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



Acknowledgements

To our many private landowners and:













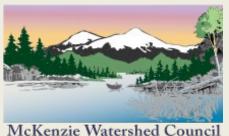














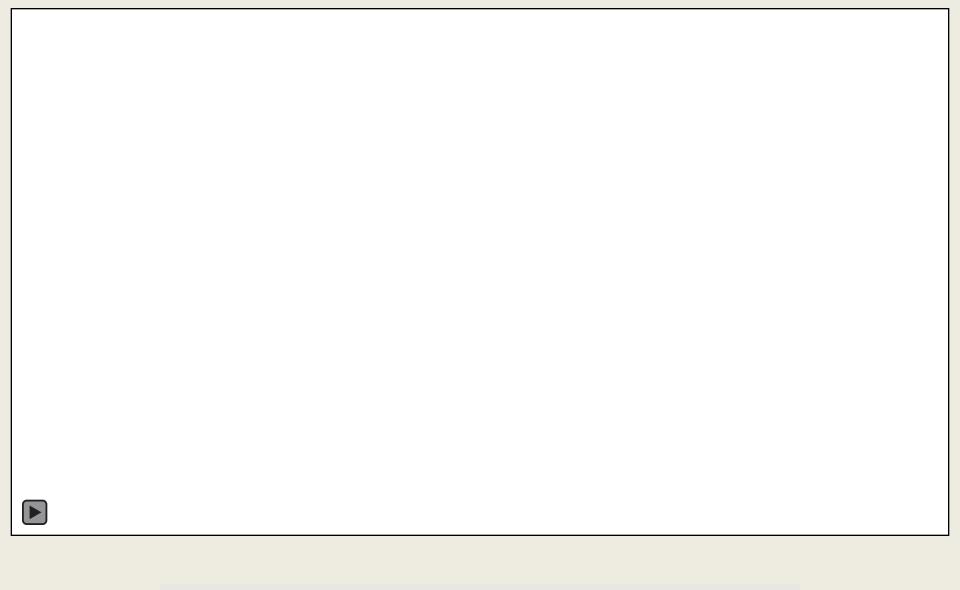


AND MANY OTHERS!

What do we do?

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

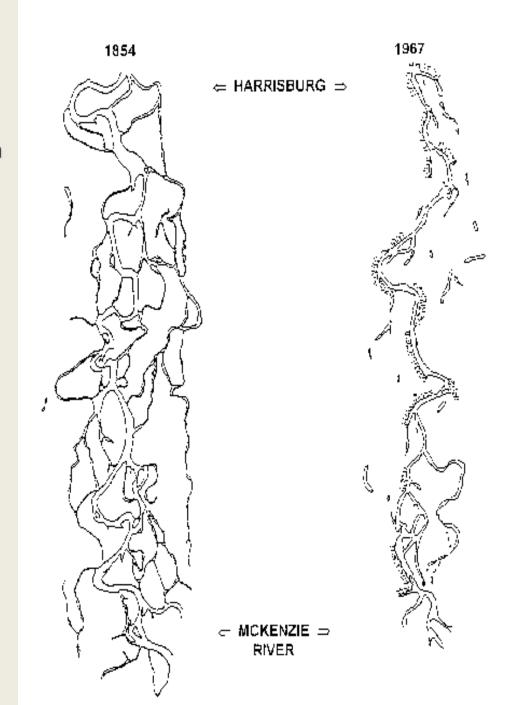




Film by Freshwaters Illustrated

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)

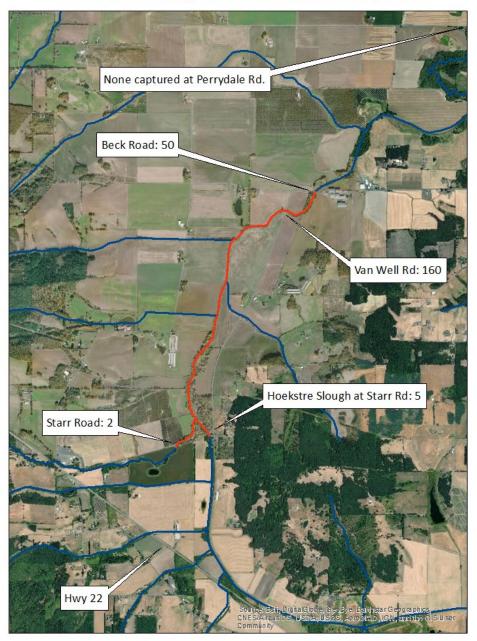
- Post-delisting Monitoring: 2019 is year 5 of 9
- Chub are doing very well ongoing conservation
- Nonnatives in chub habitat (esp. Green Sunfish)



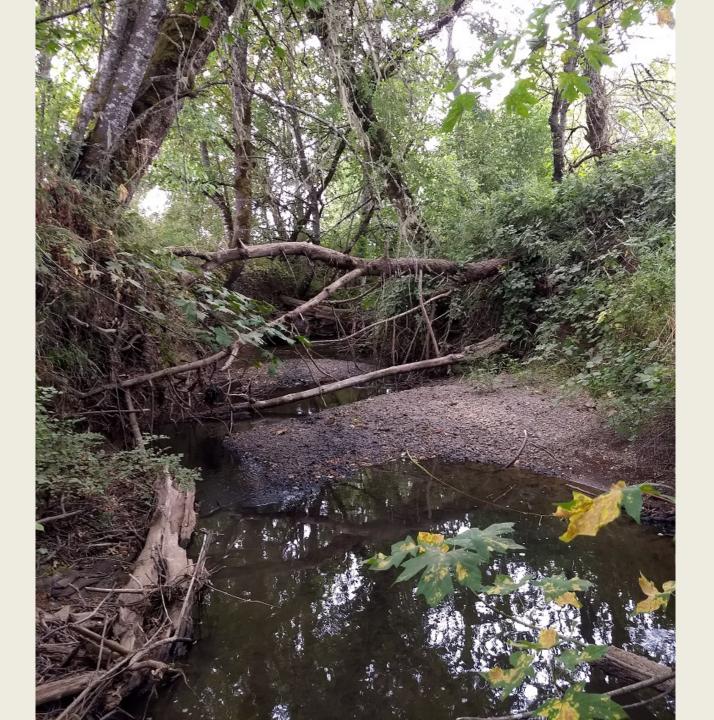
Yamhill River Basin

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

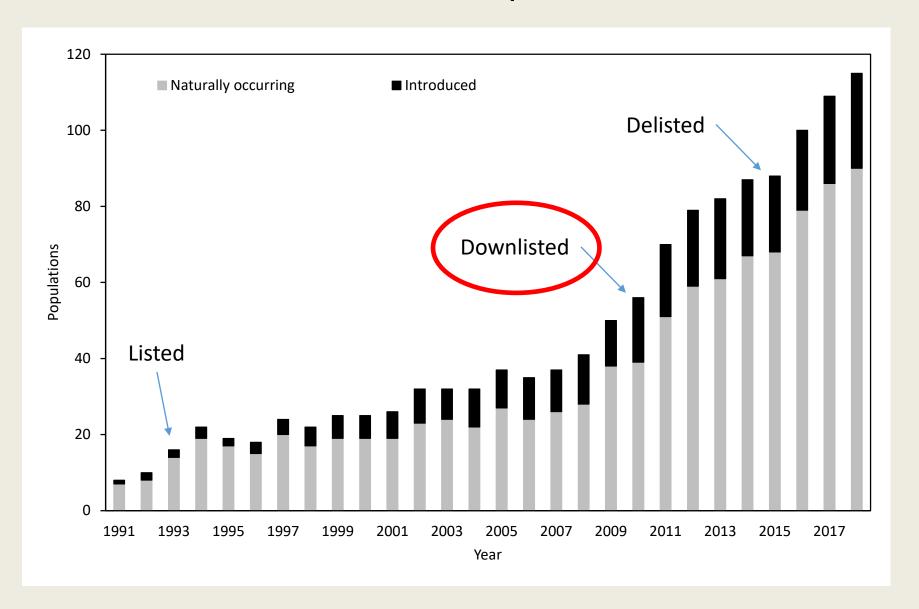
Salt Creek Oregon Chub Locations 7/2018







Number of Populations



BiOp Studies: Background



Goal

Describe relationships between

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

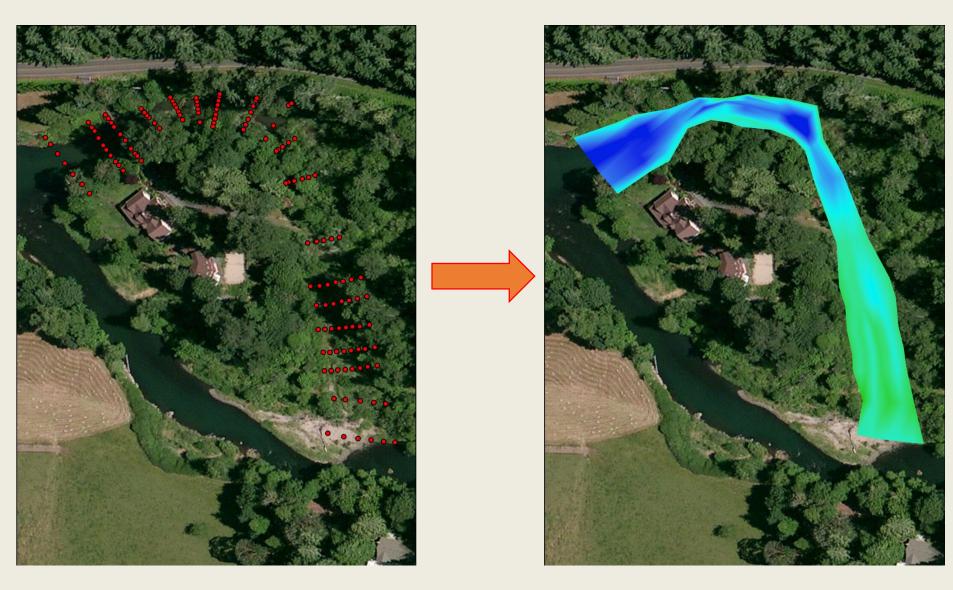
Buell-Miller Park Slough **North Santiam River** Chahalpam Slough Mehama Slough South Stayton Pond Santiam I-5 Stayton Public Works Pond Backwater Pioneer Park Pond Geren Island North Channel Greens Bridge Backwater 0 0.5 1 2 Kilometers Santiam Conservation Easement Willamette River Jasper Railroad Bridge Slough Fall Creek Confluence Slough Dougren Slough Foster Pullout Pond Brewer Slough Deep Muddy Slough Simpson Slough Pengra Oxbow Slough South Santiam River Pengra Island Slough Baumann Elijah Bristow Berry Slough Slough Elijah Bristow North Gravel Pond Elijah Bristow Island Pond Elijah Bristow Northeast Slough Elijah Bristow South Slough Dexter Dam Slough McKenzie River Big Island Hunsaker Slough Green Island McKenzie Oxbow Dexter - Jasper study reach Elijah Bristow and Dexter Reservoir ponds Fall Creek Spillway Ponds Coast Fork Willamette Backwater Lynx Hollow Middle Fork Willamette River Coast Fork Willamette River Hospital Pond Oregon Chub Floodplain Study 2009-2012 Barnhard Slough Floodplain study site Hills Creek Pond Haws Pond Dexter - Jasper study sites Haws Enhancement Pond

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

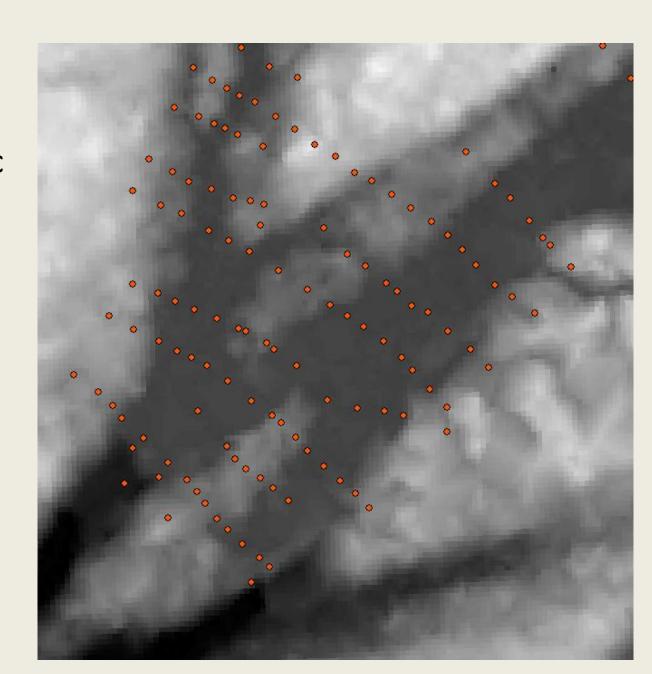


Bathymetry mapping

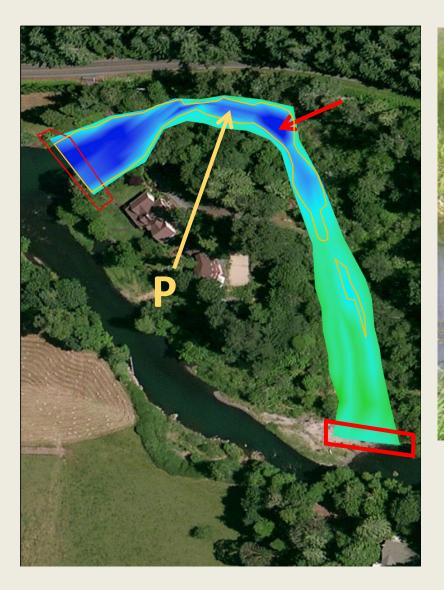


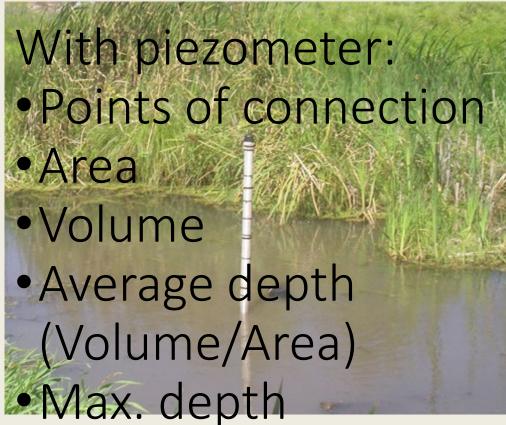
Bathymetry

- "Real world" elevation
- Assess hydrologic connectivity



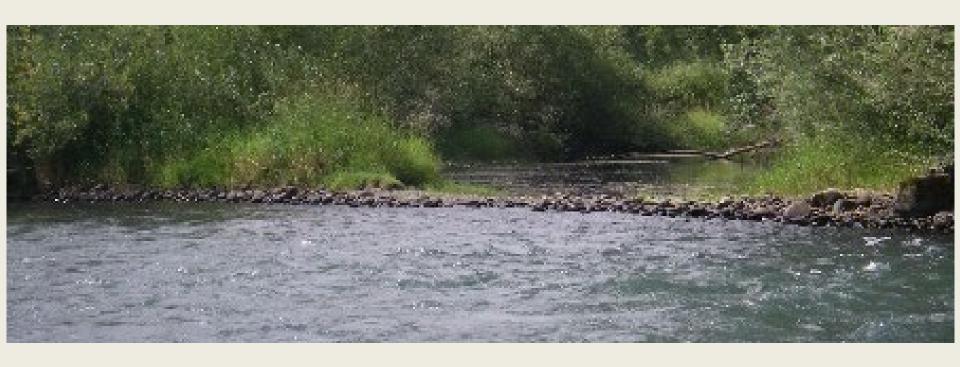
What is it good for?





Hysteresis

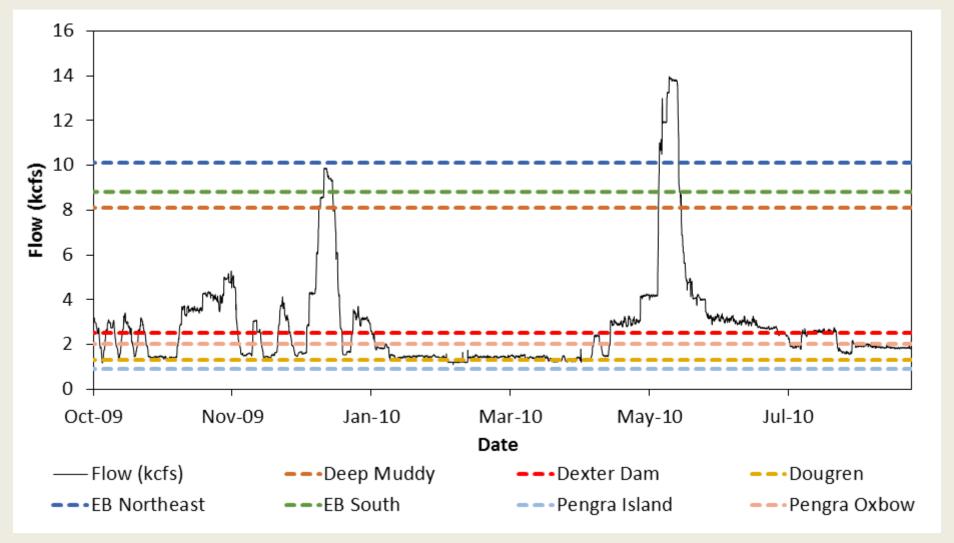
Connectivity



What do we mean?

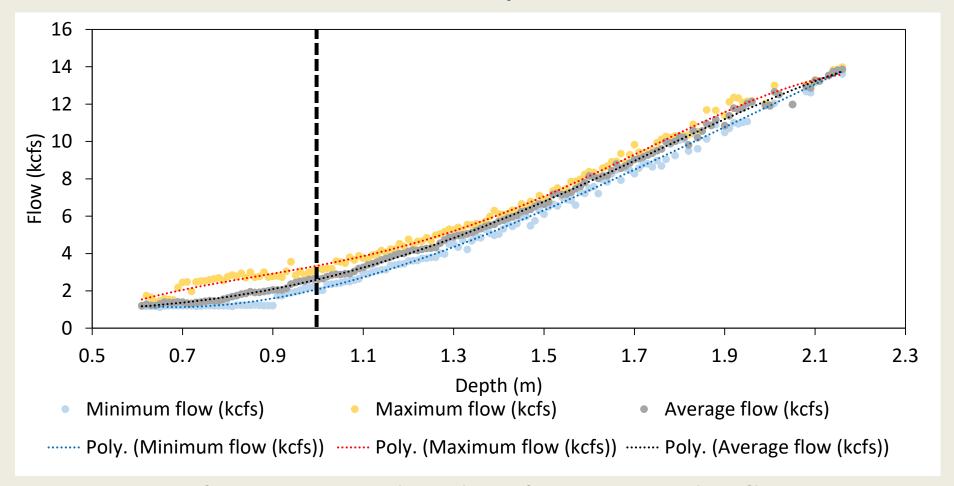
Open water, direct connection to surrounding waterbodies

Connectivity and flow



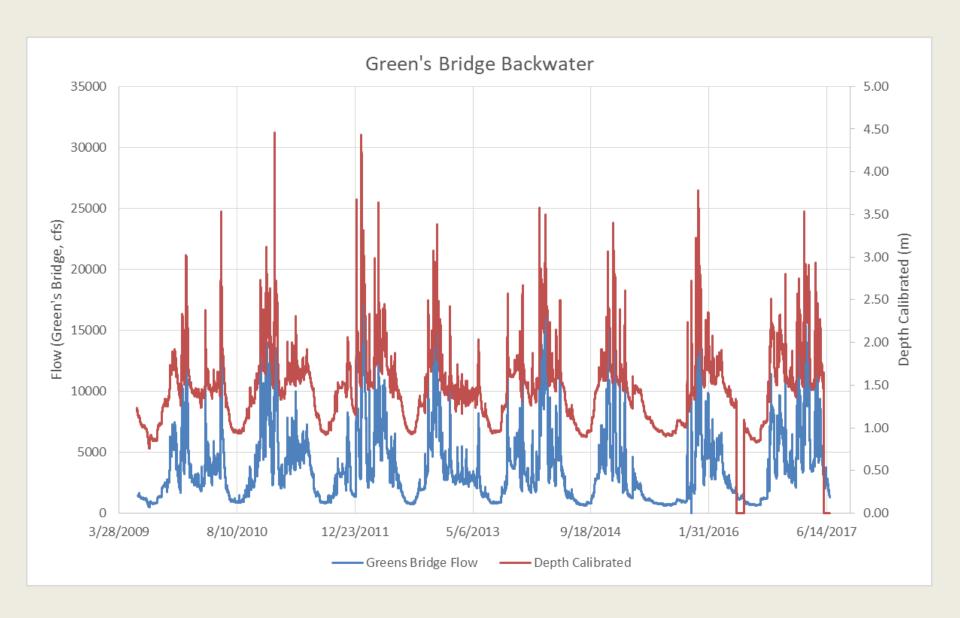
- Flows required to connect sloughs Middle Fork Willamette
- Variable, but we can determine when sites connect

Connectivity, better?



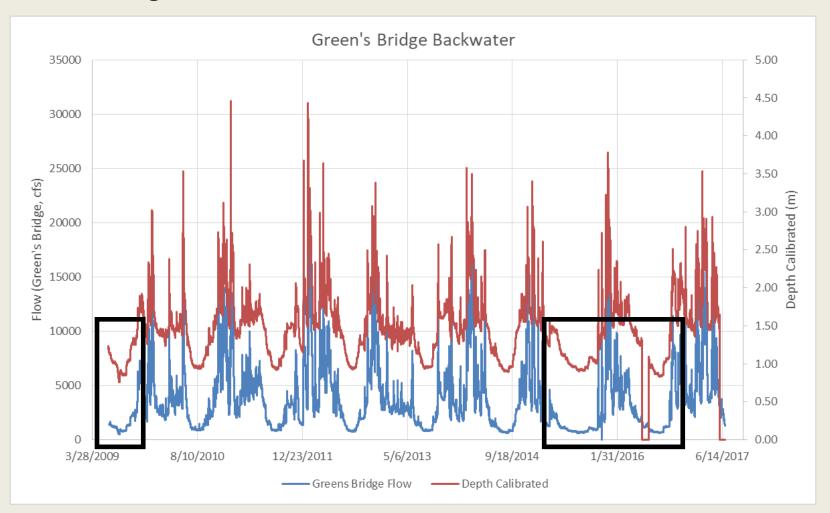
- At point of connection height of 1.002 m, the flow necessary to connect the site:
 - Min.: 2.104 kcfs
 Avg.: 2.629 kcfs
 Max.: 3.368 kcfs

Habitat dataset: Now current

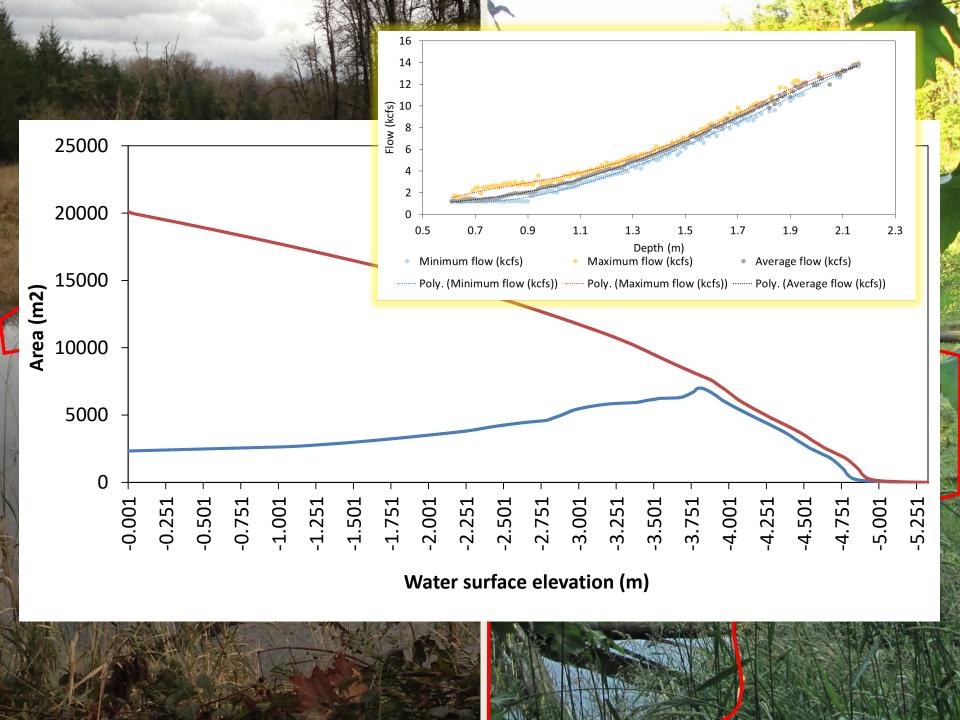


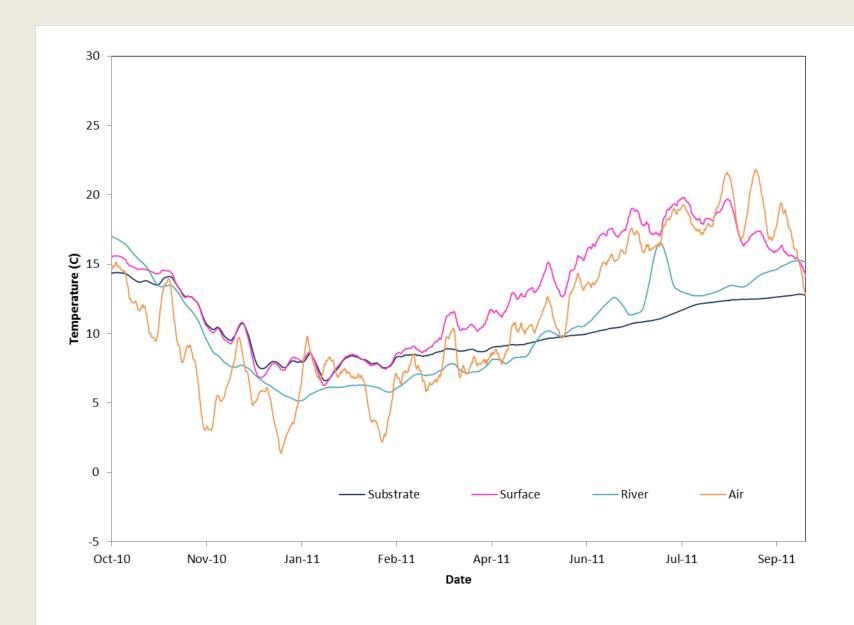
Interpretation

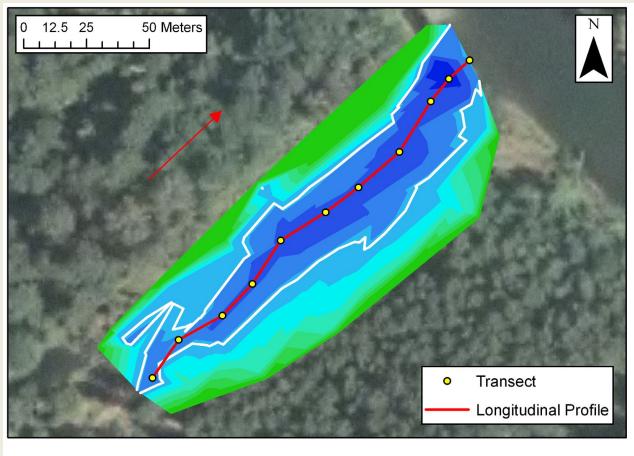
- Focus on two periods
 - 2009 Big Cliff event
 - Droughts: 2015, 2016

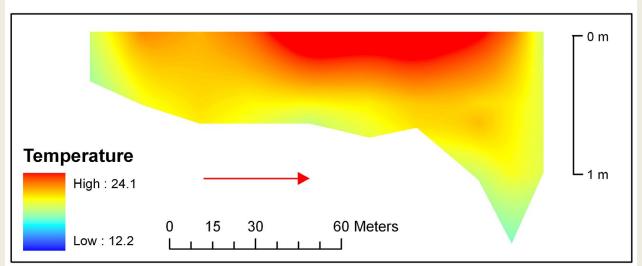






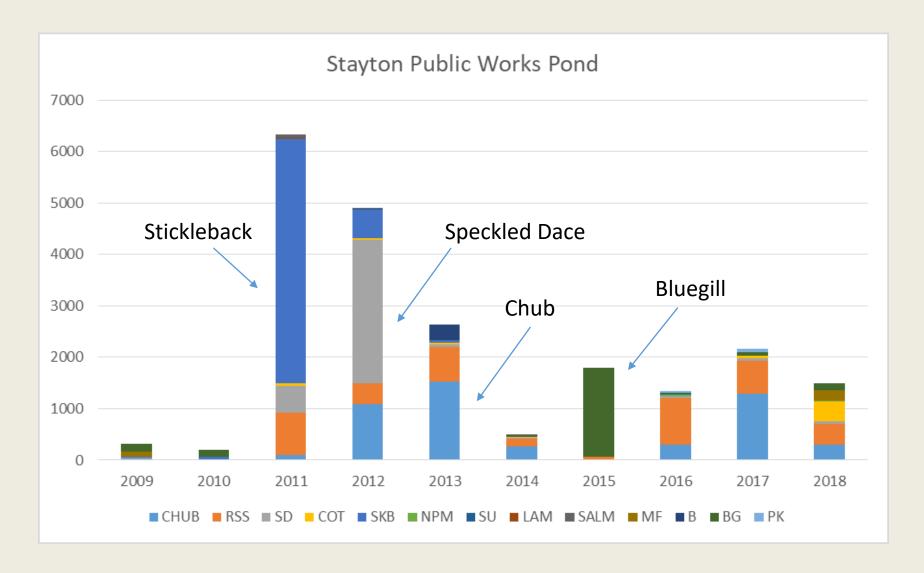




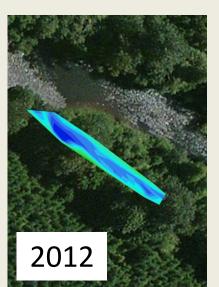


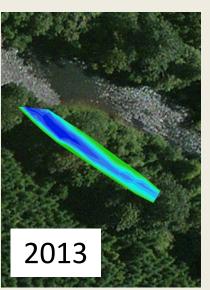


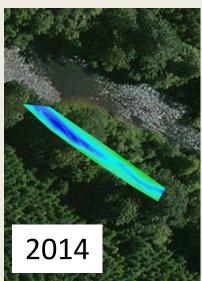
Fish assemblage, abundance dataset



Additional studies: Fall Creek Drawdown





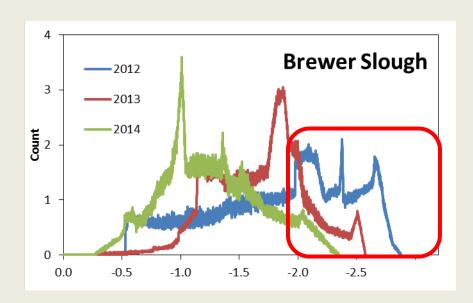


Objective:
Determine the impact of complete reservoir drawdown on off-channel habitats

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

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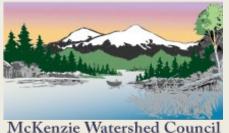
















AND MANY OTHERS!

Questions?



WORLD RECORD

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