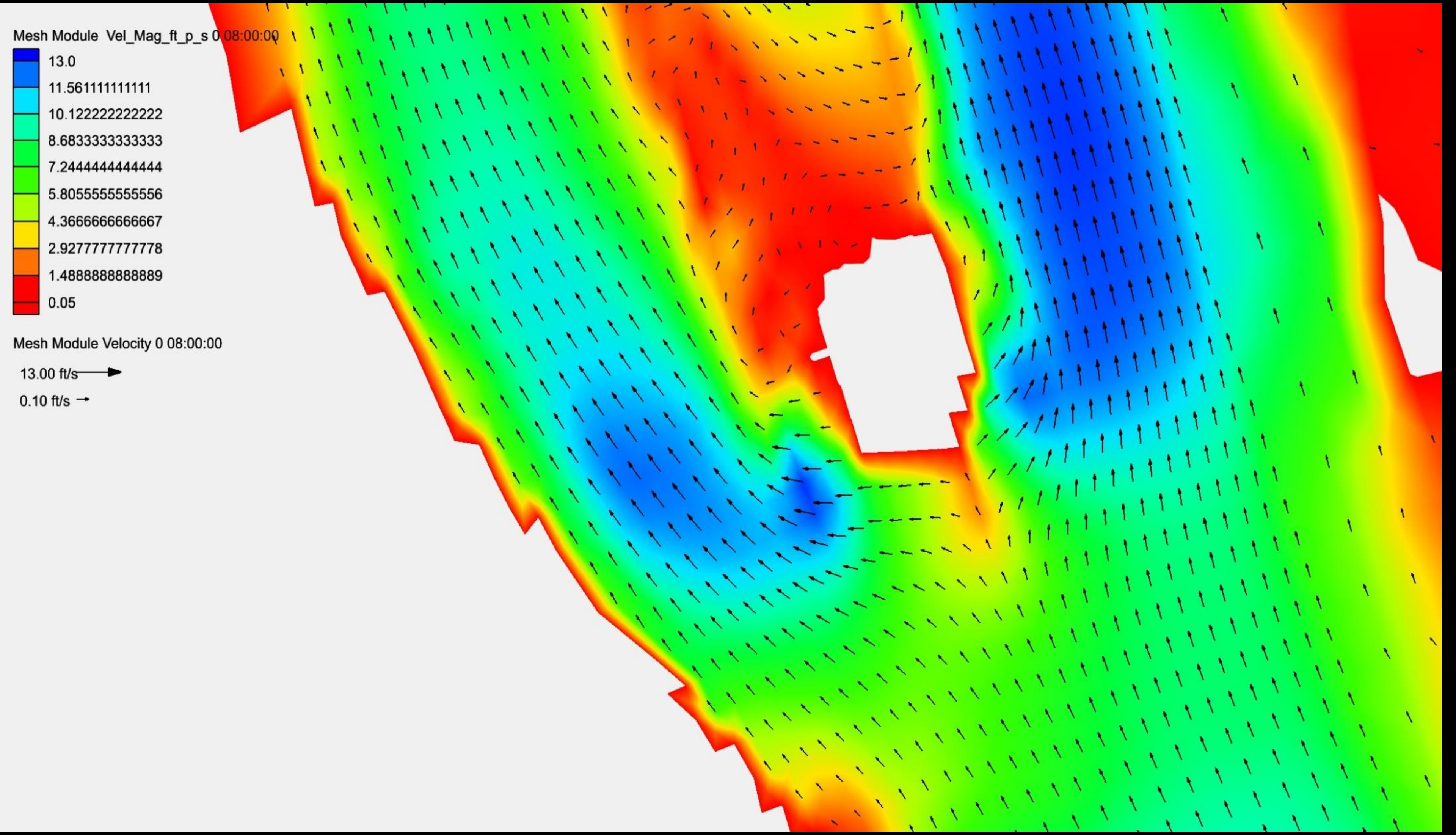
TRINITY COUNTY, CALIFORNIA

DATE:	06/26/12
DESIGNED BY:	CM/ZL
DRAWN BY:	ZL
CHECKED BY:	CM
ENTRIX JOB NO.	30088130
PLAN NO.	09

SHEET 09 of 24



2D Hydraulic Output – 7500 cfs – Velocity Vectors at Large Wood Jam and Sheer Stress Output Balancing Stream Power – Ability to do Geomorphic to Developing Habitat Through Process



Large Wood Implementation Sequence

LARGE WOOD NATIONAL MANUAL – COMING SOON…

Large Wood – National Design Manual

Guidelines For Planning, Design, Placement and Maintenance of Large Wood In Rivers: Restoring Process And Function

David (DJ) Bandrowski PE[1], Bureau of Reclamation, Trinity River Restoration Program; Jock Conyngham[2], US Army Corp of Engineers, Engineer Research and Development Center

1. Civil Engineer, dbandrowski@usbr.gov, TRRP, 1300 Main St., Weaverville, CA 96093; 2. Research Ecologist, Jock.N.Conyngham@usace.army.mil, USACE, 1600 North Avenue West, Suite 105, Missoula, MT 59801

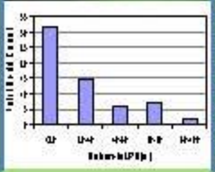
Primary Chapter Authors: Leo Lentsch (ICF), Tim Abbe (Natural Systems Design - NSD), Doug Shields (Shields Engineering), Todd Crowl (Utah State University),

Primary Contributing Authors: Martin Fox (Fox Environmental), Chris Earle (ICF), David Hanson (ICF), Mike (Rocky) Hrachovec (NSD), Liz Strange (ICF), Willis (Chip) McConnaha (ICF), Greg Ellis (ICF), Ann Choate (ICF), Leif Embertson (NSD), Martin Fisher (ICF), Rocco Fiori (Fiori GeoSciences), Carl Jensen (ICF), John Hecht (ICF), Peter Wilcock (JHU), DJ Bandrowski (BOR), Jock Conyngham (USACE)

General purpose of Manual:
A multi-agency, collaborative approach to train and educate restoration practitioners on the planning, design, placement and maintenance of large wood in streams with an emphasis of restoring process and function. As such, the proposed content includes the following:





Chapter 3: Geomorphic and Hydrologic Considerations – Tim Abbe PhD

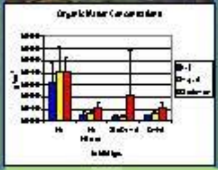
Section 3-2 Geomorphology Content:
A well-founded understanding of the physical and biological processes influencing landscape development is critical to stream restoration and management. Geomorphology is the study of the earth's surface, the processes that formed it, and how it will change in the future. Fluvial geomorphology focuses on streams and rivers: the flow of water through a channel network, the movement of sediment and woody debris, the reasons different channel forms development, the stability of stream banks, the rate and magnitude to which channels move, how large wood and logjams influence flow conditions to alter the channels and floodplains. The linkages between forests, hillsides, and floodplains to wood and channel form. Geographical context will influence climate, hydrology, geomorphology, ecology, size and types of trees, historic development, local perceptions and regulations, and wood decay.

Chapter 4. Ecological Considerations – Todd Crowl PhD

Section 4-2 Food Web / Aquatic Ecology Content:
This section will describe the ecological role and function of large wood (LW) including decomposition and nutrient cycling that is essential for living organisms. Specific nutrients include carbon, nitrogen, potassium, and phosphorus. For example, saprotrophic fungi and detritivores such as bacteria and insects directly consume dead wood, releasing nutrients by converting them into other forms of organic matter that may then be consumed by other organisms. LW, while itself not particularly rich in nitrogen, contributes nitrogen to the ecosystem by acting as a host for nonsymbiotic free-living nitrogen-fixing bacteria. Additionally, studies show that LW can be a significant contributor to biological carbon sequestration. Trees store atmospheric carbon in their wood using photosynthesis. Once the trees die, fungi and other saprotrophs transfer some of that carbon from LW into the soil. This sequestration can continue in old-growth forests for hundreds of years.





Chapter 6. Regulatory Compliance, Trade-Offs and Uncertainty Considerations - Leo Lentsch

Section 6-3 Habitat Quality and Quantification - Chip McConnaha PhD
This section will describe the concept of habitat as a species-focused view of the environment and will discuss metrics and means of quantification. It will emphasize the notion of life history trajectories as habitat pathways defined by the species life-history to succeed species must have suitable habitat quantity and quality distributed spatio-temporally for each life stage. Based on these concepts, habitat quantification requires measures of biological performance as reflections of habitat characteristics. Classic stock-recruitment relationships provide a basis for species-habitat quantification. Environmental characteristics can be related to species performance to derive population performance metrics. Qualitative measures of habitat such as the number of days with suitable conditions, HSI and others provide simplified metrics that focus on particular aspects of the species habitat.

Chapter 7. Design and Engineering Considerations Doug Shields PhD

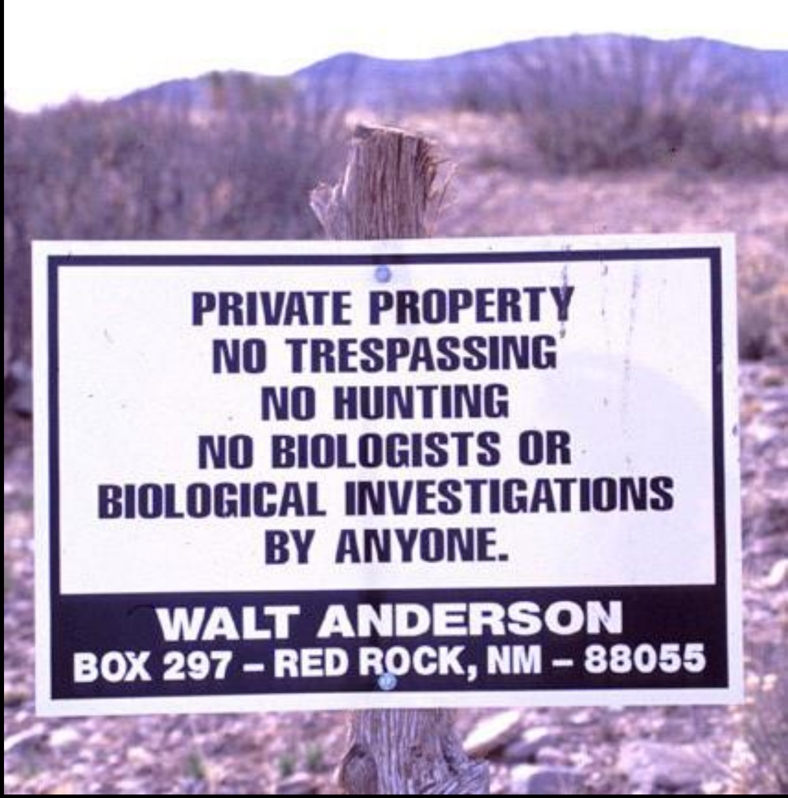
Section 7-2 Key Design Considerations Content:
Key issues for design of instream and floodplain LW placements will be identified and addressed. Key physical limitations on LW use will be identified. The fact that small projects may call for very simple designs while larger, more risk-prone projects may require a more quantitative, rigorous approach will be acknowledged. Assuming the key aspects of site selection are covered under the previous heading, guidance will be provided for placement of LW within a given reach, selecting the type of LW structure and choosing its size and orientation. Anchoring approaches will be described, and computations for sizing/designing anchors or ballast will be presented. Guidance for computations to check the design and reduce uncertainty will be presented, including assessing impacts on high flow conveyance and sediment transport including scour.

LEARNING FROM PROGRESS THROUGH MONITORING AND EVALUATION

HOOPA VALLEY TRIBE
P.O. Box 417
Hoopa, CA 95546

U.S. FISH AND WILDLIFE SERVICE
1655 Heindon Road
Arcata, CA 95521

YUROK TRIBE
2500 Hwy. 96
Weitchpec, CA, 95525



Linking the Design to Validation Monitoring

<u>Design Performance Goals (from the Upper Junction City Design Report):</u>

1. Double shoreline rearing habitat with cover through the length of the flow split.
2. Create 350m2 of new low velocity eddy habitat at 450 ft3/s.
3. Create 6000m^2 of new side-channel & connected pond rearing habitat at flows of ~2500 ft3/s.
3. Limit flow velocities at 7500 ft3/s to less than 1 ft/s over at least 4600 m2 of floodplain
4. Retain 95% of bankfull flow in mainstem through the upstream third of the site at 7500 ft3/s.
5. Limit conveyance of the R-5/R-6 side channel to 6% of the total flow at 7500 ft3/s.
6. Reduce floodplain conveyance adjacent to the R-4 flow split to near zero at 7500 ft3/s

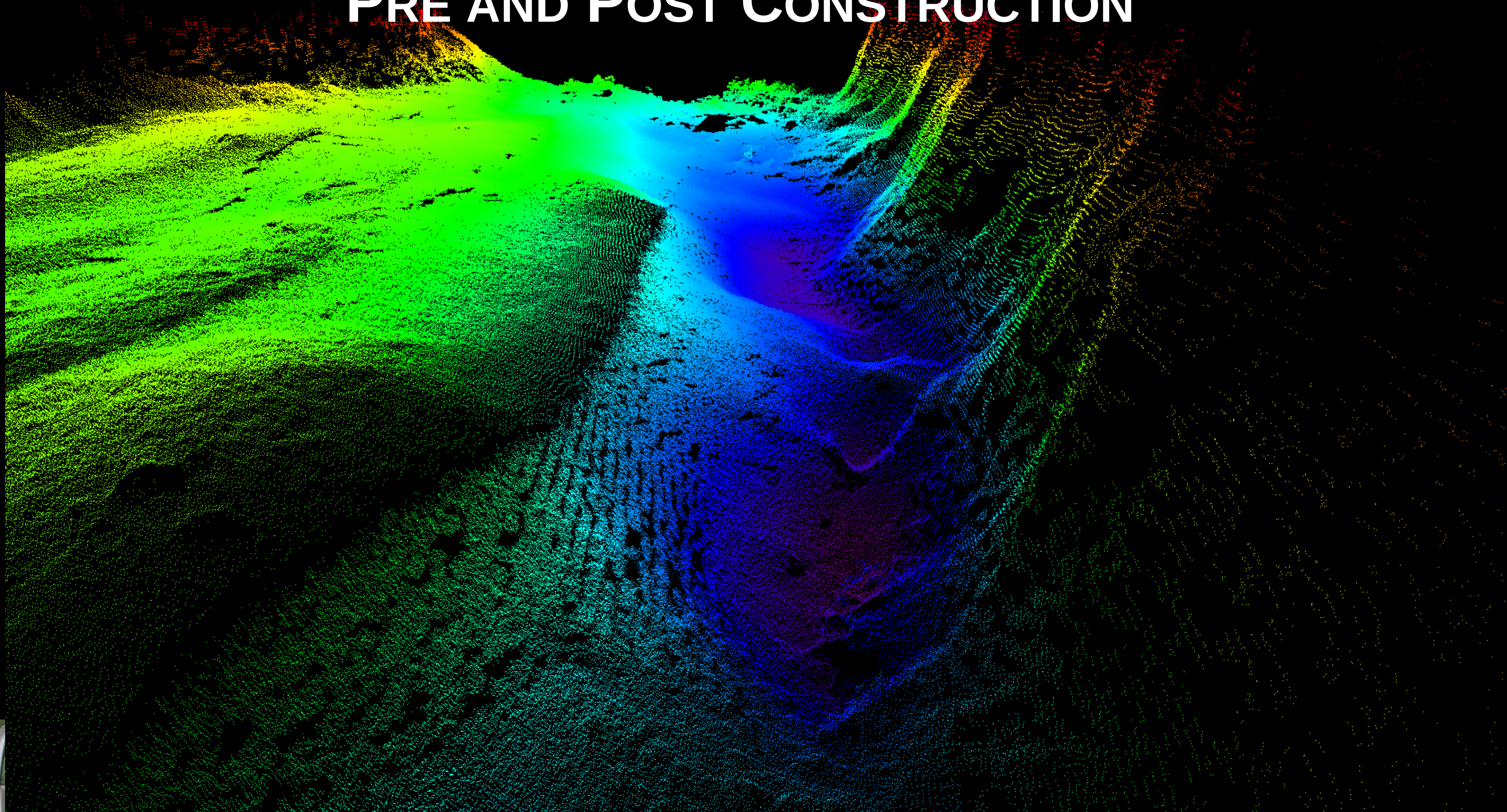
Post Construction – Asbuilt Condition
4,500 cfs

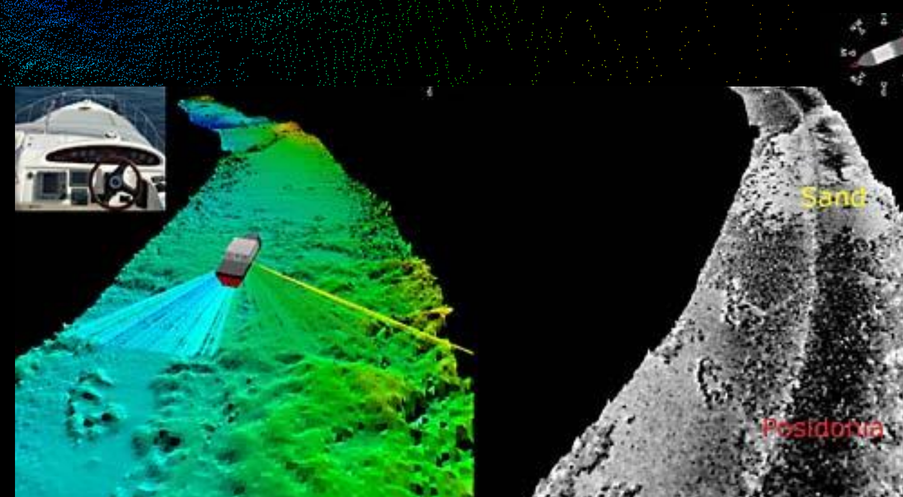
Pre and Post Habitat Mapping – Model Validation

Post Construction – REDD Surveys

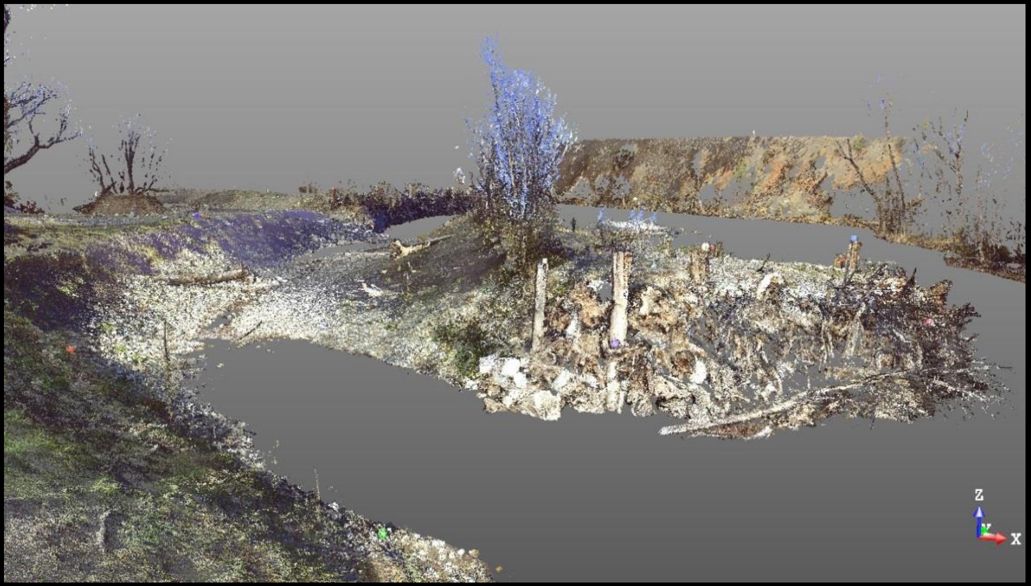
TERRAIN MODEL DATA COLLECTION – BATHYMETRY AND LIDAR

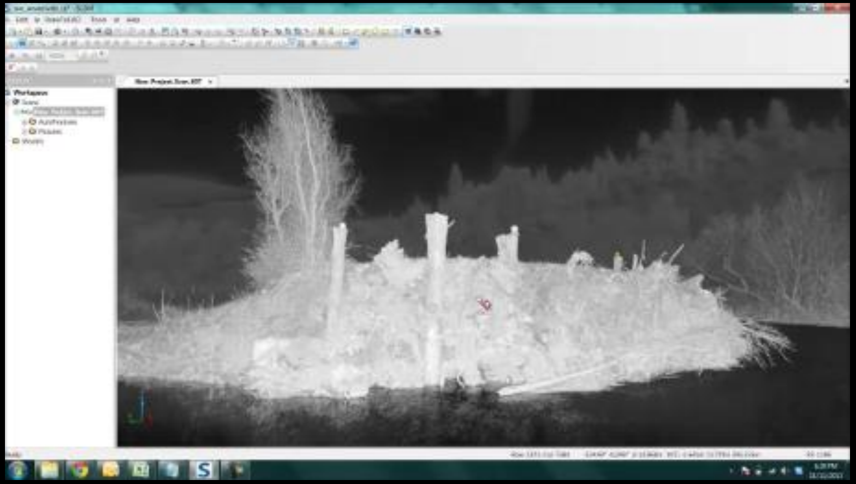
Repeat Physical Monitoring – Side Scan Sonar Data
Pre and Post Construction





Post Construction – 3D Laser Scanning of Wood





TRINITY RIVER RESTORATION PROGRAM - PARTNERSHIP

Tell me and I'll forget. Show me, and I may not remember. Involve me, and I'll understand.

\- Native American Saying -

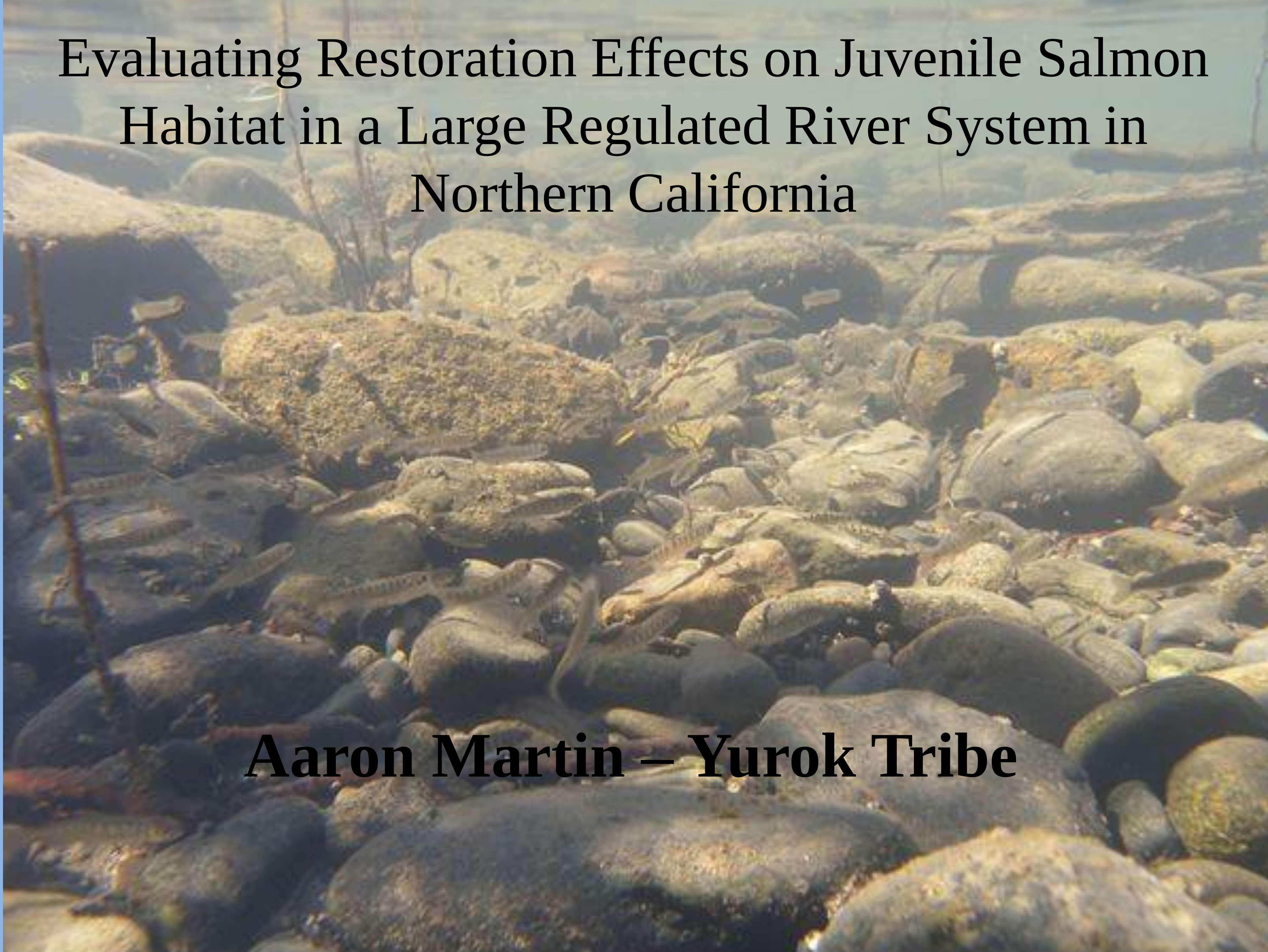
DJ Bandrowski P.E., Project Engineer

djbandrowski@yuroktribe.nsn.us

906-225-9137




Evaluating Restoration Effects on Juvenile Salmon Habitat in a Large Regulated River System in Northern California

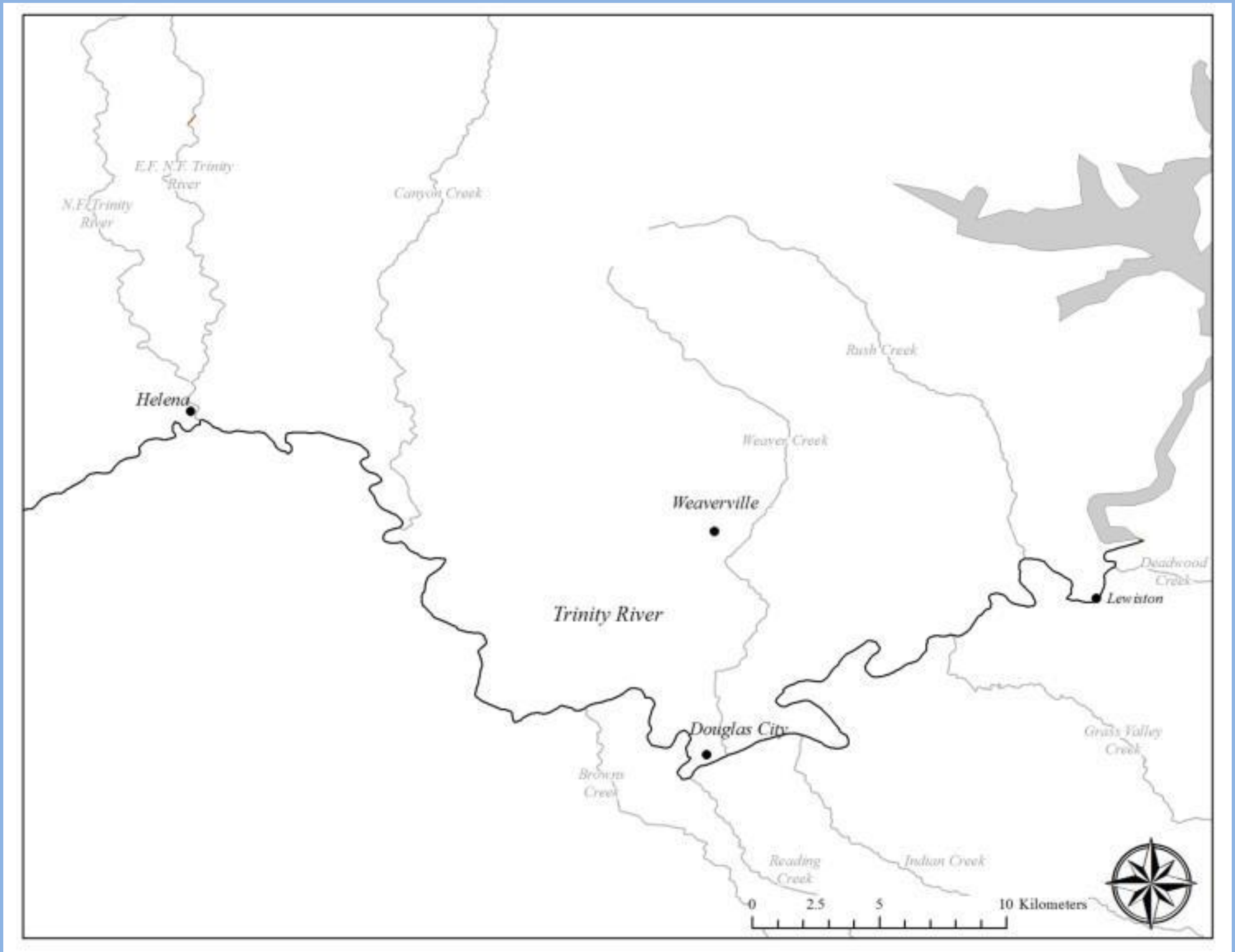


Aaron Martin – Yurok Tribe

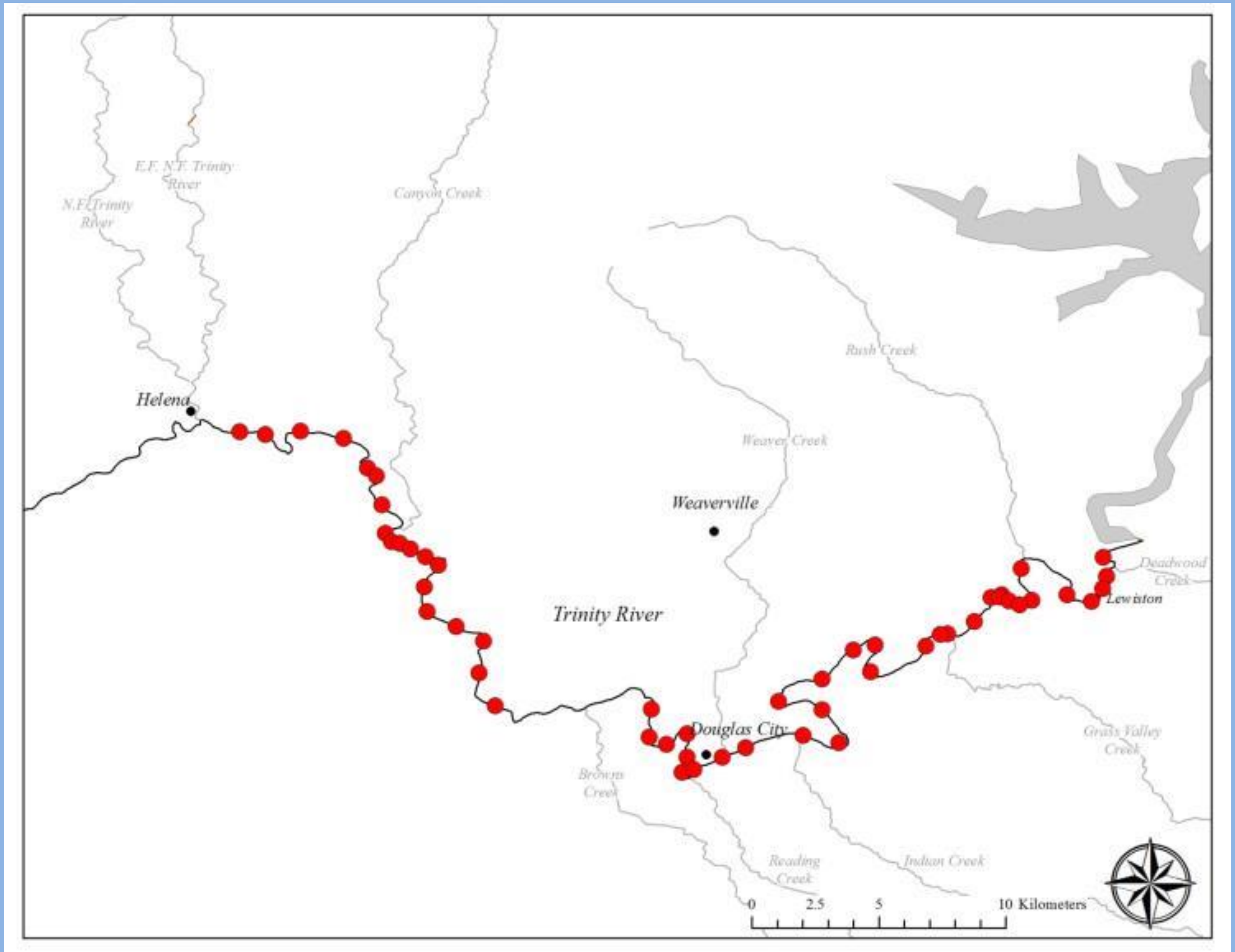
Trinity River Restoration

- Restoration goals include
  - Restore natural salmon production
    - 64 km restoration reach
    - Rearing habitat availability limiting factor
- Restoration strategy
  - Process based restoration
    - Restored streamflow – simulated spring snowmelt events
    - Coarse sediment augmentation
    - Channel rehabilitation (~47 sites)
  - Project evolution
  - Adaptive management

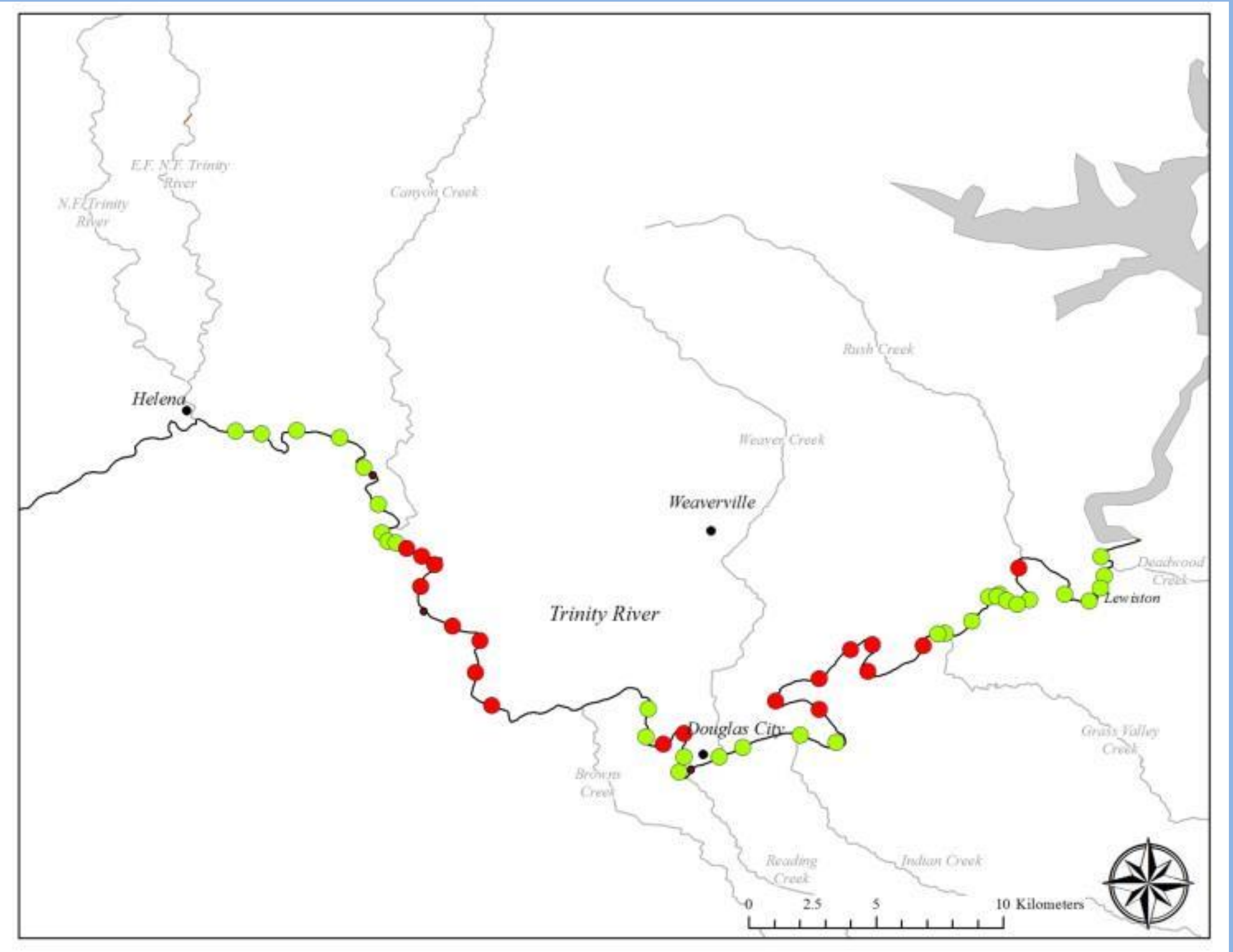
Restoration Reach



Proposed Channel Rehabilitation Sites



Channel Rehabilitation to Date



Rearing Habitat Assessment Methods

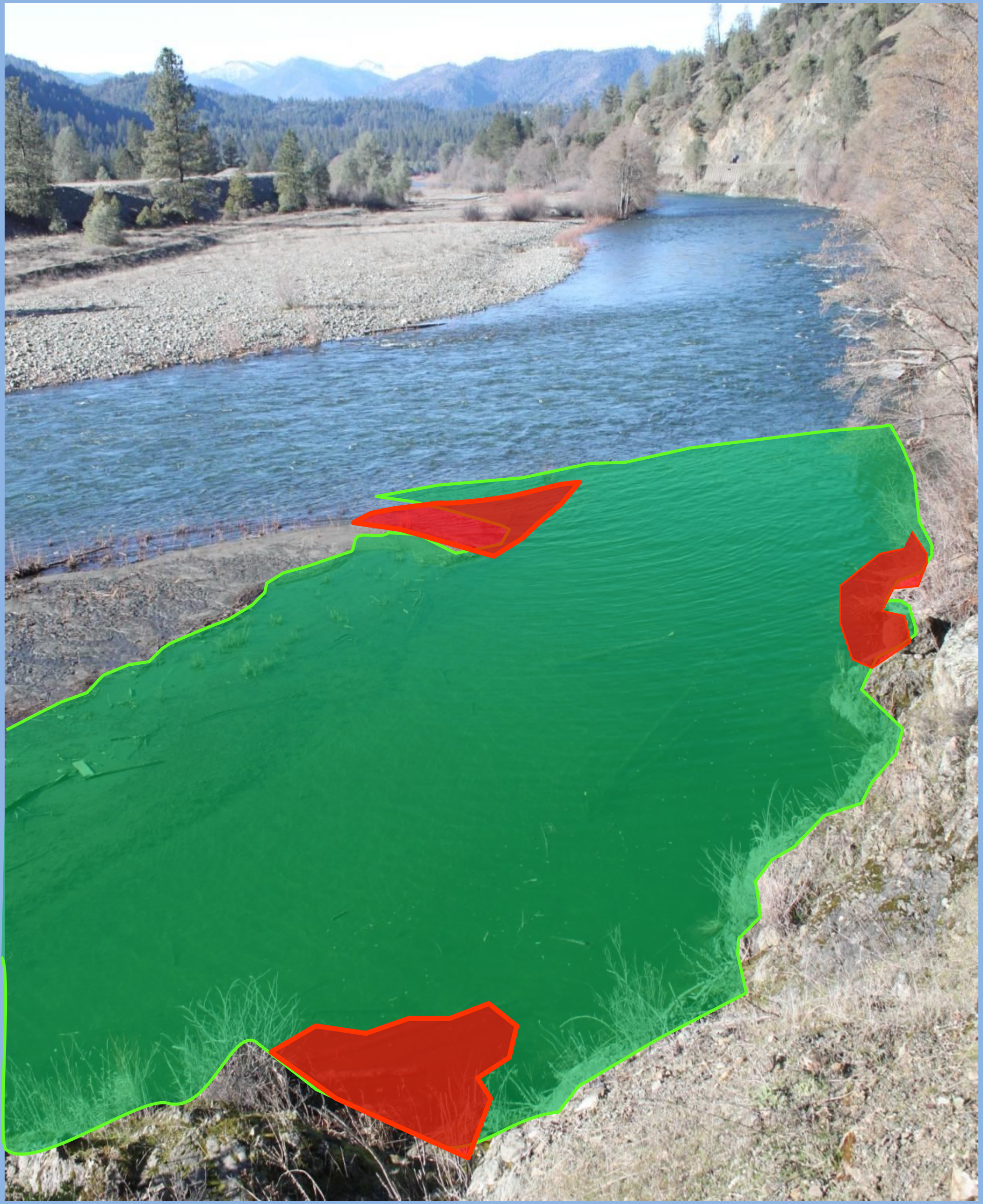
- Develop habitat definitions
  - HSC identified specific depths and velocities
- Habitat guilds
  - Chinook and coho salmon
    - Fry (<50 mm FL)
    - Presmolt (50-100 mm FL)
- Map shallow/slow areas and cover independently

Rearing Habitat Assessment Methods

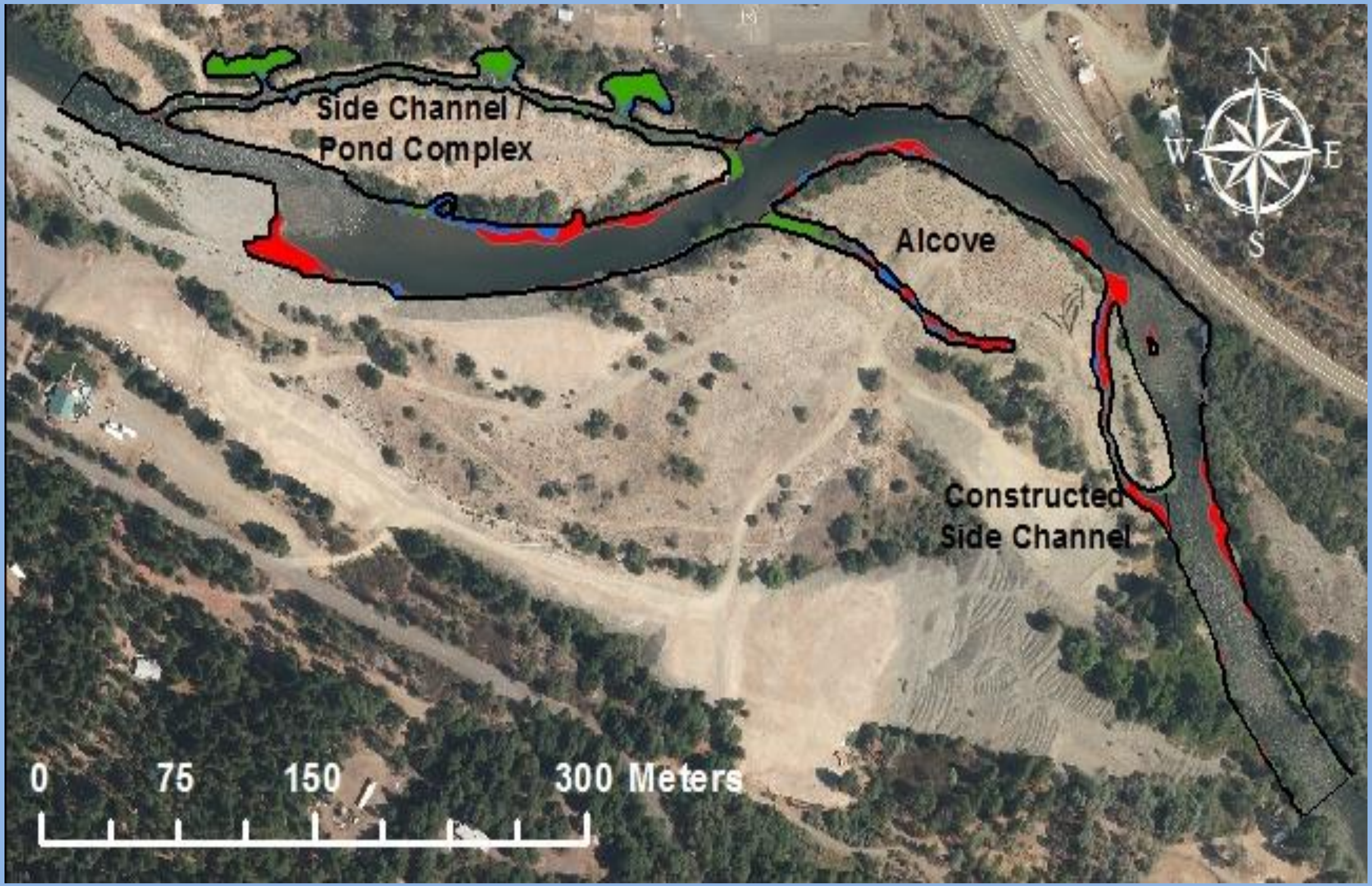
Reporting Metrics:

- Optimal habitat
- Total habitat

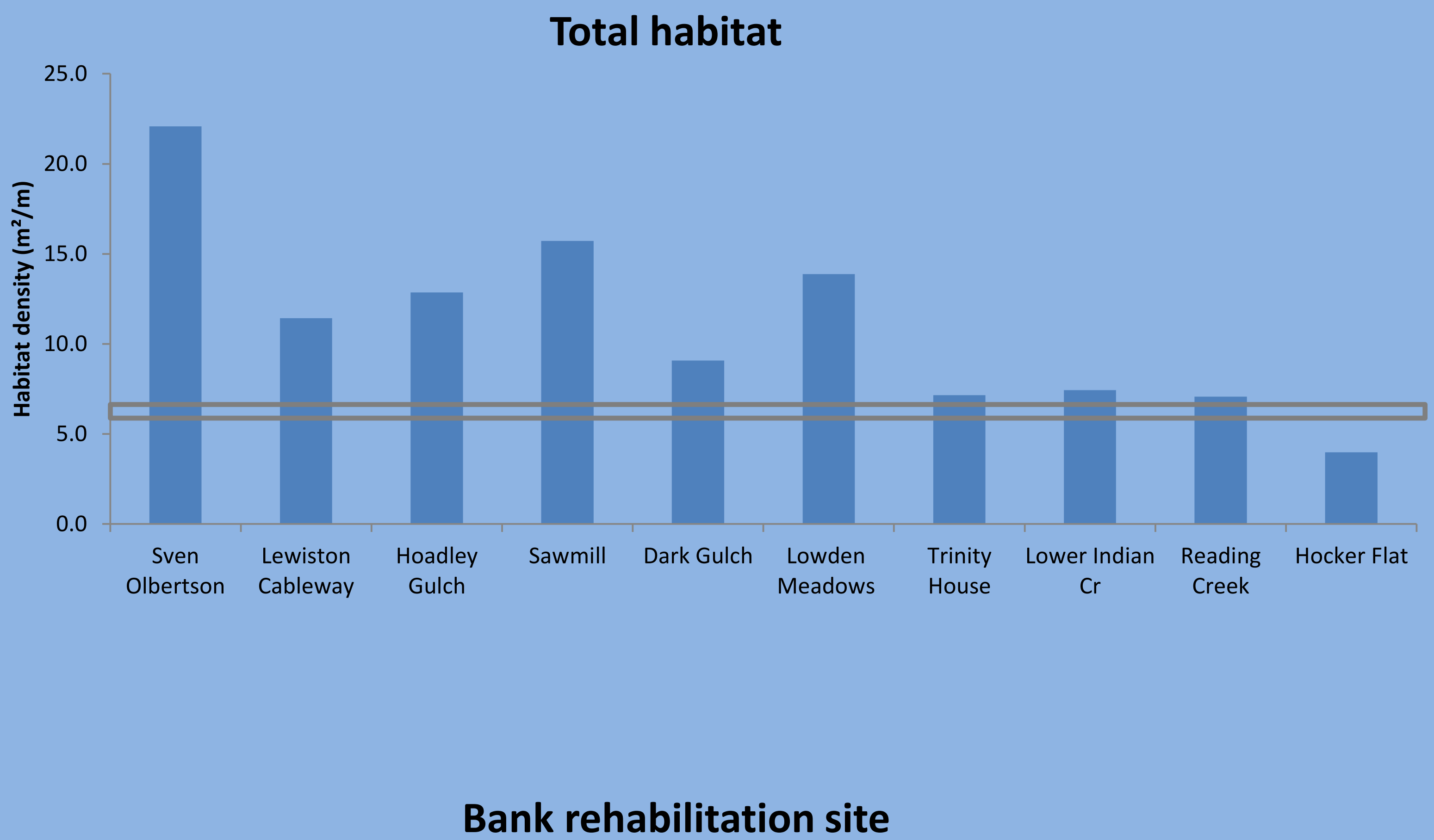
Conducted validation studies using snorkel counts to prove definitions



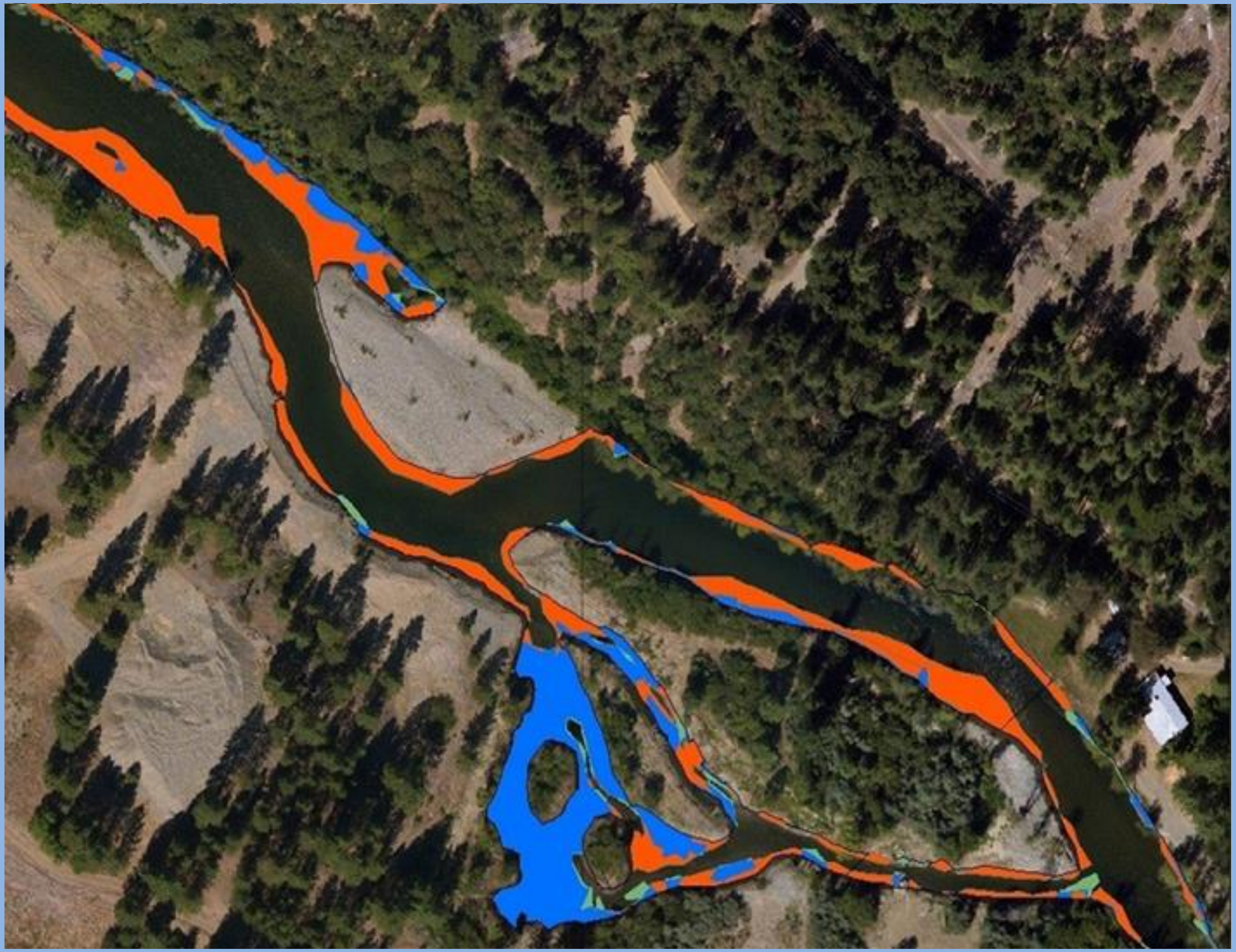
Habitat Mapping Example



Comparison of sites



Lowden Meadows

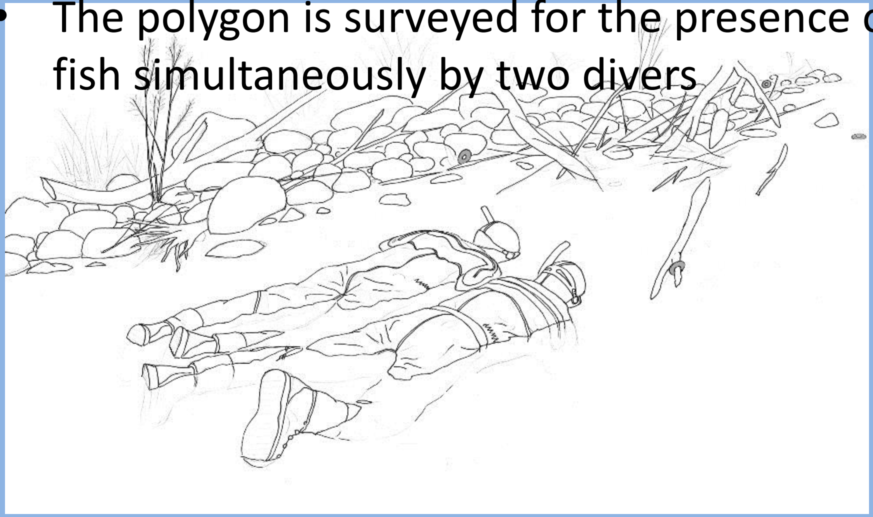


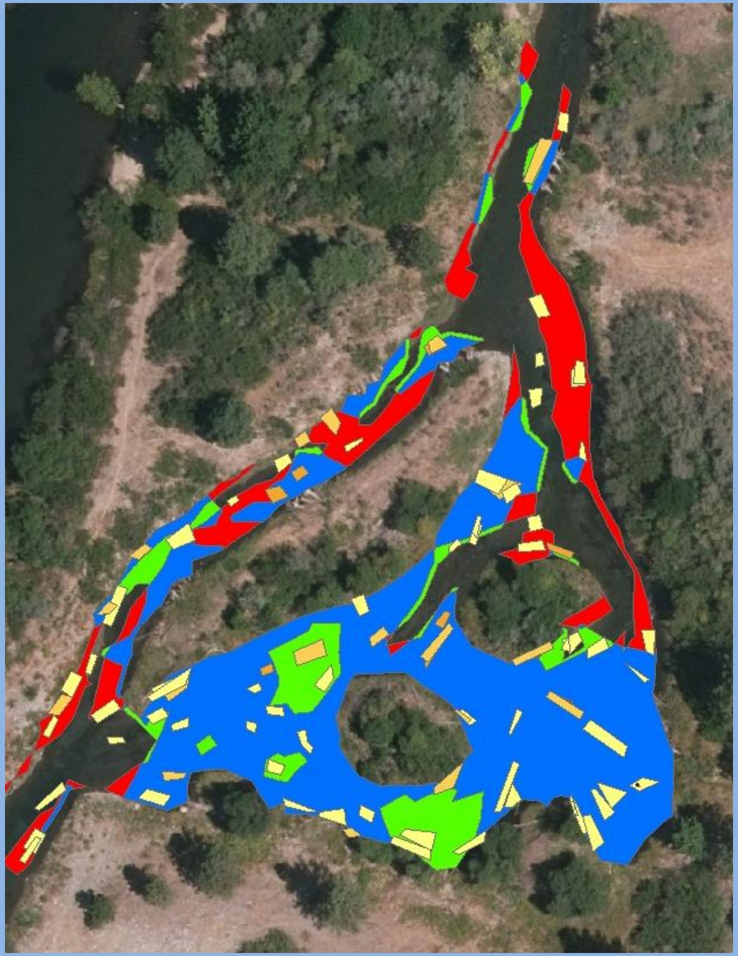
Evaluating fish response

- Can use the habitat maps/categories to help develop a sampling strategy to look at fish use
- What design elements are most heavily utilized by juvenile fish (i.e., LWD, ponds, alcoves, flow)?
- Do juvenile salmonids use all identified rearing habitat equally?

A Sample of Monitoring Effort

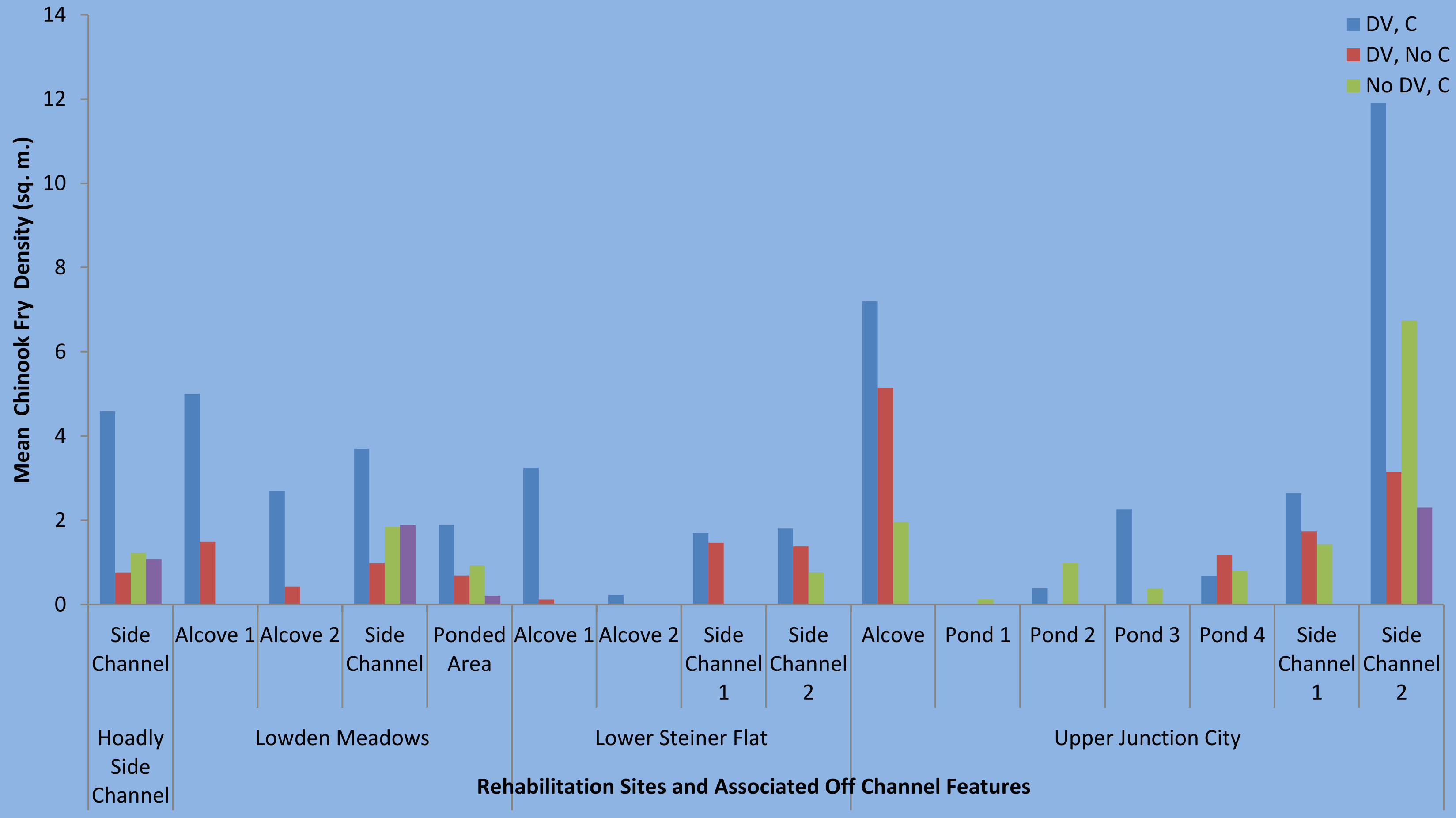
- Sampling is distributed amongst categorical habitat bins based on depth, velocity, and cover (DVC) proportional to availability
- A habitat unit or "Polygon" of like DVC is identified, delineated, and physical parameters are measured
- The polygon is revisited after a 24 hour period to allow fish present to return to normal behavior
- The polygon is surveyed for the presence of fish simultaneously by two divers





Fish use at 2 sites by feature type

Fish density*

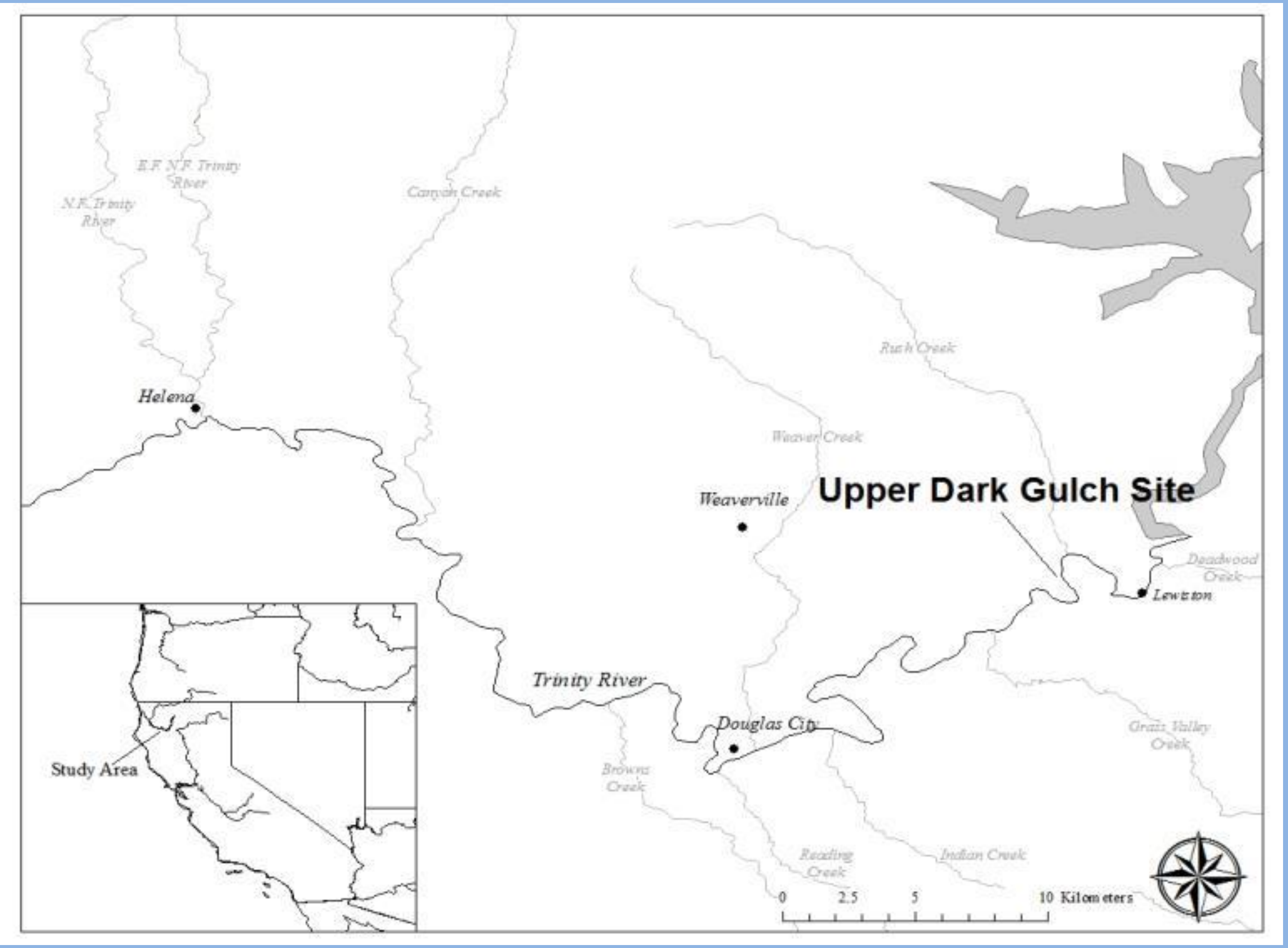


*Unpublished data

Bringing it back to design

- Habitat mapping at rehab sites has been a key element feeding design evolution since 2008.
- Relatively quick assessment, accurate results, able to cover a lot of ground
- Important to track progress through time, after site has had time to evolve
- Consider including fish use as part of evaluation

Channel Rehabilitation Assessment Example



Before Construction 2008

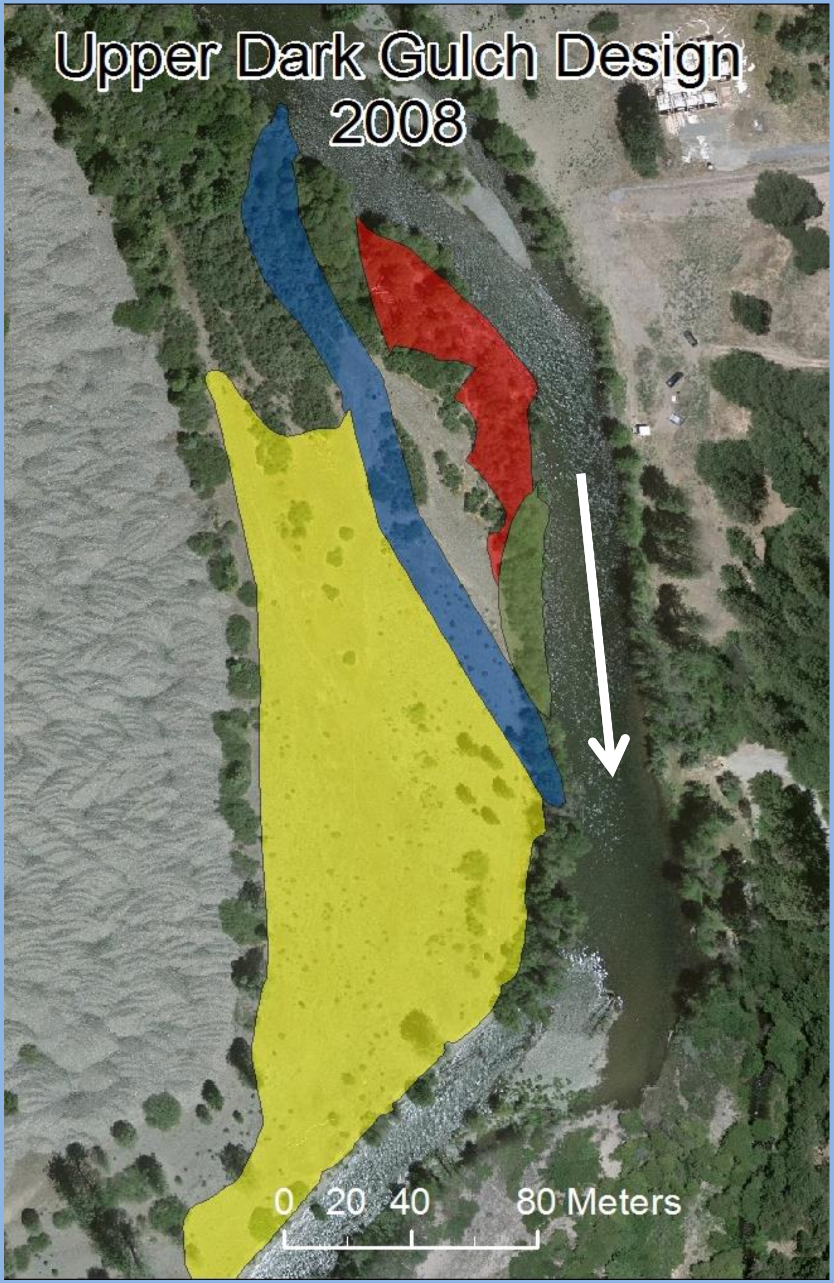
- Riparian encroachment
- Main channel disconnected from floodplain
  - Intermediate streamflows
- Lack of habitat complexity

Project Design

Project Goal- Increase salmonid rearing habitat at all flows

Design Elements include:

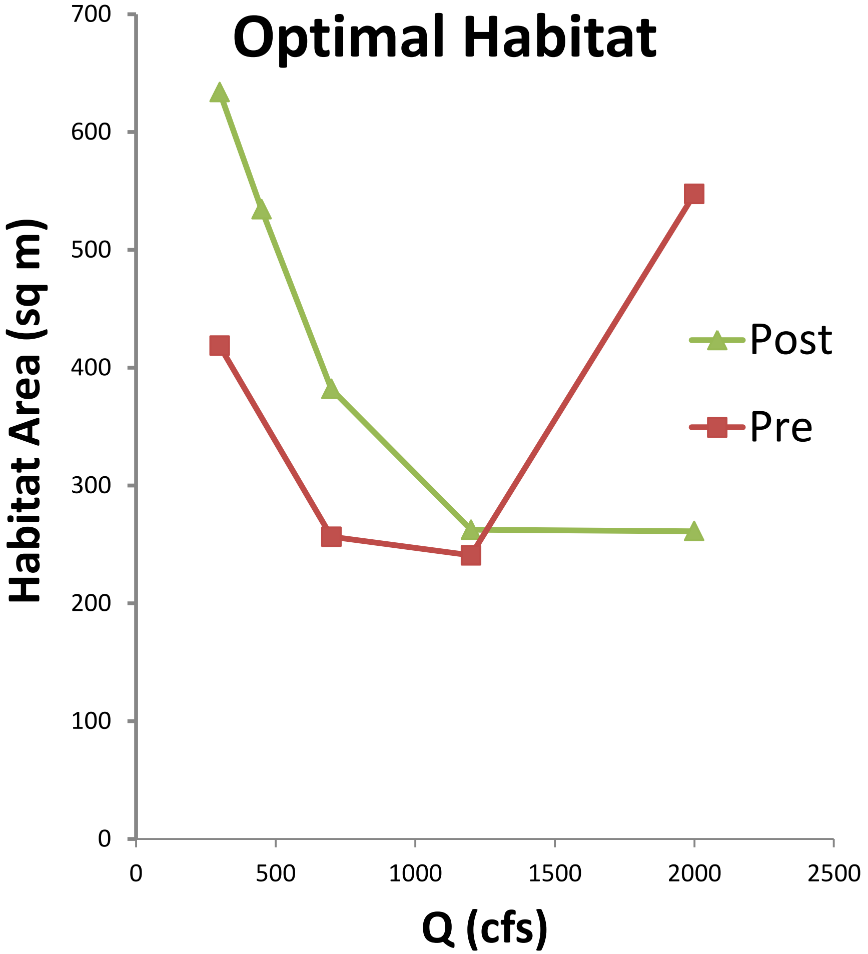
- Berm Removal
- Floodplain lowering
- Side channel creation
- Addition of large wood and riparian plantings
- 24,000 CY excavation

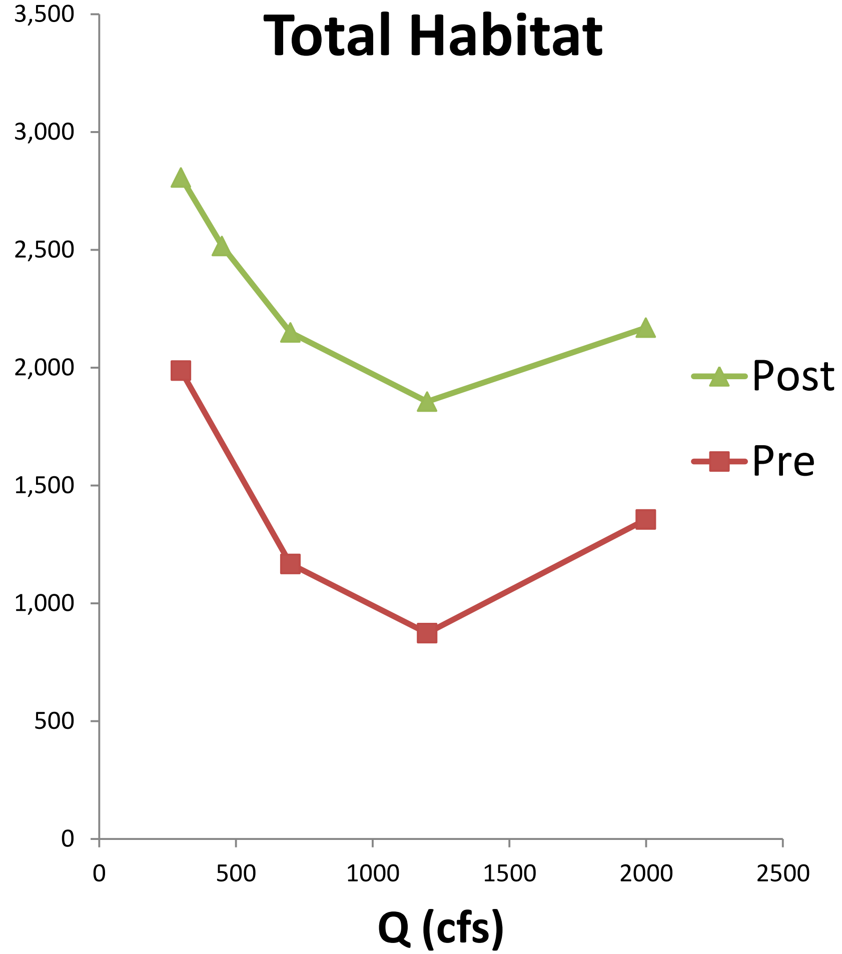


Habitat Assessment

- Conducted pre and post-construction mapping (2008 & 2009)
- Mapped site at 5 flows (300, 450, 700, 1200, 2000 cfs dam release)
- Revisited site in 2013 after 2011 high flow event
- Report optimal and total habitat

Pre vs Post-construction



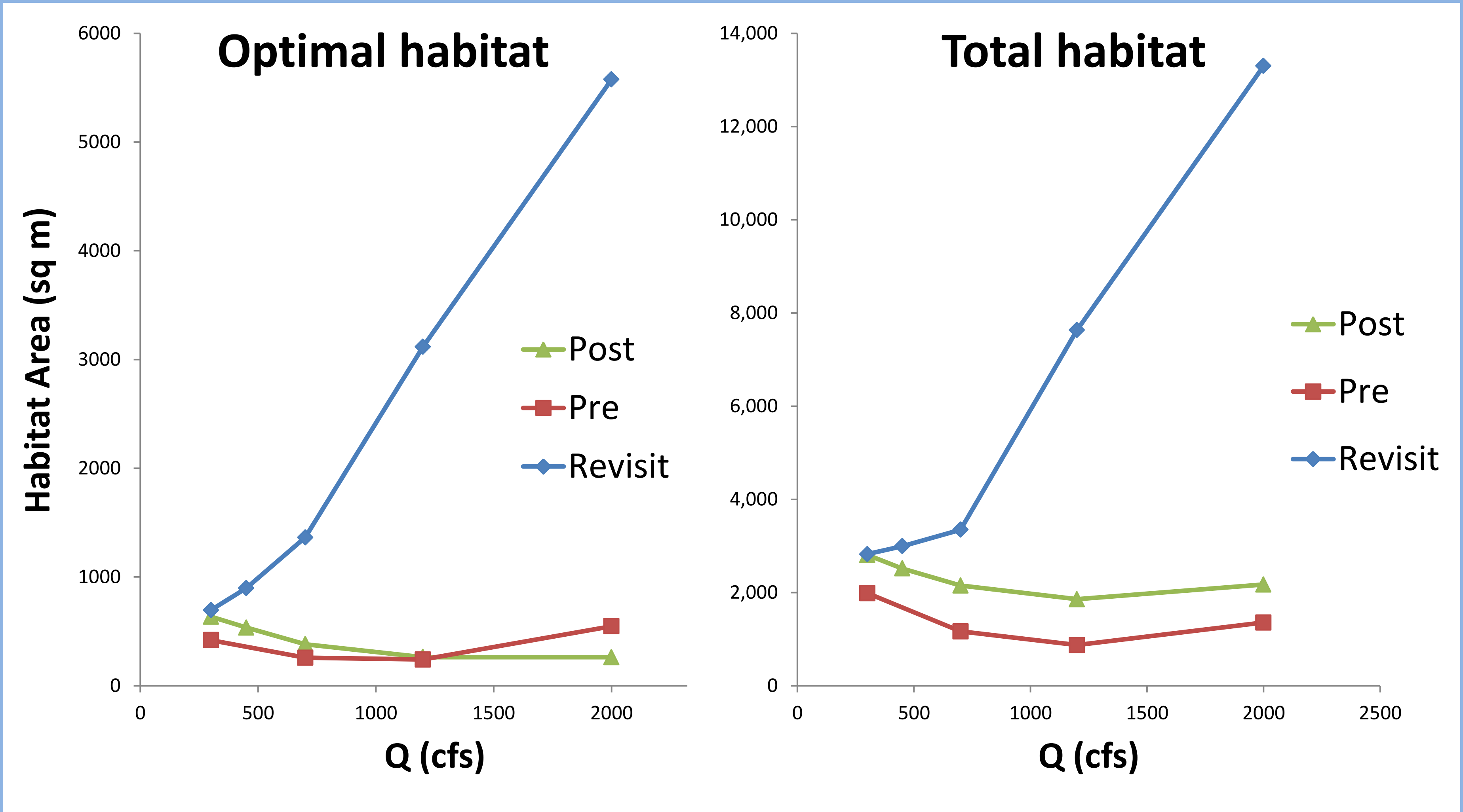



Pre-construction 2000 cfs
0 15 30 60 Meters

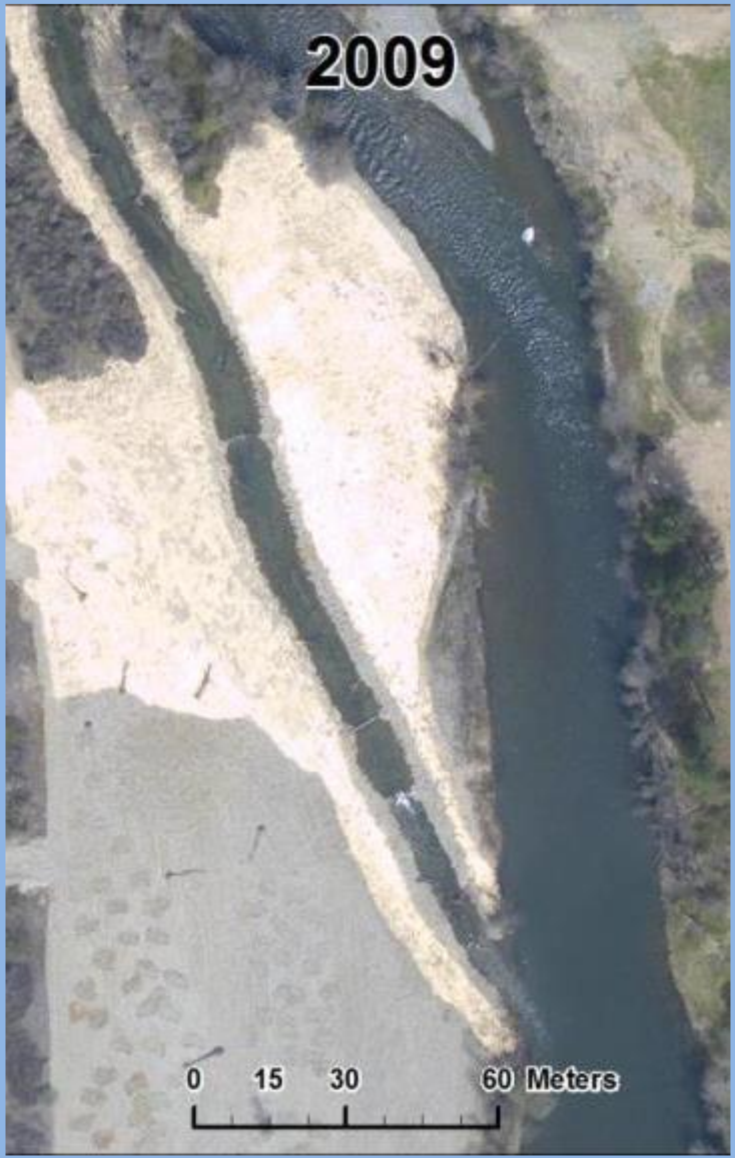

Post-construction 2000 cfs
0 15 30 60 Meters

High Streamflow Event 2011

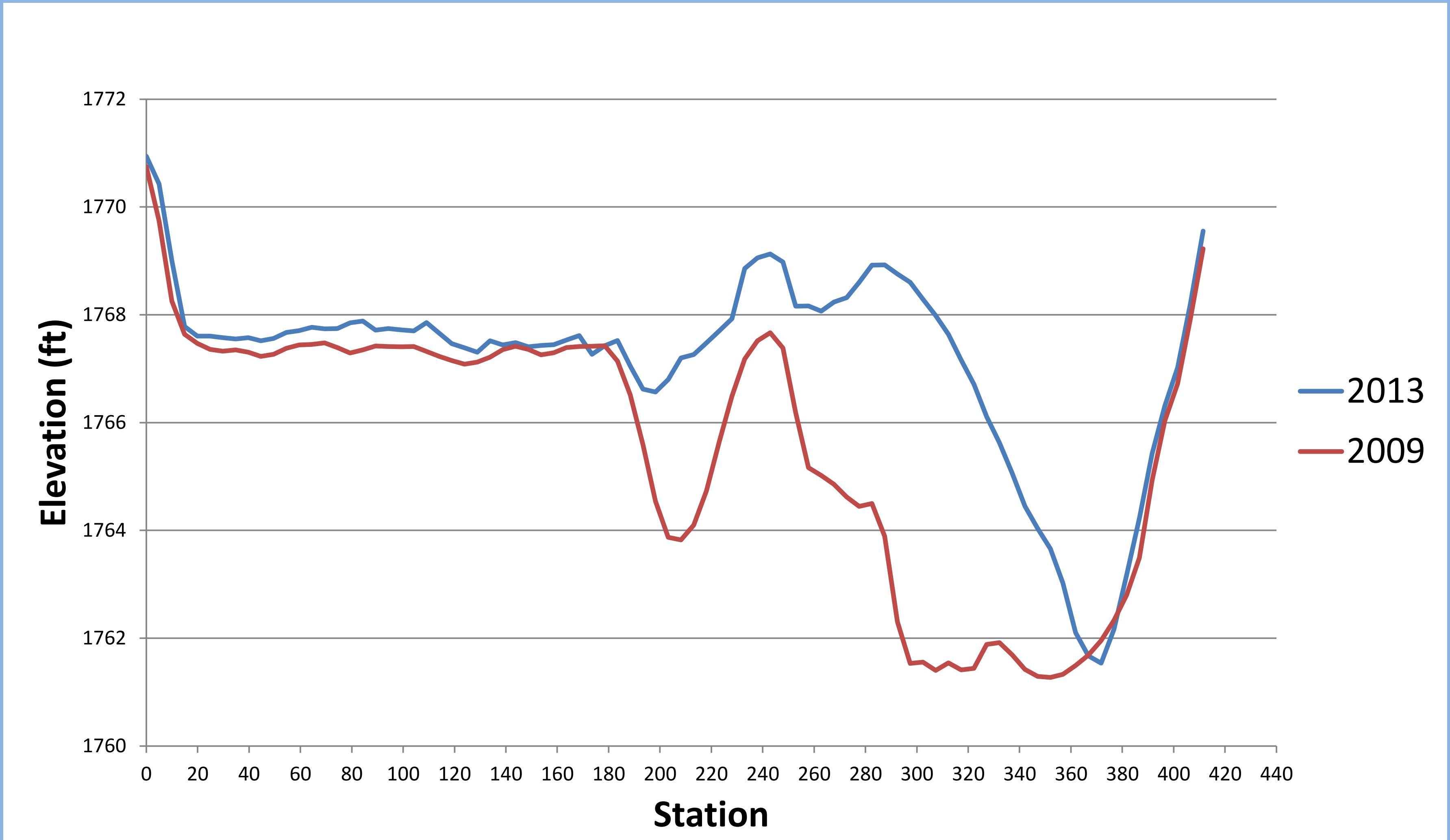
Revisit (post high flow)



What Happened?!?



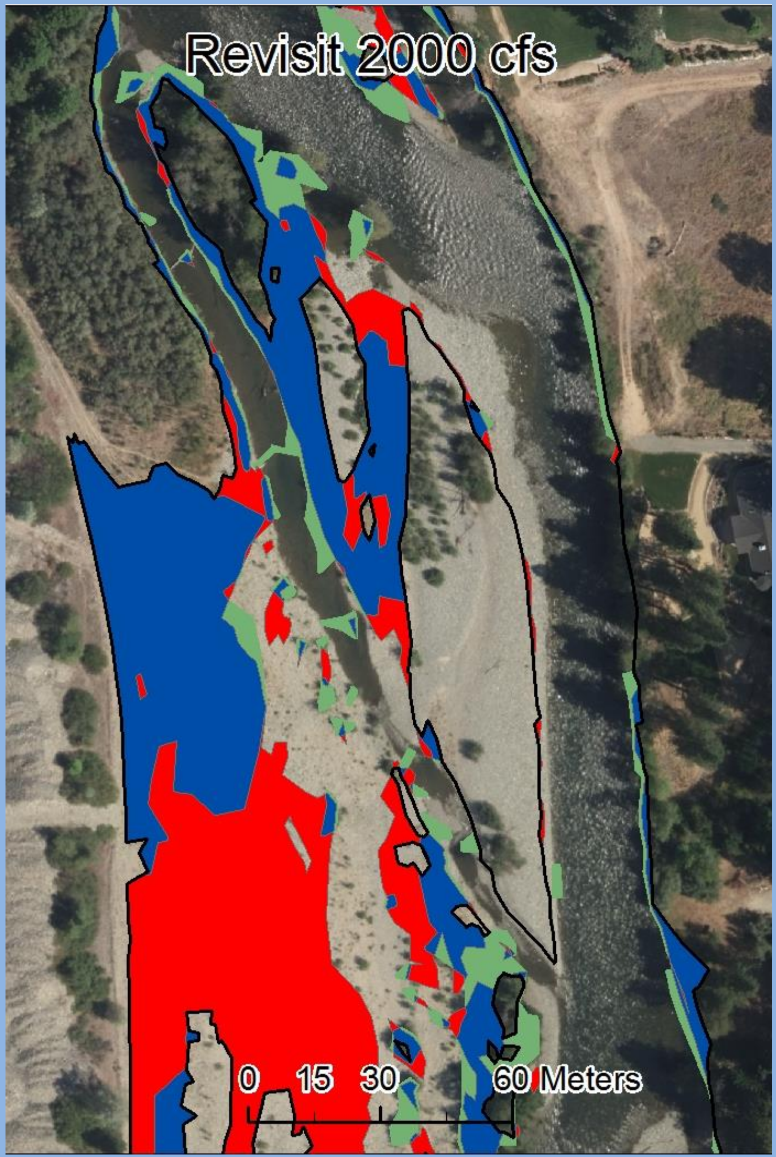
Topographic Change



Riparian Development

Process!!


Post-construction 2000 cfs
0 15 30 60 Meters


Revisit 2000 cfs
0 15 30 60 Meters

Acknowledgements

- Trinity Habitat Team
  - Nicholas A. Som, Dan Menton, Matt Smith-Caggiano, Mike Sundman, Nick Van Vleet & Arcata Fisheries Staff (USFWS)
  - Kyle DeJuilio, Andreas Krause, Hank, Jeremy & Larry Alameda (YTFP)
  - Rocky Jones ,Thomas Masten, Seth Brenten, Keith Hostler (HVTFP)
- Trinity River Restoration Program staff

For more information see

Goodman DH, NA Som, J Alvarez and A Martin. 2015. A mapping technique to evaluate age-0 salmon habitat response from restoration. Restoration Ecology doi: 10.1111/rec.12148


Questions?

Restoration of Complex Habitat Assemblies in Sediment Rich Ecosystems: Examples from Lower Klamath Tributaries

Rocco Fiori (Fiori GeoSciences) &
Sarah Beesley (Yurok Tribal Fisheries Program)

Discussion Topics

Complementary wood loading & off-channel construction techniques in 2^{nd} to 5^{th} Order Streams

- Bank Based Jams
- Bar Apex Jams
- Stumps
- Off-Channel Features

Biologic Hot Spots

- Tributary Confluences
- Pre-existing Side Channels & Wetlands
- Springs
- Beaver Activity

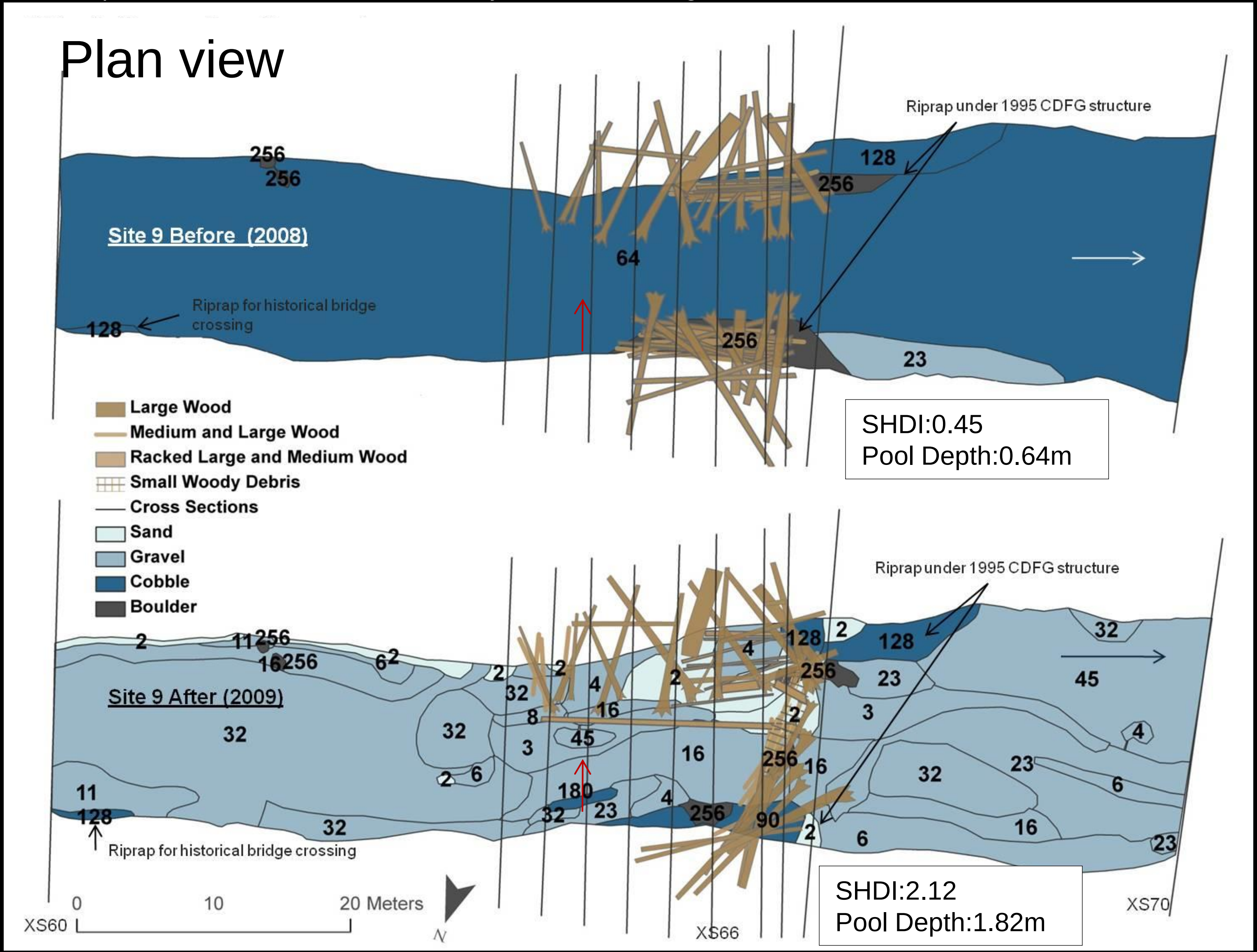
Long Term Approach

Wood loading & augmentation applied until natural recruitment supplies wood needed to restore geomorphic function and self-maintaining habitat requirements

Guiding Concepts

Habitat Changes Related to Large Wood Loading

Benegar et al. (In Review) Evaluation of constructed wood jams in a forest, gravelbed stream.



Guiding Concepts

Habitat Changes Related to Large Wood Loading

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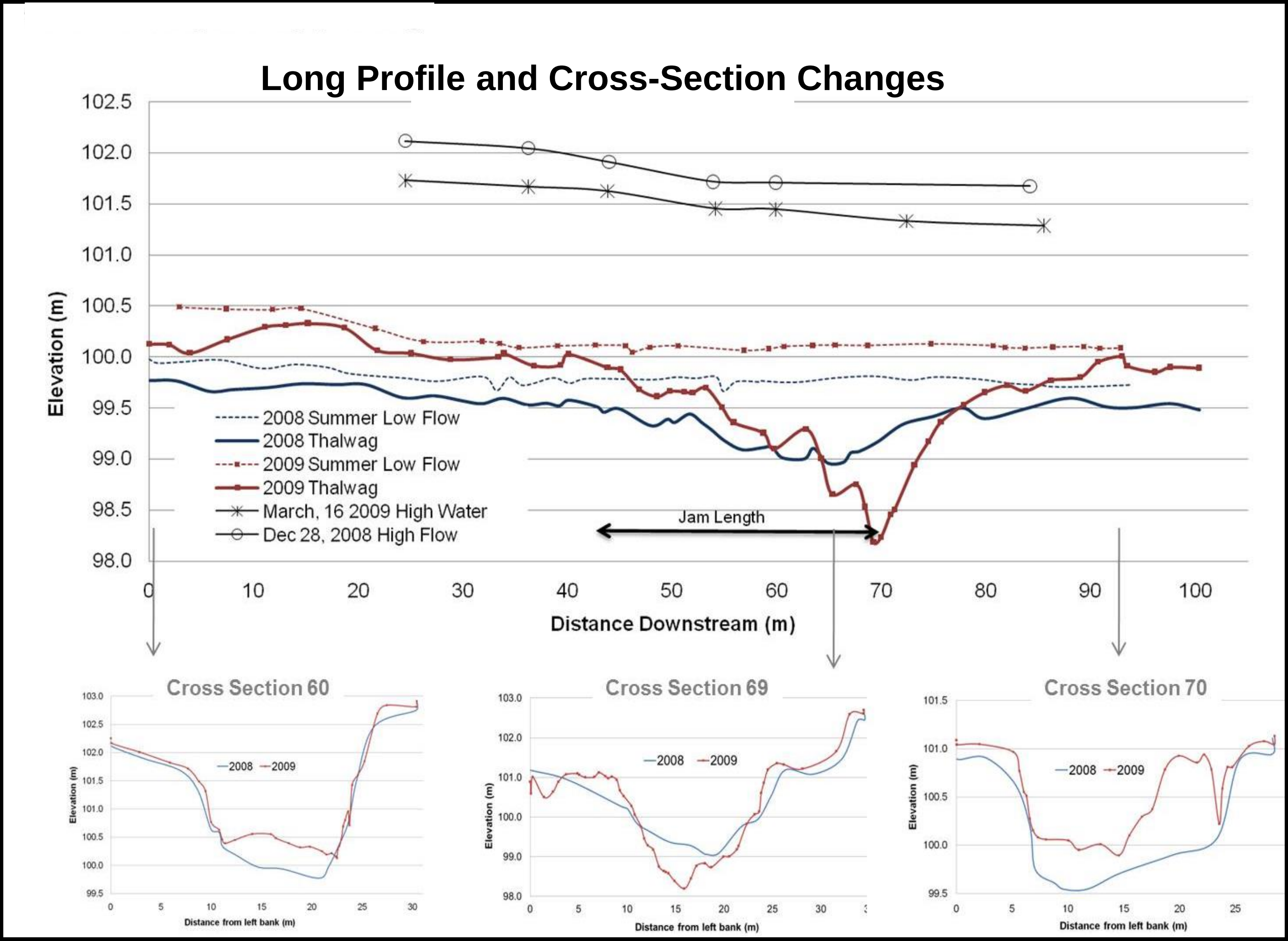

Guiding Concepts

Habitat Changes Related to Large Wood Loading

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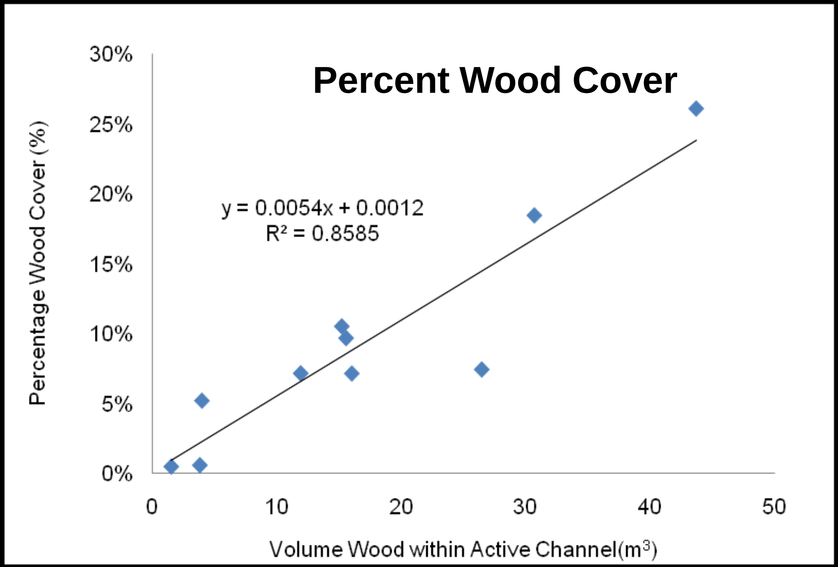
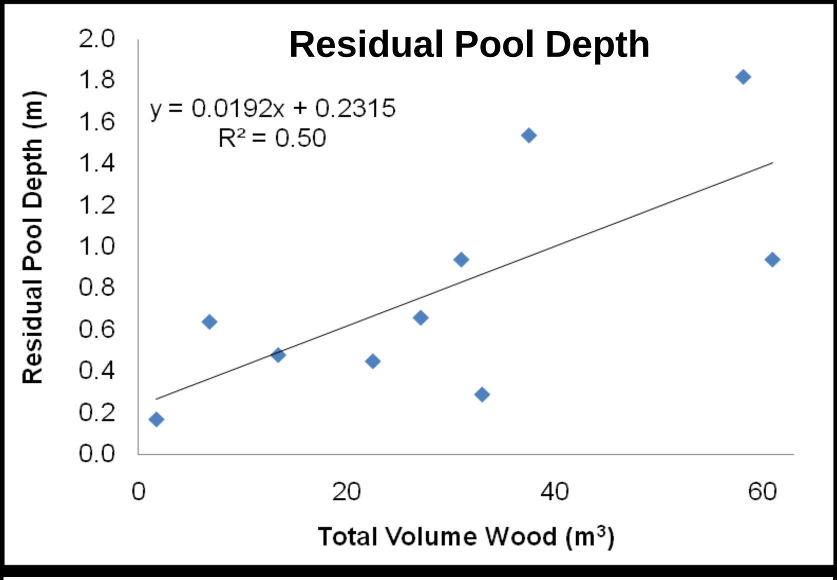
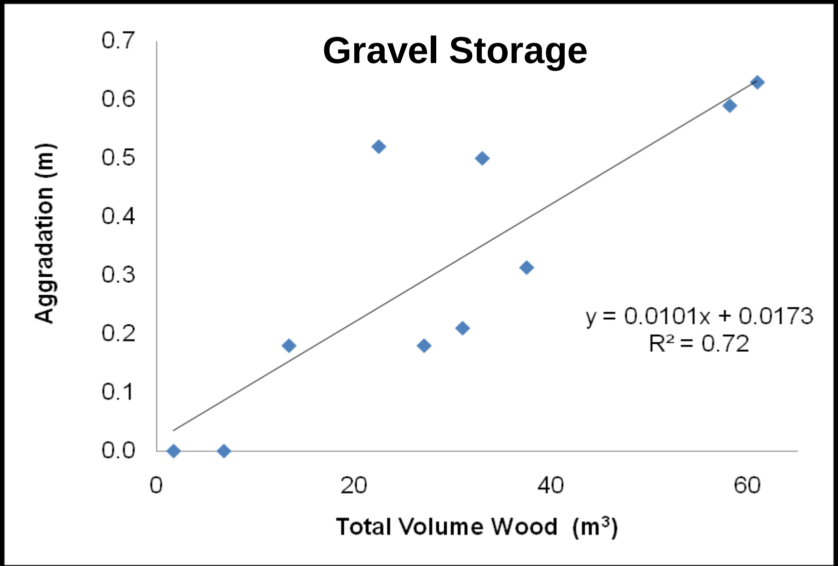
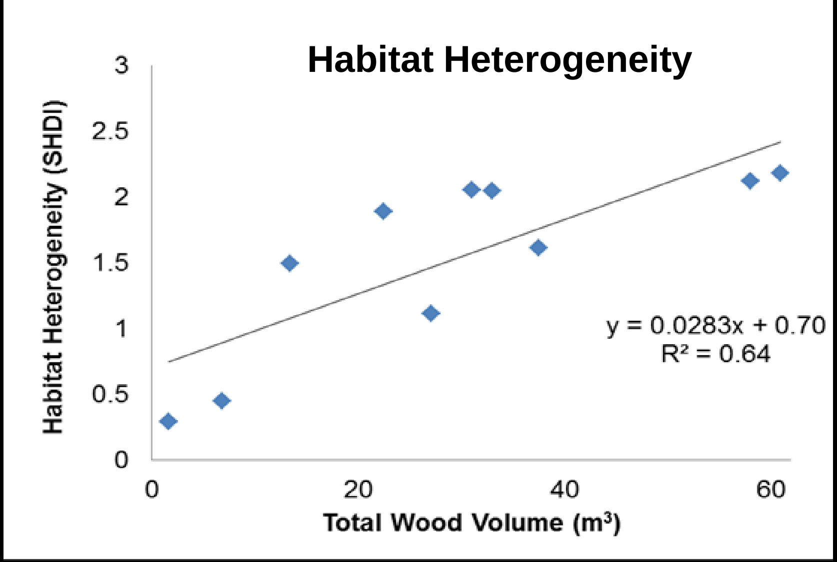


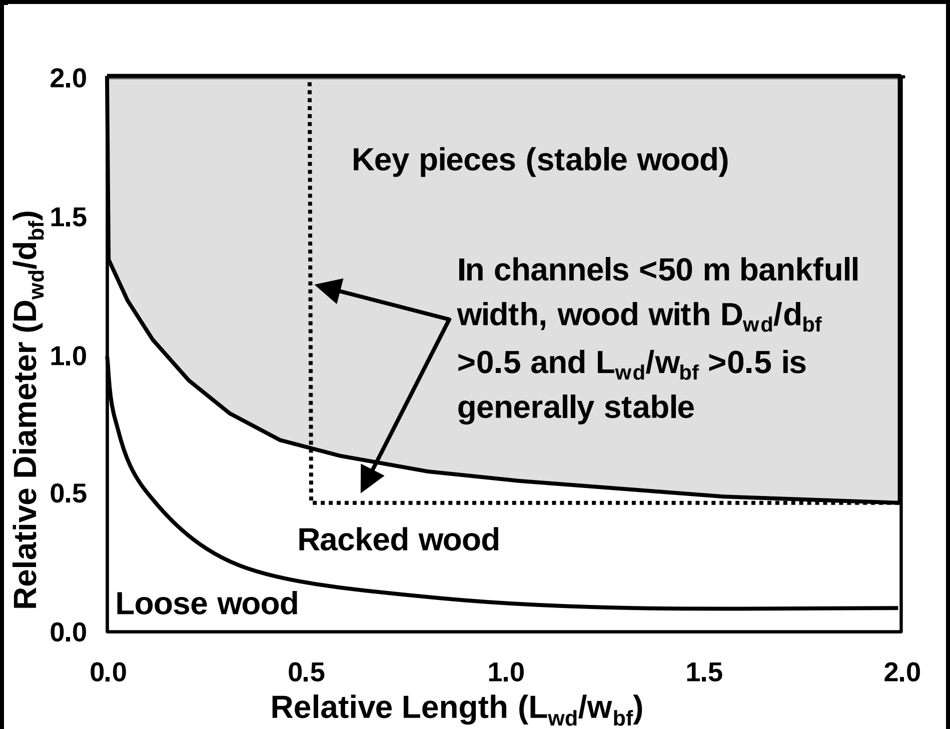


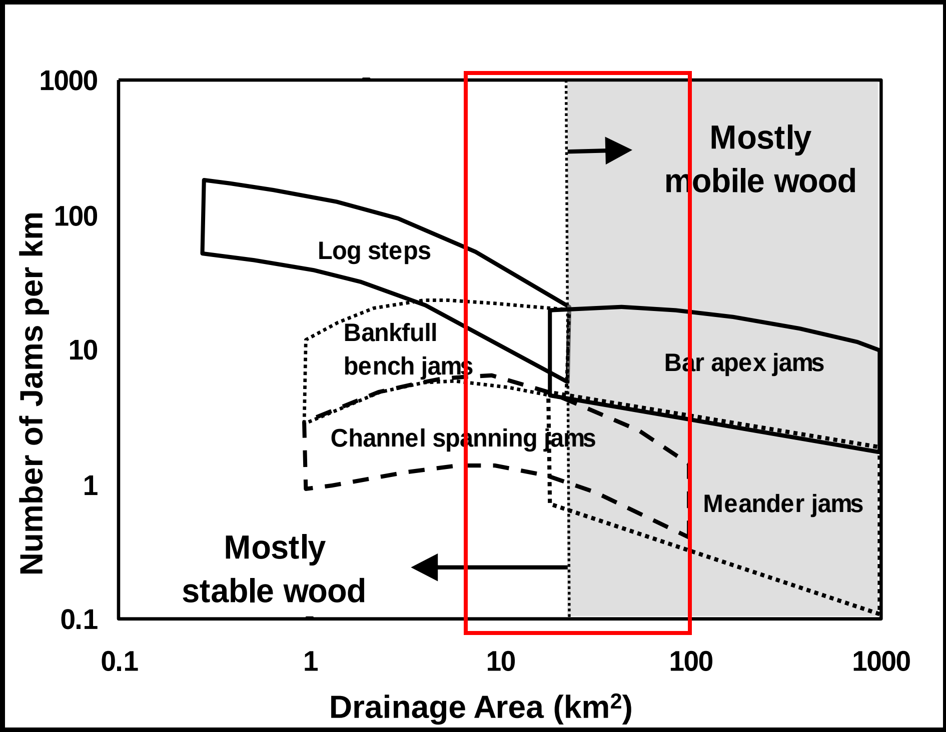




Guiding Concepts

Wood Dynamics and Function





Abbe and Montgomery (2003) Patterns and processes of wood debris accumulation in the Queets River basin, Washington.

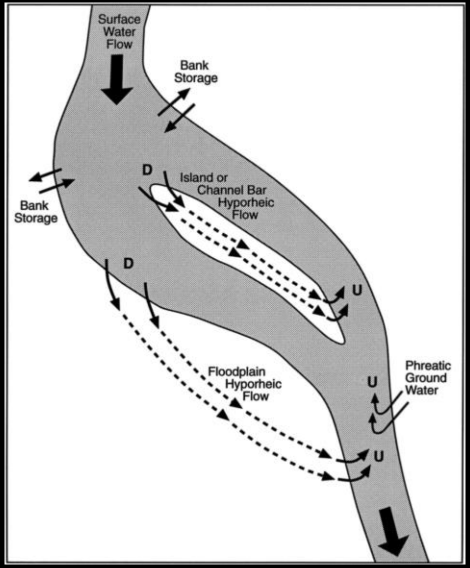
Wohl (2013) Floodplains and Wood.

Roni et al. (2015) Wood placement in river restoration: fact, fiction, and future direction.

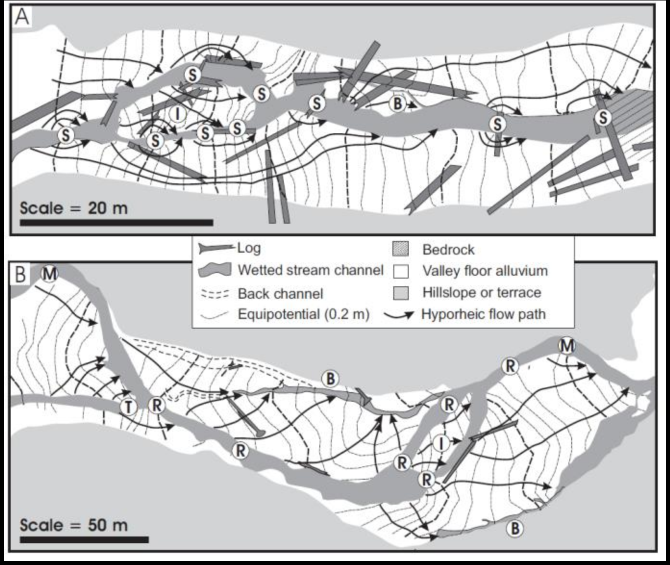
USACE & BOR (2015) Large Wood National Manual.

Guiding Concepts

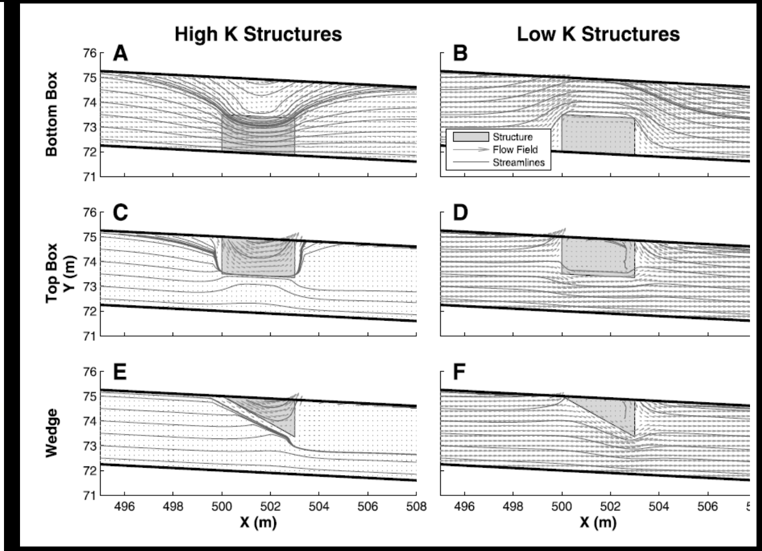
Hyporheic Exchange Mechanisms and Function



Redd Site Selection and Spawning Habitat Used by Chinook Salmon. From: Geist & Dauble (1998).

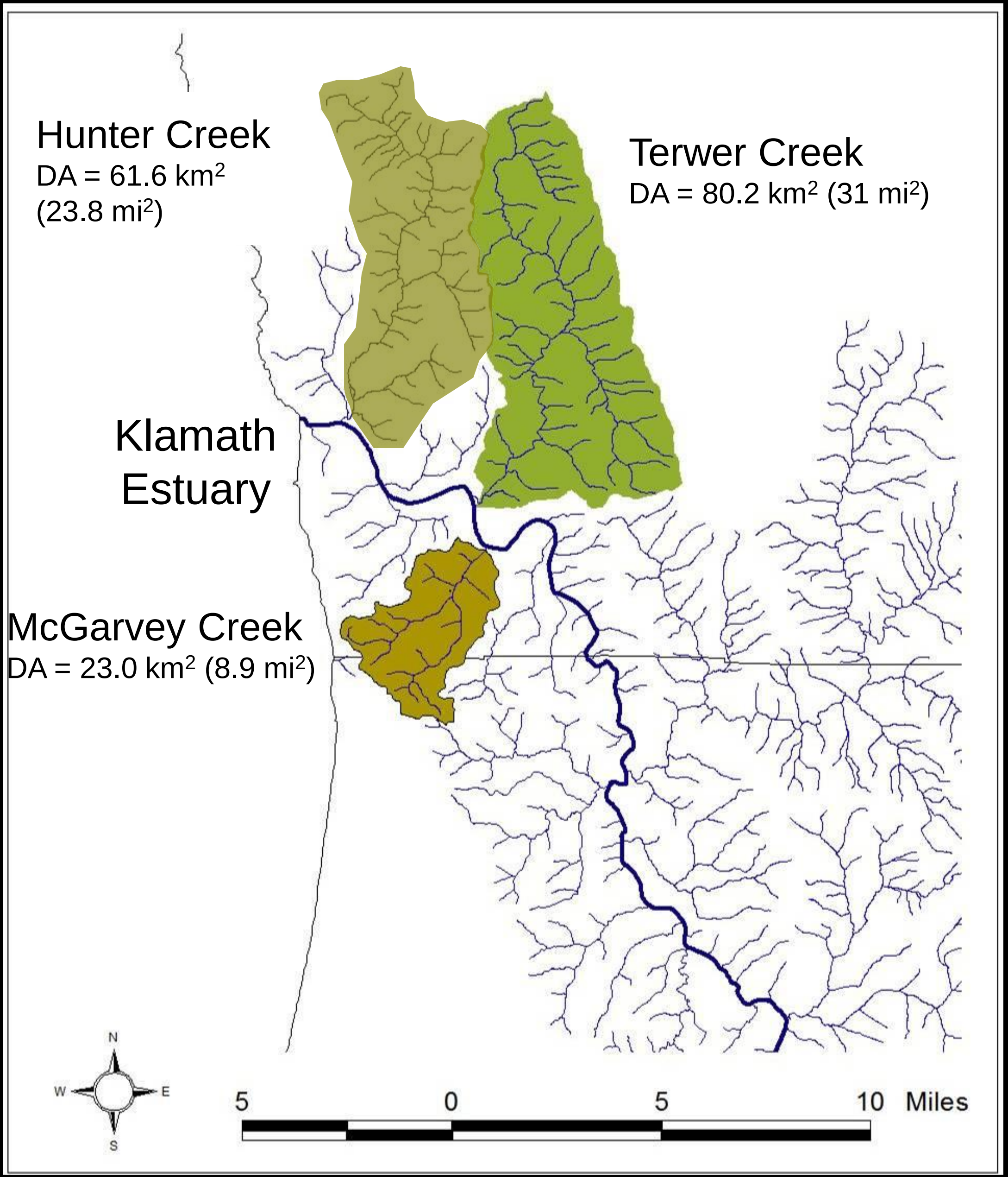


Geomorphic Controls on Hyporheic Exchange. From: Wondzell & Gooseff (Pre-Print).

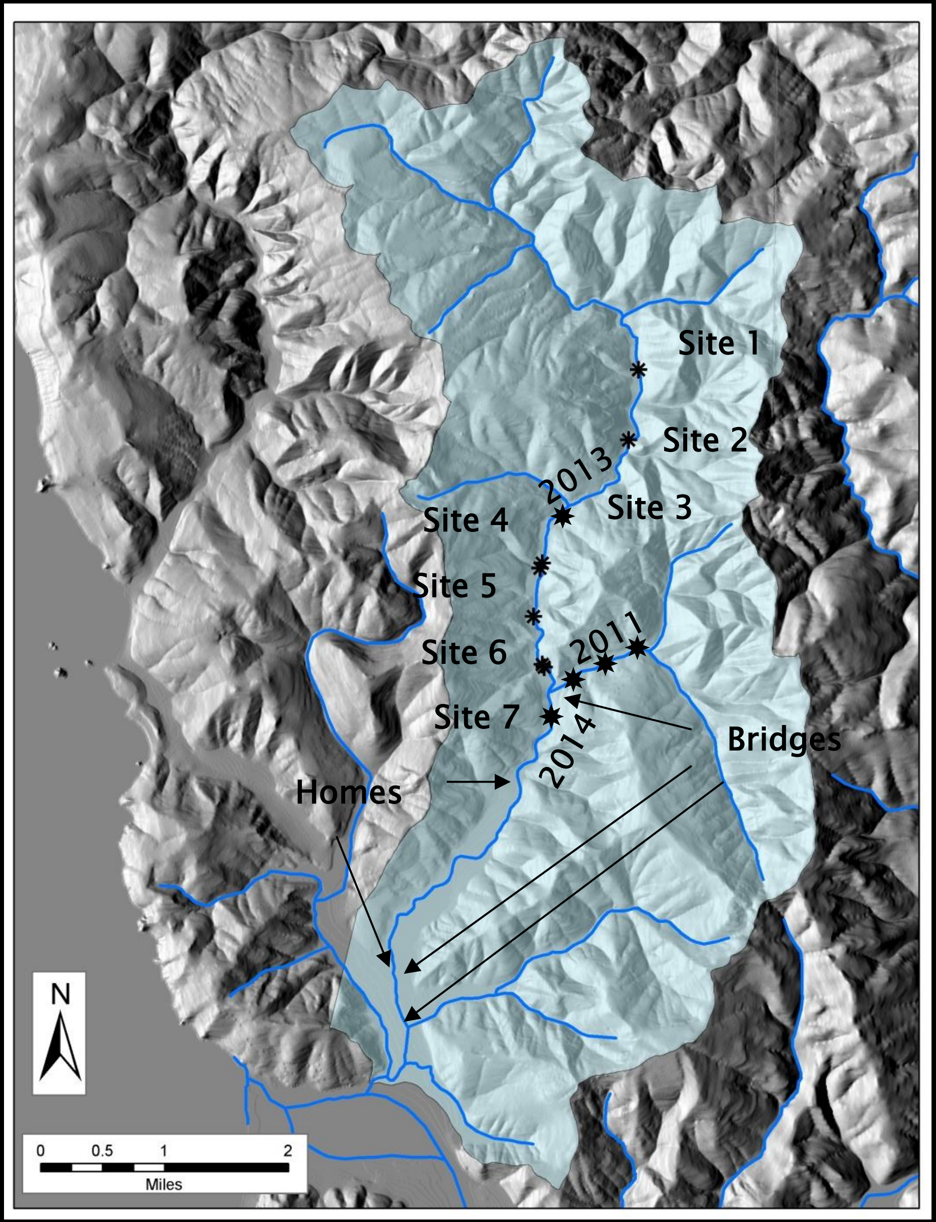


Influence of Subsurface Structures on Hyporheic Exchange. From: Ward et al. (2011).

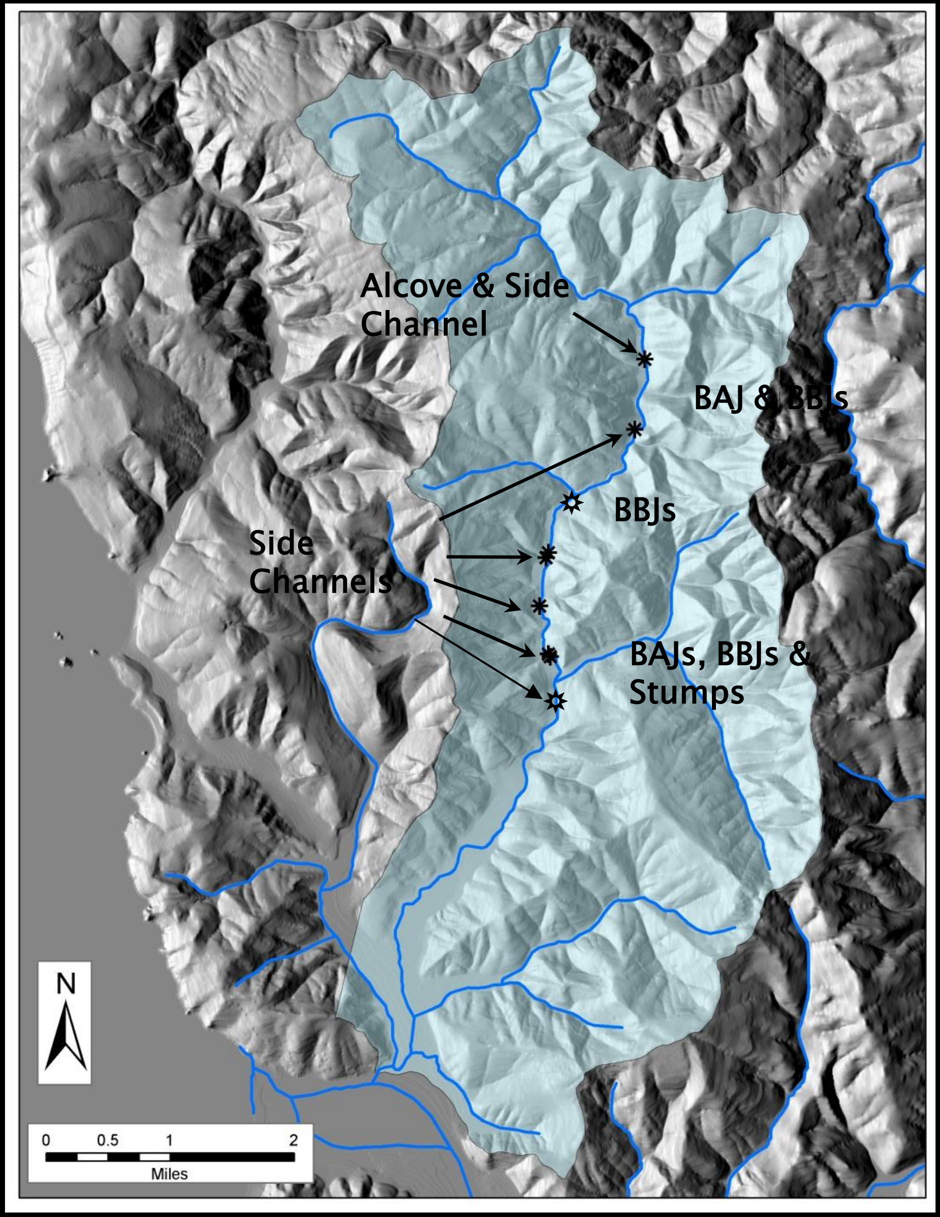
Project Locations



Hunter Creek Watershed



Hunter Creek Watershed



Hunter Creek Site 1

Hunter Creek Site 1

Hunter Creek Site 4

Construction 2012

As-Built 2012

Tributary Confluence

Hunter Creek Site 4

As-Built 2012

Post 5-yr RI flood WY15

Hunter Creek Site 4

As-Built 2012

Post 5-yr RI flood WY15

Hunter Creek Site 7 - BAJ 1

First flows 2014

Post 5-yr RI flood WY15

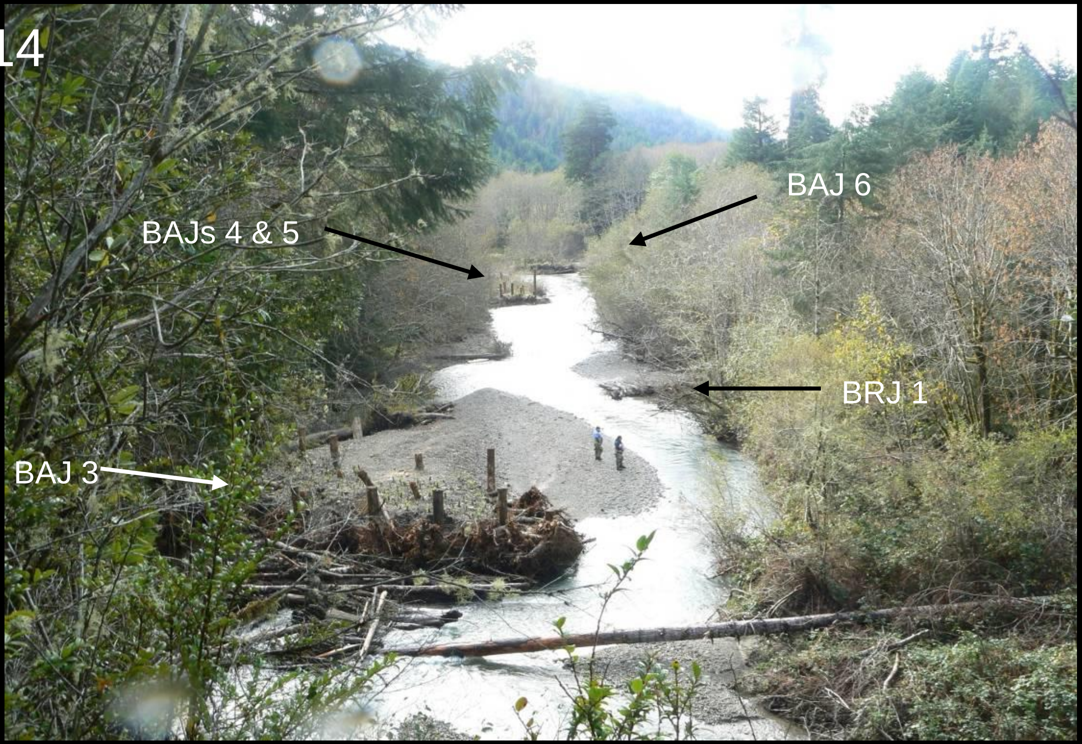
Hunter Creek Site 7
BAJ 2, BBJs & Stumps

Hunter Creek Site 7
BAJ 2

Hunter Creek Site 7
BAJs and BRJ

As-Built 2014

First flows 2014



Hunter Creek BAJ 3 - Chaos Jam

Pre-Project 2012

Construction 2012

Hunter Creek BAJ 3 - Chaos Jam

As-Built 2014

First flows 2014

Hunter Creek BAJ 3 - Chaos Jam

Hunter Creek Site 7 Bank Based Jams

Digger Log & Stump

Bar Roughness Jam

Hunter Creek Site 7 - BAJ 4, 5 & 6

Hunter Creek Site 7
BAJ 6

Hunter Creek Site 7 - BAJ 6

Post 5-yr RI Flood WY15

Hunter Creek Site 7 – PADR 1 & 2

Pre- Construction 2014

As-Built 2014

Hunter Creek Site 7 – PADR 1 & 2

Hunter Creek Site 7 – PADR 1 & 2

First Flows 2014

Post 5-yr RI flood WY15

Hunter Creek Site 7 – PADR 1 & 2

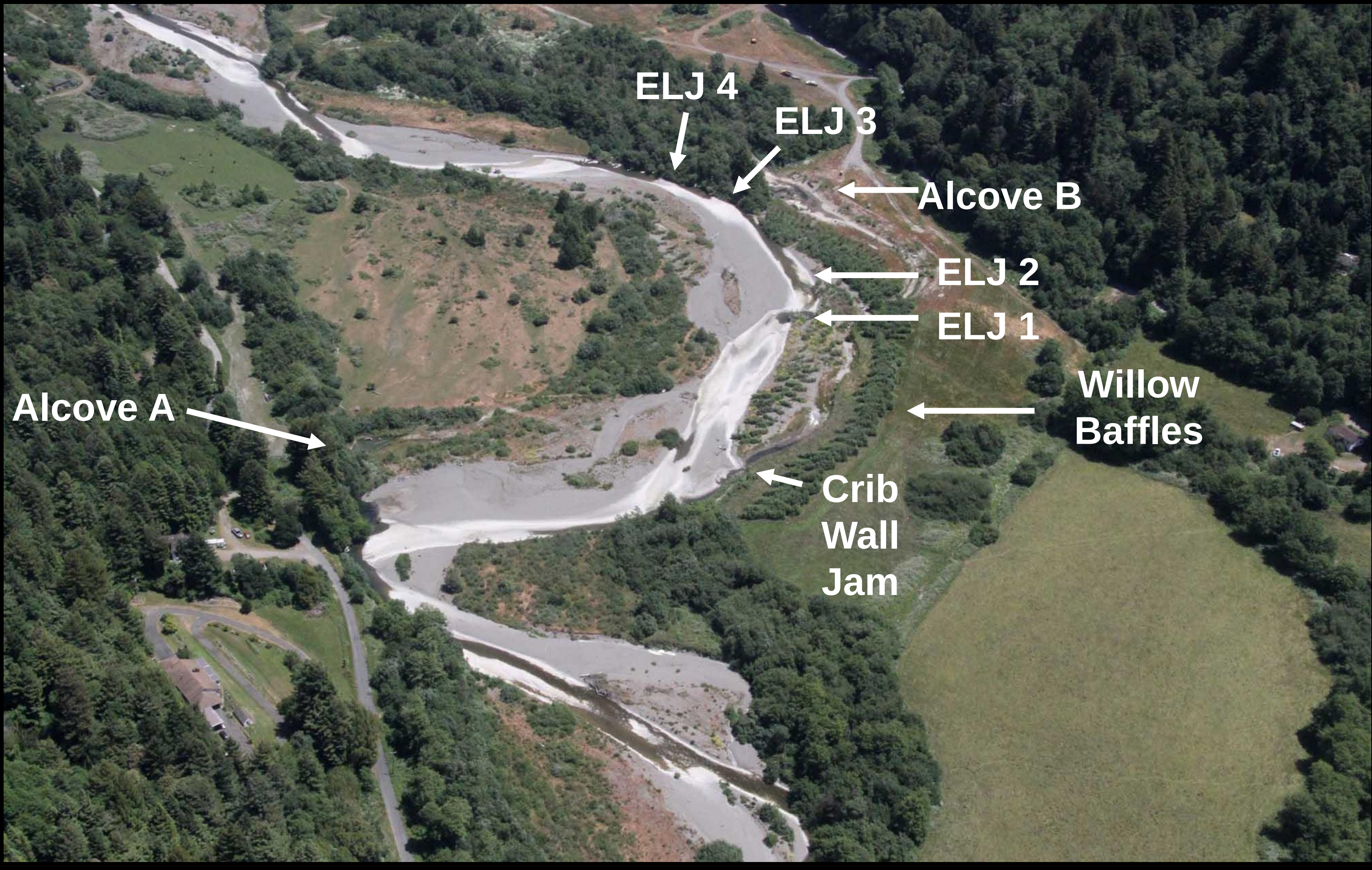
First Flows 2014

Post 5-yr RI flood WY15

Terwer Creek

Terwer Creek

Terwer Creek
Integrated Use of ELJs, Alcoves & BioEngineering




ELJ 1
As-Built
Flow


ELJ 1 2-yrs Post-Construction


ELJ 1
5-yrs Post-Construction

Terwer Creek
First Winter
Post-Project

Terwer Creek

Pre-Construction 2008

Post-Construction 2009

McGarvey Creek – Alcove I

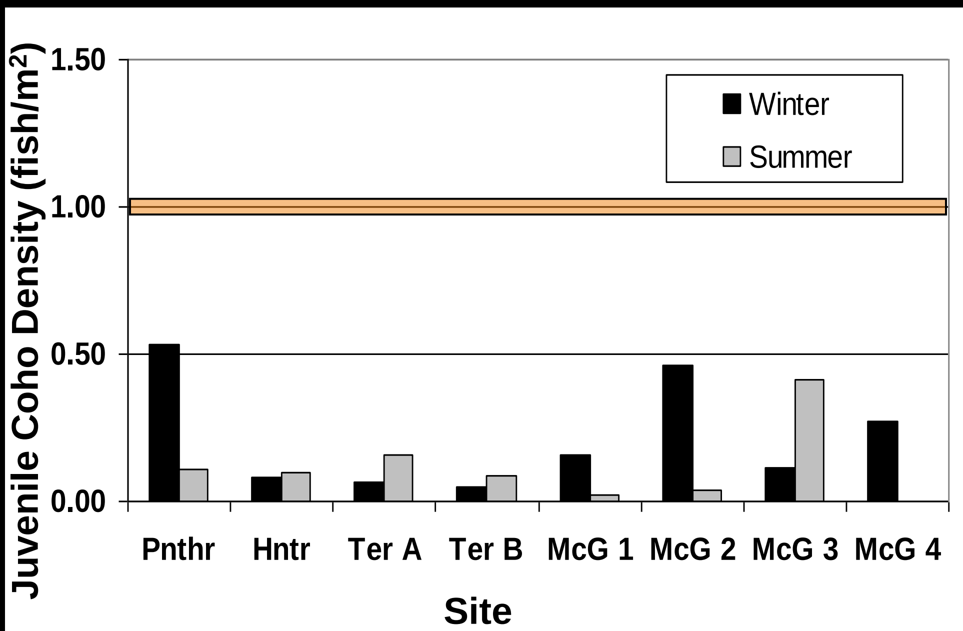
Pre-Construction

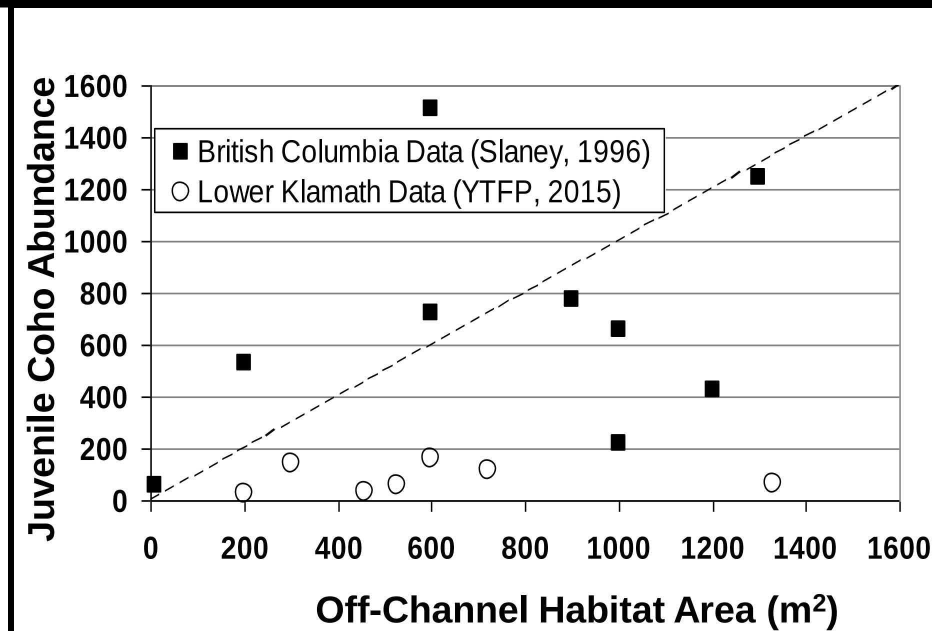
Post-Construction

McGarvey Creek – Alcove II

Juvenile Coho Use of Off-Channel Habitats

Preliminary Data





Nickelson (2008) A Habitat-Based Assessment of Coho Salmon Production Potential and Spawner Escapement Needs for Oregon Coastal Streams.

Off-Channel Habitat Restoration Cost Effectiveness

Location	Wetted Habitat Area (m^2)	Average Juvenile Abundance (# of yrs)	Average Fish Density ($\#/m^2$)	Cost* ($\$/m^2$)	Cost $/fish (30 yrs)
Terwer Alcove A	458	35 (3)	0.07	49	22
Terwer Alcove B	1330	66 (5)	0.05	141	95
McG Alcove 1	723	115 (4)	0.16	150	32
McG Alcove 2	300	139 (3)	0.46	220	16
McG Alcove 3	527	59 (2)	0.13	123	36
McG Alcove 4	600	162 (1)	0.27	125	16
Hnt Alcove 1	200	27 (4)	0.8	78	20

*** Construction costs are based on the wetted habitat area created and are preliminary estimates that include wood loading, monitoring and other project related costs.**

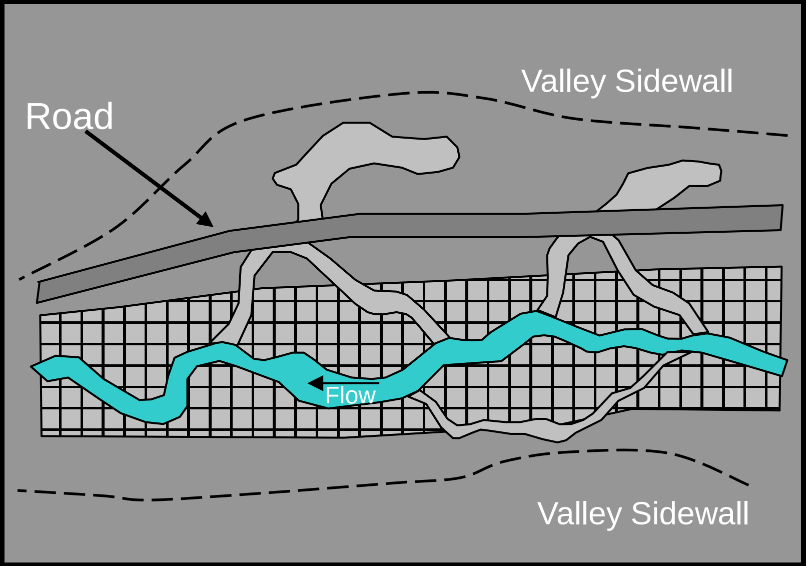
Ogston et al. (2014) Watershed-scale effectiveness of floodplain habitat restoration for juvenile coho salmon in the Chilliwack River, British Columbia.

Roni et al. 2010. Estimating changes in coho salmon and steelhead abundance from watershed restoration: how much restoration is needed to measurably increase smolt production?

Wood Loading Costs

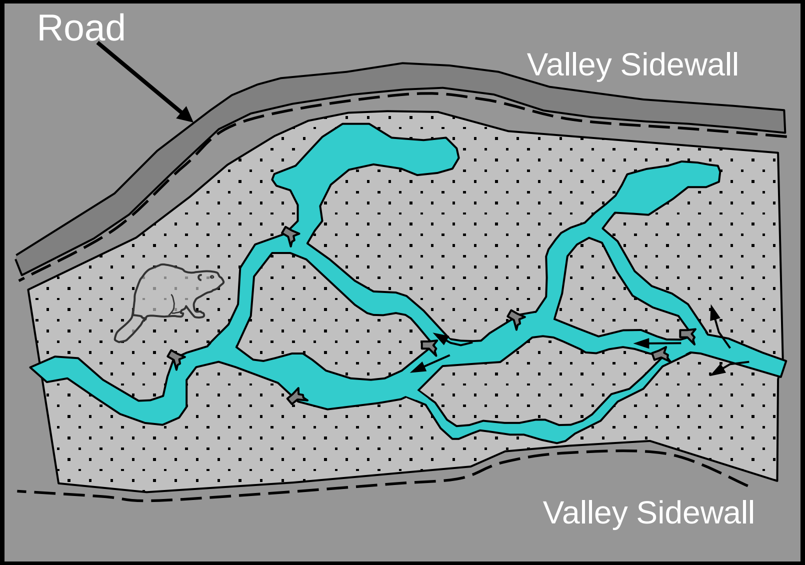
Carah et al. (2014) Low-Cost Restoration Techniques for Rapidly Increasing Wood Cover in Coastal Coho Salmon Streams

Next Steps



VALLEY FLOOR MANAGED AS TRANSPORTATION & FLOOD CORIDOR

ECO-HYDRAULIC FUNCTION DISRUPTED BY FLOODPLAIN ROADS, LEVEES AND OTHER LAND USES



VALLEY FLOOR MANAGED AS FLOODPLAIN

RELOCATE ROAD

DISEMCUMBER THE CHANNEL MIGRATION ZONE

BEAVER AS LEAD-ENGINEER

Salmon Need Habitat – We Need Salmon

Off Road Vehicle Impacts

Contributors

- Rocco Fiori – Engineering Geologist/Operating Engineer, Fiori GeoSciences
- Sarah Beesley – Fisheries Biologist, Yurok Tribal Fisheries Program
- Aldaron McCovey - Fisheries Technician, Yurok Tribal Fisheries Program
- Steven Nova - Fisheries Technician, Yurok Tribal Fisheries Program
- Robert Grubbs – Fisheries Technician, Yurok Tribal Fisheries Program
- Scott Silloway – Fisheries Biologist, Yurok Tribal Fisheries Program
- Andrew Antonetti – Fisheries Biologist, Yurok Tribal Fisheries Program
- Walter Mecklenburg – Fisheries Biologist, Yurok Tribal Fisheries Program

Funding Partners, Landowners and Cooperators

- U.S. Fish and Wildlife Service
- U.S. Bureau of Reclamation
- National Oceanic and Atmospheric Administration
- CA Dept of Fish and Wildlife
- Green Diamond Resources Company
- Yurok Tribe Watershed Restoration Dept.
- Yurok Tribe Environmental Program

Round-Table Discussion

- Today, 12:30
- 1700 9thStreet (corner of Q an 9th)
  - Third floor conference room
- Call-in: 1-877-336-1831, Participant #940704