

Colorado & Wyoming AFS



Low-tech Process-based Restoration Workshop



Workshop Agenda

1. Introductions & Goals
2. Background - Scope of Problem & Principles
3. Assessment and Approaches
4. **Science & Policy**
5. Open Discussion/ Q & A



3. Science of Low-tech Process-based Restoration

- **What's worked**

- Suzzie and Maggie Creeks, NV – Grazing Management
- Spawn Creek, UT – Riparian & Beaver Management
- Birch Creek, ID – Beaver Relocation
- Intensively Monitored Watersheds

LOW-TECH SUCCESS STORIES



United States Department of Agriculture
Northwest Climate Hub

If You Build It, They Will Come: Ranching, Riparian Revegetation, and Beaver Colonization in Elko County, Nevada

Susan Charnley



Charnley (2019)

Grazing & Riparian Management

Maggie and Susie Creek, NV



**Carol Evans
BLM**



**Jon Griggs
Rancher**

Grazing & Riparian Management

Susie Creek, NV



1989

Summer grazing



1994

Fall grazing

Grazing & riparian management



2003

Fall Grazing, Beavers



2017

Beavers, Intensive Grazing

Birch Creek, ID - Beaver Relocation



Low-tech – Successes

Relocation of beaver – Birch Creek, ID



Low-tech – Successes

Relocation of beaver – Birch Creek, ID

Valley Bottom



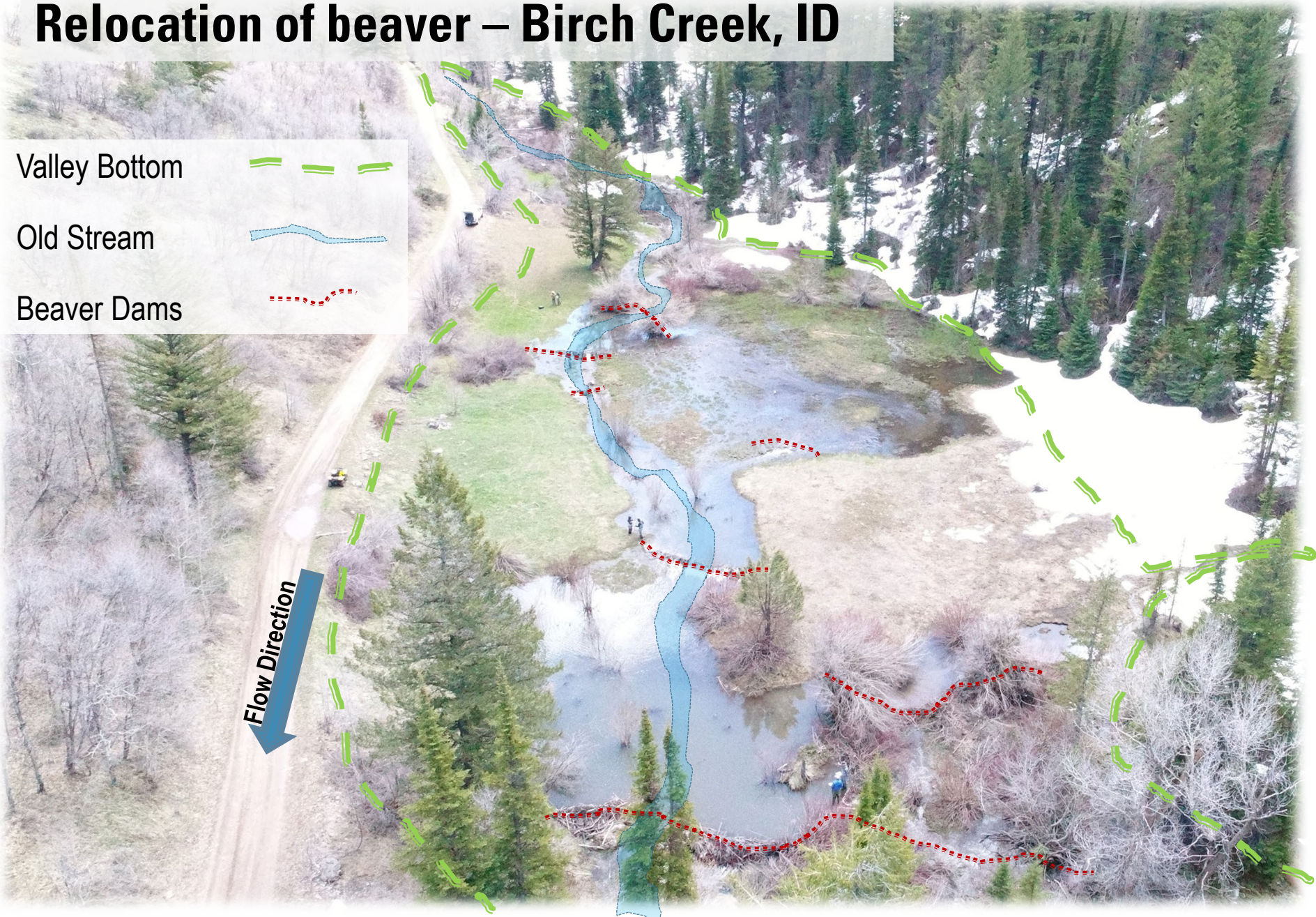
Old Stream



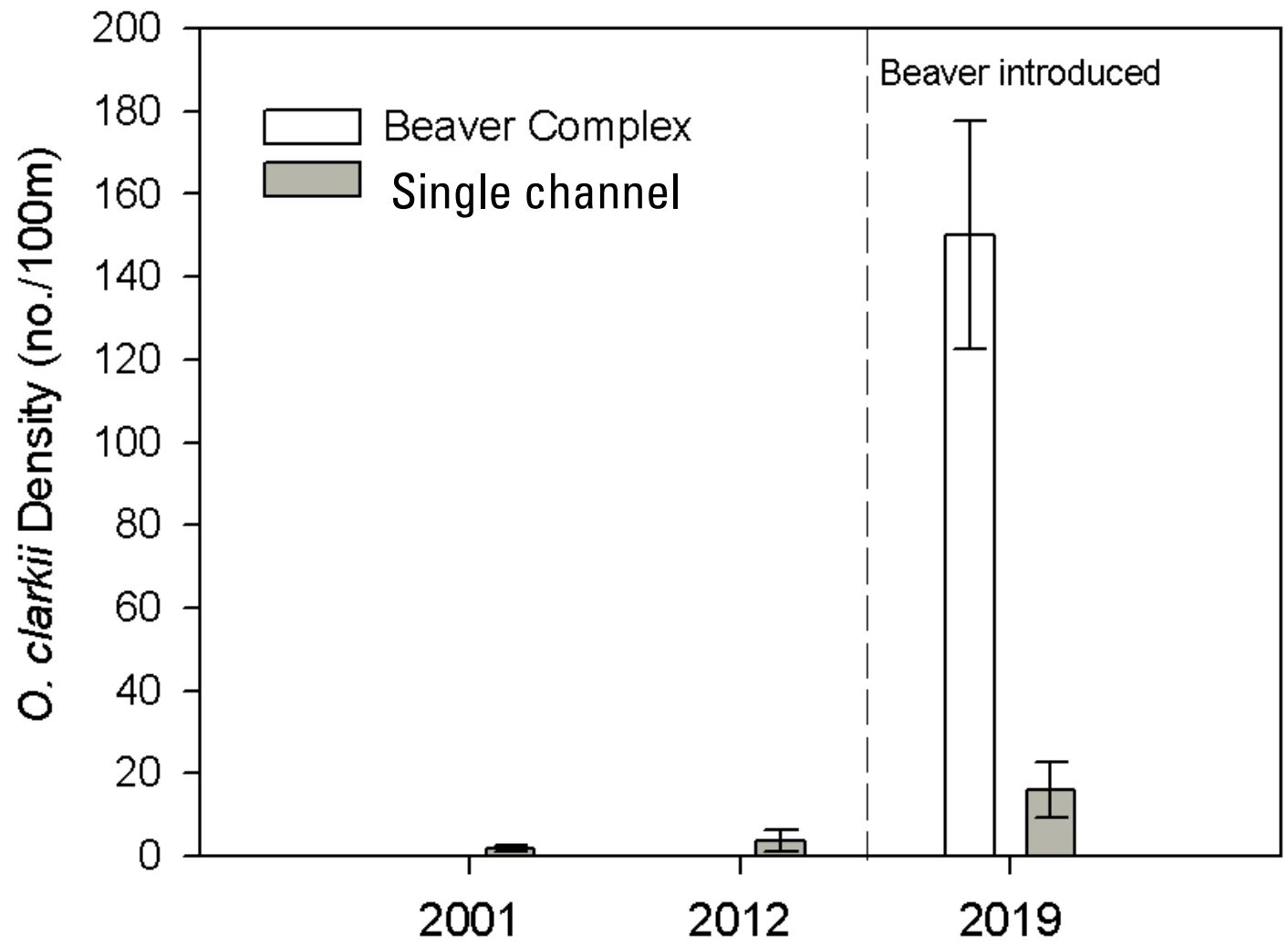
Beaver Dams



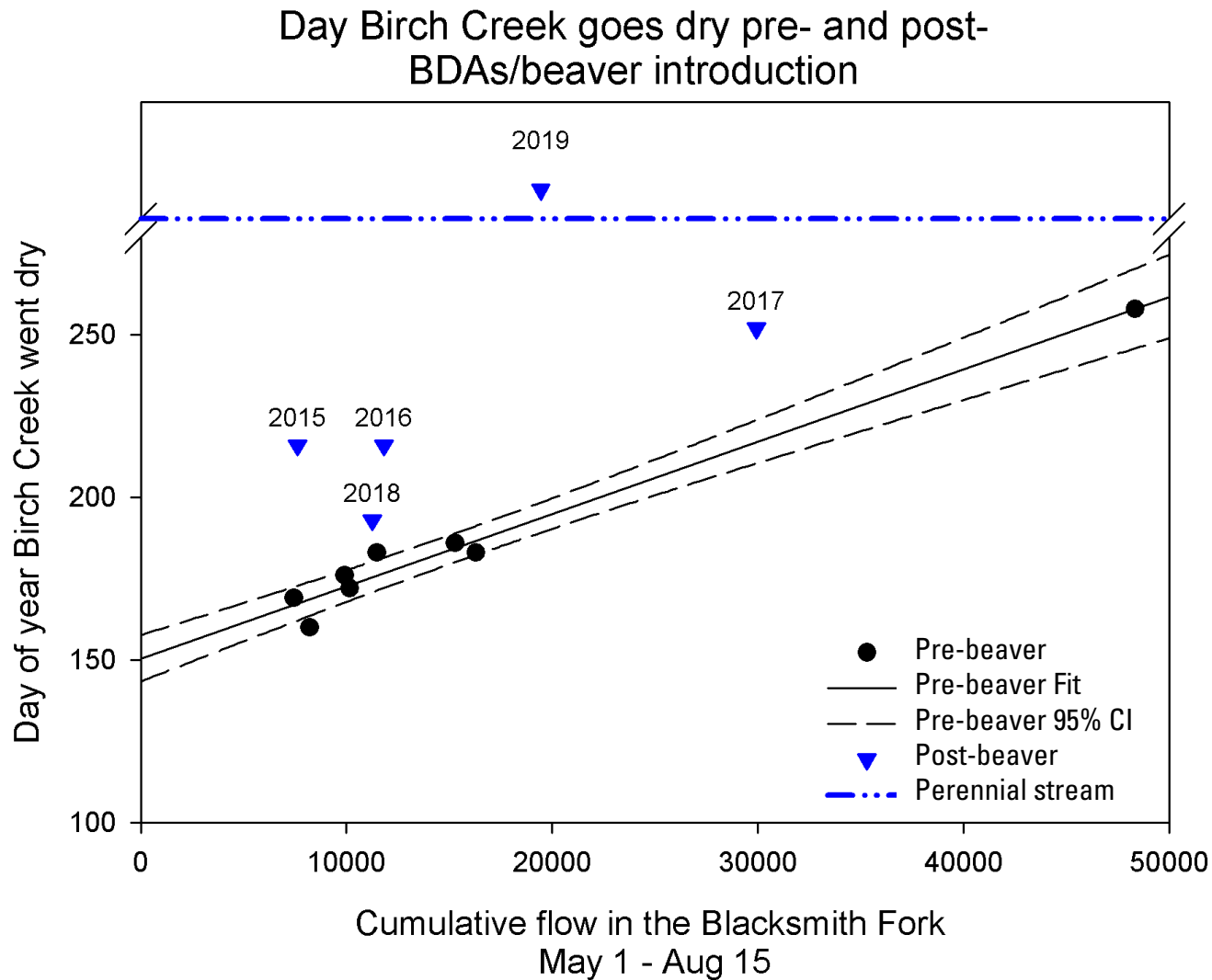
Flow Direction



Relocation of beaver – Birch Creek, ID



Beaver Dams – Low flow duration

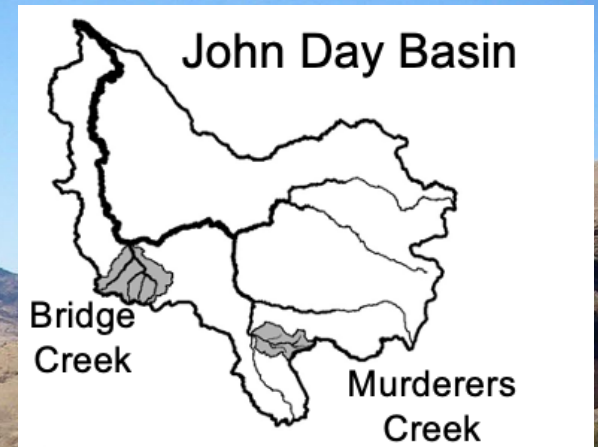


3. Science of Low-tech Process-based Restoration



Intensively Monitored Watersheds IMWs; Bennett et al. (2016)

Birch Creek IMW



Pollock et al. 2014, Bouwes et al. 2016, Weber et al. 2017

Pre-restoration




Demmer and Beschta (2008)

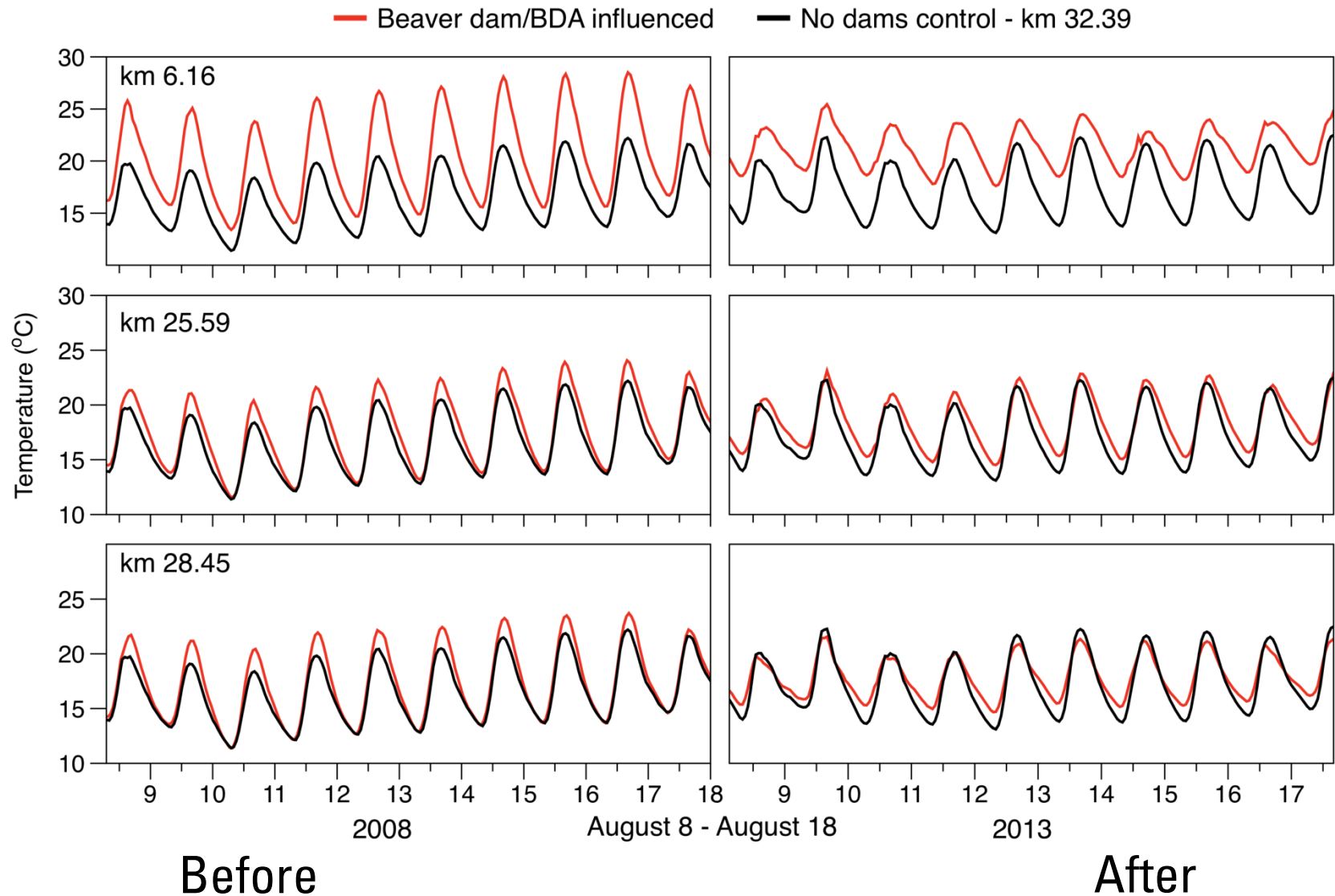
Beaver Dam Analogue Restoration – support and mimic beaver dams



Physical Response – Bridge Creek

- 
- An aerial photograph of Bridge Creek in a rural, hilly landscape. The creek is heavily flooded, with water overflowing its banks and inundating large areas of grassy fields. The water is murky brown, and there is a large accumulation of debris, including fallen trees and branches, in the center of the main channel. The surrounding hills are covered in green grass and some shrubs. In the background, there are more hills and a clear blue sky with some wispy clouds. A paved road is visible on the right side of the image, with a small white car driving on it.
- > 260 dams
 - 1-3' deposition
 - 1-3' water table
 - 230% inundation
 - 1,200% side-channel

Surface Water Temperature Response



Response: Channel Temperature Heterogeneity

Beaver/BDA impounded

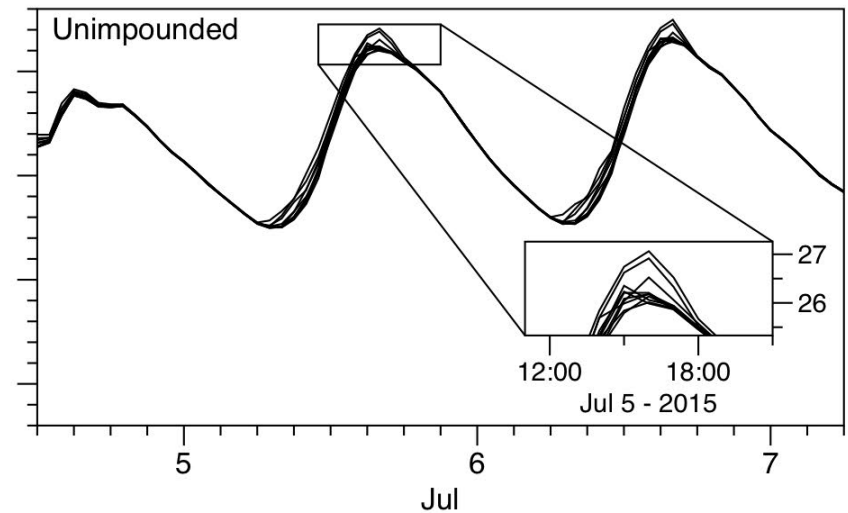
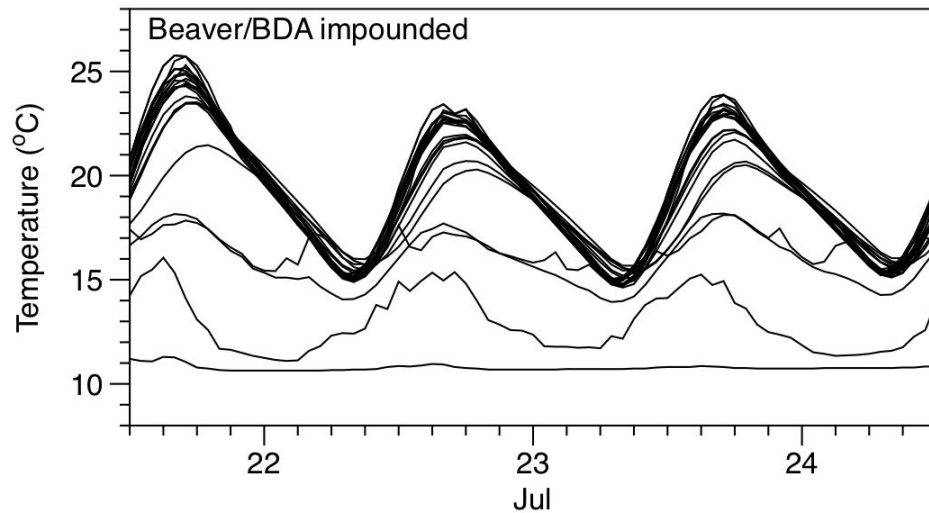


● Temperature measurement location ■ Beaver dam

Unimpounded

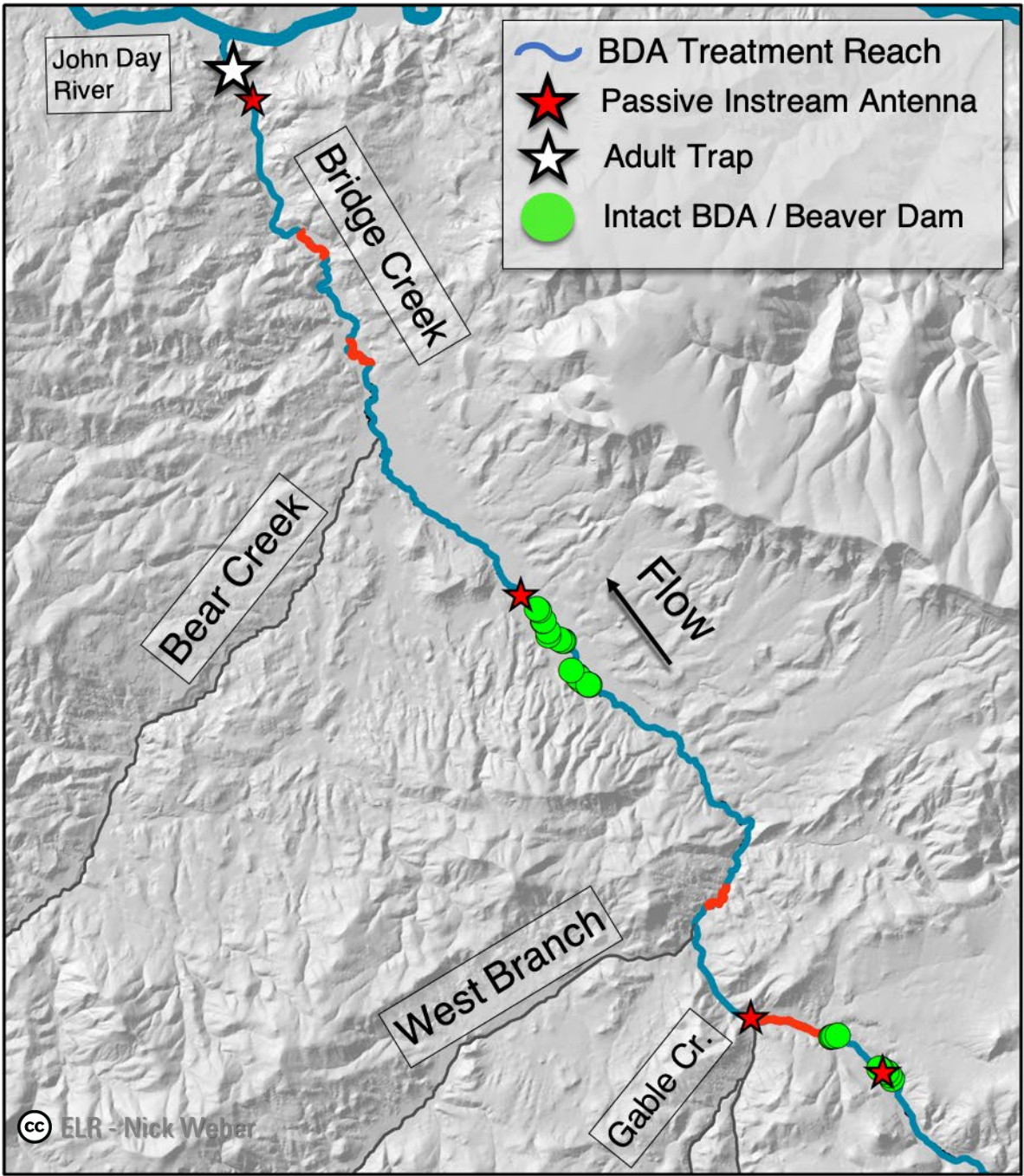


← Flow 0 m 10 m 20 m



From: Weber et al. (2017) PLoS ONE

DOI: [10.1371/journal.pone.0176313](https://doi.org/10.1371/journal.pone.0176313)



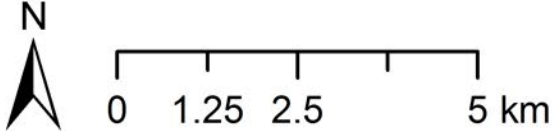
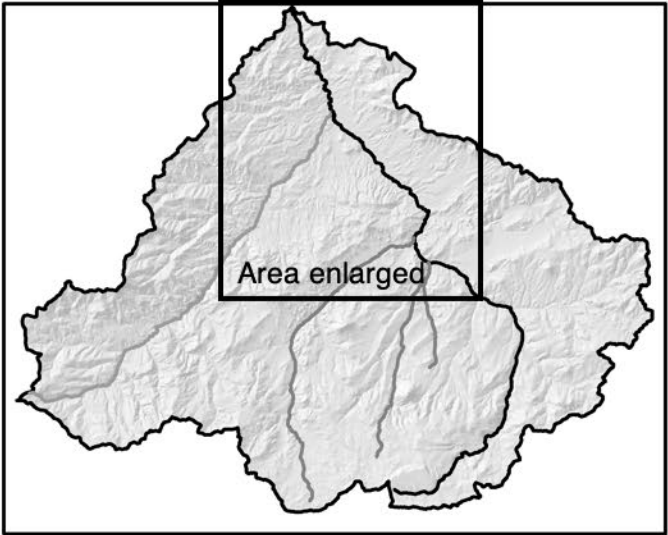
2009

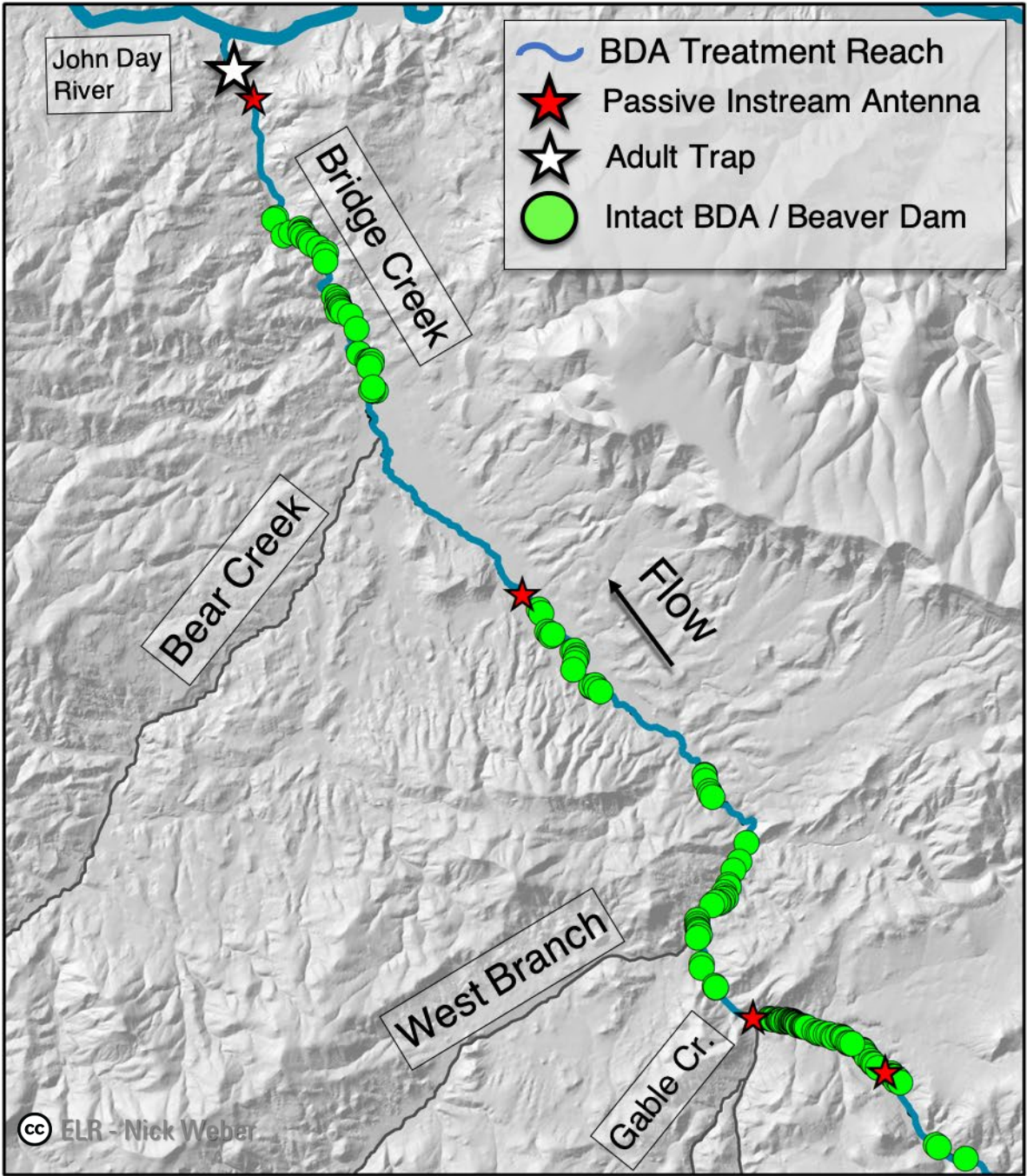
Pre-restoration

22 Beaver Dams



17% Passage





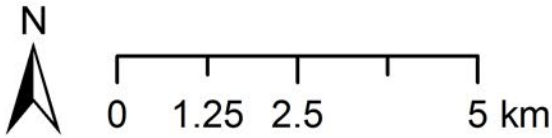
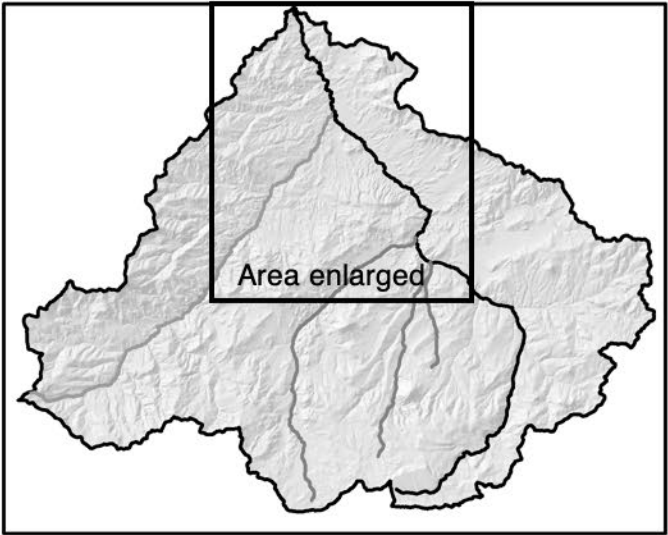
2016

Post-restoration

164 Beaver Dams



29% Passage



Fish Response – Bridge Creek



168% increase in abundance

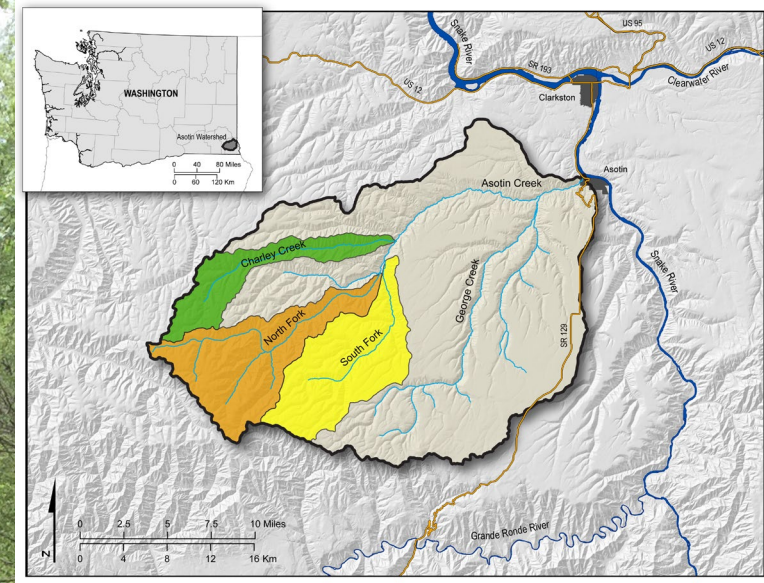
X
65% decrease in growth

X
52% increase in survival

=

172% increase in production (g/km/year)

Asotin Creek IMW

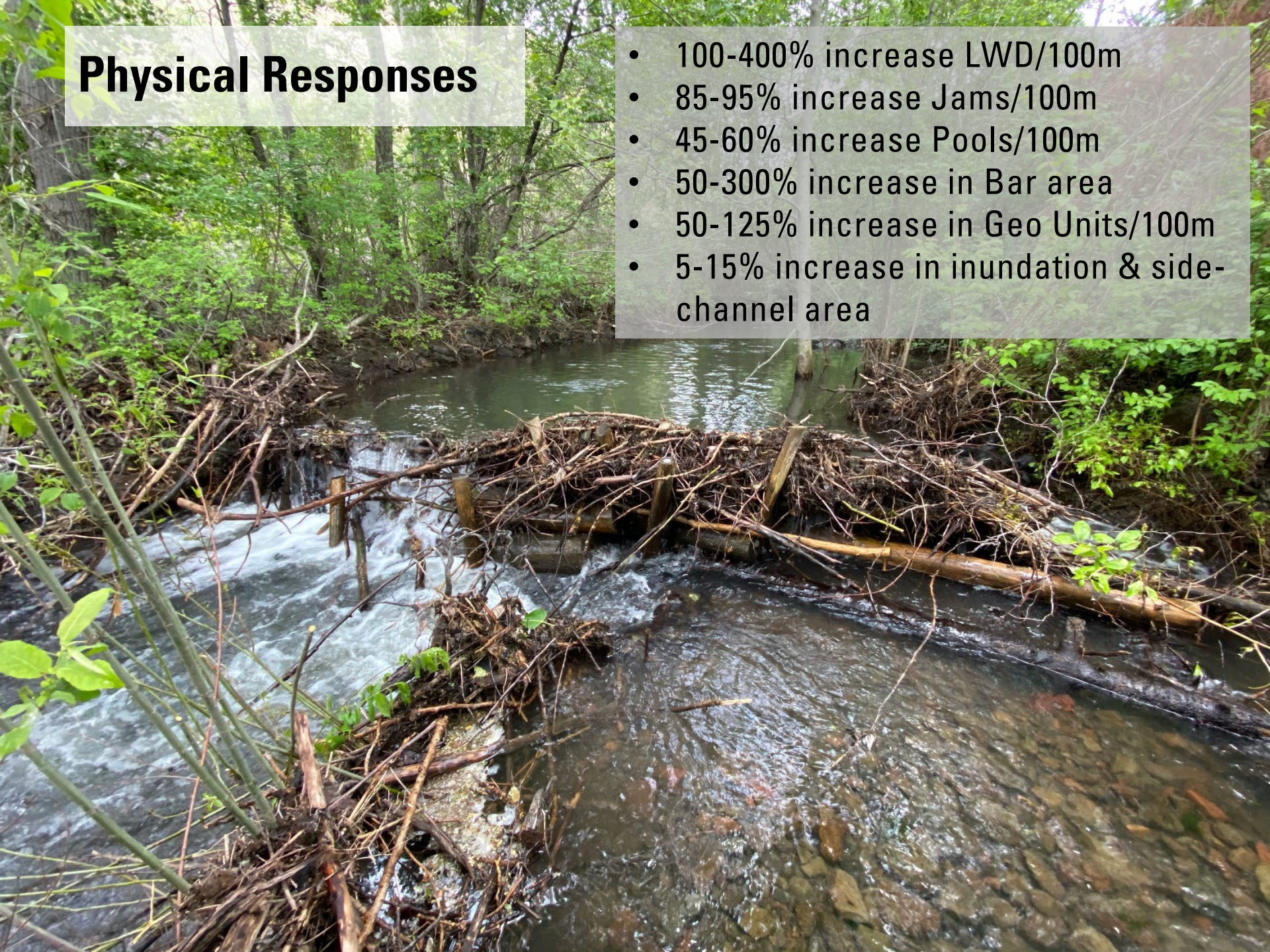


High-density post-assisted log structure treatment



Physical Responses

- 100-400% increase LWD/100m
- 85-95% increase Jams/100m
- 45-60% increase Pools/100m
- 50-300% increase in Bar area
- 50-125% increase in Geo Units/100m
- 5-15% increase in inundation & side-channel area



Physical Responses – Asotin Creek



Fish Response – Asotin Creek



40-50% increase in abundance
X
0% change growth & survival
=
25-90% increase in production (g/km/year)
30-80% increase in productivity (smolts/♀)

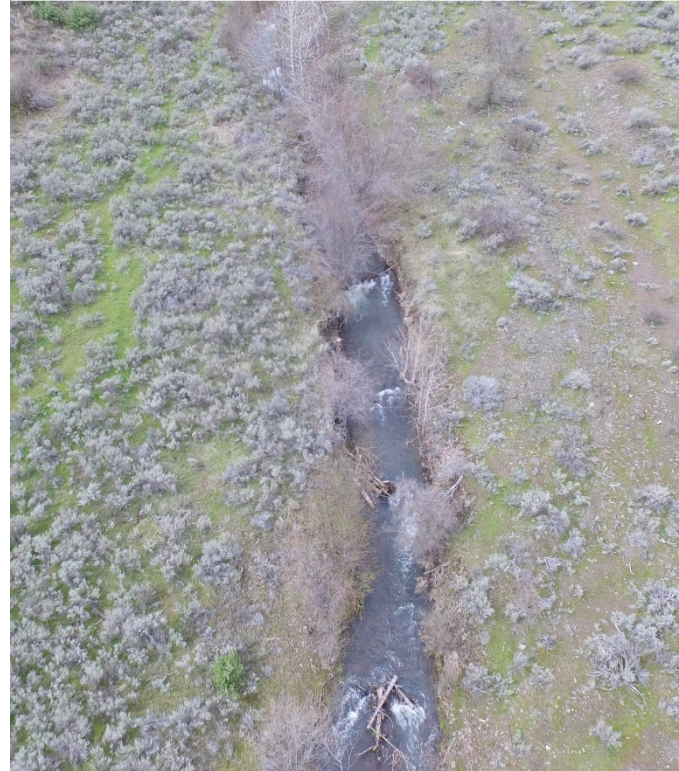
Contrasting Fish Responses

- Inundation ↑ 230%
- Production ↑ 170%



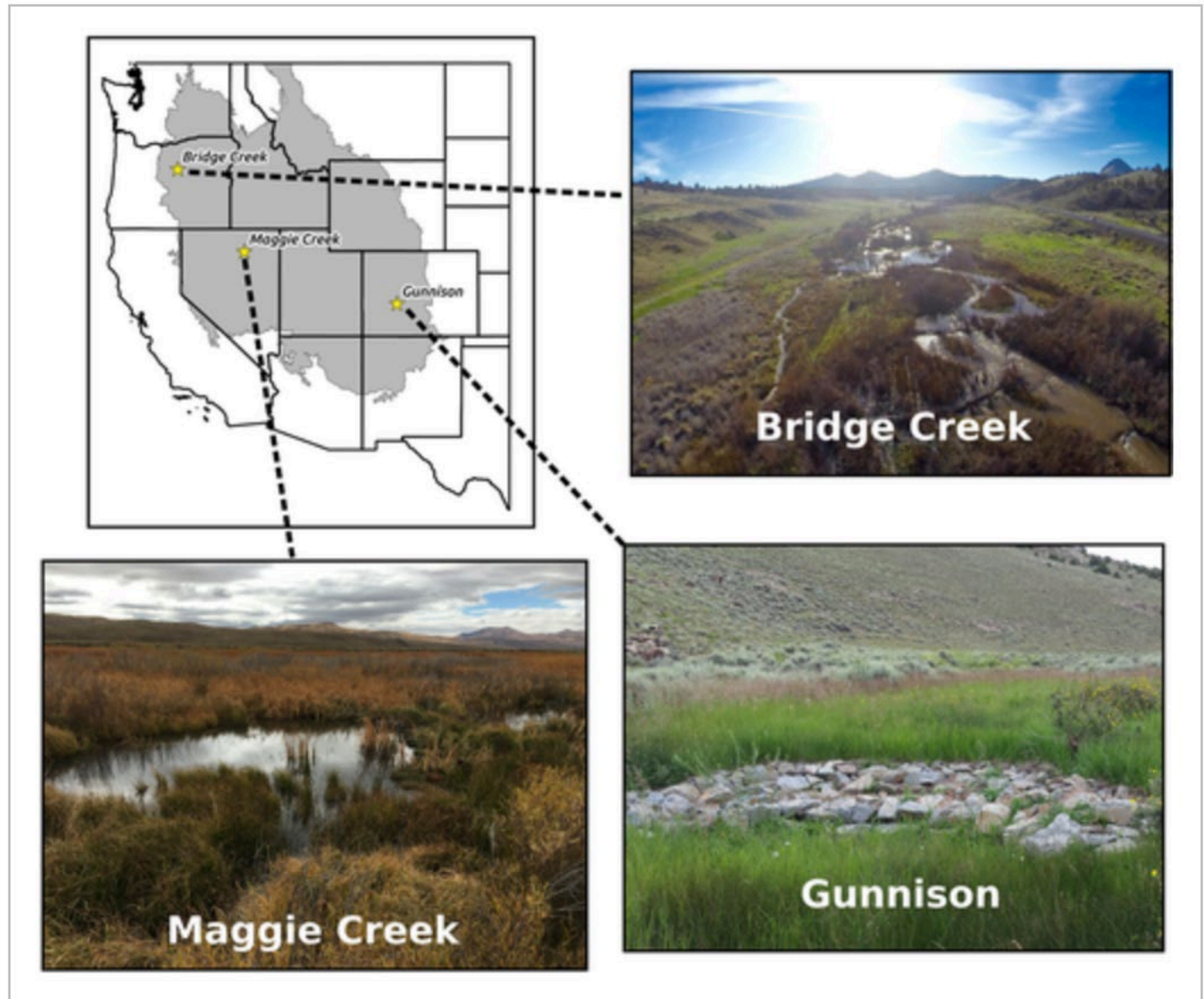
Bridge IMW
(120 BDAs)

- Inundation ↑ 5-15%
- Production ↑ 25-90%



Asotin IMW
(~700 PALS)

Low-tech - Resilience



Silverman et al. (2018)

An aerial photograph of a river valley in a dry, mountainous region. The river flows through a lush green riparian area, contrasting with the surrounding brown, rocky, and sparsely vegetated slopes. The valley is flanked by steep, rugged mountains under a clear blue sky with a few wispy clouds.

Baugh Creek, ID

Beavers and wood = fire (ecological) resilience

Fairfax and Whittle 2020

Supporting Science – Questions/Discussions