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

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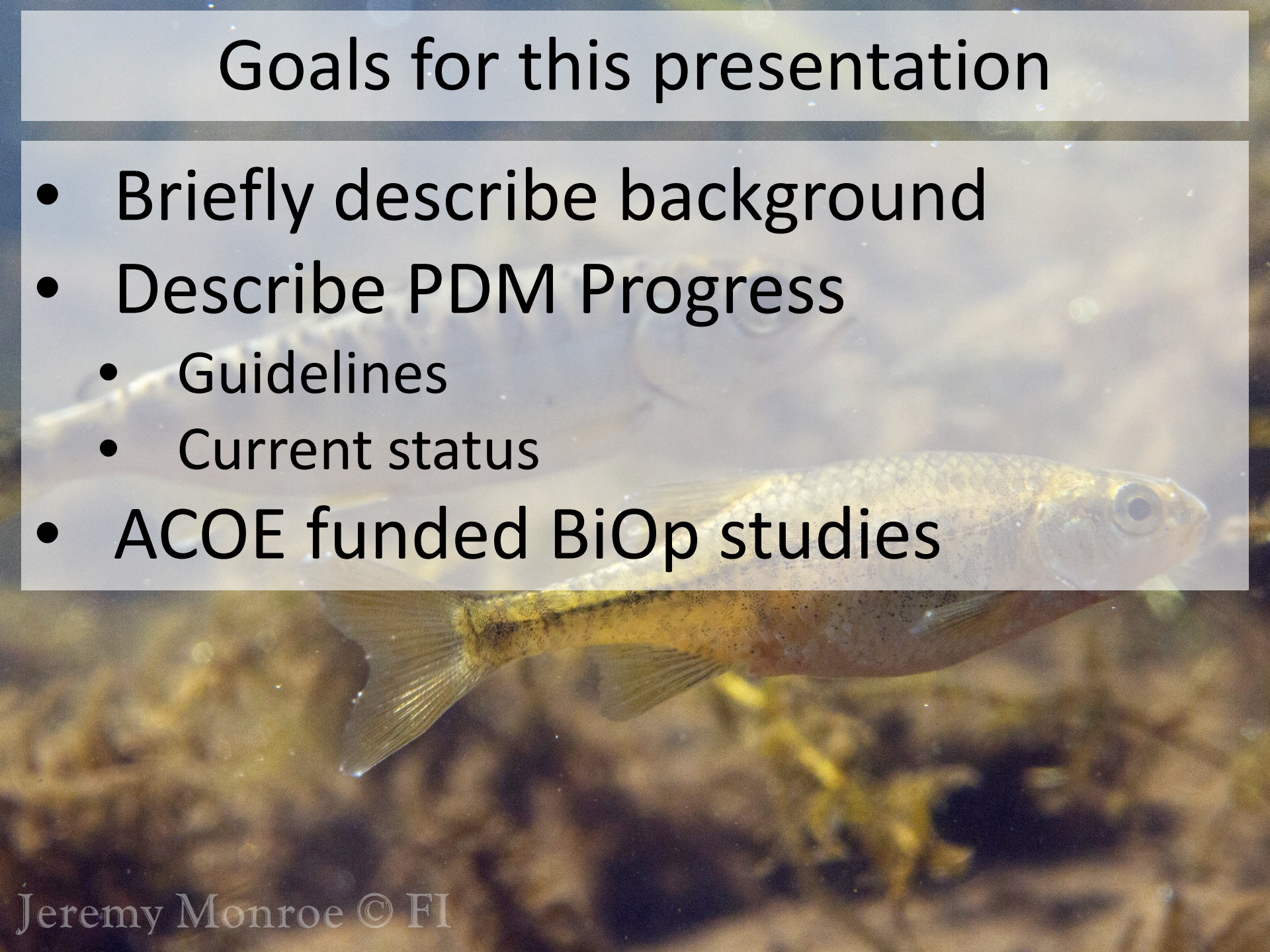
Goals for this presentation

- Briefly describe background
- Describe PDM Progress
  - Guidelines
  - Current status
- ACOE funded BiOp studies



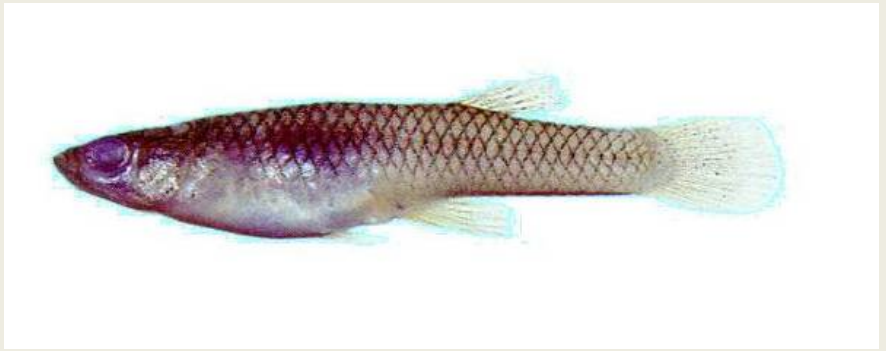
Film by Freshwaters Illustrated

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)

ESA History

Snyder 1908

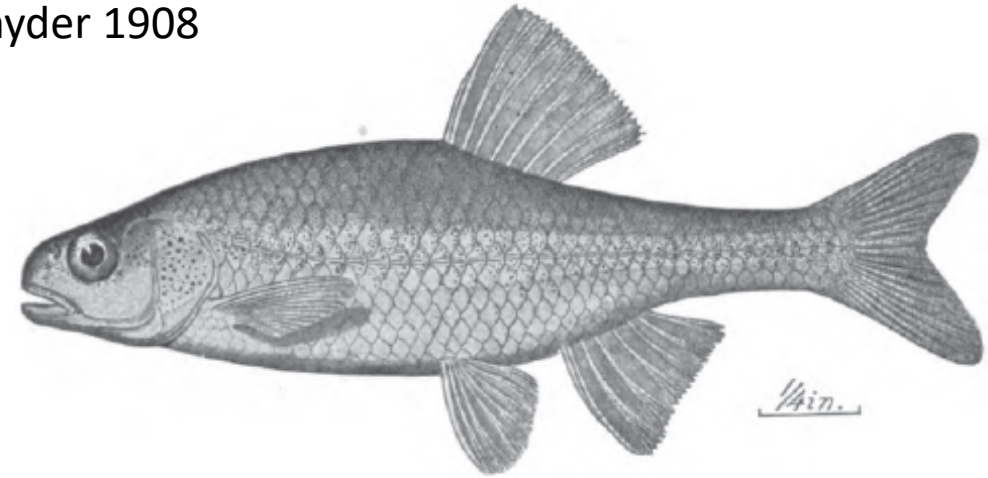
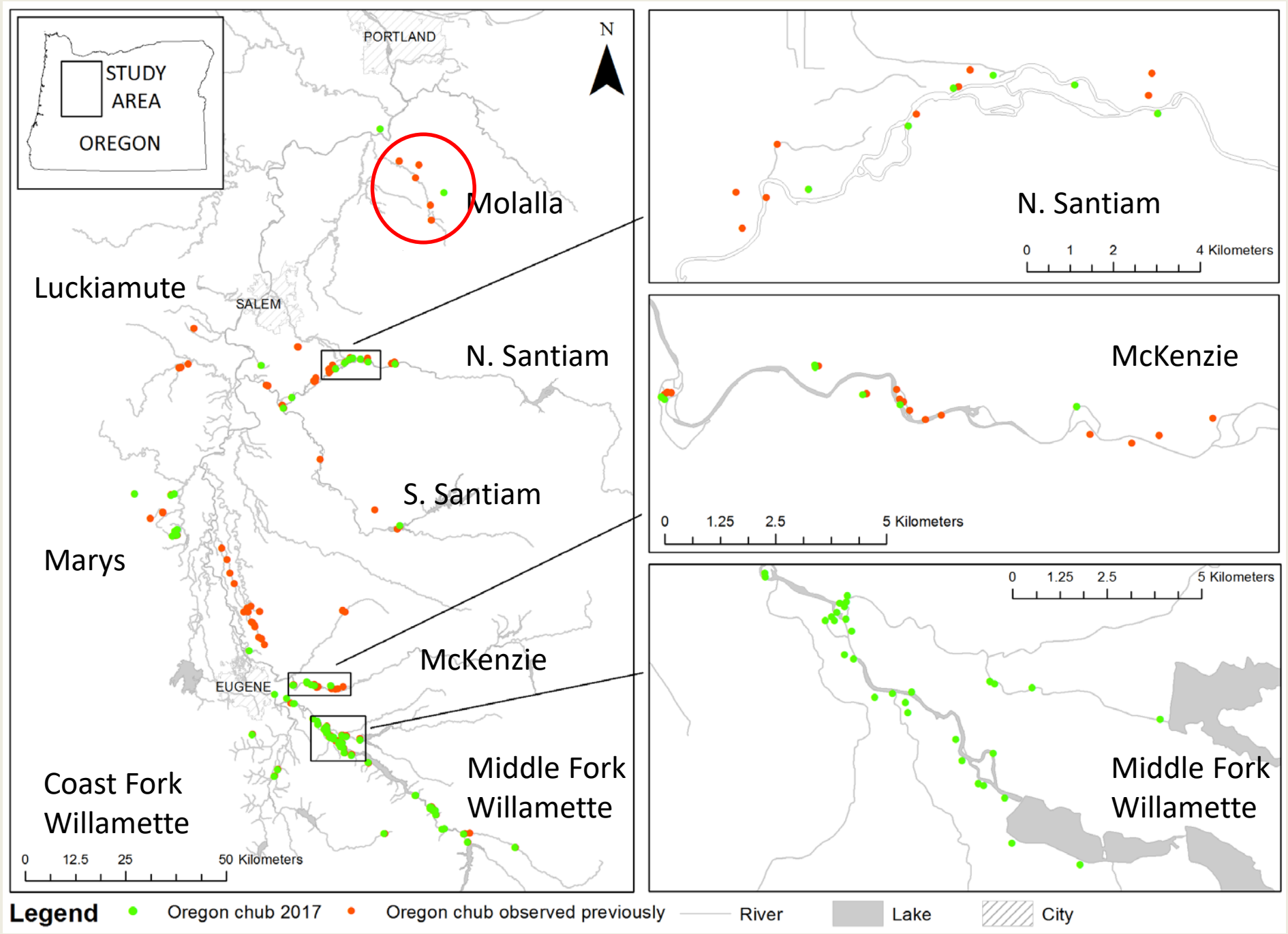


FIG. 5.—Hybopsis crameri, new species. Type.

- Petition to list: 1990
- Multi-agency Conservation Agreement: 1992
- Listed as Endangered: 1993
- Recovery Plan: 1998
- Downlisted to Threatened: 2010
- Delisted: 2015 First fish recovered under ESA


STUDY AREA
OREGON
PORTLAND
N
Molalla
Luckiamute
SALEM
N. Santiam
S. Santiam
Marys
McKenzie
EUGENE
Coast Fork Willamette
Middle Fork Willamette
0 12.5 25 50 Kilometers
N. Santiam
0 1 2 4 Kilometers
McKenzie
0 1.25 2.5 5 Kilometers
Middle Fork Willamette
0 1.25 2.5 5 Kilometers
Legend
Oregon chub 2017
Oregon chub observed previously
River
Lake
City

Post-delisting monitoring plan

- Builds on the success of the recovery plan
  - Oregon chub distribution and abundance
  - Potential adverse changes to habitat from environmental or anthropogenic factors
  - Distribution of nonnative fishes in Oregon chub habitats
- Three 3-year cycles (9 years total)

Implementation Schedule

Recovery Area	Year								
	Cycle 1			Cycle 2			Cycle 3		
Santiam	Year 1	2015		Year 4	2018		Year 7		
Mainstem Willamette		Year 2	2016		Year 5			Year 8	
Middle Fork Willamette			Year 3	2017		Year 6			Year 9

- In addition: Annual sampling at subsample of sites (39) associated with BiOp study

Other surveys:

- Assess unoccupied habitats for introductions
- Search for undocumented populations
- Assist partnering agencies and programs

Post-delisting monitoring plan

- Provides set of triggers and responses which should aid in future management of chub
  - Some triggers extend or intensify monitoring
  - Others demonstrate need to assess status
- Defines the conclusion of monitoring
- The USFWS many consider relisting at any time during the PDM

PDM Triggers

- Trigger: Population Abundance and Distribution
  - At least 25 populations with ≥500 individuals
  - 5 abundant pops in each recovery area
- Only triggers which potentially change status

PDM Triggers

- Trigger: Nonnative Species
  - Fewer than 80% of all habitats currently occupied contain competitive or predatory nonnative species
  - No new competitive or predatory nonnative species become distributed in Oregon chub habitats

PDM Triggers

- Trigger: Habitat Triggers
  - No additional complete reservoir drawdowns
  - ≥50% of hydrologically connected Oregon chub habitats in each subbasin continue to have sufficient habitat quality to support Oregon chub
  - A 50 year flood interval does not occur
    - Potentially introduce nonnative fish, alter habitat

2017 Sampling Summary

- Sampled 141 locations in 2017
  - 2016: 130, 2015: 118
- 73 populations sampled (2016: 70, 2015: 68)
  - Abundance estimates at 41 sites
    - 2016: 48, 2015: 44
  - Discovered 2 new populations
    - 2016: 7, 2015: 5
- Established 2 new populations
- 109 populations

2017 Status

PDM:

≥ 25 pops of 500 adult chub

- 39 pops met this criterion in 2017
  - 2016: 41
  - 2015: 43

≥ 5 abundant pops in each recovery area

- Santiam: 12 populations
- Mainstem: 12 populations
- MFW: 15 populations

2017 Status: Other Triggers

Nonnative species:

Fewer than 80% of all habitats currently occupied contain competitive or predatory nonnative species

- 50% across range (40% when PDM written)
  - Santiam: 72%
  - Mainstem: 34%
  - Middle Fork: 50%

2017 Status: Other Triggers

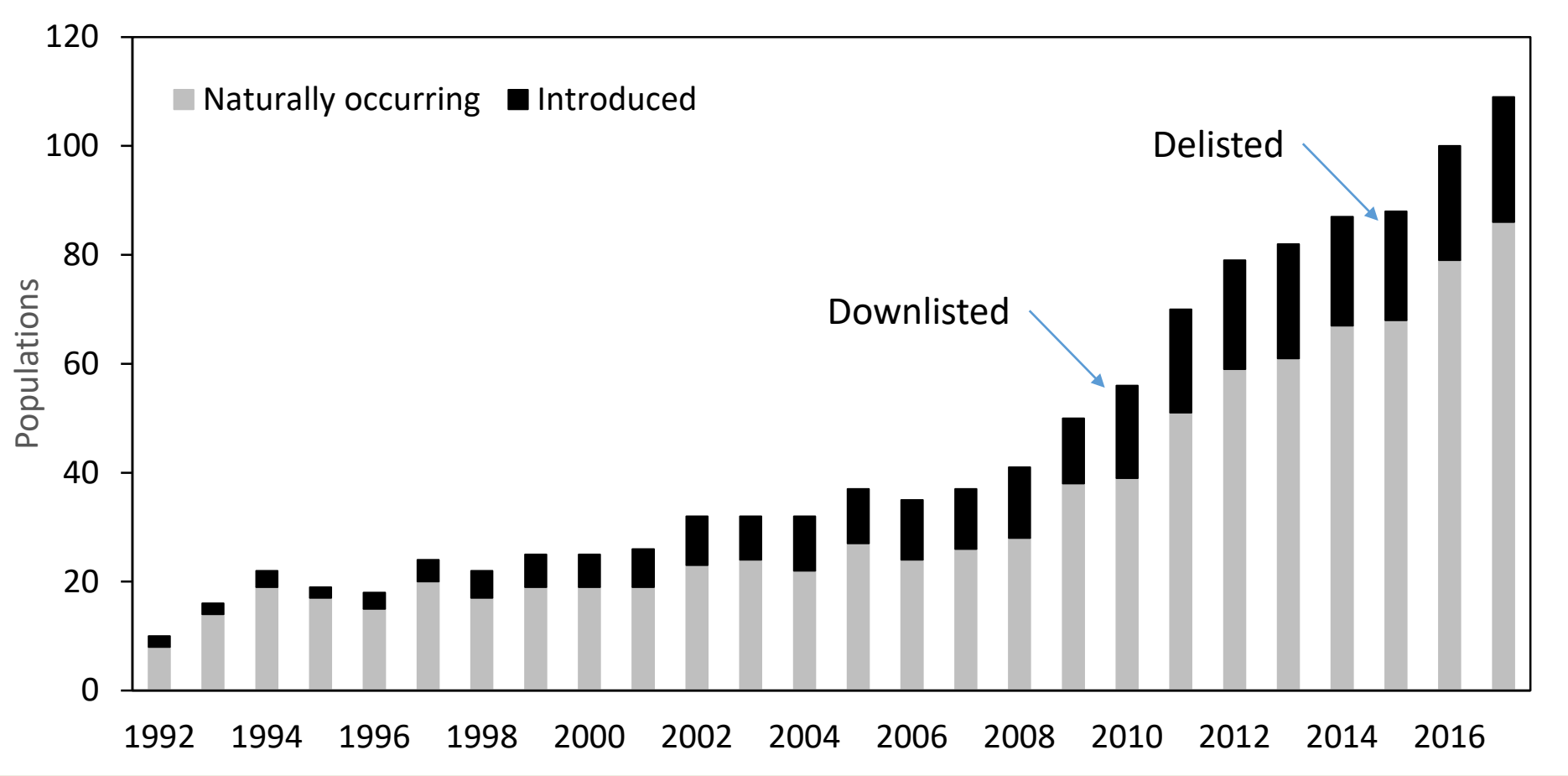
No new competitive or predatory nonnative species become distributed in Oregon chub habitats

- Green sunfish
  - 2015: 3 habitats
  - 2016: 7 habitats
  - 2017: 2 habitats
    - Dominance
    - No change in chub abundance

2017 Status: other triggers

- Trigger: Habitat Triggers
  - No additional complete reservoir drawdowns
    - Currently only Fall Creek Reservoir
    - ACOE: potential for Lookout Point, Dorena Reservoirs
  - ≥50% of hydrologically connected Oregon chub habitats in each subbasin continue to have sufficient habitat quality to support Oregon chub
    - 2/3 of our habitats are connected
    - Lose some, gain some annually
  - A 50 year flood interval does not occur
    - Consult Weather Channel

Number of Populations



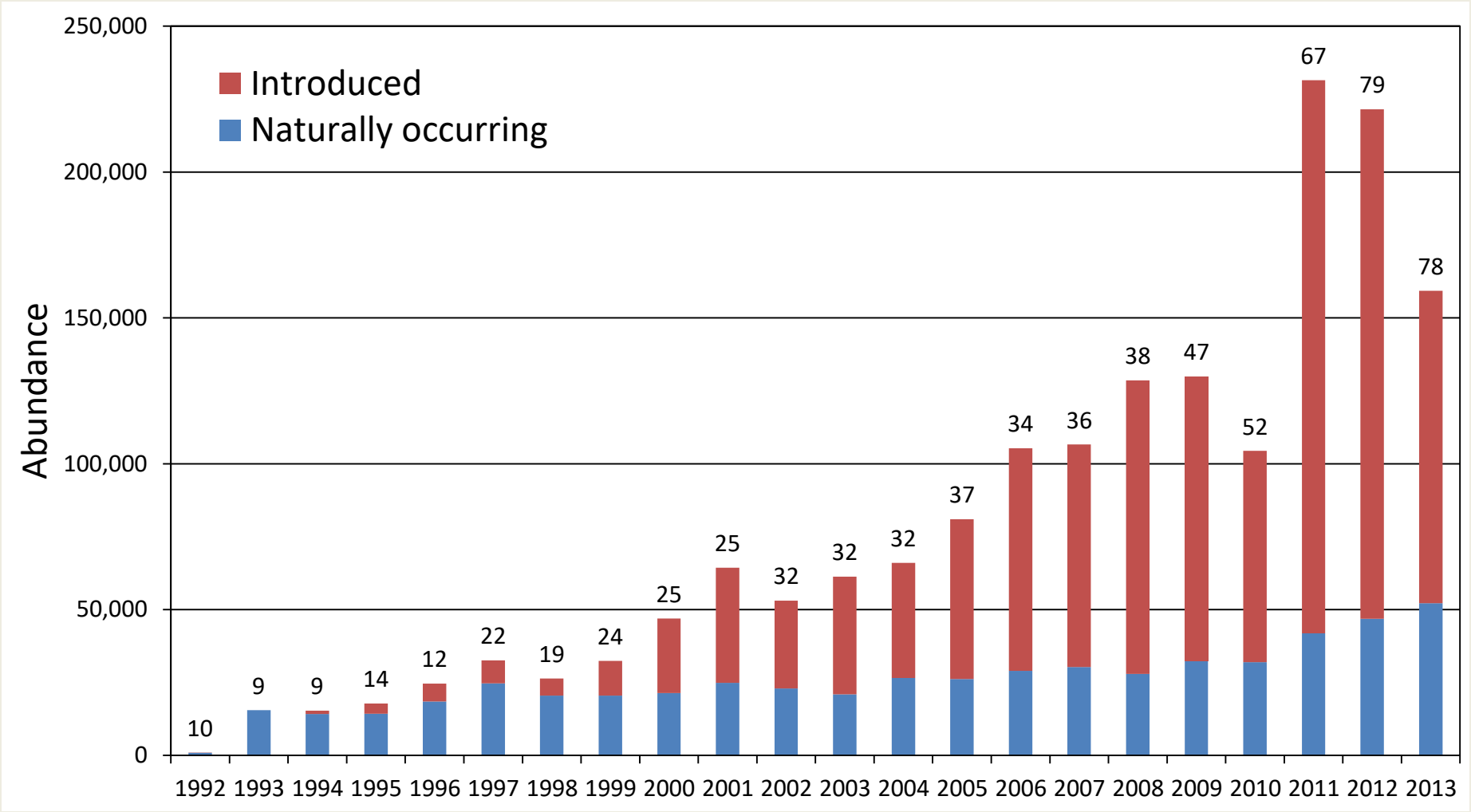
Early recovery objective: establish introduced populations

- Recovery plan favored maintaining isolated populations
- Connected populations: lower abundance, threat of nonnative fish, habitat loss
  - What we (disparagingly) called “chubs in tubs”

Working Together

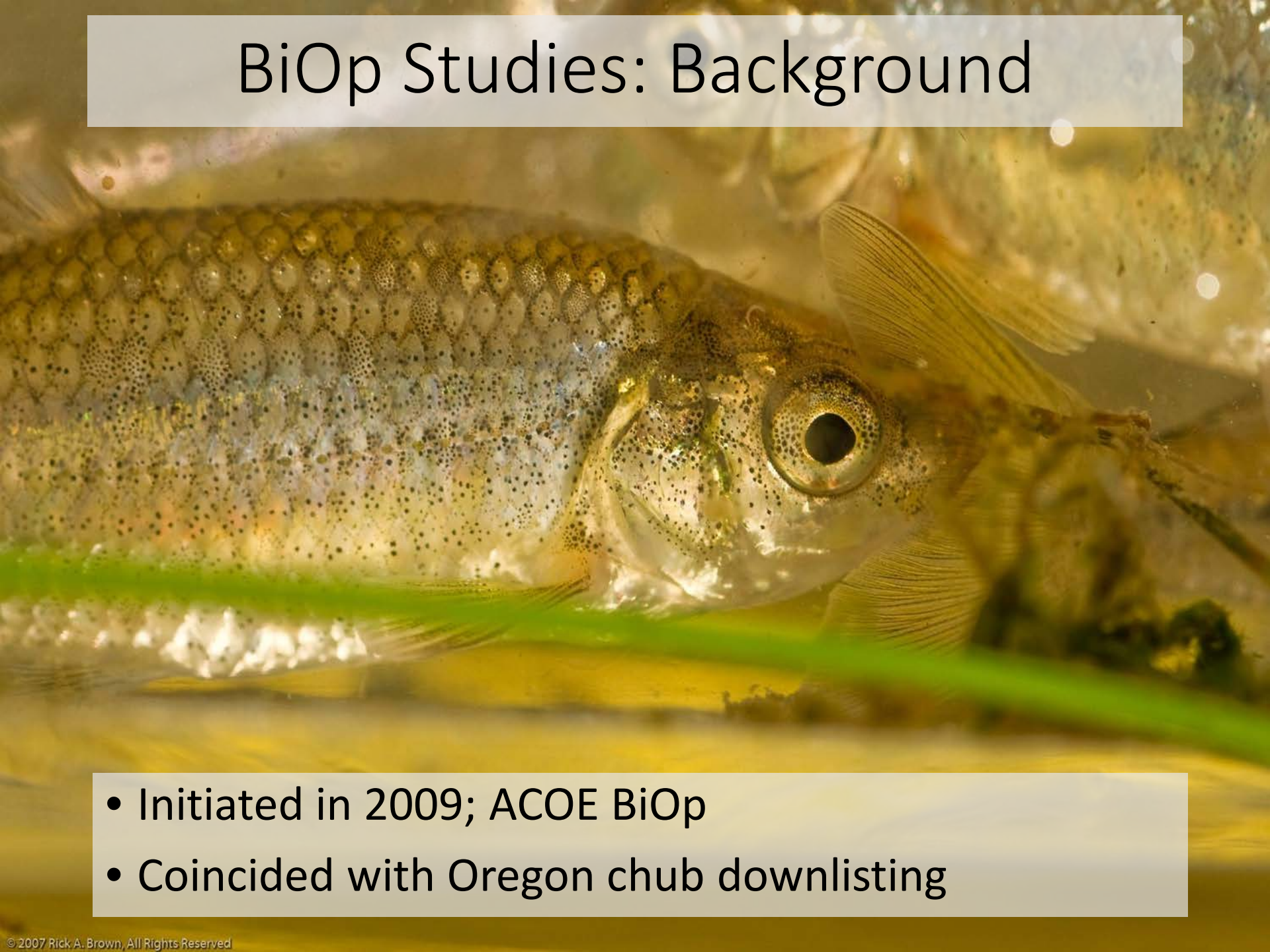
Private landowners

Oregon chub populations



In 2013, 2/3 of all Oregon chub occur in the 21 introduced sites (107,000 of 159,000 total)

BiOp Studies: Background

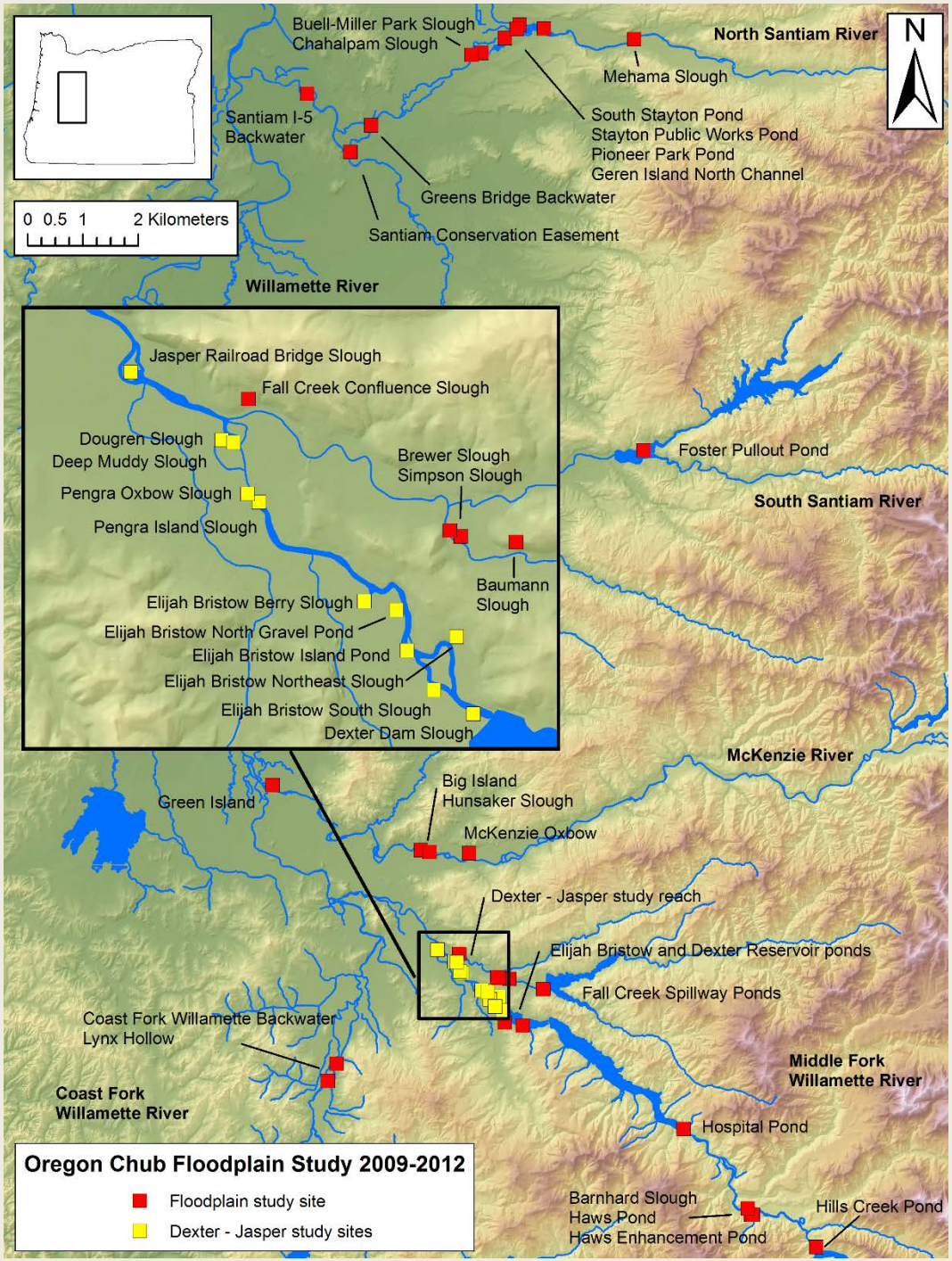


- Initiated in 2009; ACOE BiOp
- Coincided with Oregon chub downlisting

Goal

Describe relationships between

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

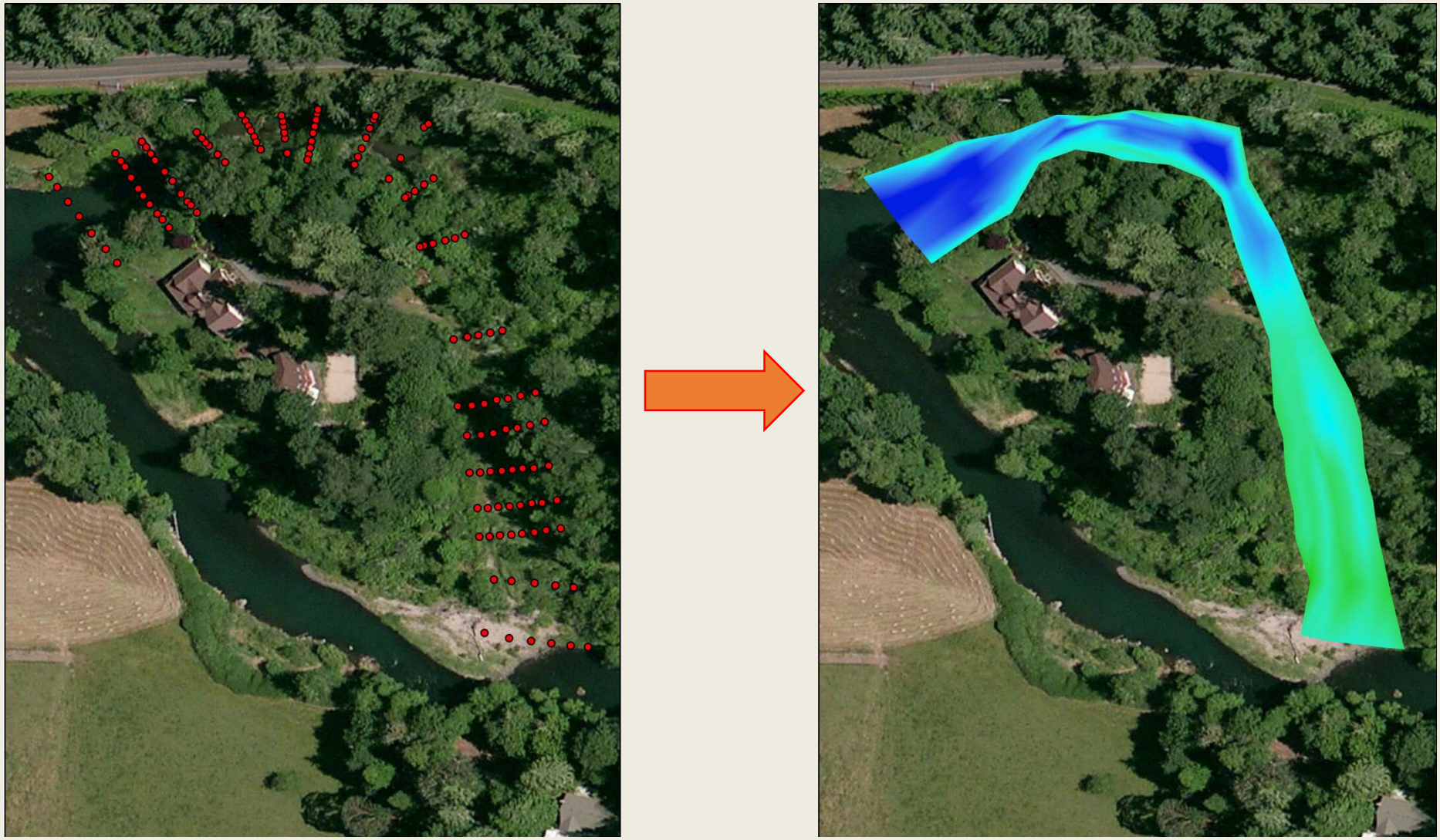


Study Locations

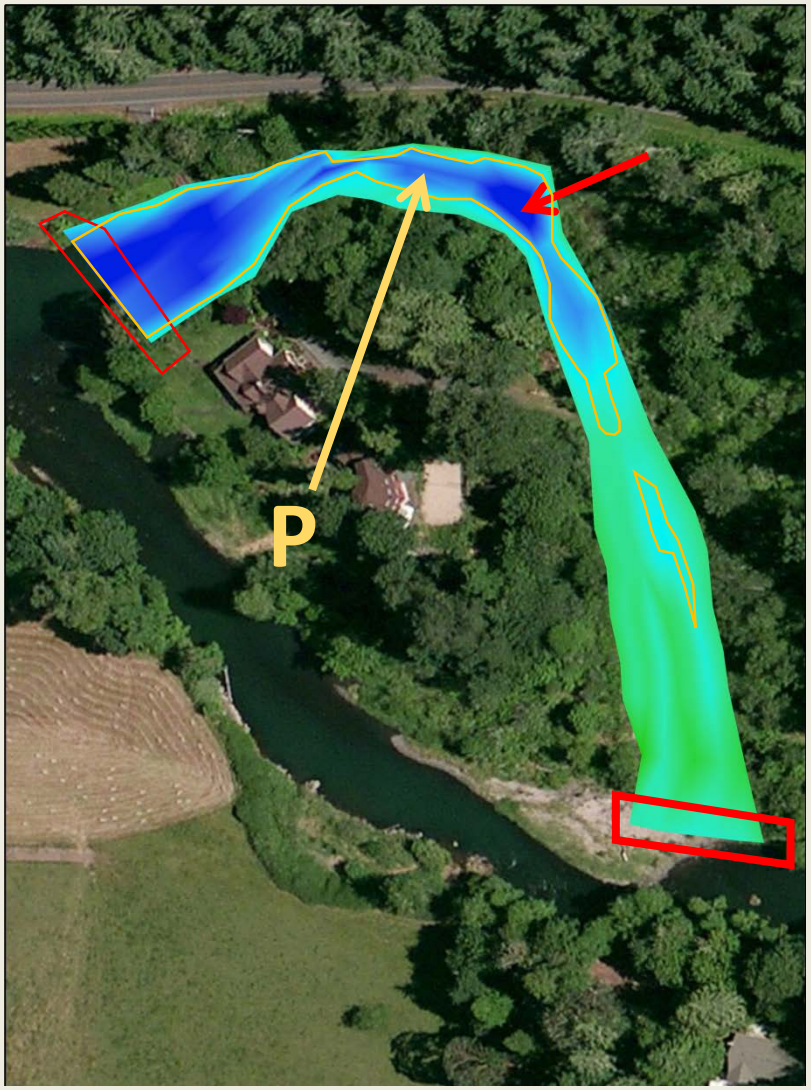
- 2017:
  39 sites located on Army Corps of Engineer land, or potentially influenced by Willamette Project Dams
  - 22 in the Middle Fork
  - 11 in the Santiam
  - 4 in the McKenzie
  - 2 Coast Fork Willamette

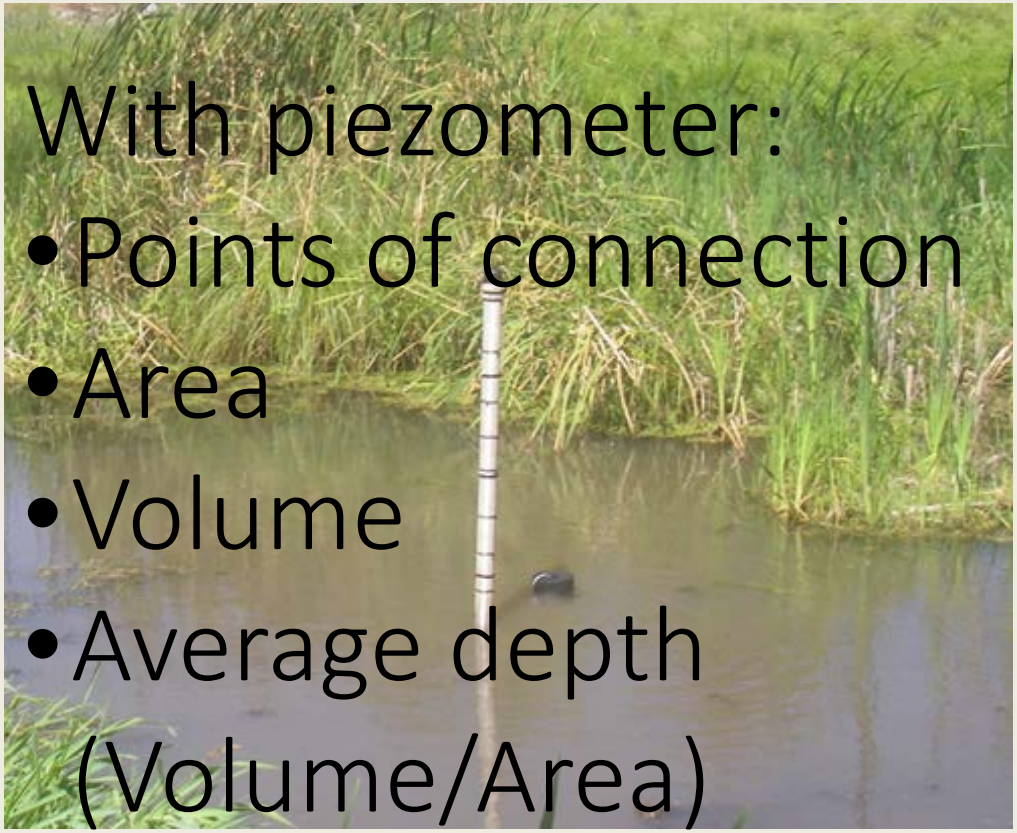
Bathymetry Mapping

Bathymetry mapping



What is it good for?





With piezometer:

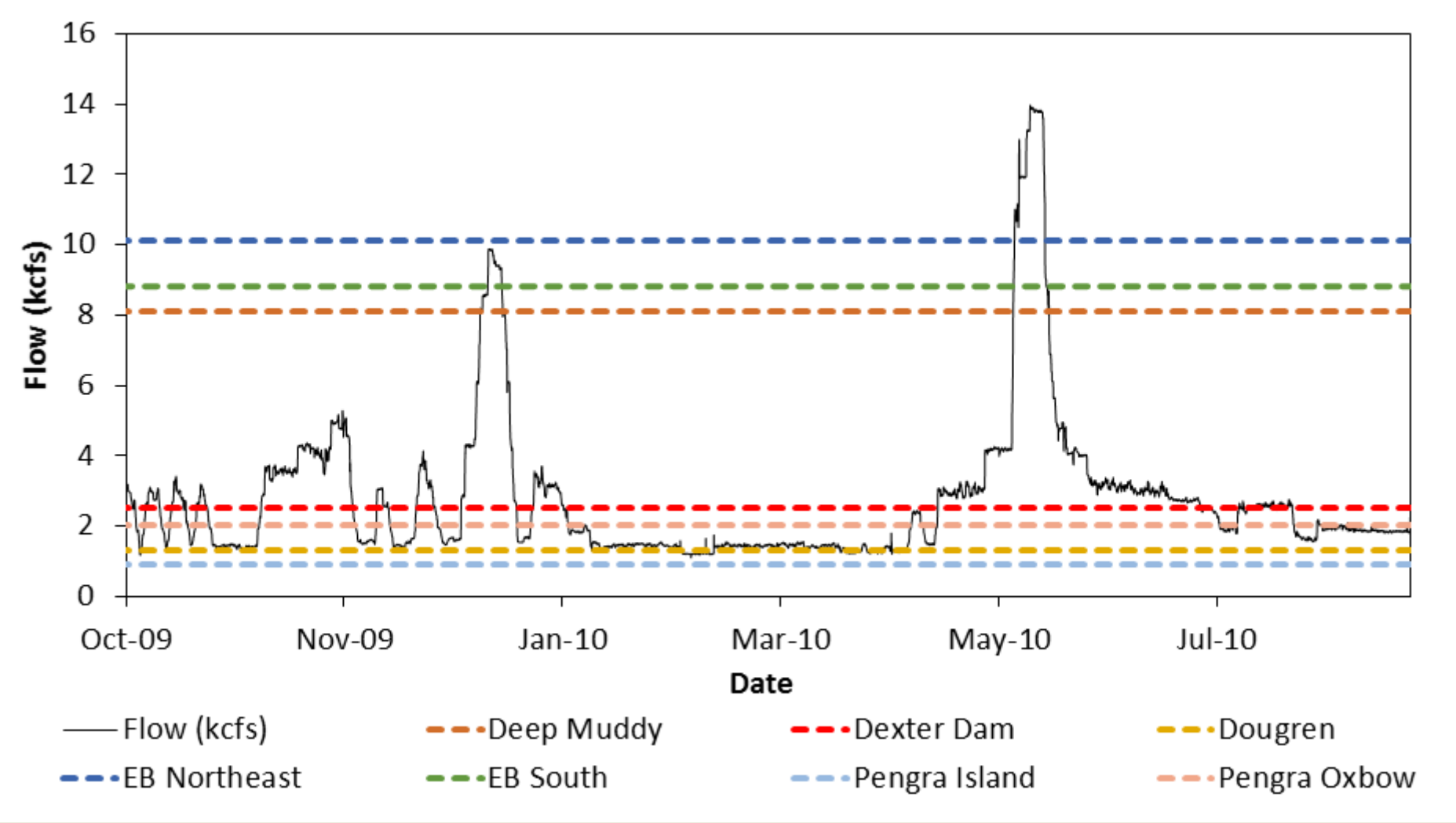
- Points of connection
- Area
- Volume
- Average depth (Volume/Area)
- Max. depth

Connectivity

What do we mean?

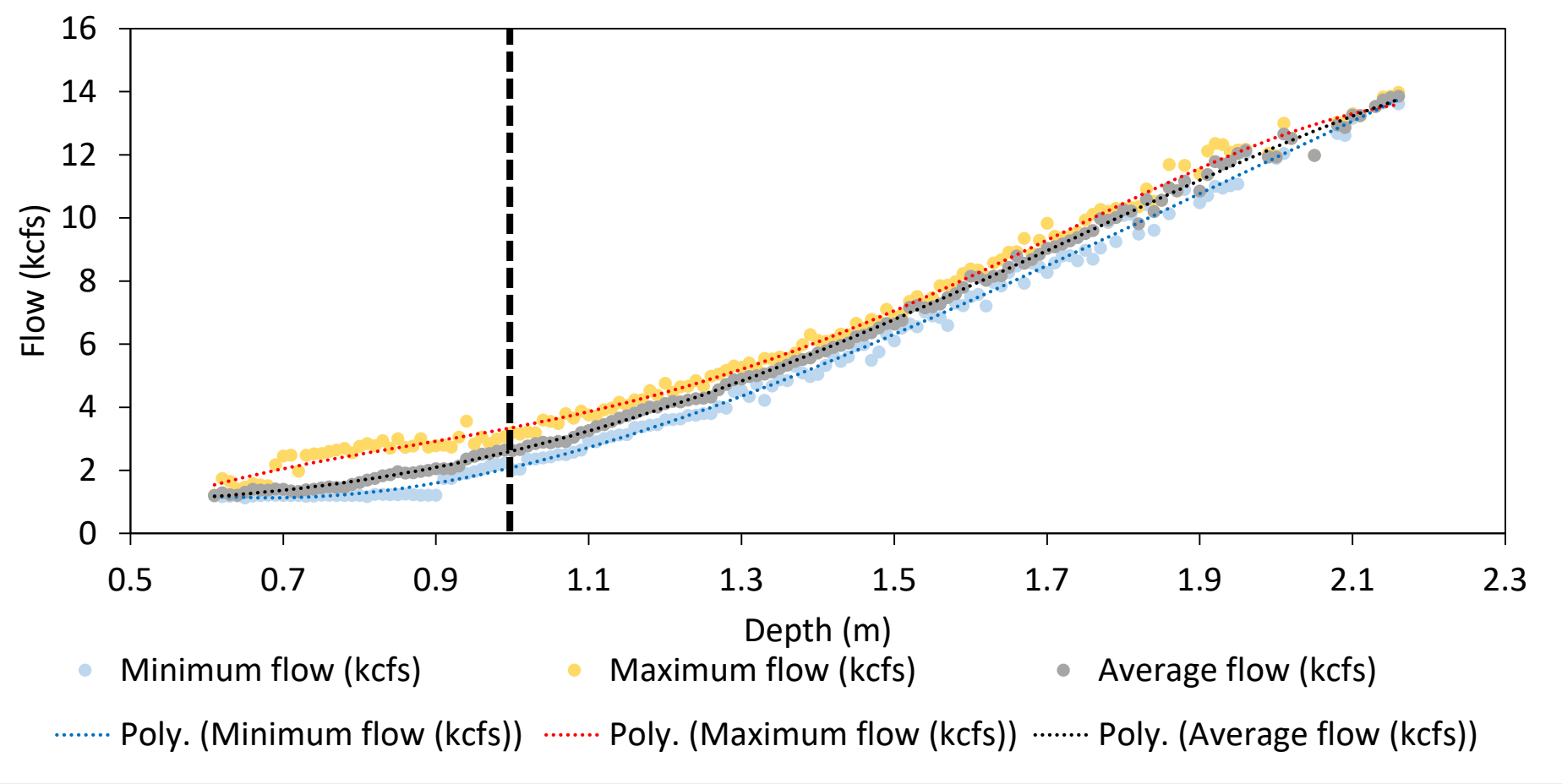
- Open water, direct connection to surrounding waterbodies

Connectivity and flow



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

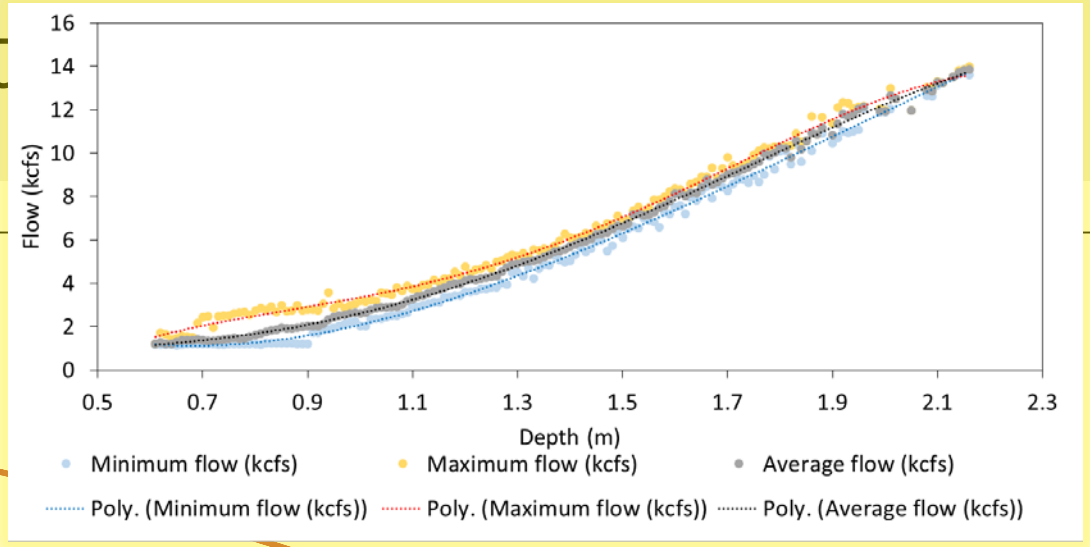
Connectivity, better?

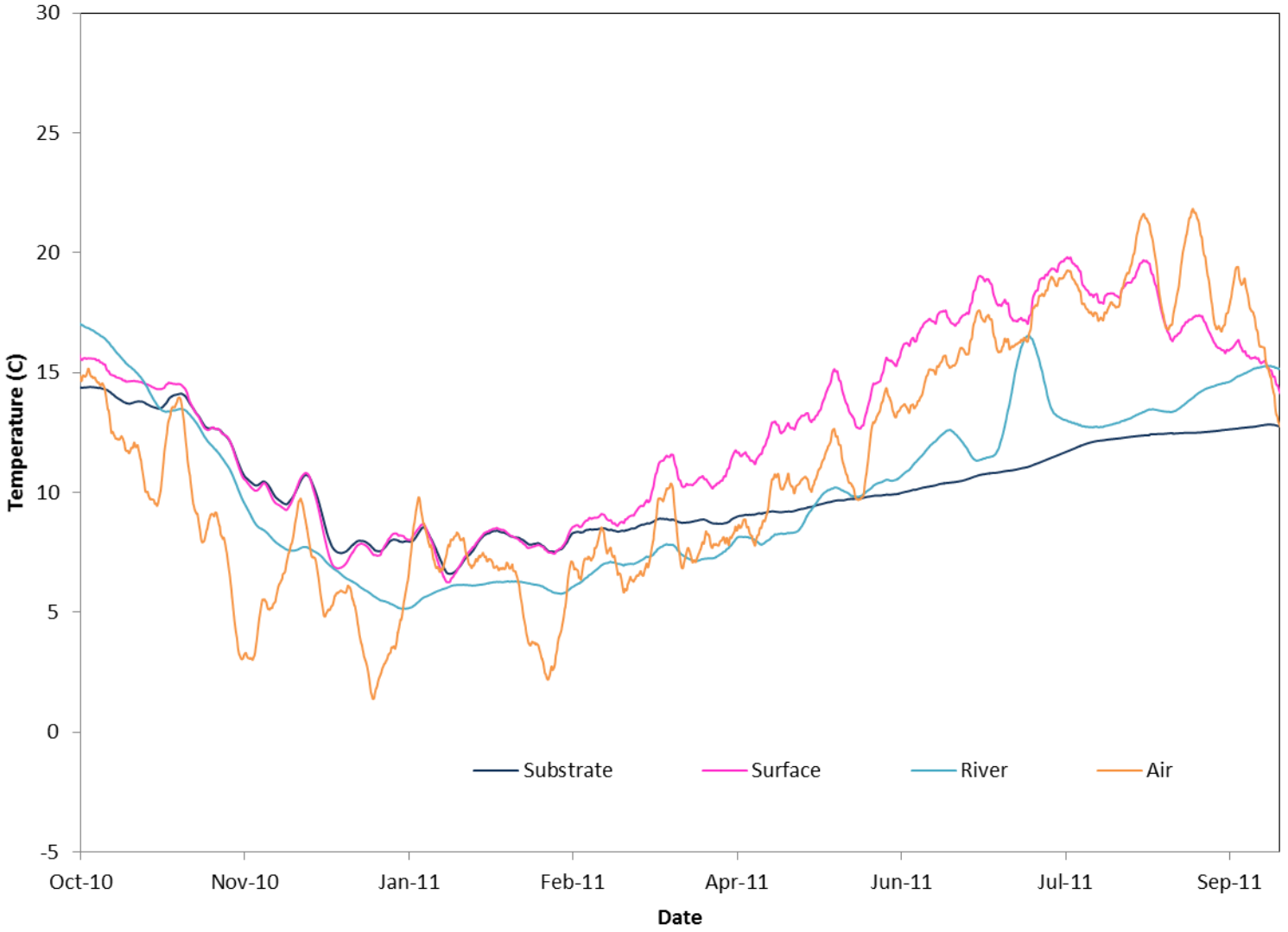


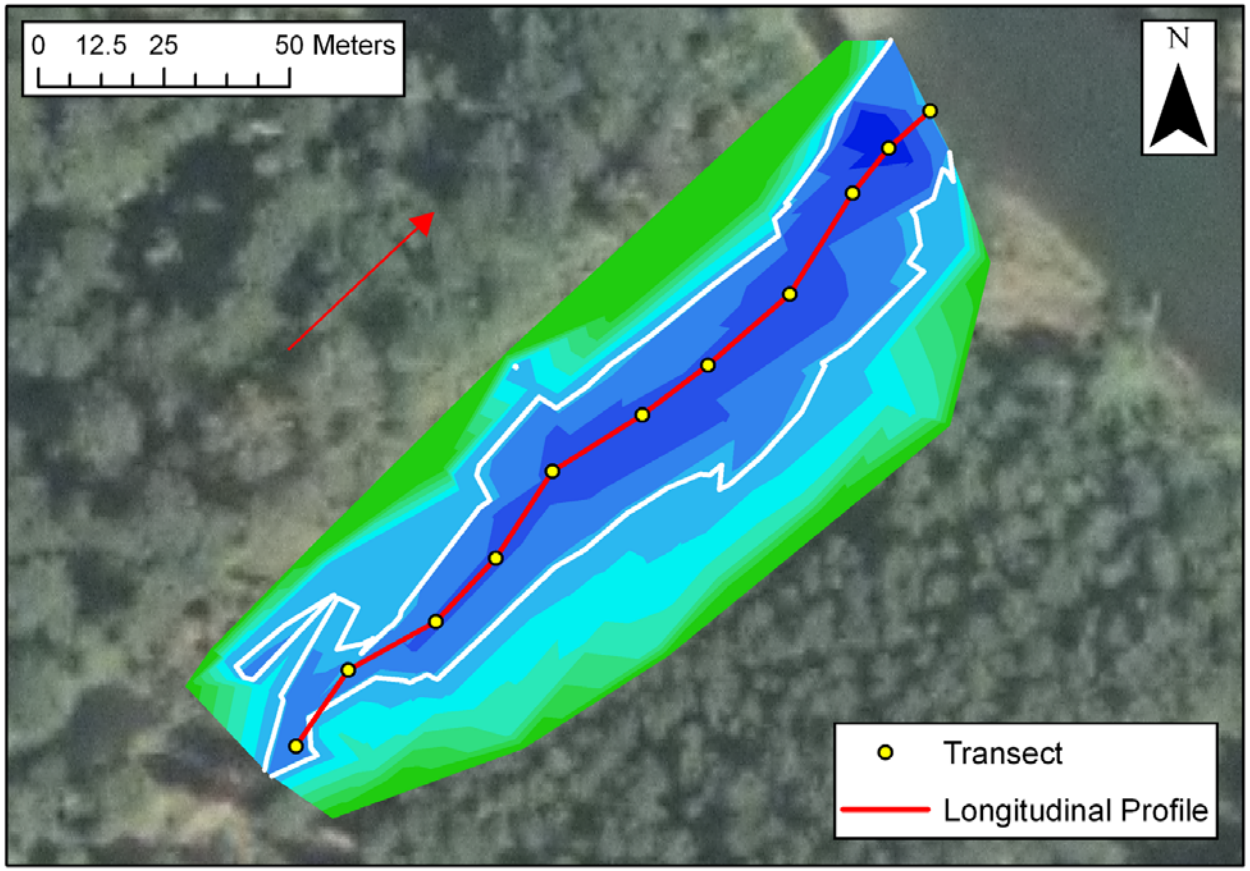
- At point of connection height of 1.002 m, the flow necessary to connect the site:
  - Min.: 2.104 kcfs • Avg.: 2.629 kcfs • Max.: 3.368 kcfs

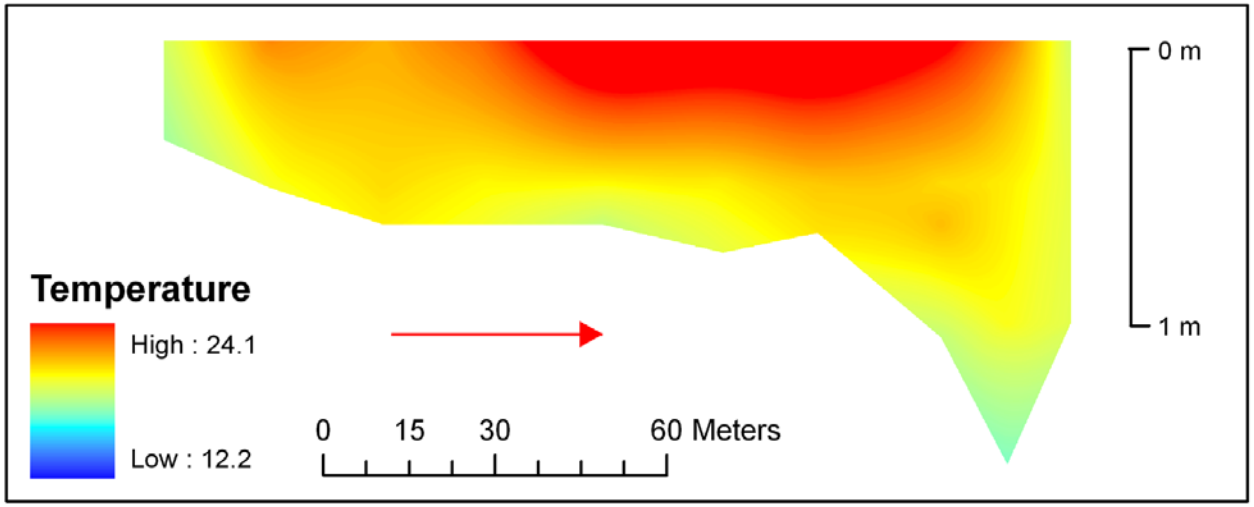

Jeremy Monroe © FI

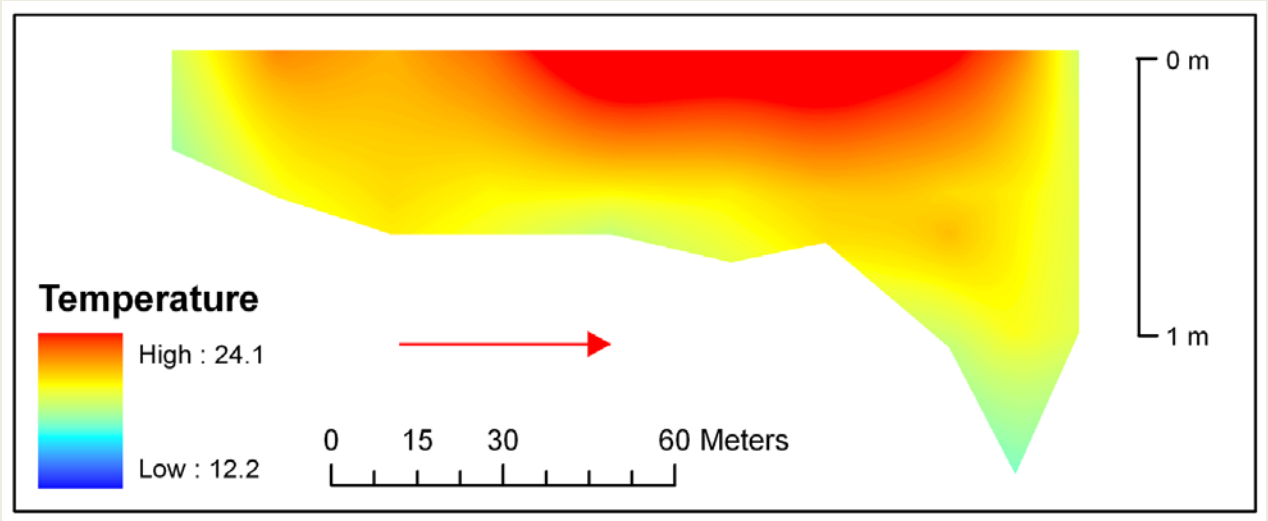
Wetted area at

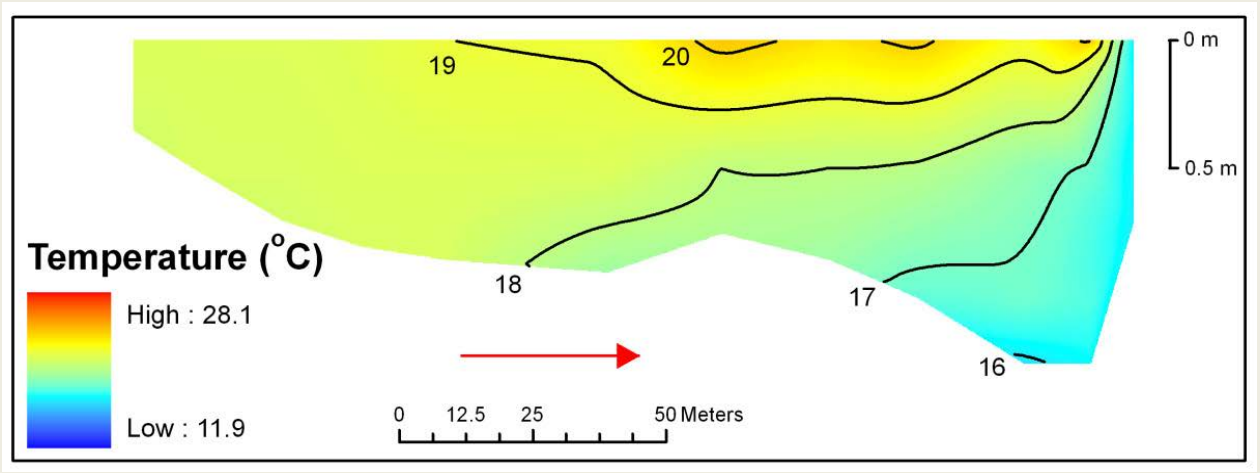



30
25
20
15
10
5
0
-5
Temperature (C)
Oct-10
Nov-10
Jan-11
Feb-11
Apr-11
Jun-11
Jul-11
Sep-11
Date
Substrate
Surface
River
Air

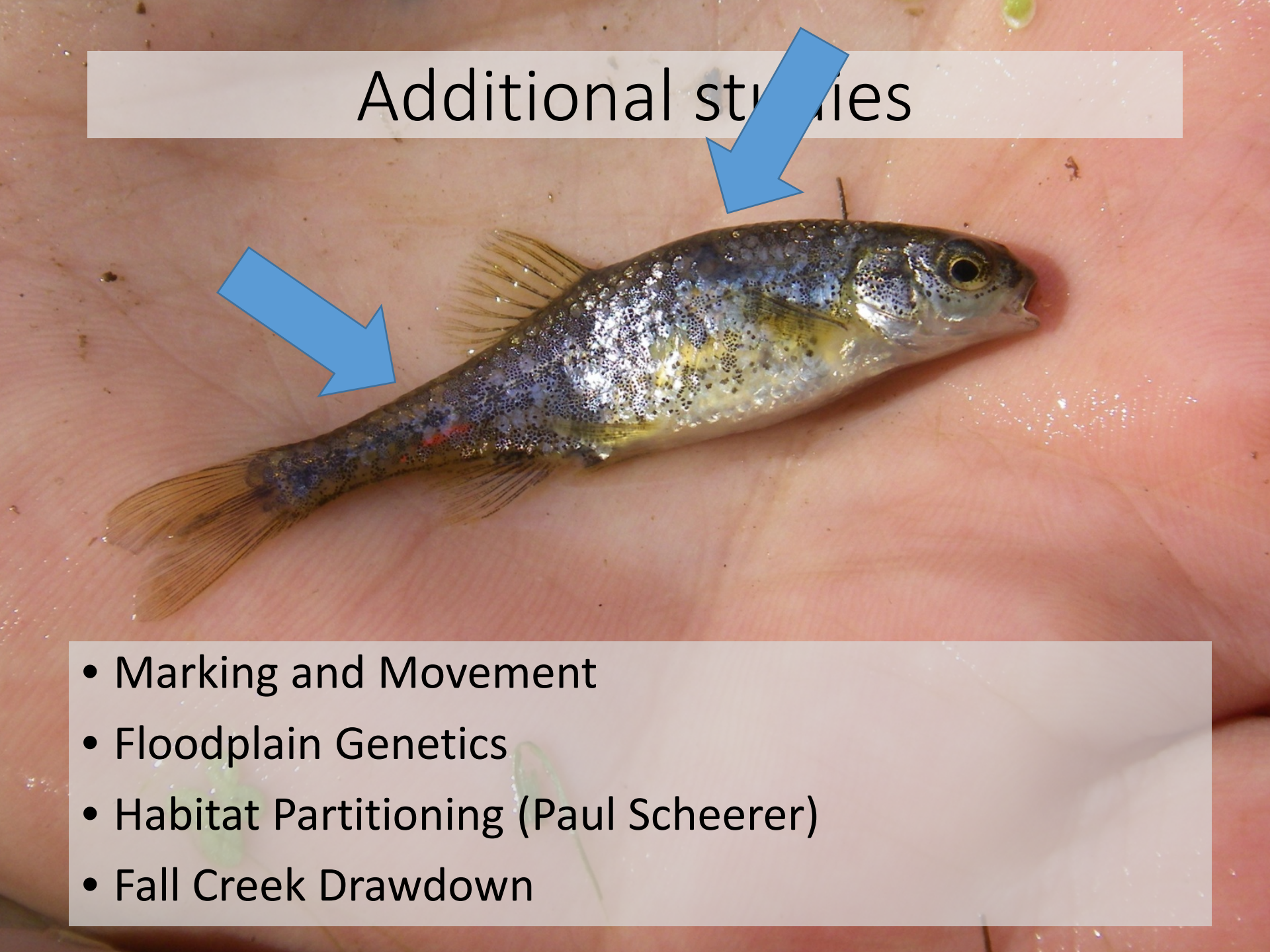

0 12.5 25 50 Meters
N
Transect
Longitudinal Profile


Temperature
High : 24.1
Low : 12.2
0 15 30 60 Meters
0 m
1 m


0 m
1 m
Temperature
High : 24.1
Low : 12.2
0 15 30 60 Meters


0 m
0.5 m
19
20
18
17
16
Temperature (°C)
High : 28.1
Low : 11.9
0 12.5 25 50 Meters

Additional studies



- Marking and Movement
- Floodplain Genetics
- Habitat Partitioning (Paul Scheerer)
- Fall Creek Drawdown

Additional studies: Movement

Hatch Side Channels

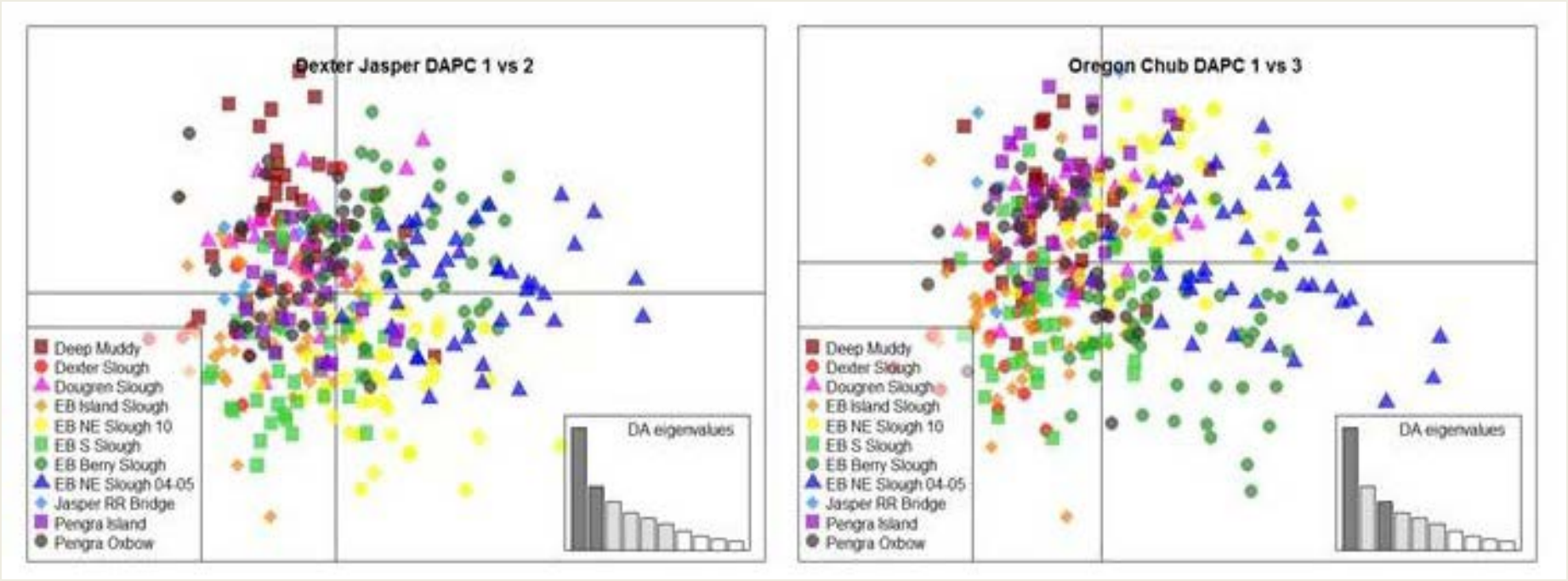
Buell-Miller Slough

Koenig Slough

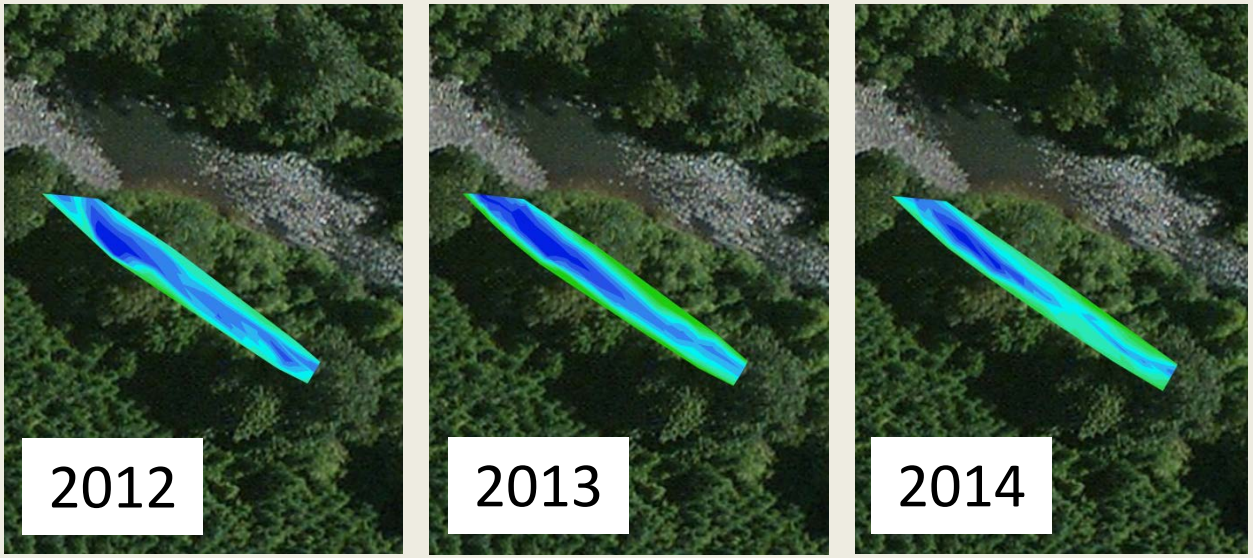
- Fish marked in 2013
- Recaptured in 2015
- 6.5 km (4.1 miles)
- N. Santiam, McKenzie, Middle Fork

Additional studies: Movement

- Middle Fork Willamette: confirmed through genetic analysis (Pat DeHaan, USFWS Abernathy FTC)
- Dexter-Jasper reach represent a single population with high levels of genetic exchange among sites



Additional studies: Fall Creek Drawdown

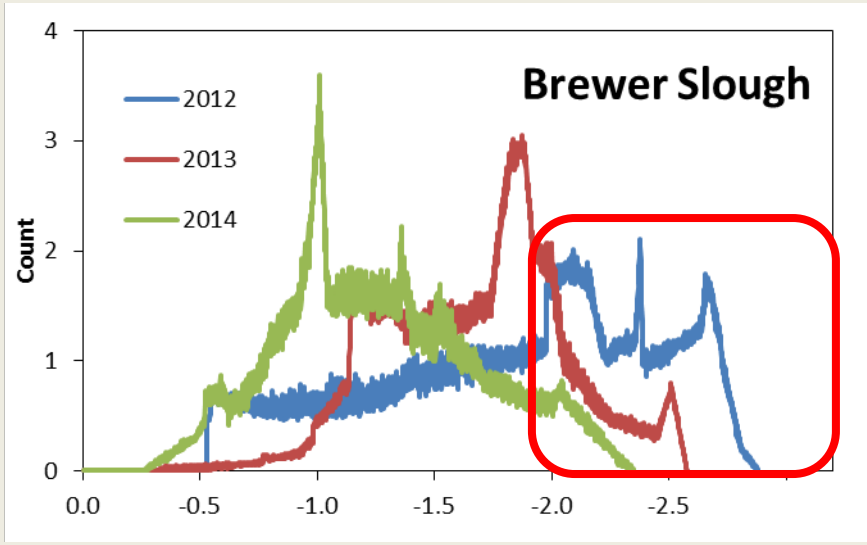


Objective: Determine the impact of complete reservoir drawdown on off-channel habitats

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

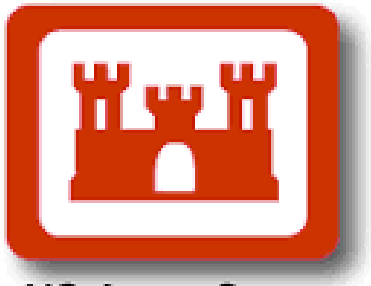
- Initial analyses
  - Positive relationship between flow and abundance
  - Strong relationship between flow and water depth, habitat quality
  - Temperature varied

Future work, conclusions

- PDM
  - Concludes in 2023
  - Build on success of the Recovery Plan
  - Tools to support species
    - Triggers
      - Status change
      - Further monitoring
- Floodplain Study
  - Provide information to ACOE
    - Manage flow, temperature
  - Support Oregon Chub, other native species in connected habitats

Acknowledgements

To our many private landowners and:



AND MANY OTHERS!

Questions?

WORLD RECORD

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