

# Investigating the Relationship Between Instream Flow, Hydrologic Connectivity, and Habitat Quality in Off-Channel Habitats



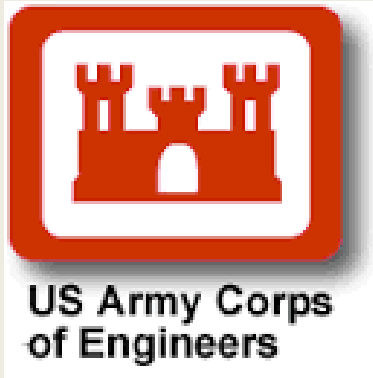
Brian Bangs, Matt Collver  
ODFW Native Fish Investigations Program

Jeremy Monroe © FI



# Acknowledgements

To our many private landowners and:



**AND MANY OTHERS!**



# What do we do?

- Post-delisting Monitoring Plan
  - USFWS
- Floodplain Study (2008 Biological Opinion)
  - US Army Corps of Engineers







Film by Freshwaters Illustrated



Habitat Loss  
(from Sedell &  
Froggatt 1984)

~75% Reduction in  
shoreline





# Factors Implicated in Decline





# Reasons for decline



- Half of the fish in the Willamette are non-native
- Largemouth bass, bluegill (and other sunfish)



- Post-delisting Monitoring: 2019 is year 5 of 9
- Chub are doing very well – ongoing conservation
- Nonnatives in chub habitat (esp. Green Sunfish)

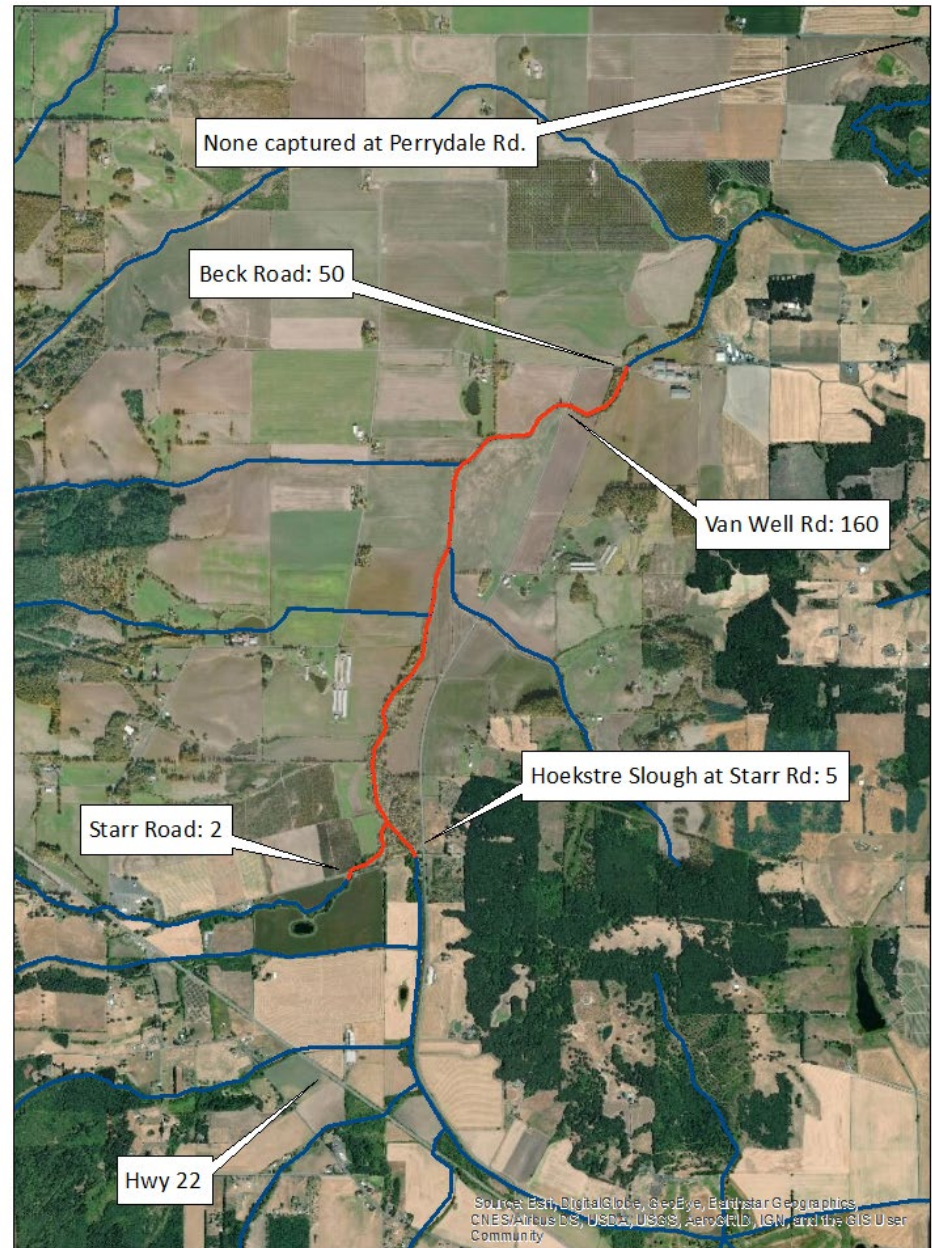




# Yamhill River Basin

No historic records  
Salt Creek  
Discovered 2018  
Ditched, flowing creek  
Poor habitat for chub  
Private ownership  
Bridge crossings:  
210 adult fish caught

Salt Creek Oregon Chub Locations 7/2018



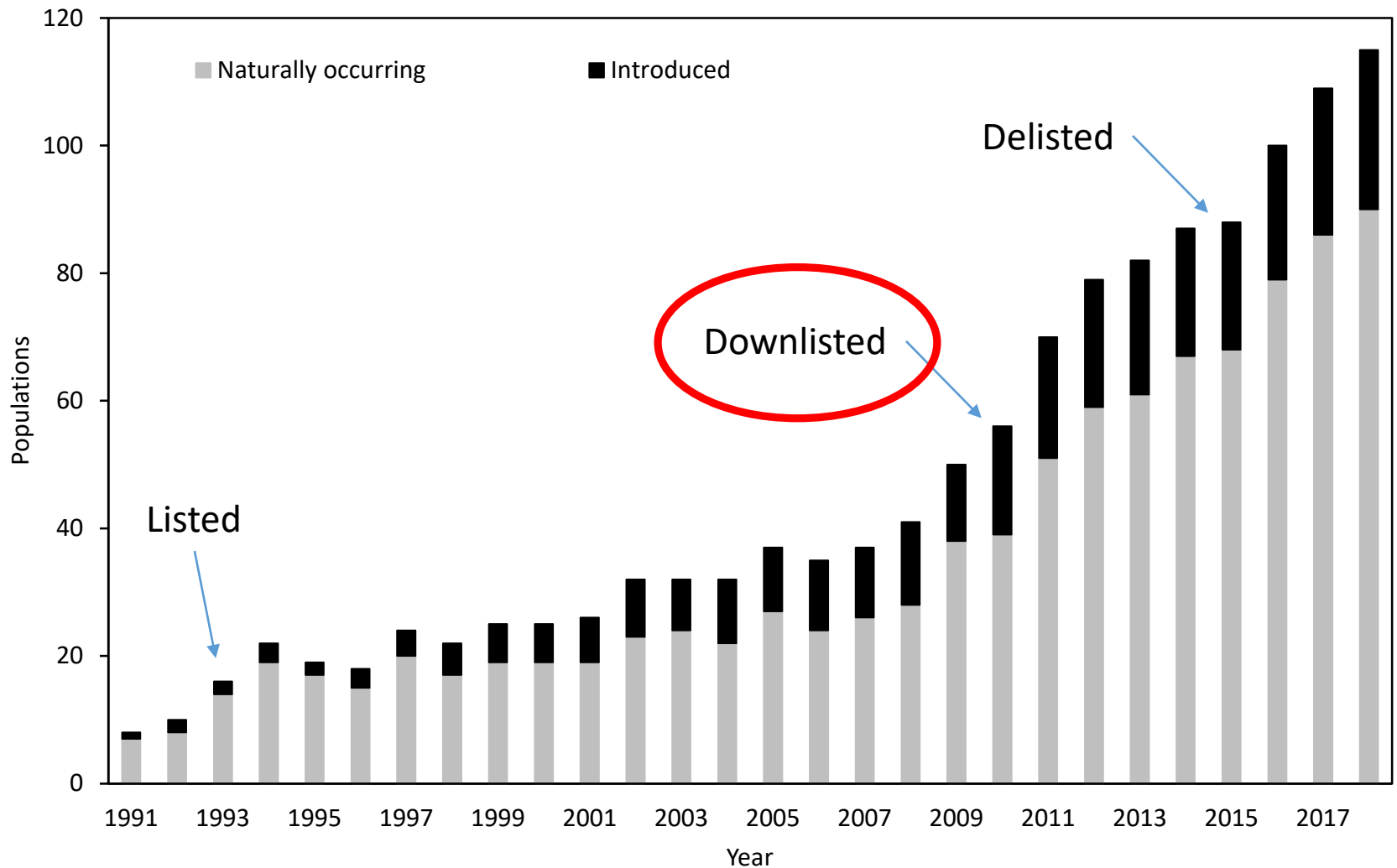








# Number of Populations





# BiOp Studies: Background



- Initiated in 2009; ACOE BiOp
- Coincided with Oregon chub downlisting



# Goal

Describe relationships between

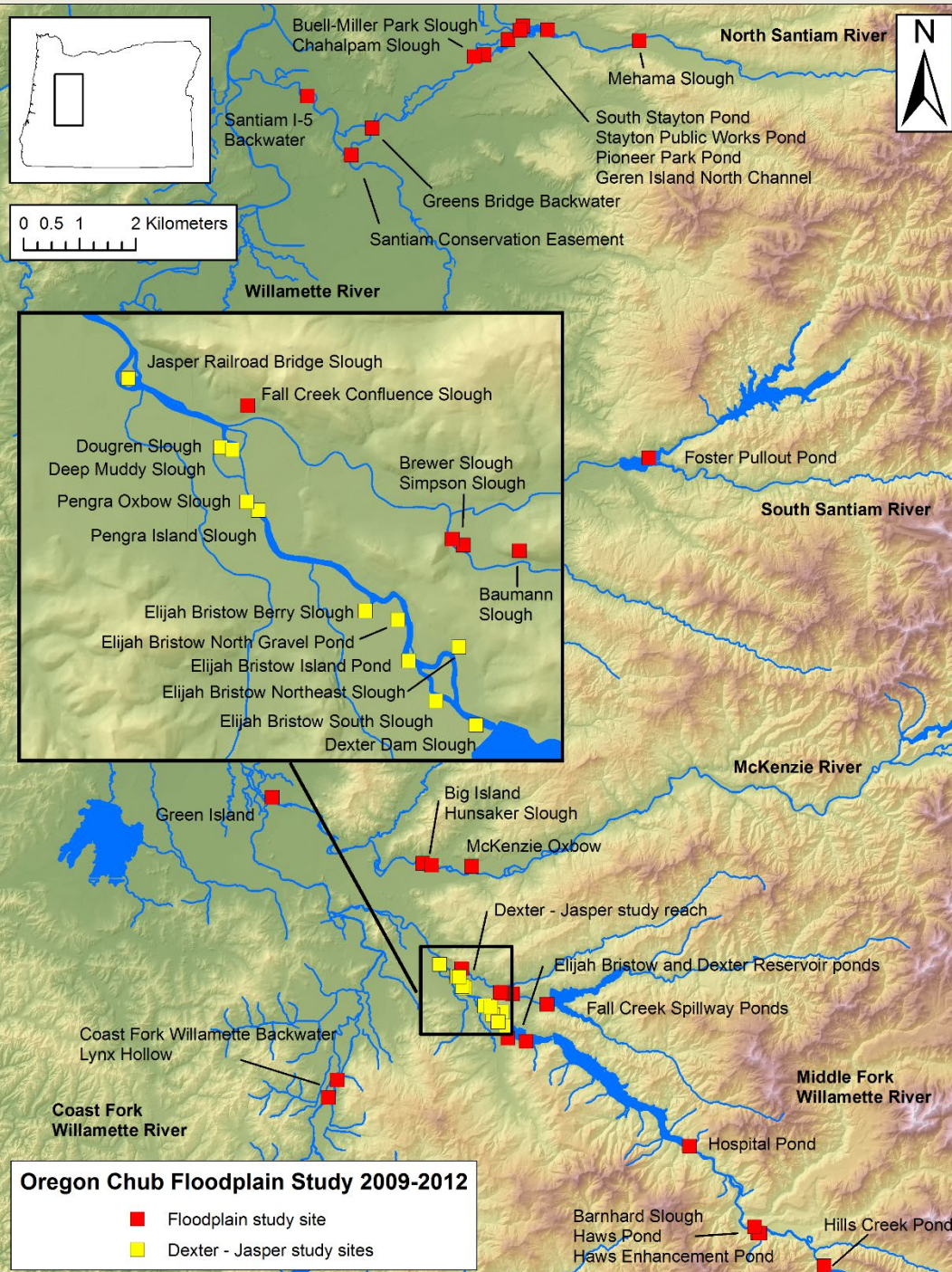
- River flows,
- Habitat characteristics,
- Temperature regimes,
- Timing, frequency, duration, magnitude of connection, **and**
- Fish assemblage structure in off-channel habitats



# Study Locations

- 2018:  
39 sites located on Army Corps of Engineer land, or potentially influenced by Willamette Project Dams  
22 in the Middle Fork  
11 in the Santiam  
4 in the McKenzie  
2 Coast Fork Willamette

- 2018: Two new locations  
Mainstem Willamette  
Near Rickreall Creek/Salem



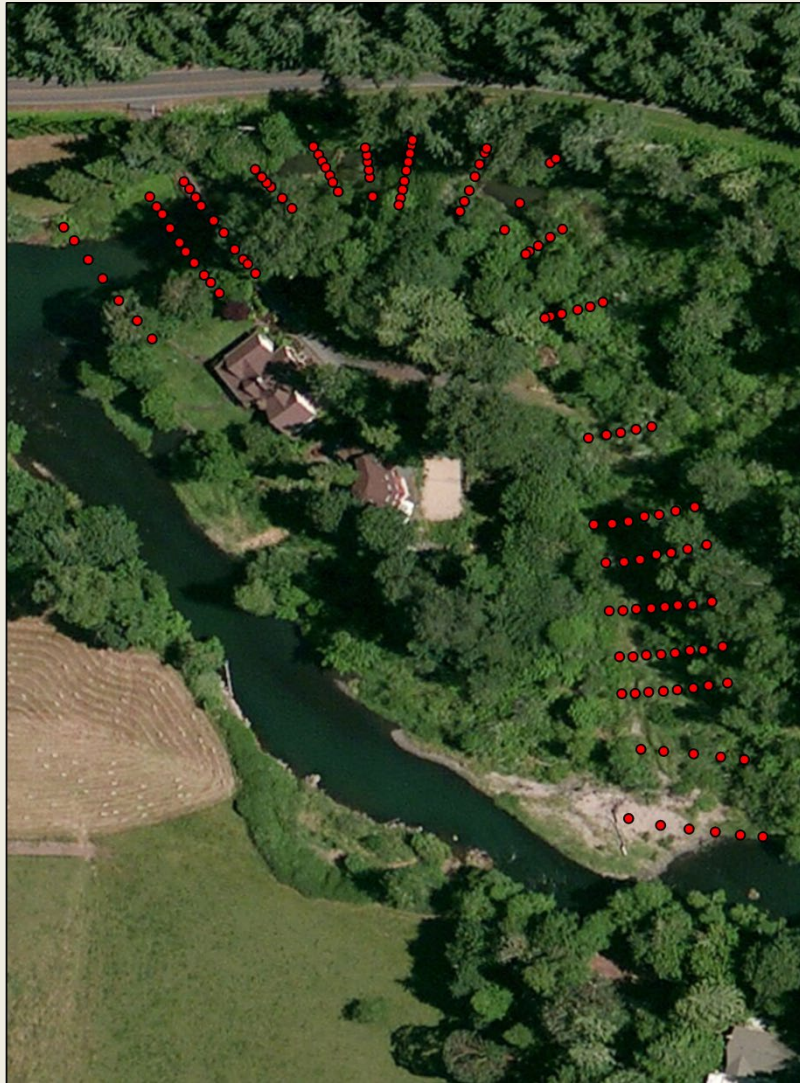


# Bathymetry Mapping





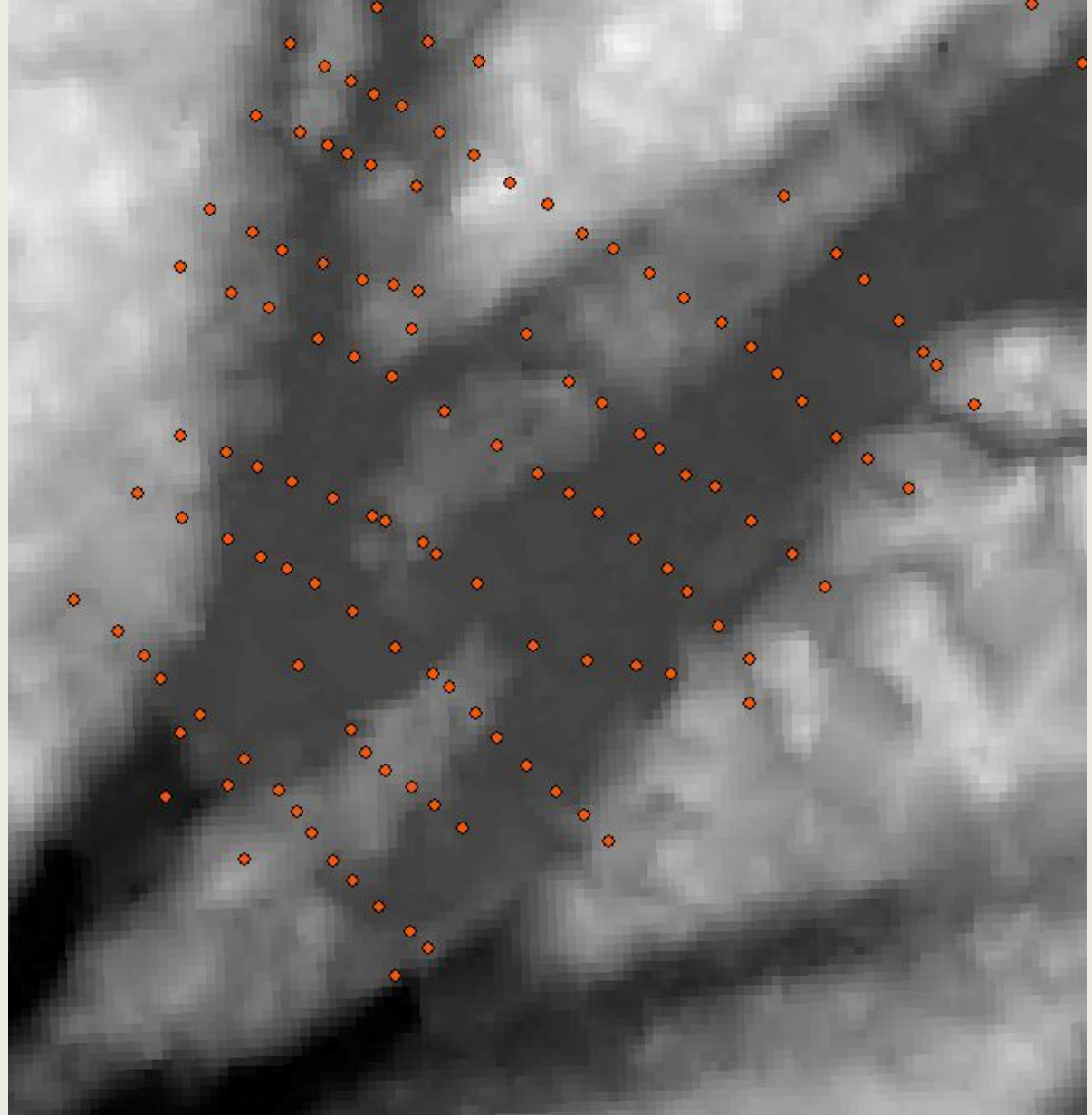
# Bathymetry mapping





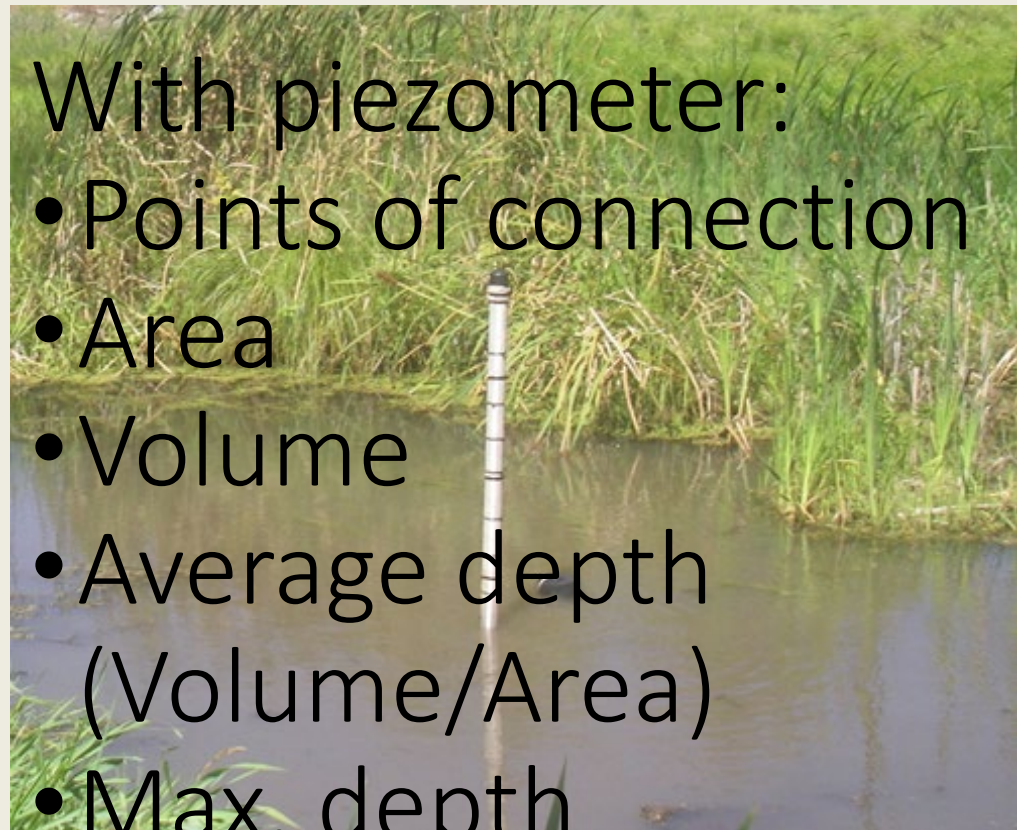
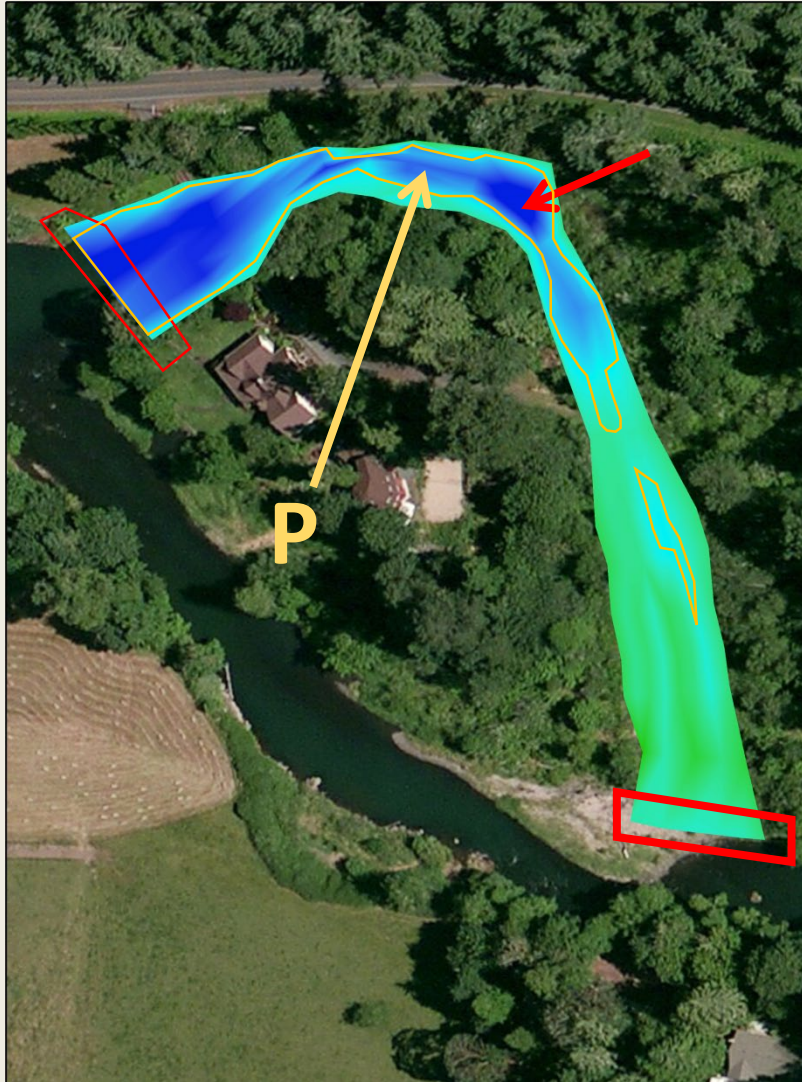
# Bathymetry

- “Real world” elevation
- Assess hydrologic connectivity





# What is it good for?



With piezometer:

- Points of connection
- Area
- Volume
- Average depth  
(Volume/Area)
- Max. depth
- Hysteresis



# Connectivity

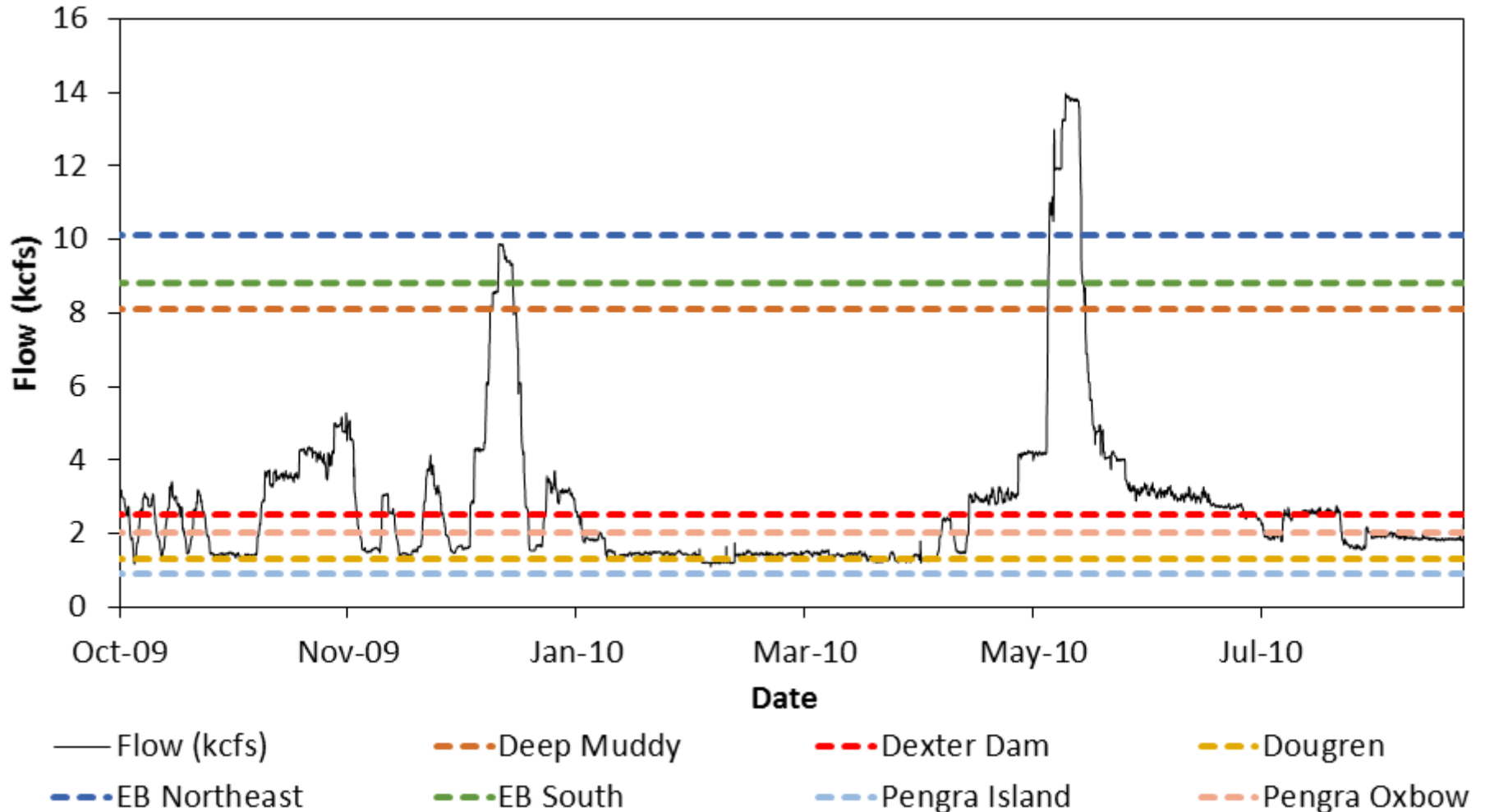


What do we mean?

- Open water, direct connection to surrounding waterbodies



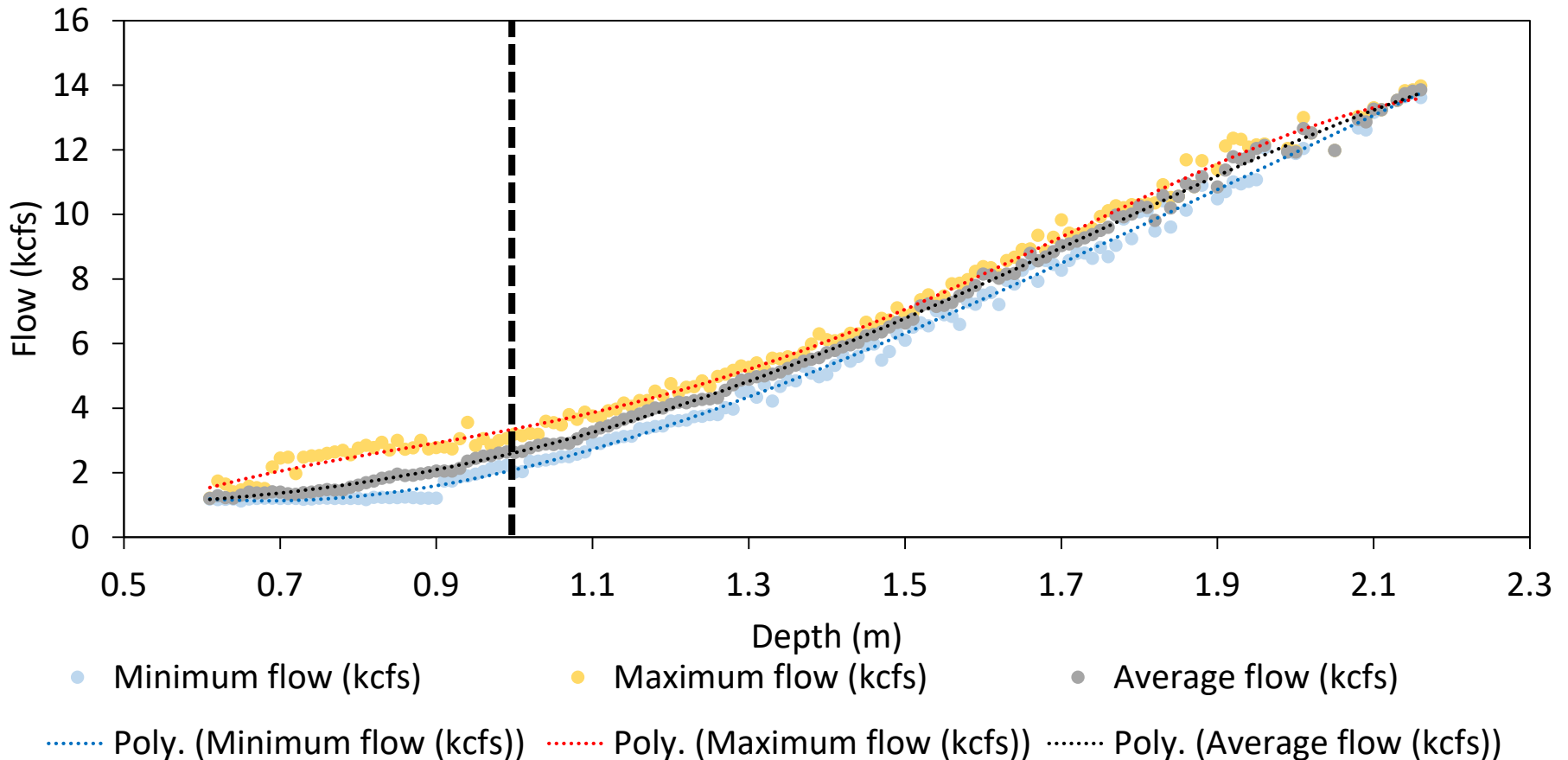
# Connectivity and flow



- Flows required to connect sloughs – Middle Fork Willamette
- Variable, but we can determine when sites connect



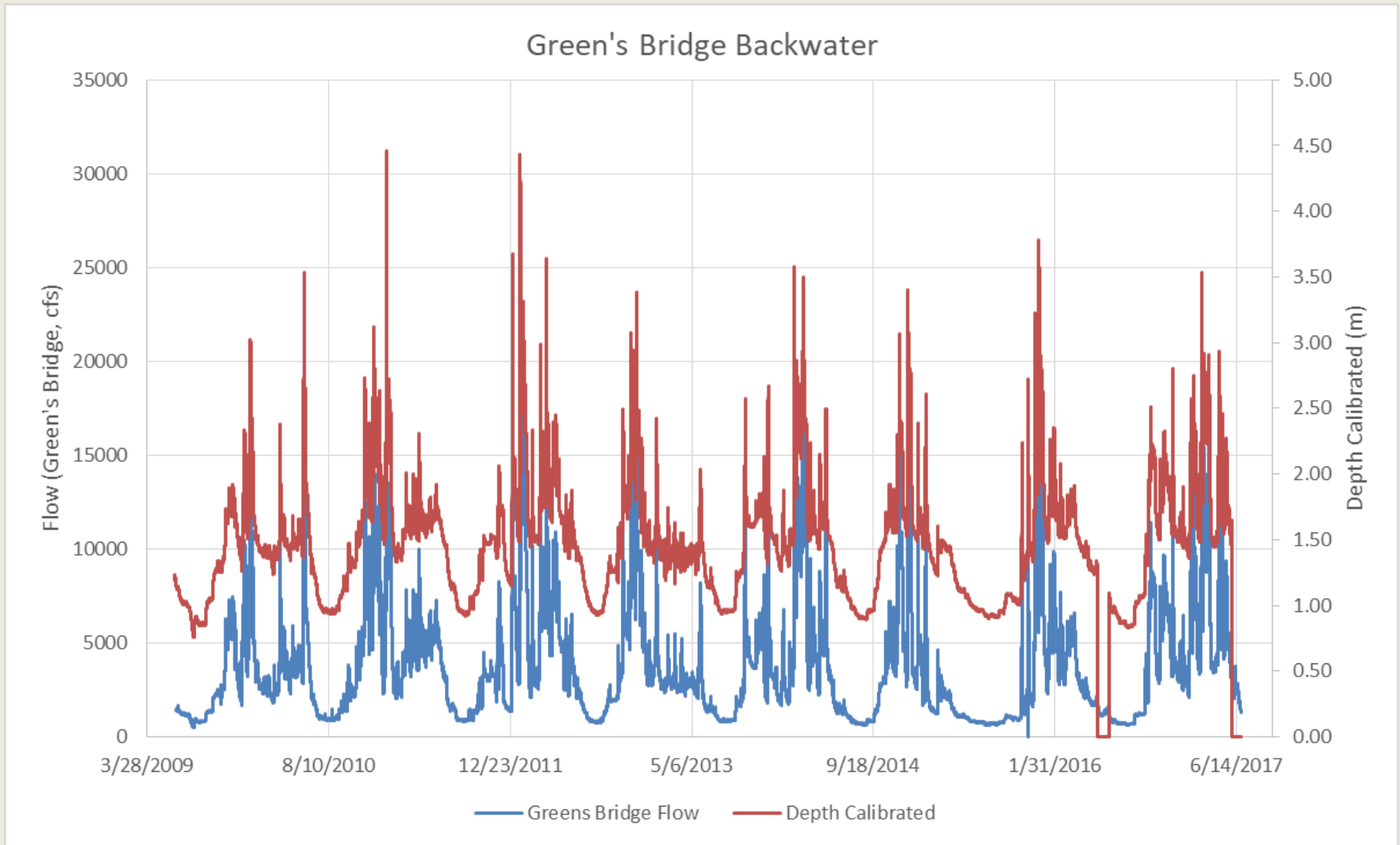
# Connectivity, better?



- At point of connection height of 1.002 m, the flow necessary to connect the site:
  - Min.: 2.104 kcfs
  - Avg.: 2.629 kcfs
  - Max.: 3.368 kcfs



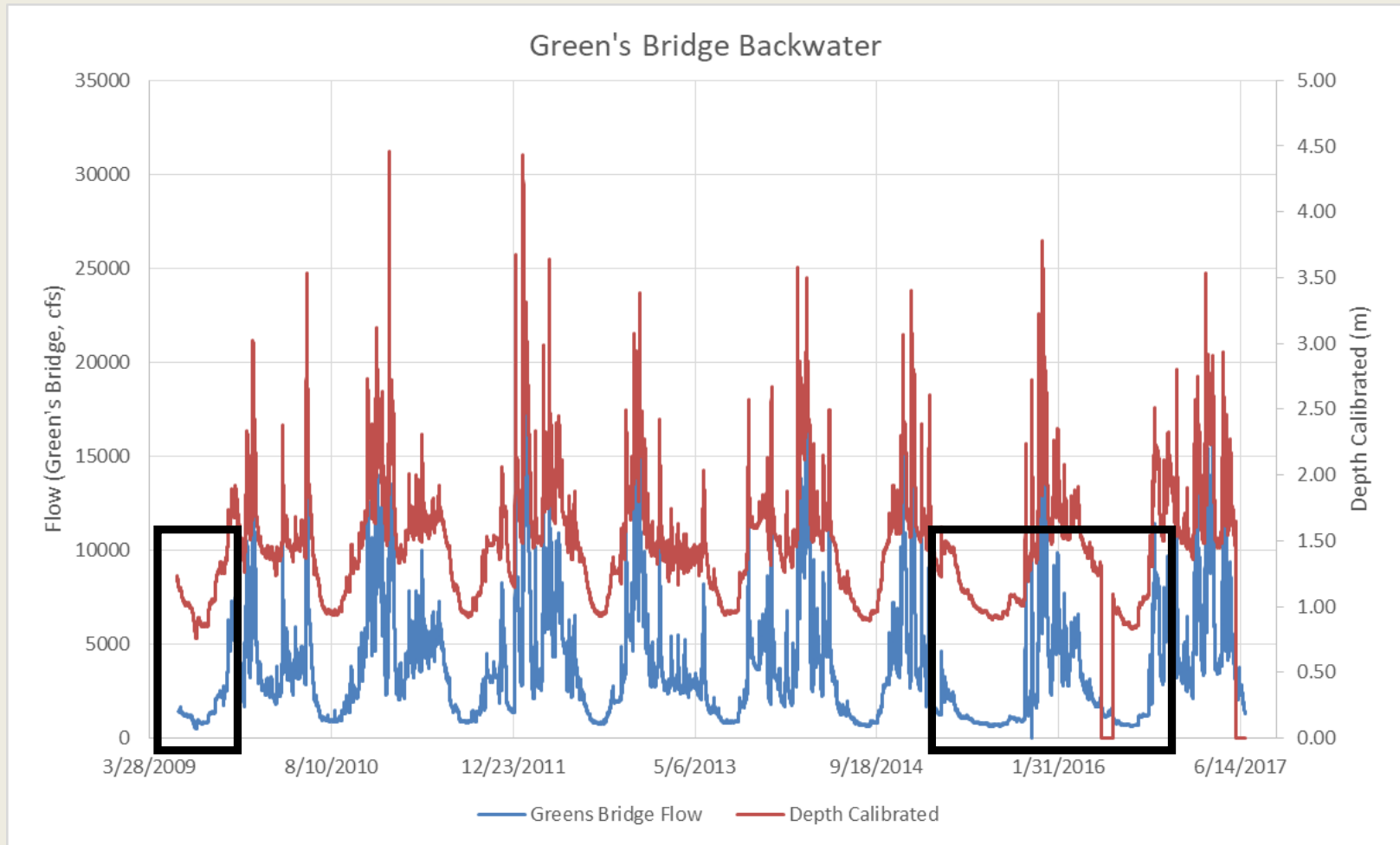
# Habitat dataset: Now current





# Interpretation

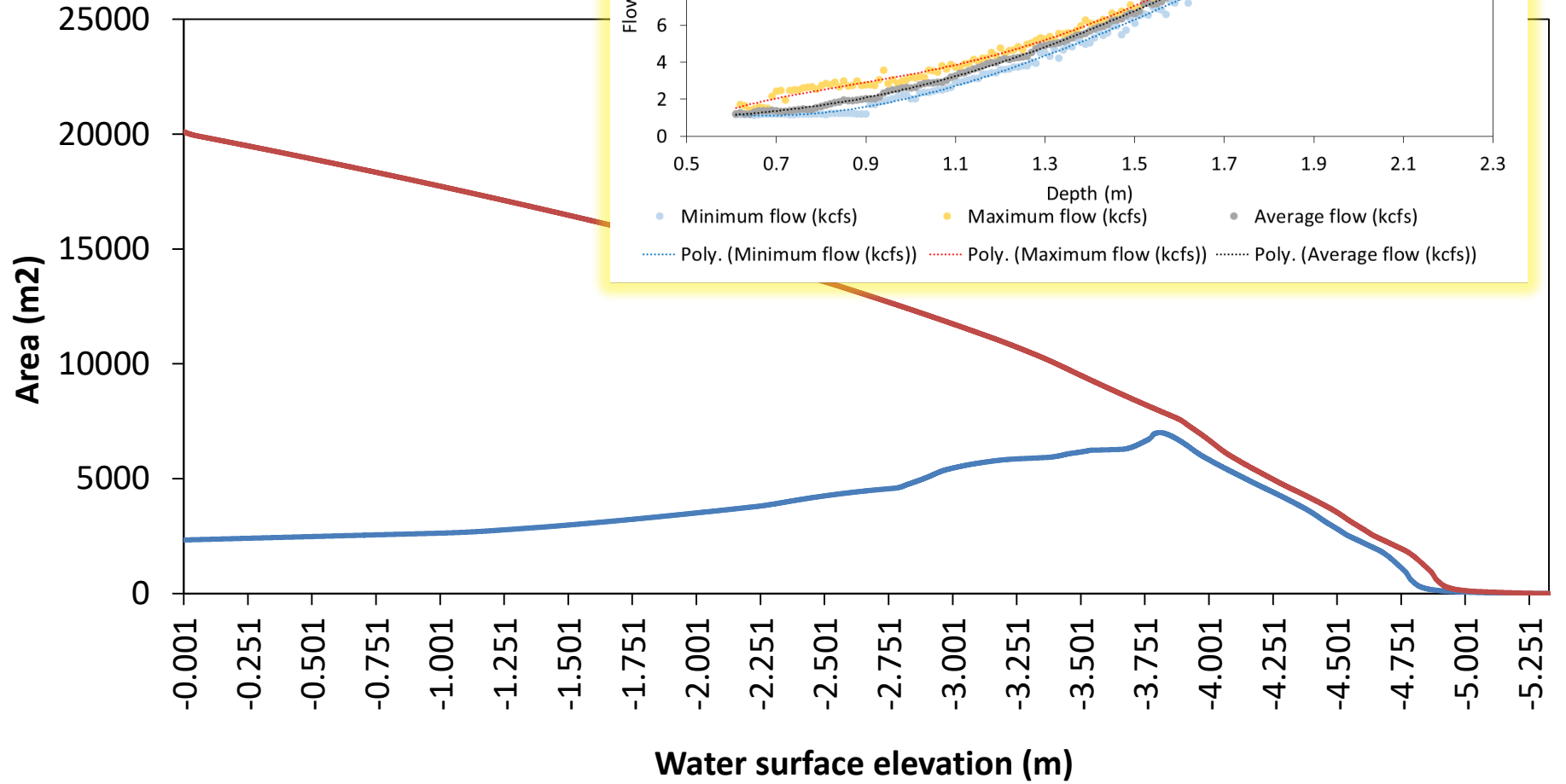
- Focus on two periods
  - 2009 Big Cliff event
  - Droughts: 2015, 2016





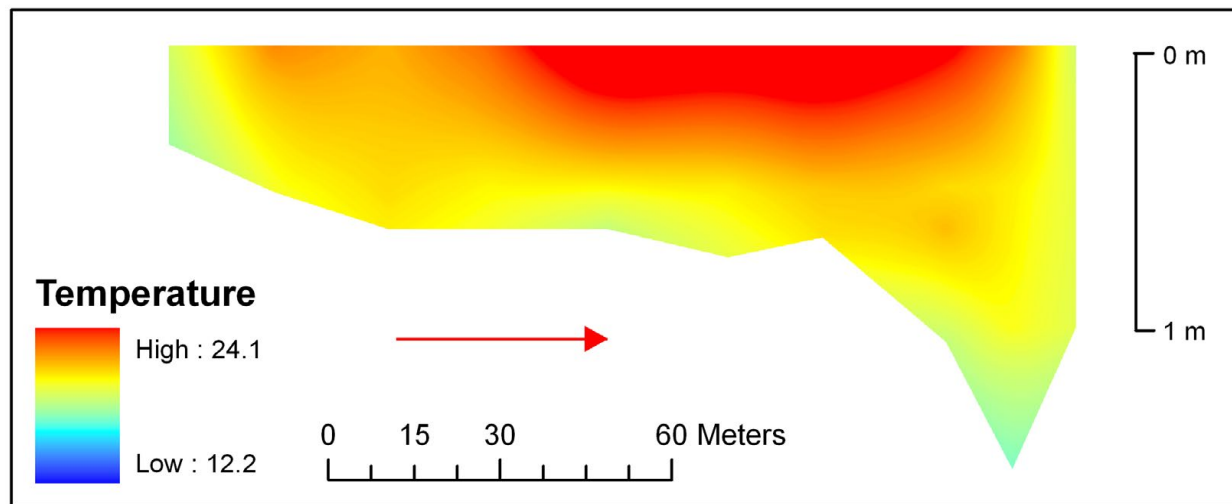
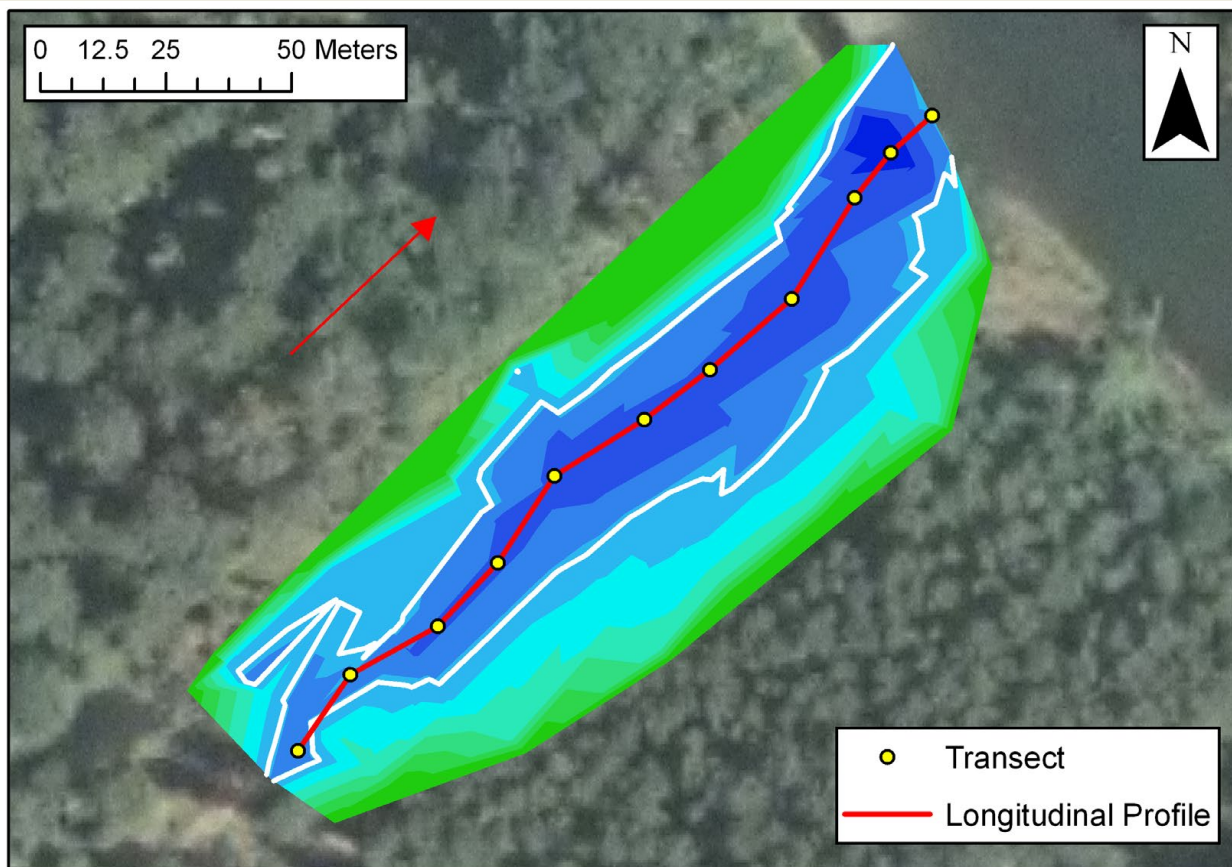








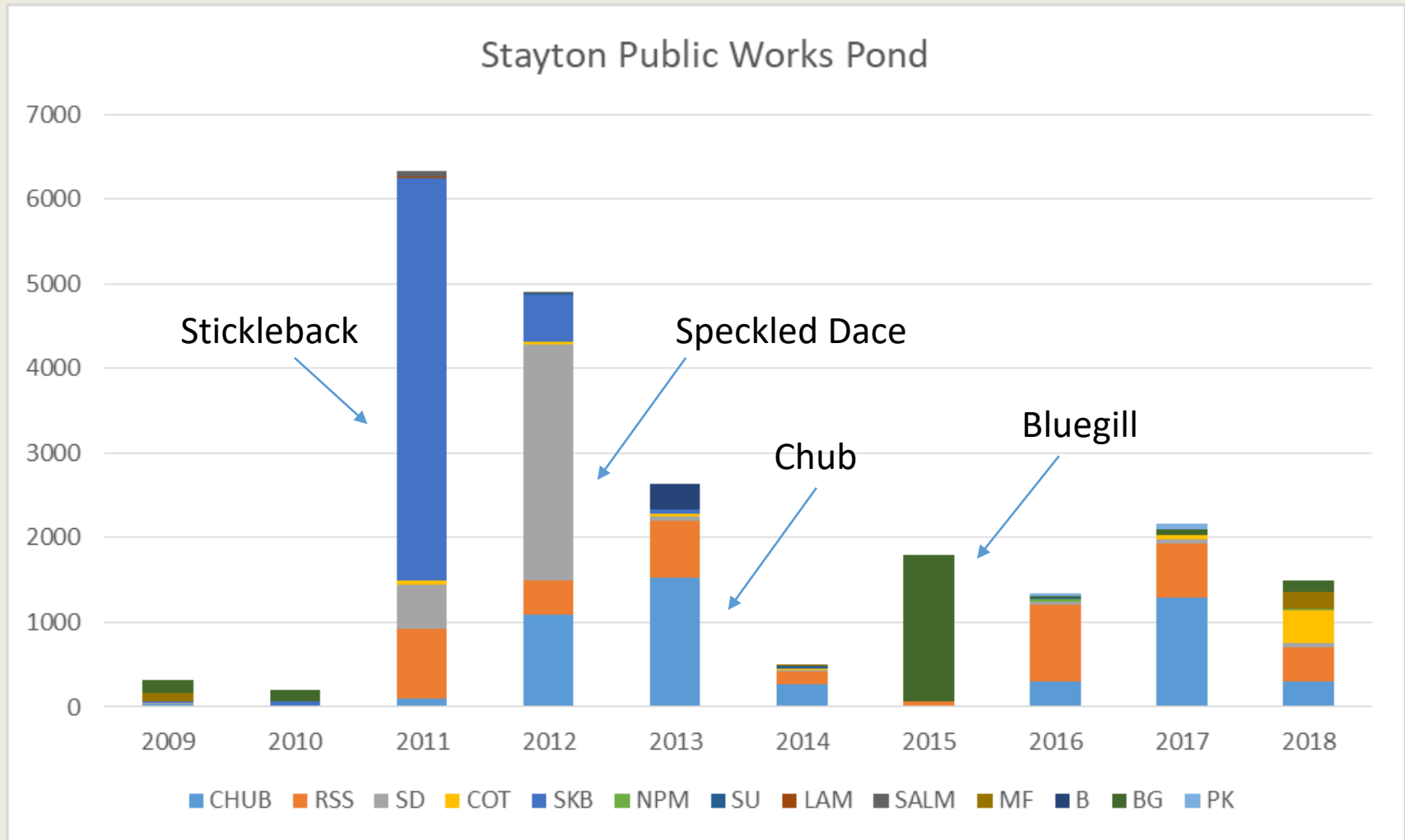






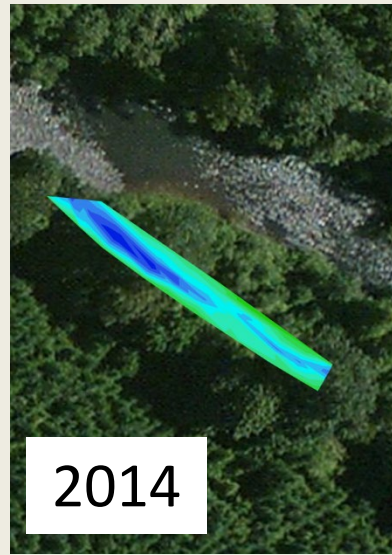
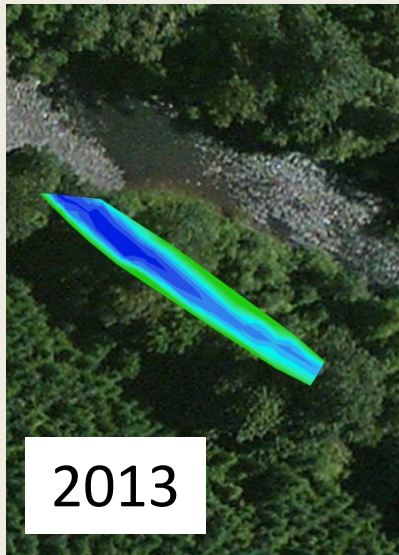
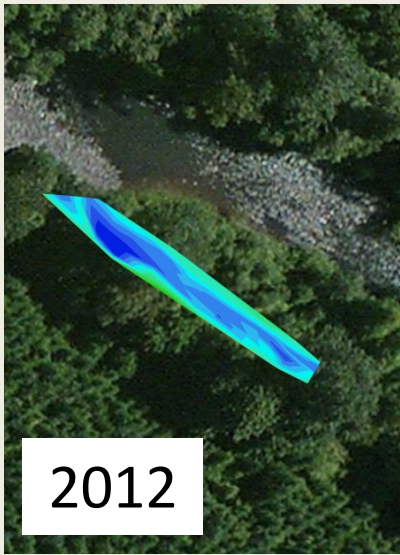


# Fish assemblage, abundance dataset





# Additional studies: Fall Creek Drawdown

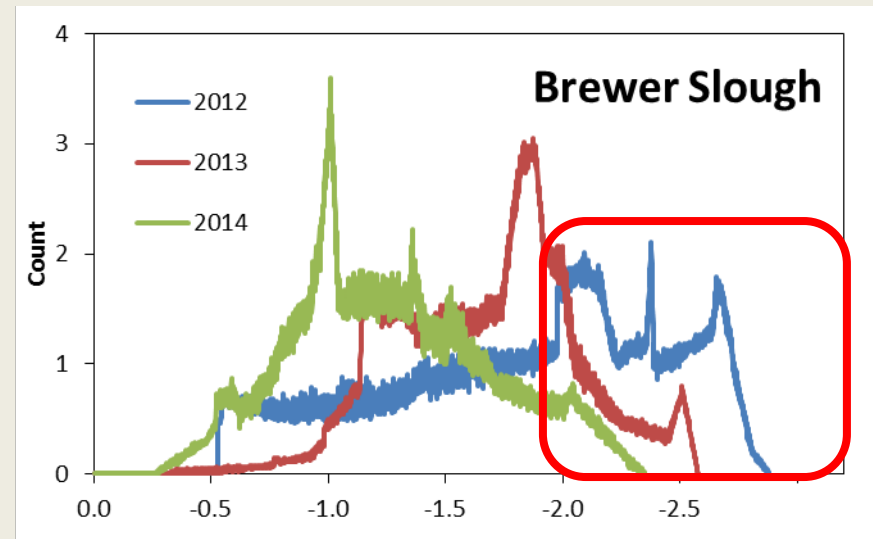


Objective:  
Determine the  
impact of  
complete  
reservoir  
drawdown on off-  
channel habitats

Initially: Sedimentation severely  
reduced off-channel habitat

Recently: Some sites have  
partially recovered

Managed flows may not have  
energy necessary to move  
sediment from off-channel  
locations



# Initial Findings

- Initial analyses
  - Positive relationship between flow and abundance
  - Strong relationship between flow and water depth, habitat quality
  - Temperature varied



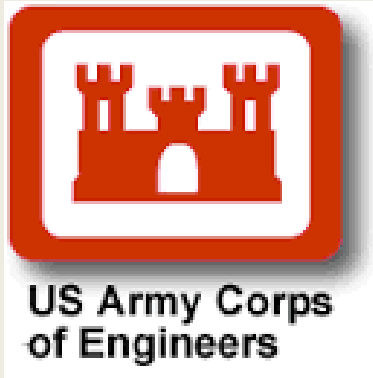
# Future work, conclusions

- Post-delisting Monitoring Plan
  - Concludes in 2023
  - Tools to support species
- Floodplain Study
  - Provide information to ACOE, partners
    - Manage flow, temperature
  - Support Oregon Chub, other native species in connected habitats
- Sustained recovery



# Acknowledgements

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# Questions?



**WORLD RECORD**

office: 541-757-5080  
brian.bangs@oregonstate.edu