

# Watershed Scale Habitat Restoration of Lower Klamath Tributaries



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



# 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

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- 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

# Discussion Topics

Complementary wood loading & off-channel construction techniques in 2<sup>nd</sup> to 5<sup>th</sup> Order Streams

- Bank Based Jams

- Bar Apex Jams

- Stumps

- Off-Channel Features

Biologic Hot Spots

- Tributary Confluences

- Pre-existing Side Channels & Wetlands

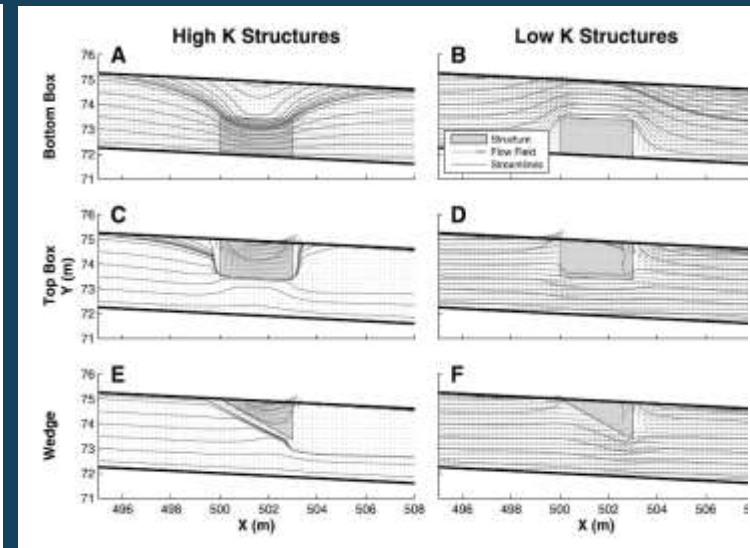
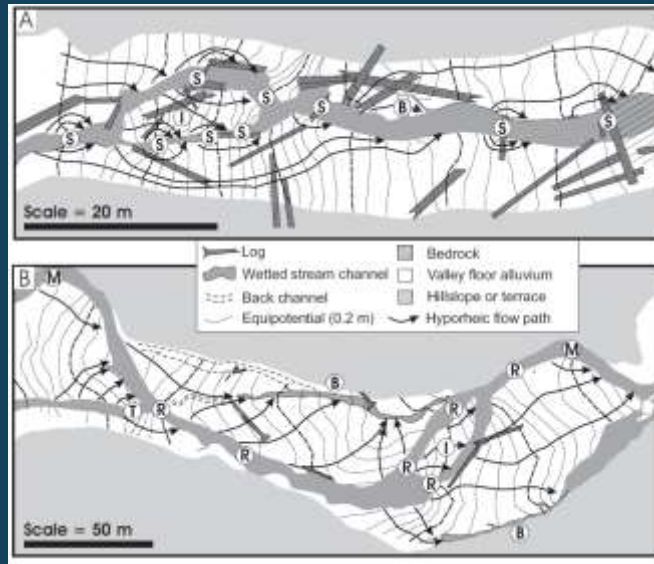
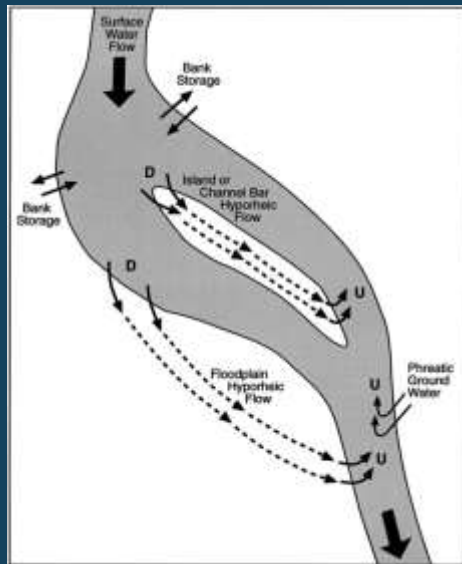
- Springs

- Beaver Activity

Long Term Approach

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

# Hyporheic Exchange Mechanisms and Function

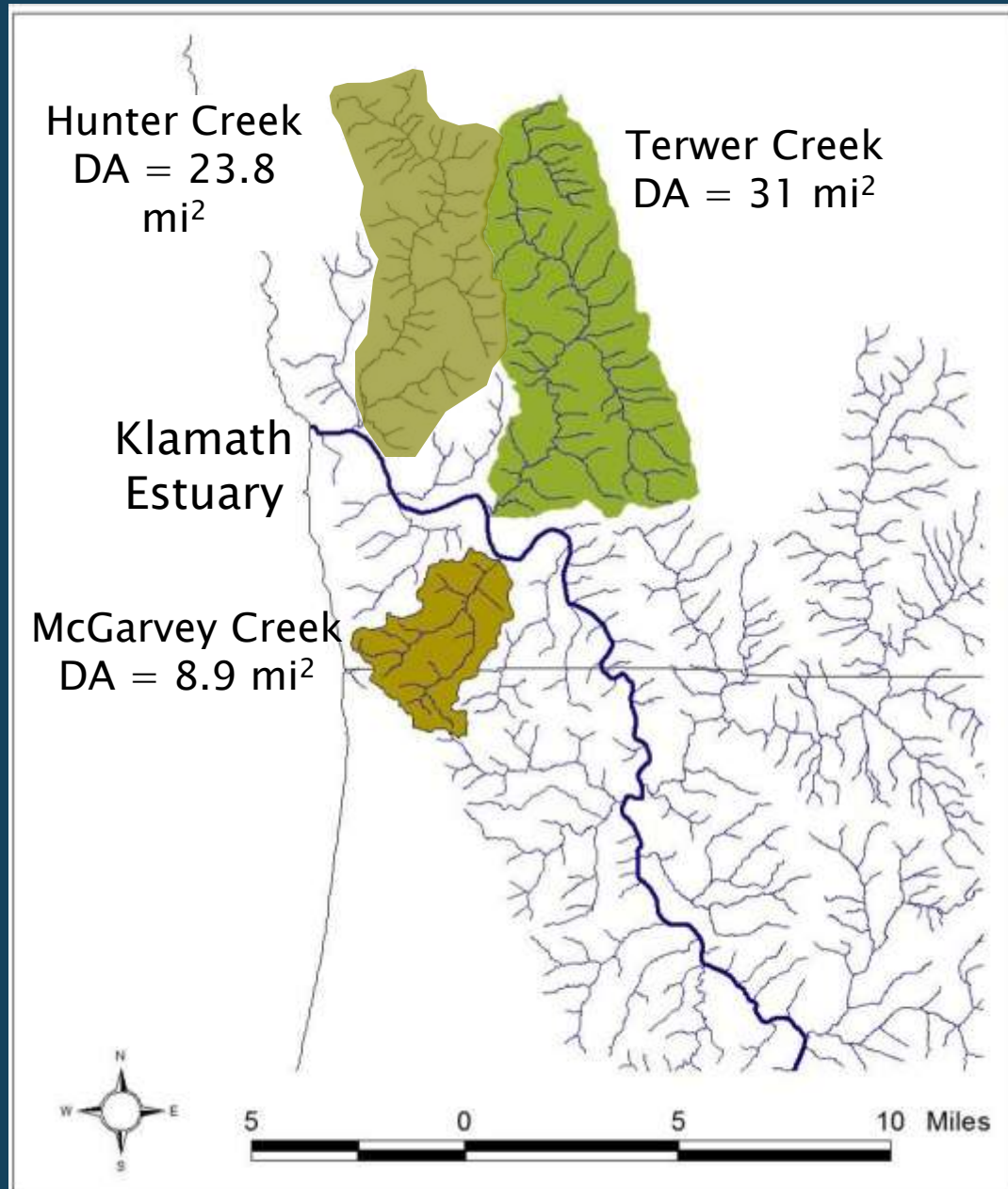


Redd Site Selection and Spawning Habitat Used by Chinook Salmon. From: Geist & Dauble (1998).

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

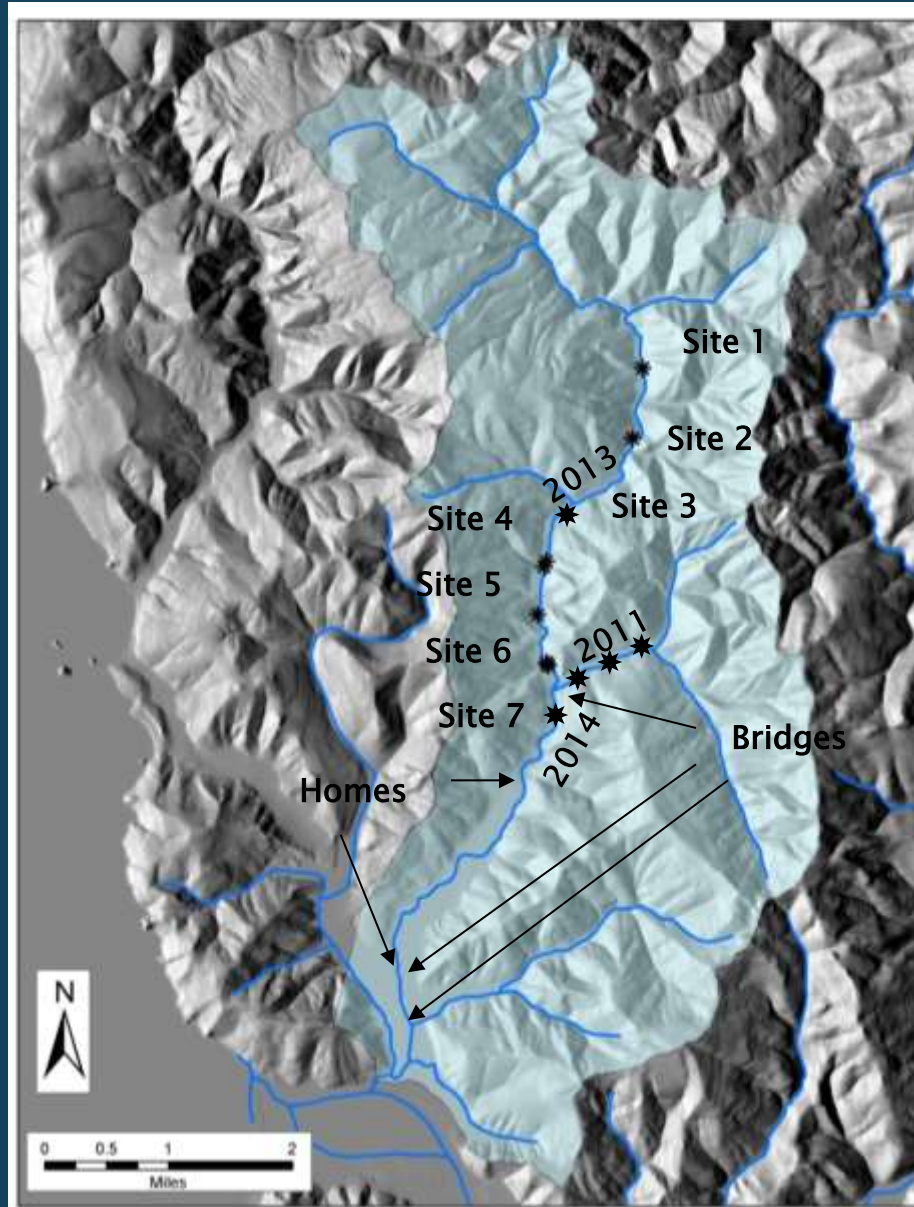
Influence of Subsurface Structures on Hyporheic Exchange. From: Ward et al. (2011).

# Project Locations

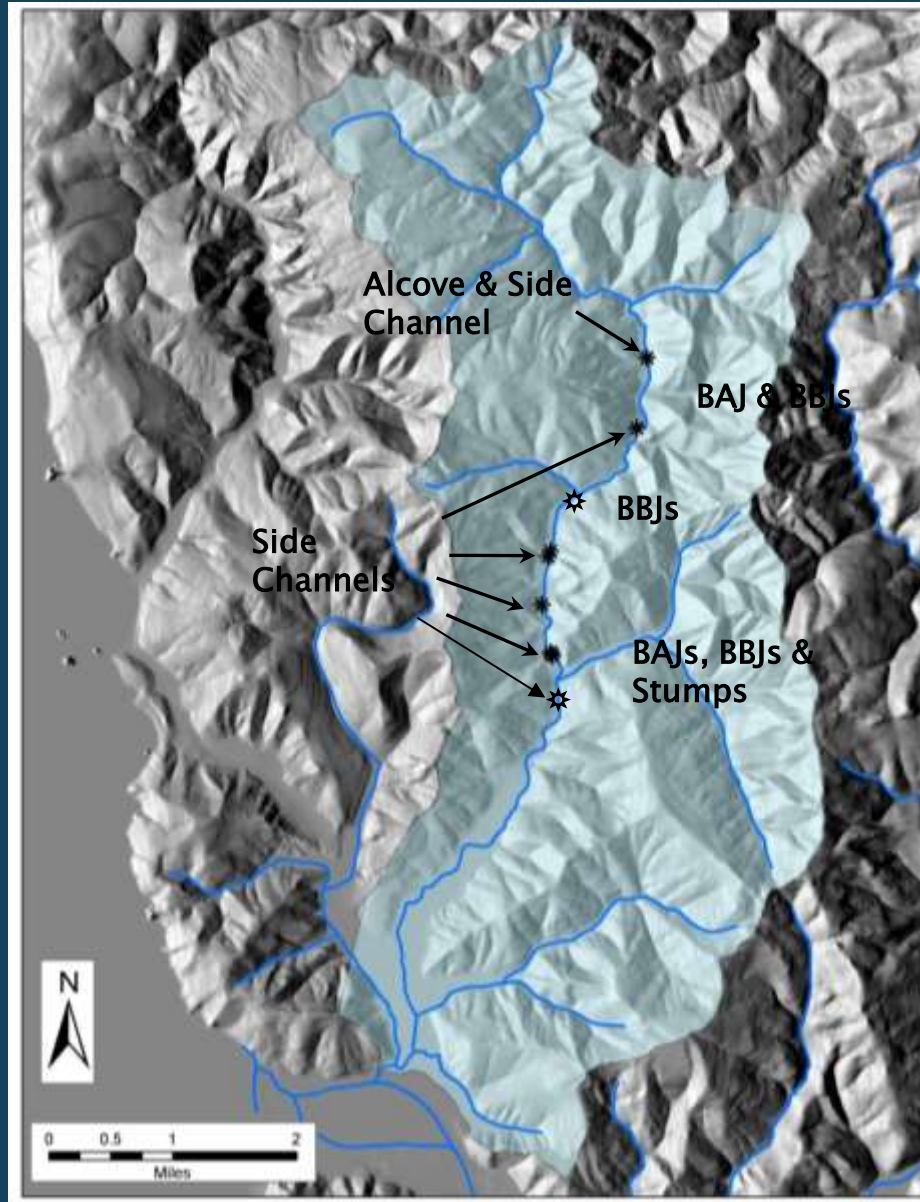




# Hunter Creek Watershed



# 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



BBJ



Stump

BBJs

BBJ



# Hunter Creek Site 7

## BAJ 2



Post 5-yr RI flood WY15

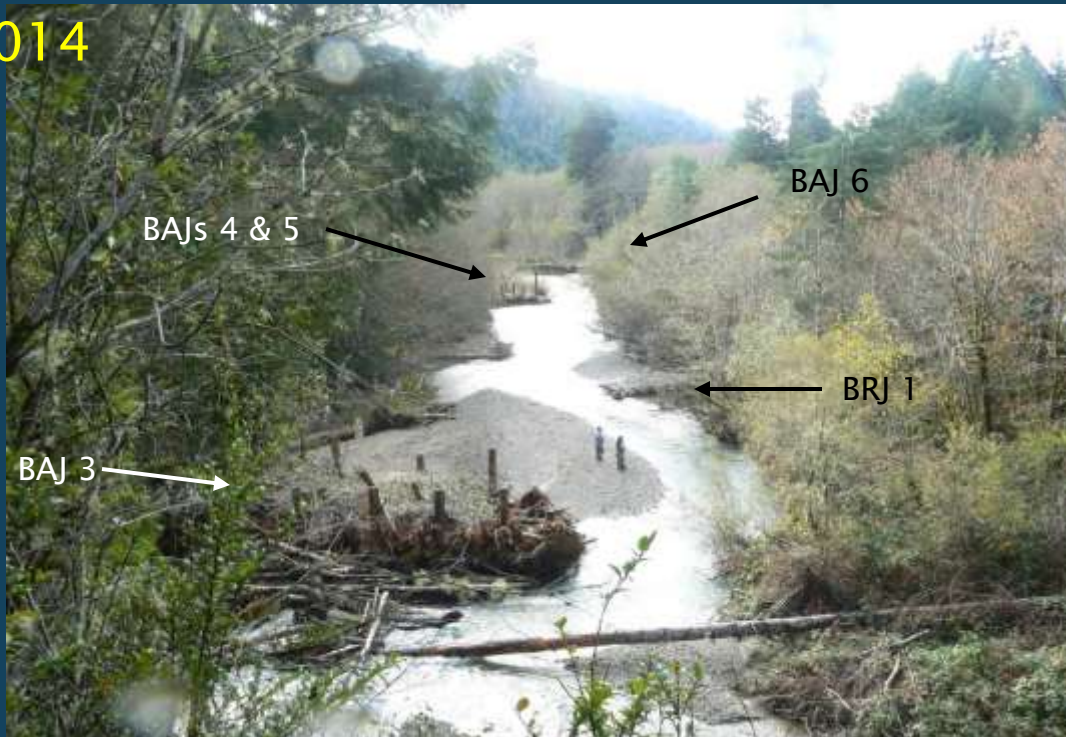


# Hunter Creek Site 7 BAJs and BRJ

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

5-yr RI flood  
12/21/14



1.2-yr RI flood  
2/07/15





# Hunter Creek Site 7 Bank Based Jams



Digger Log  
& Stump

Bar  
Roughness  
Jam



# Hunter Creek Site 7 – BAJ 4, 5 & 6

BAJ 5

BAJ 4



BAJ 5

Hyporheic fed  
side channel





# Hunter Creek Site 7

## BAJ 6



As-Built 2014



First Flows 2014



# 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

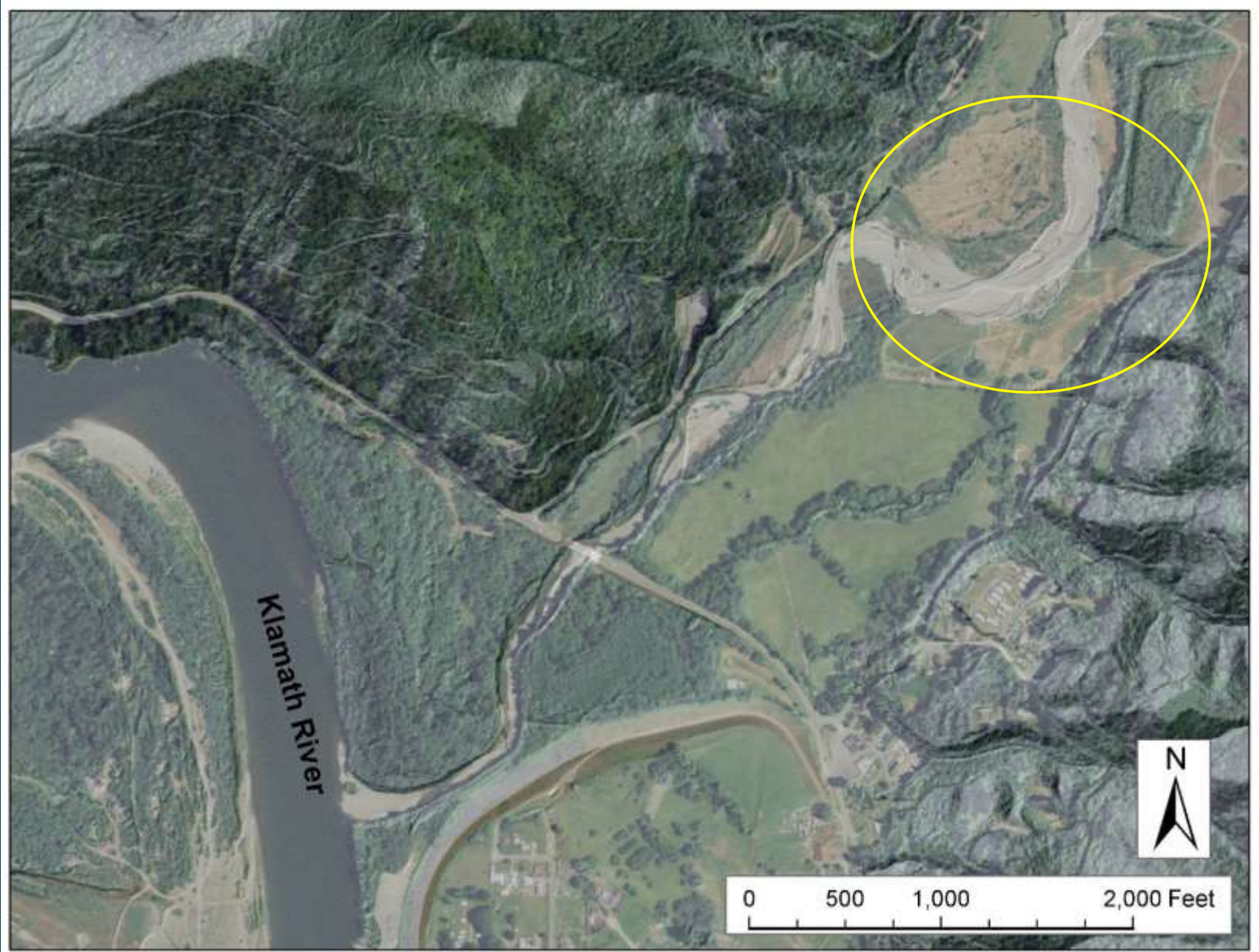


Post 5-yr RI flood WY15





# Terwer Creek





# Terwer Creek





# Terwer Creek

## Integrated Use of ELJs, Alcoves & BioEngineering





**ELJ 1- Post-  
Construction**



**2 Years Post-  
Construction**

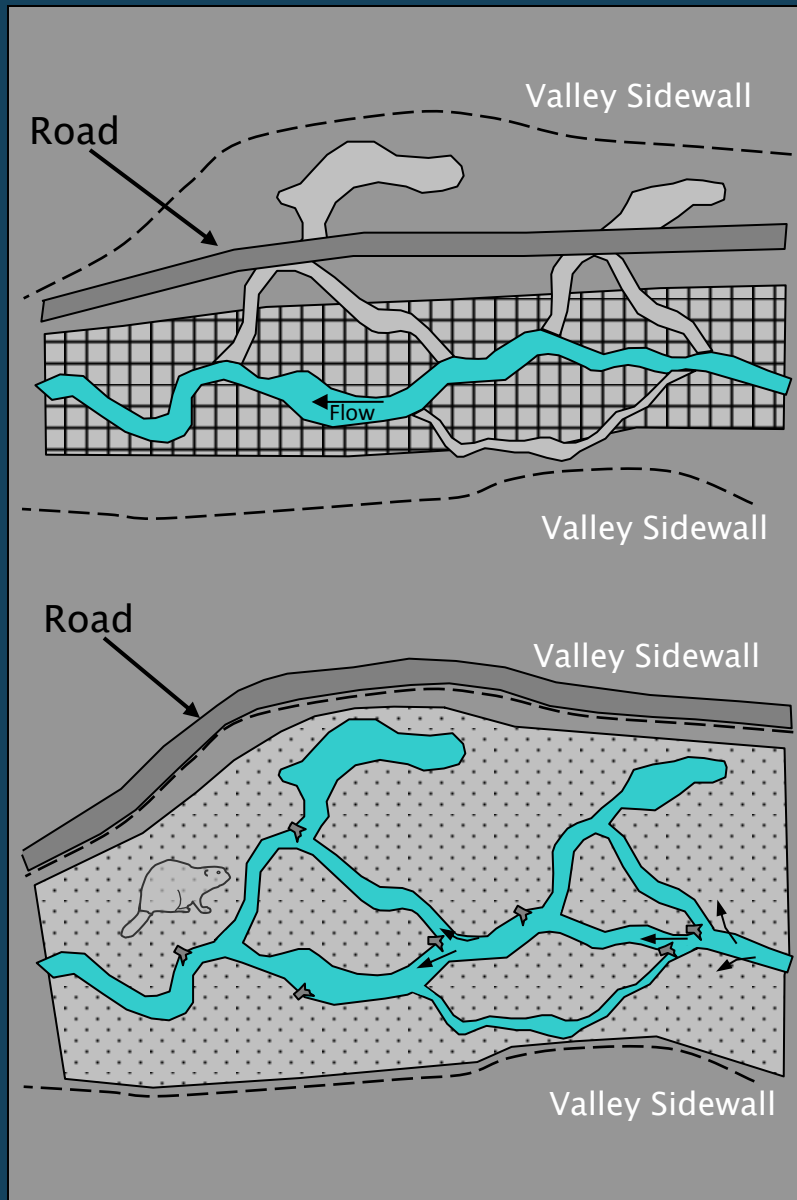




**Terwer Creek  
First Winter  
Post-Project**



# Next Steps



**VALLEY FLOOR MANAGED AS TRANSPORTATION & FLOOD CORRIDOR**

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

**VALLEY FLOOR MANAGED AS FLOODPLAIN**

**RELOCATE ROAD**

**DISEMPOWER THE CHANNEL MIGRATION ZONE**

**BEAVER AS LEAD-ENGINEER**



# Salmon Need Wood – We Need Salmon



**Thank You**

# Off Road Vehicle Impacts

