

Let the System Do the Work:

What we Know About Low-tech Process-based Restoration

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Lessons Learned from Intensively Monitored Watersheds: 03/26/2024





The Message

Context

Scale

Maintenance

Adjustments

Time

The Message

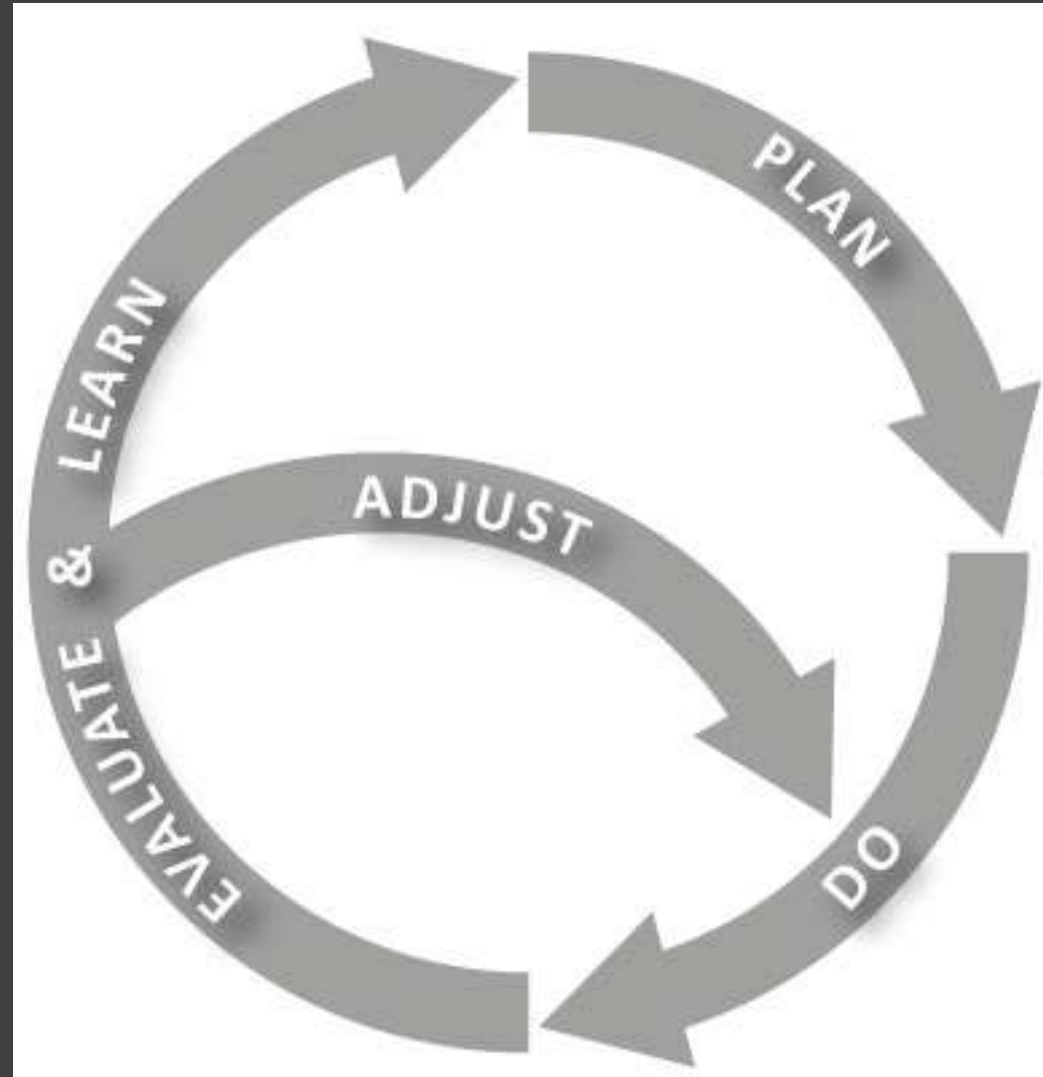
Context

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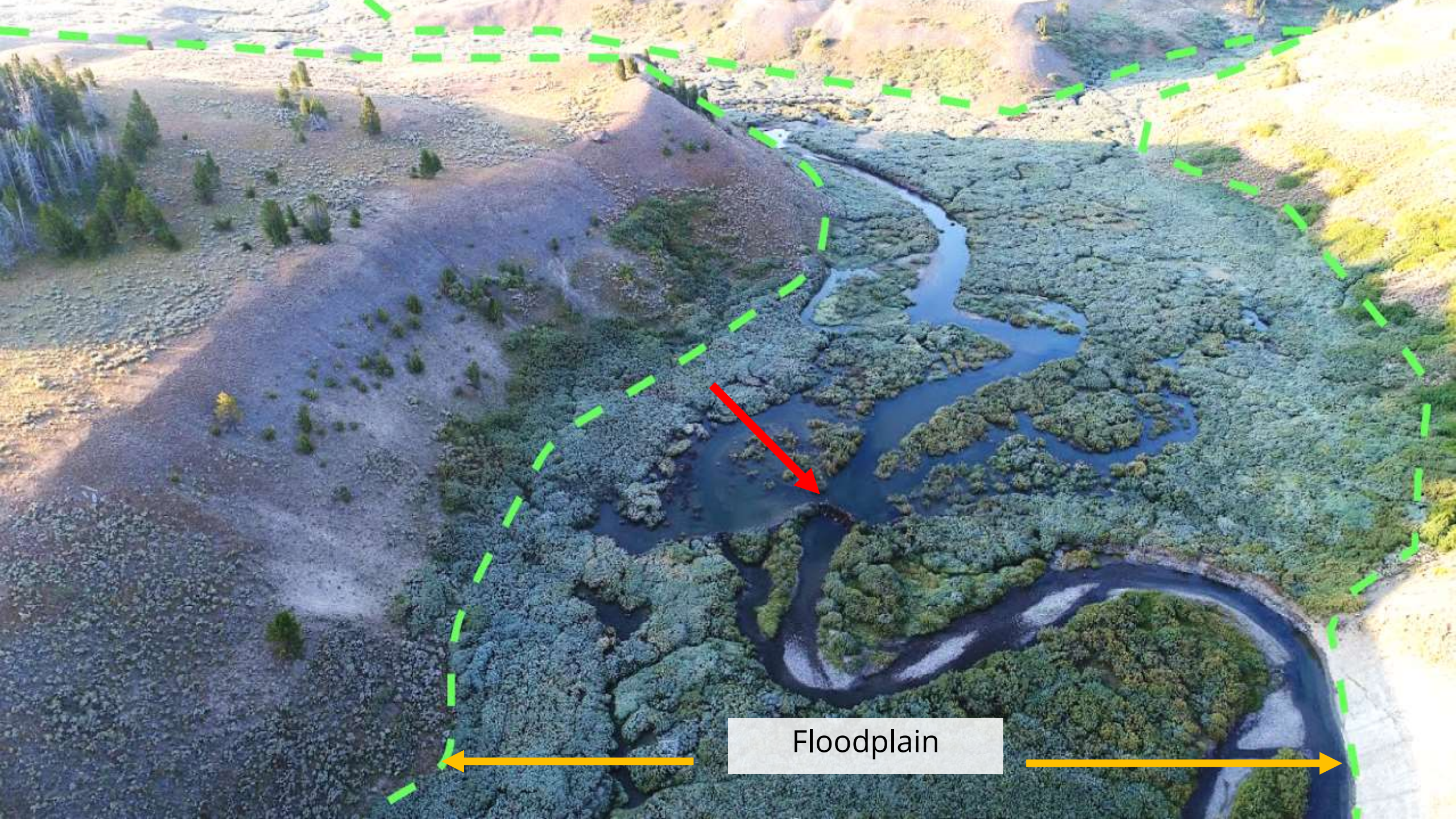
Time



Outline

- LTPBR Background
- Lessons
 - IMWs
 - Case studies
- Why it matters?
- So What?





Floodplain





Floodplain



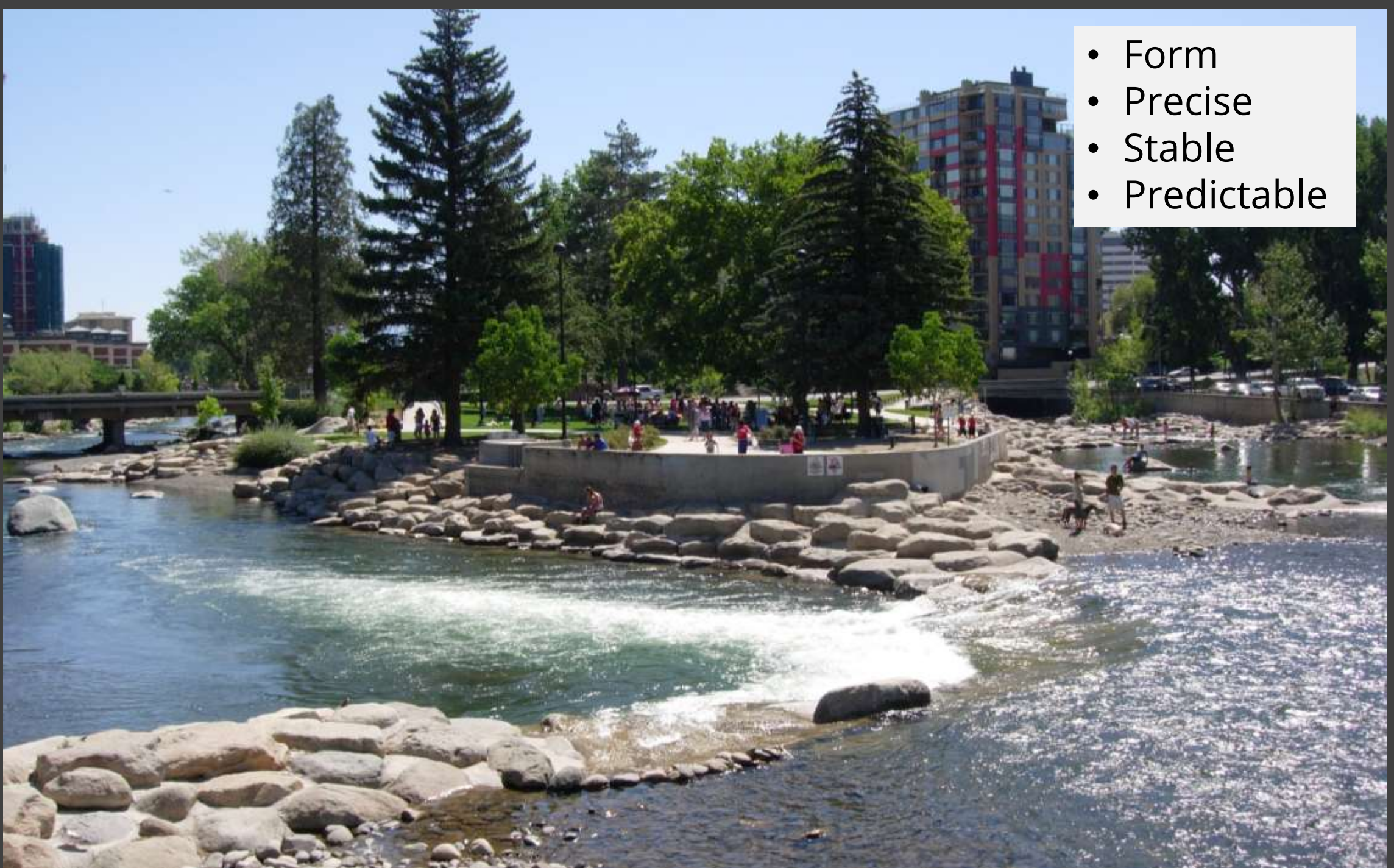








- Form
- Precise
- Stable
- Predictable





- Processes
- Root Cause
- Local setting
- Scale
- Explicit Outcomes

Low-tech Process-based Restoration



Low-tech is not new

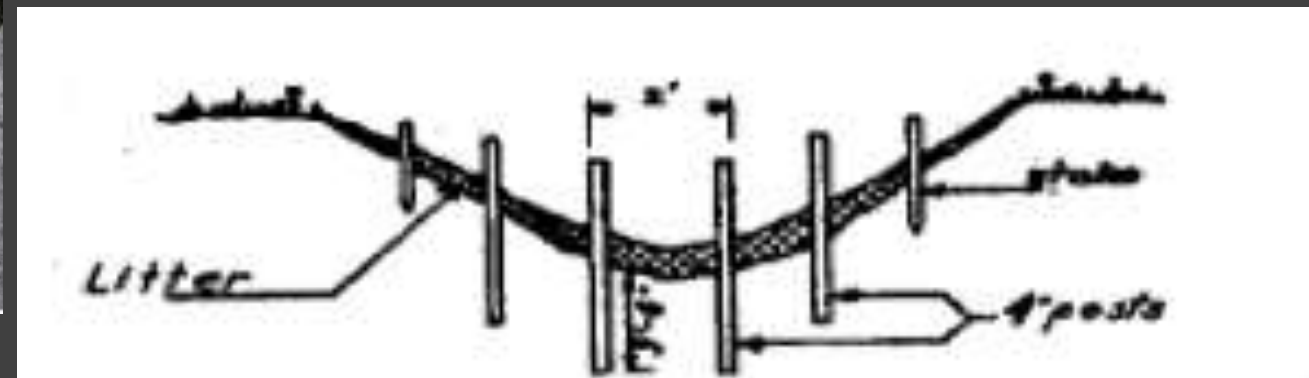


Figure 21

Elevation of gully after banks have been dug back. The posts have been set, and the layer of litter has been placed.



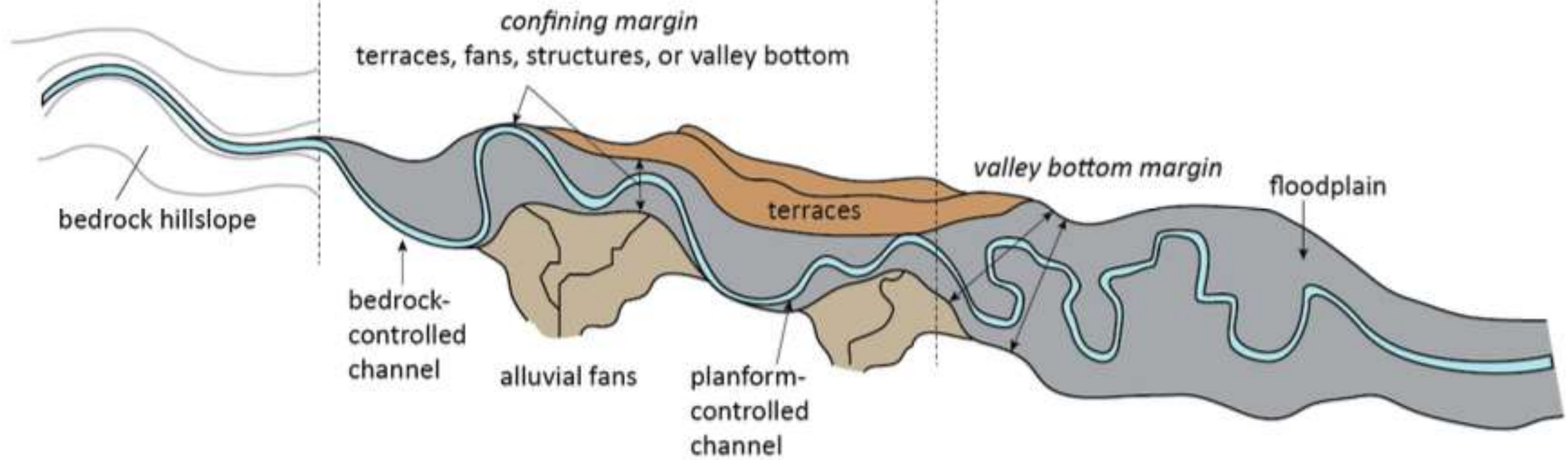


Context

Laterally Confined

Partly Confined

Laterally Unconfined



“Regimes”



Condition & Recovery Potential



Design Objectives



Beaver relocation

Design Objectives

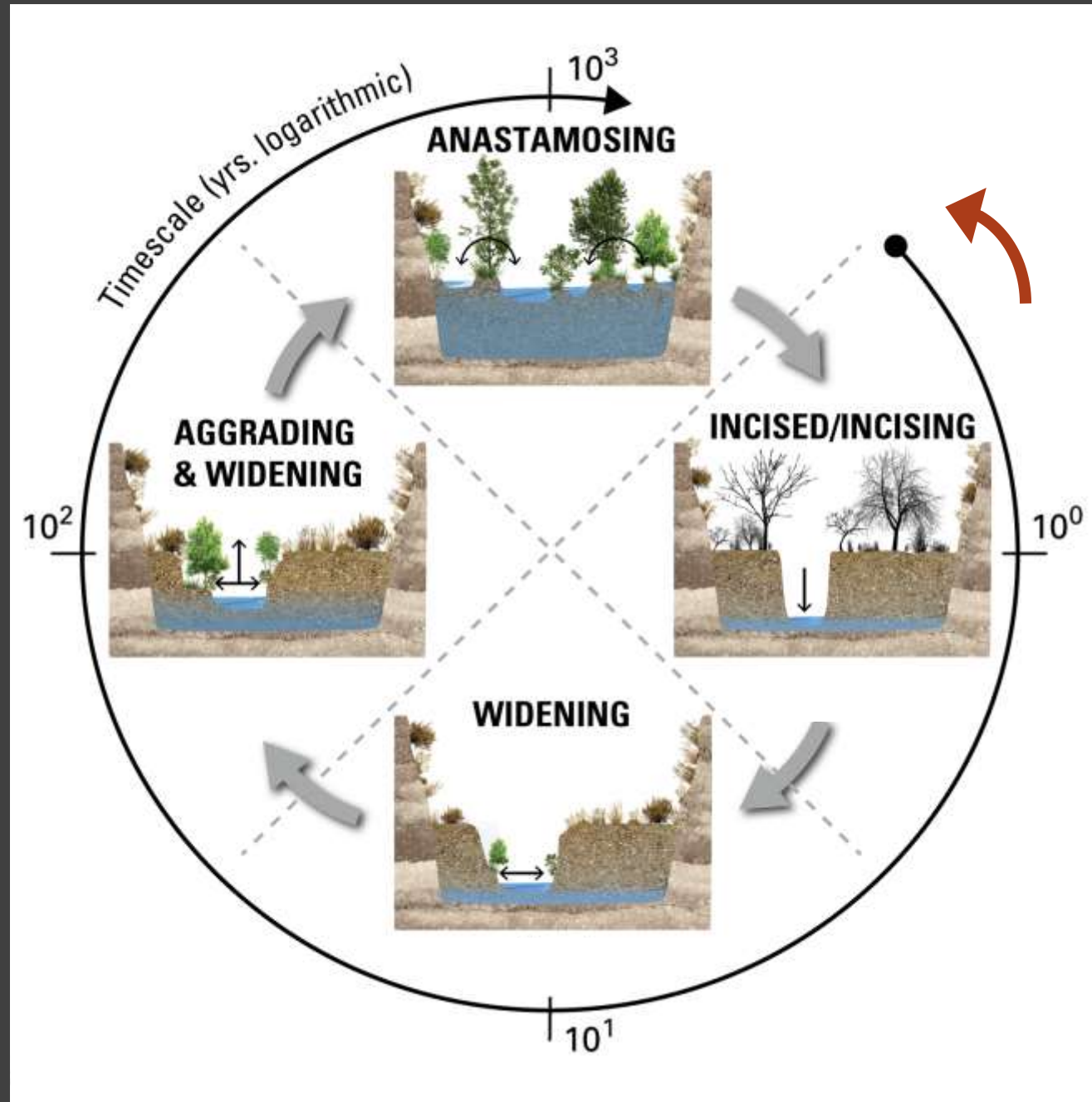


Incision
Recovery



Connection &
Complexity

Design - Stream Evolution







Low-tech process-based restoration – Case Studies

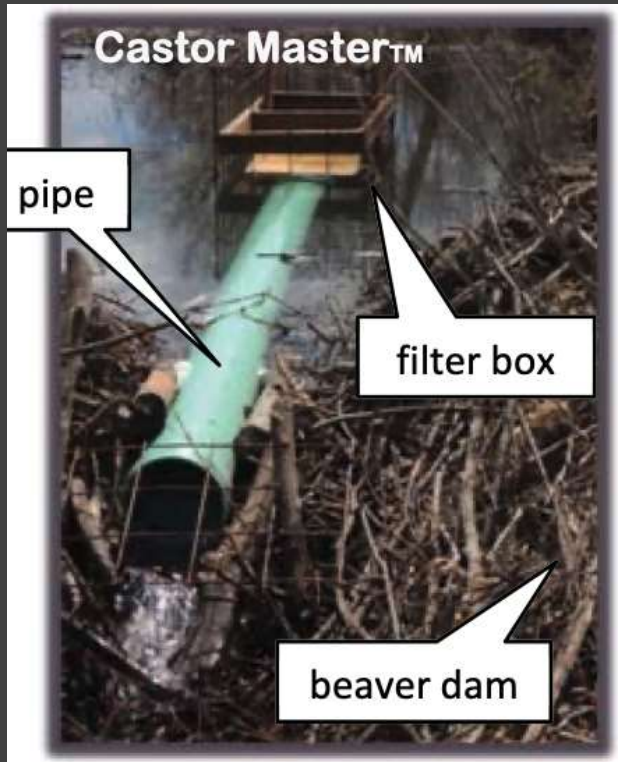


Attitude towards Beaver?

L-1911
02-01



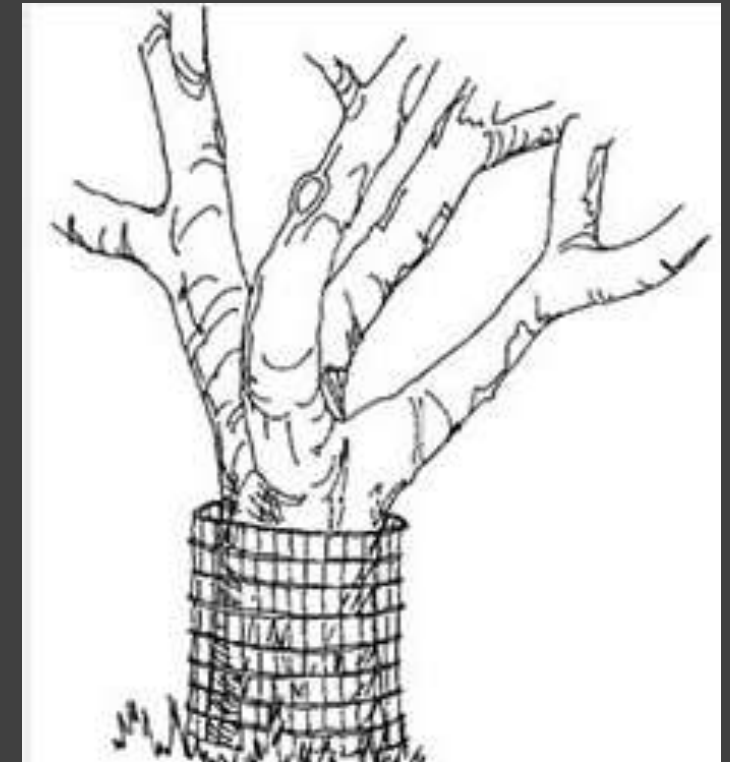
Living with beaver



Leveler



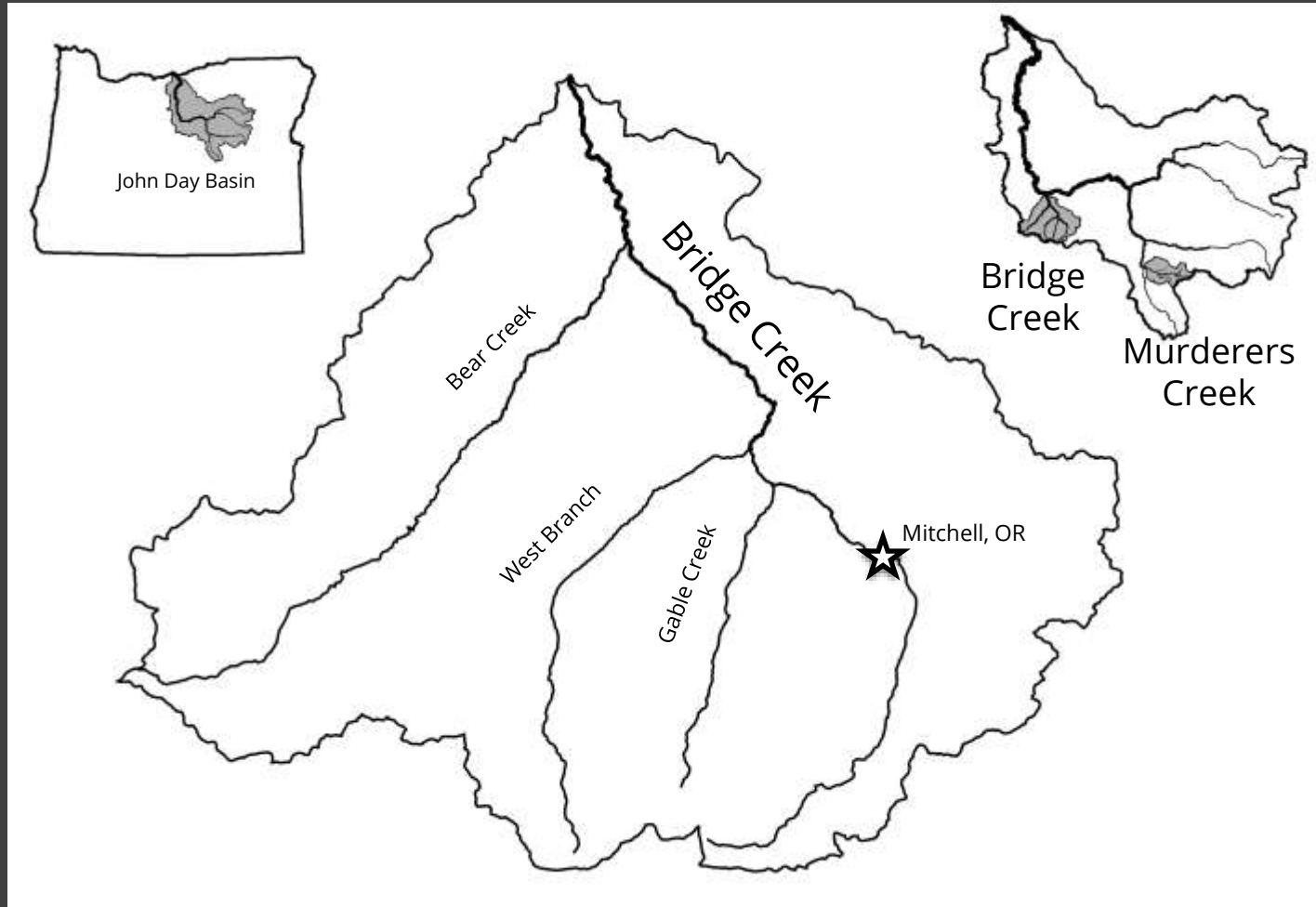
Deceiver



Protection

Bridge Creek Intensively Monitored Watershed

Oregon, USA Bridge Creek Watershed John Day Basin



Mid-Columbia Steelhead



Birch Creek Intensively Monitored Watershed, Oregon





120 BDAs, 4 km



300+ Beaver dams



Fish Response – Bridge Creek



168% increase in abundance

~~65% decrease in growth~~

~~52% increase in survival~~

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



Summer 2005

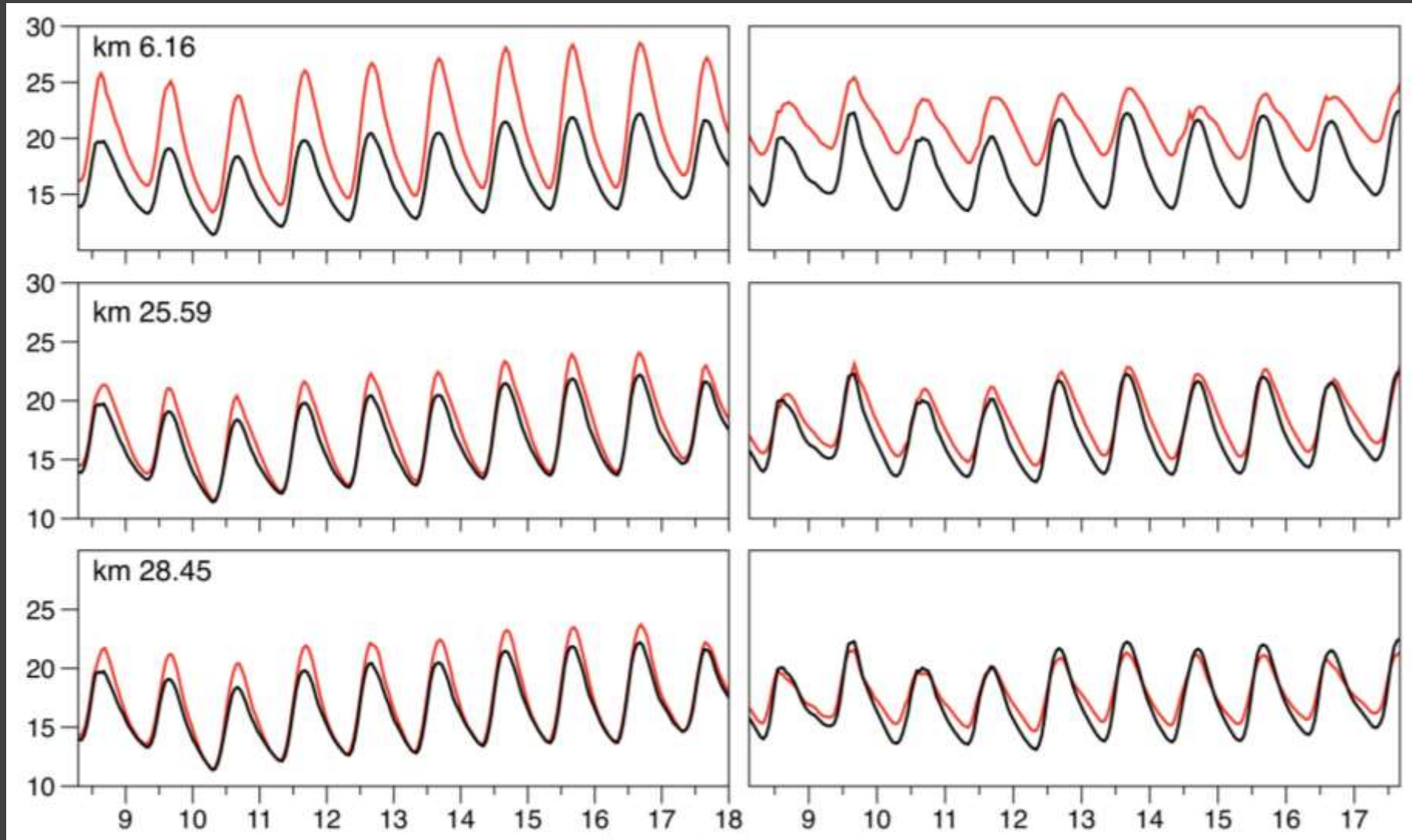


Summer 2015



Summer 2022

Water Temperature Response



2008
BEFORE

Days in August

2013
AFTER

Water Temperature Heterogeneity

Beaver/BDA impounded

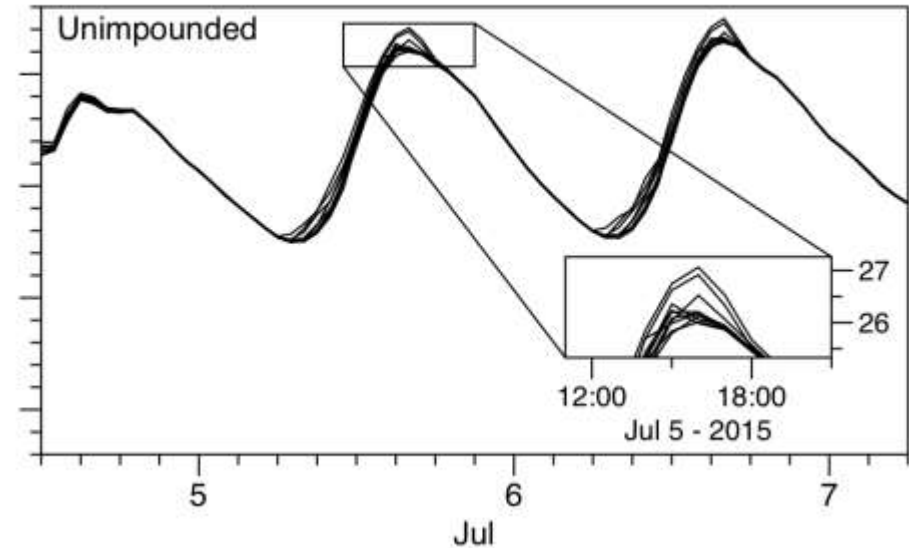
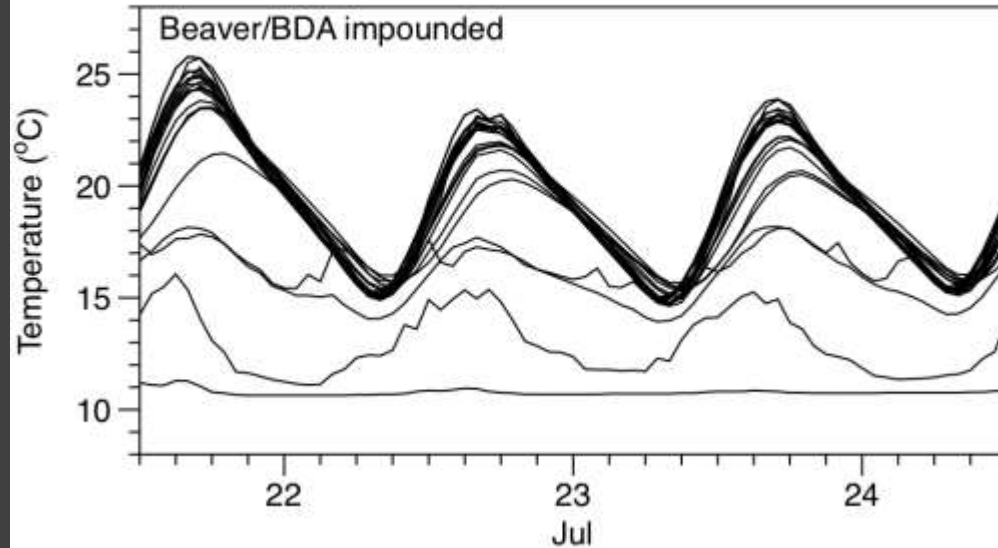


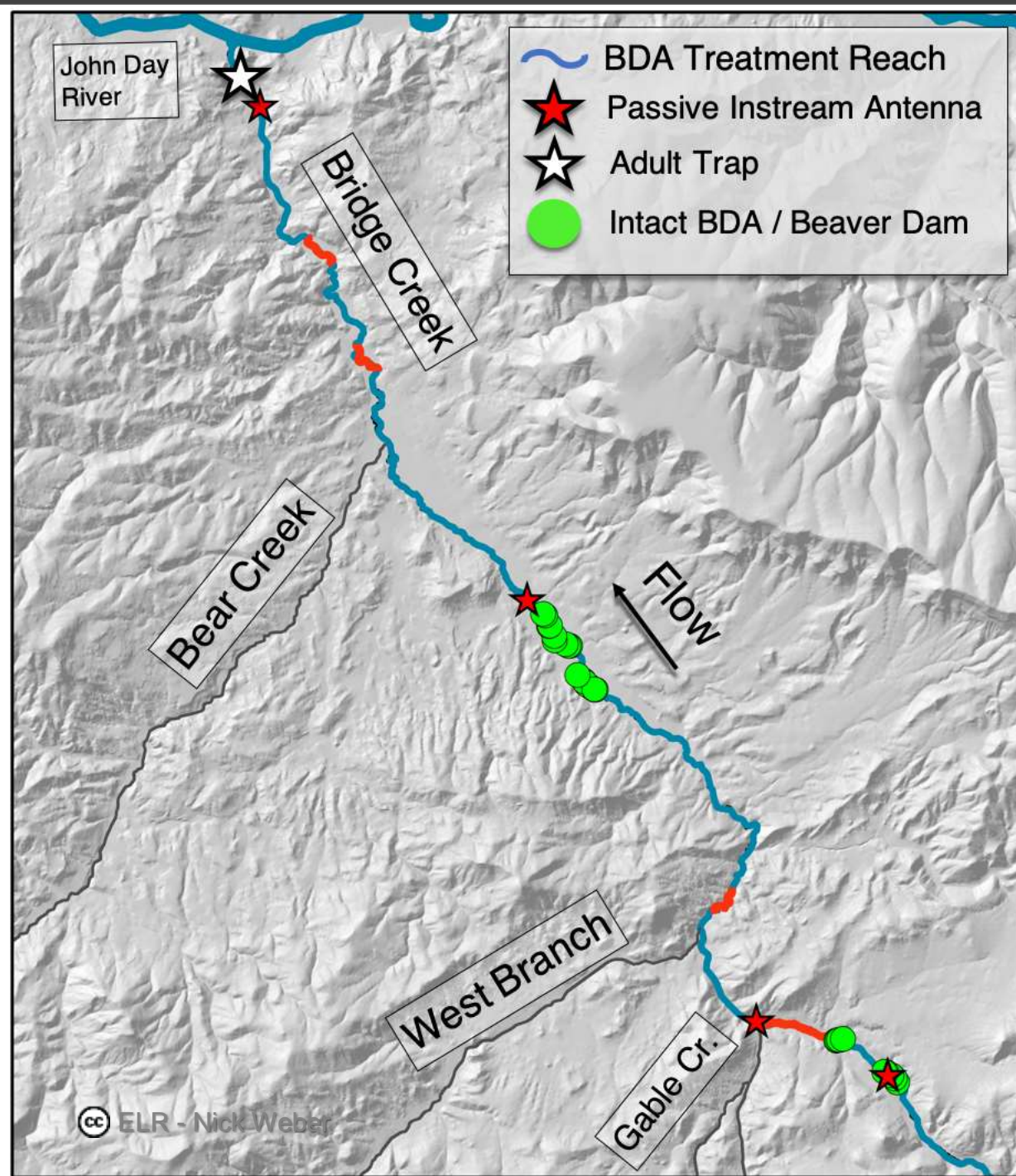
● Temperature measurement location ■ Beaver dam

Unimpounded



← Flow 0 m 10 m 20 m





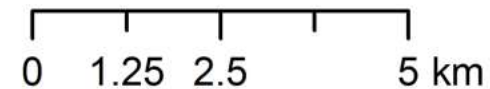
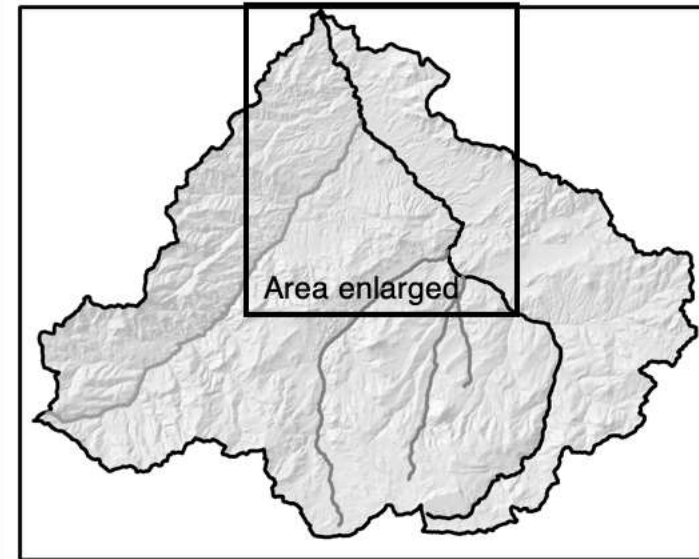
2009

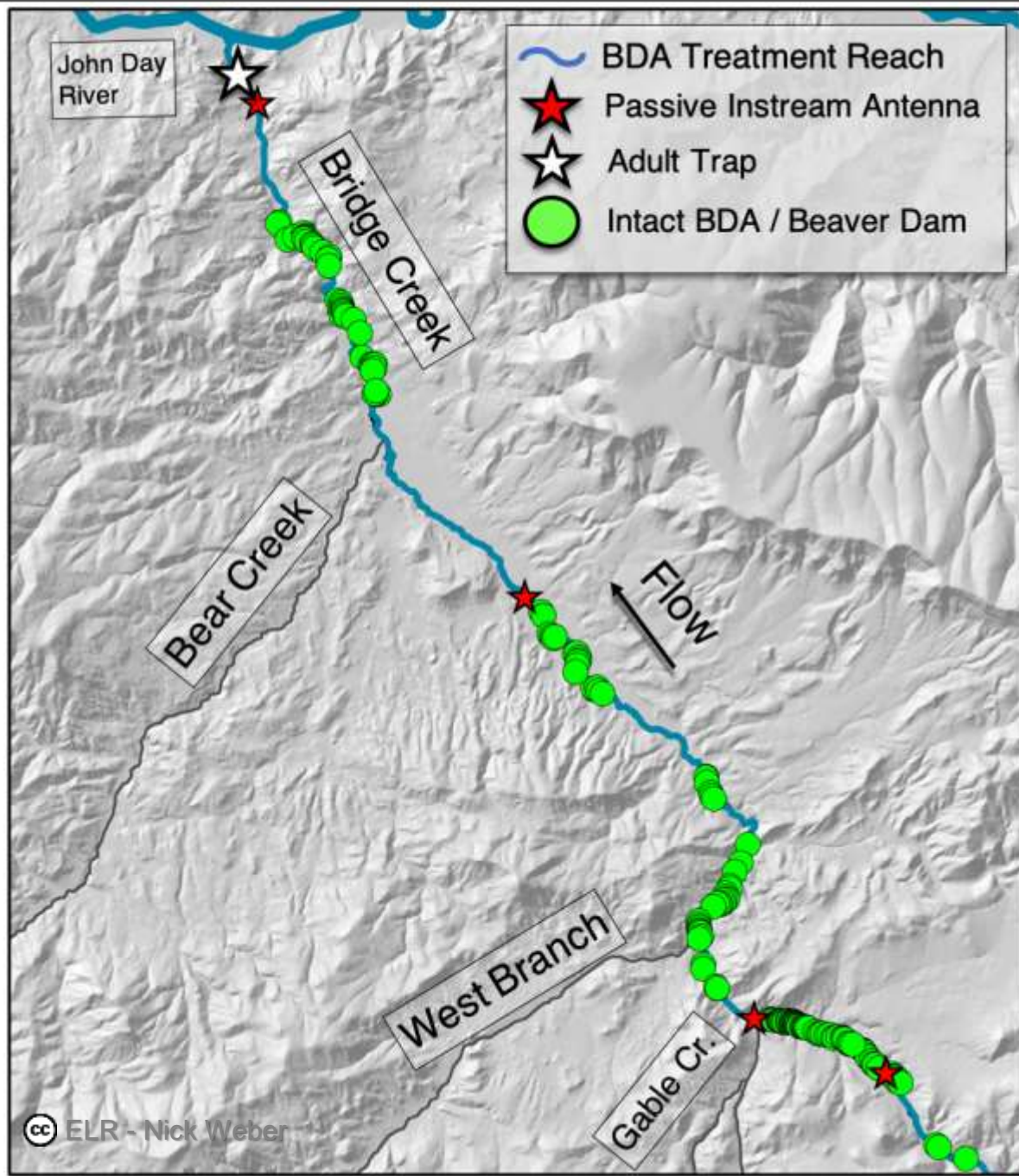
Pre-restoration

22 Beaver Dams



17% Passage





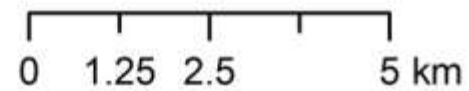
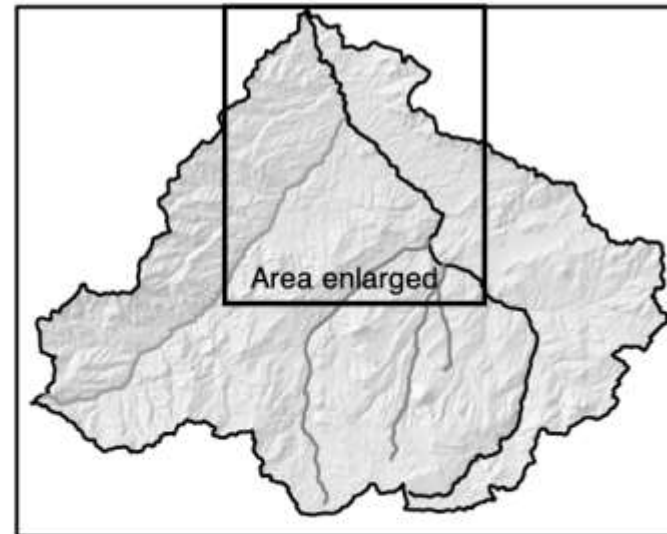
2016

Post-restoration

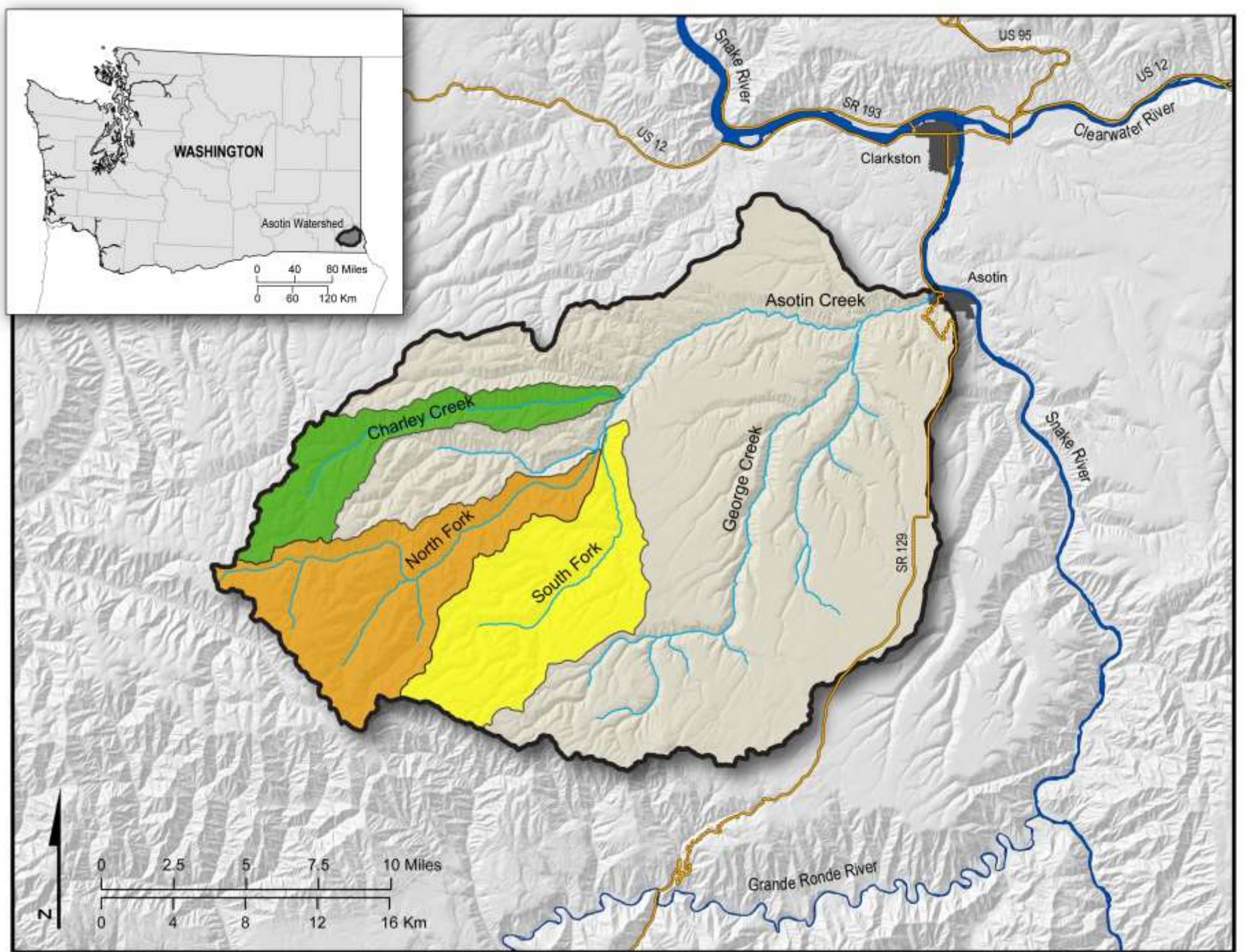
164 Beaver Dams



29% Passage



Asotin Creek IMW



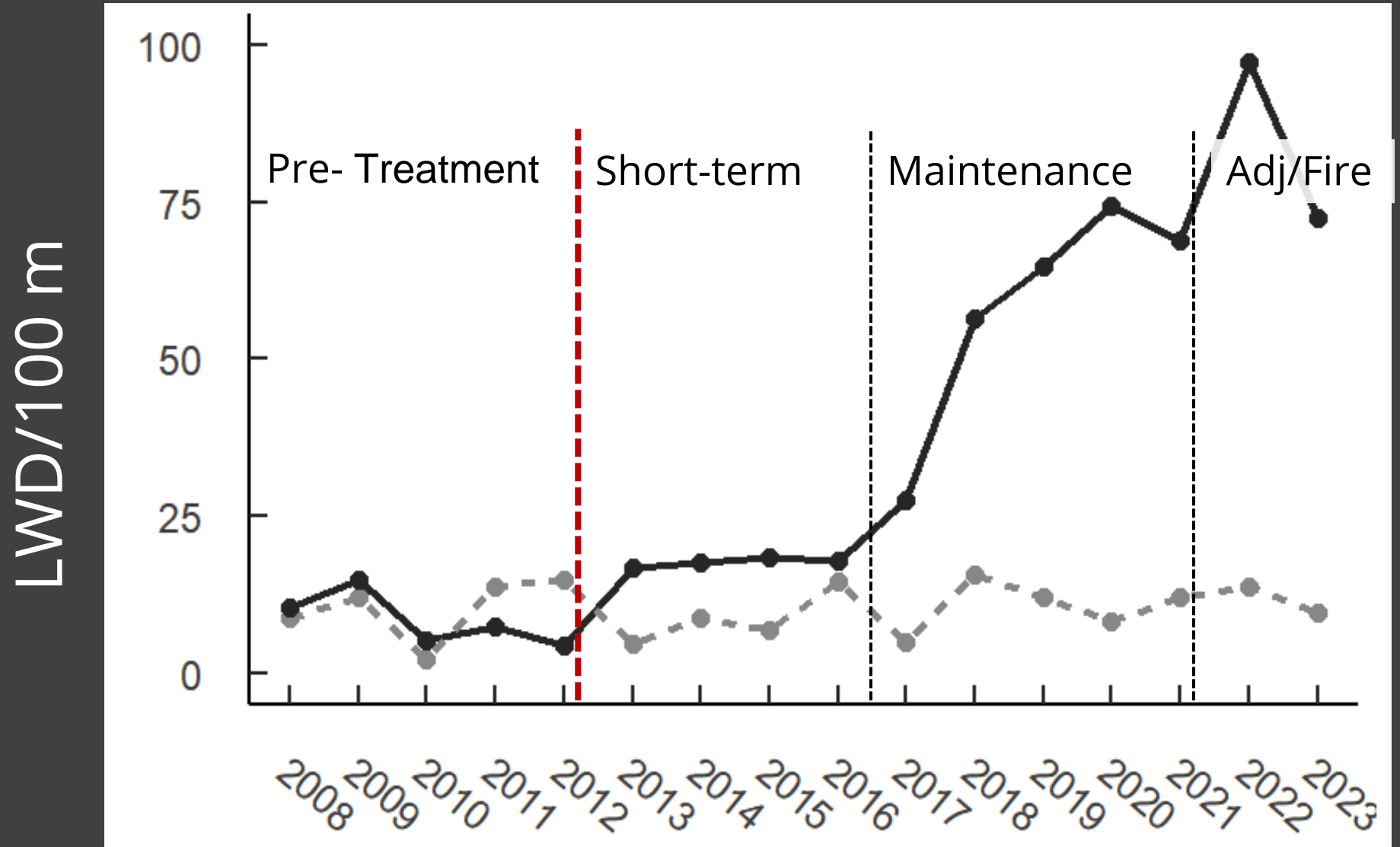
Asotin Creek Intensively Monitored Watershed, Washington



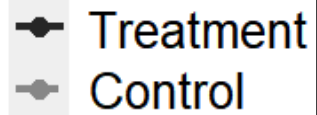




Results

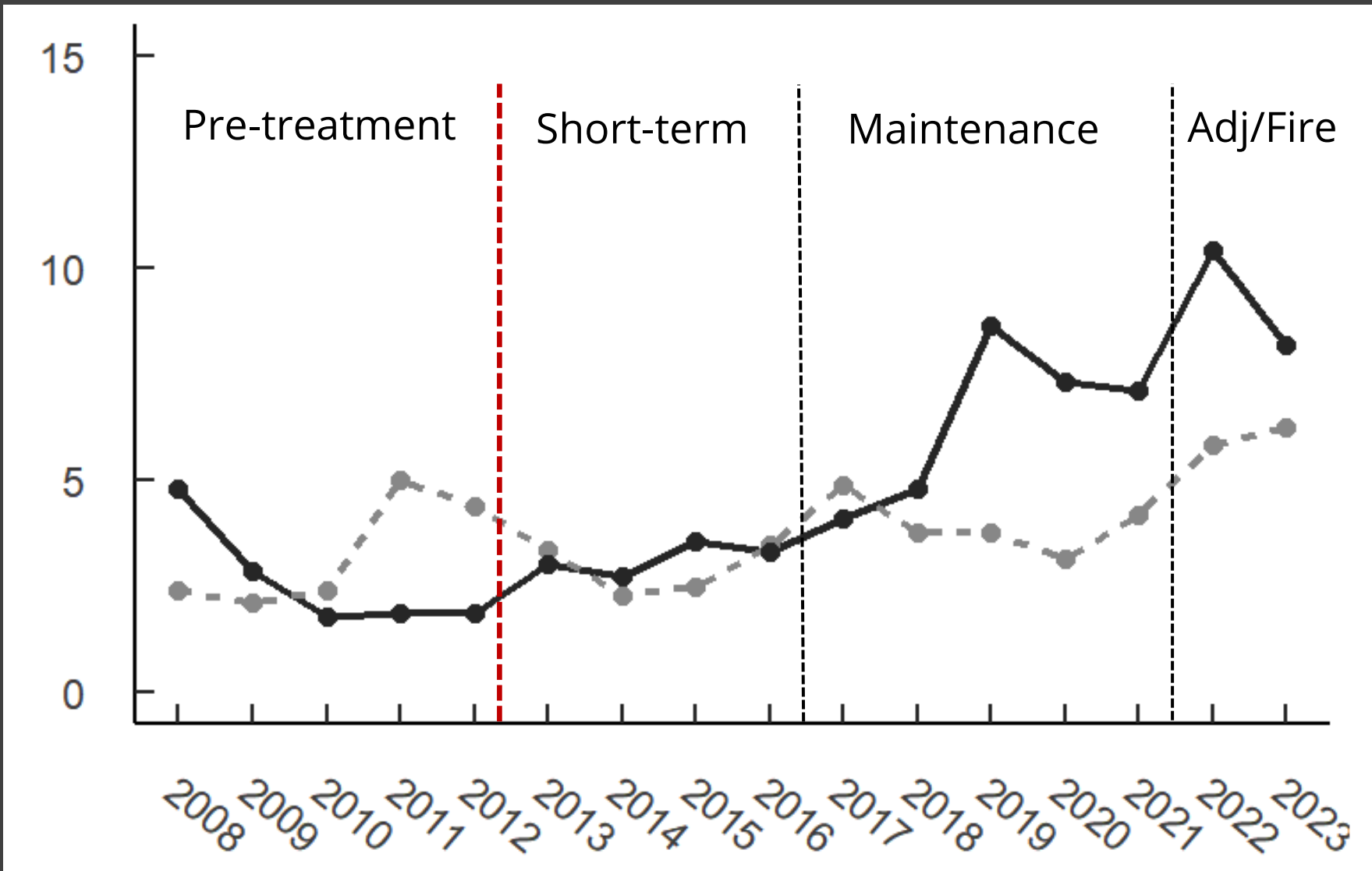


South Fork

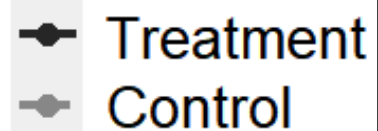


Short-term
Complexity

Pools/100 m



South Fork







Adjustment:
Fire = Larger Wood



Adjustment:
BDAs



Adjustment: Side-channel connection



Fish Response – Asotin Creek



25-40% increase in abundance

0-5% change ^X growth & survival

25-40% increase in = production (g/km/year)*

25-90% increase in smolts

Contrasting
Fish Responses

Inundation + 230%

Production + 170%



Bridge IMW - 120 BDAs

Side-channels + 600%

Production + 40 %



Asotin IMW ~750 PALS & Jams

Example: Susie Creek, Nevada - Beaver colonization



Carol Evans
BLM



Jon Griggs
Rancher

Example: Susie Creek, Nevada - Beaver colonization



1989
Summer grazing



2017
Fall grazing > Willow > Beavers

Example: Birch Creek, Idaho - Beaver relocation



Deep water refuge



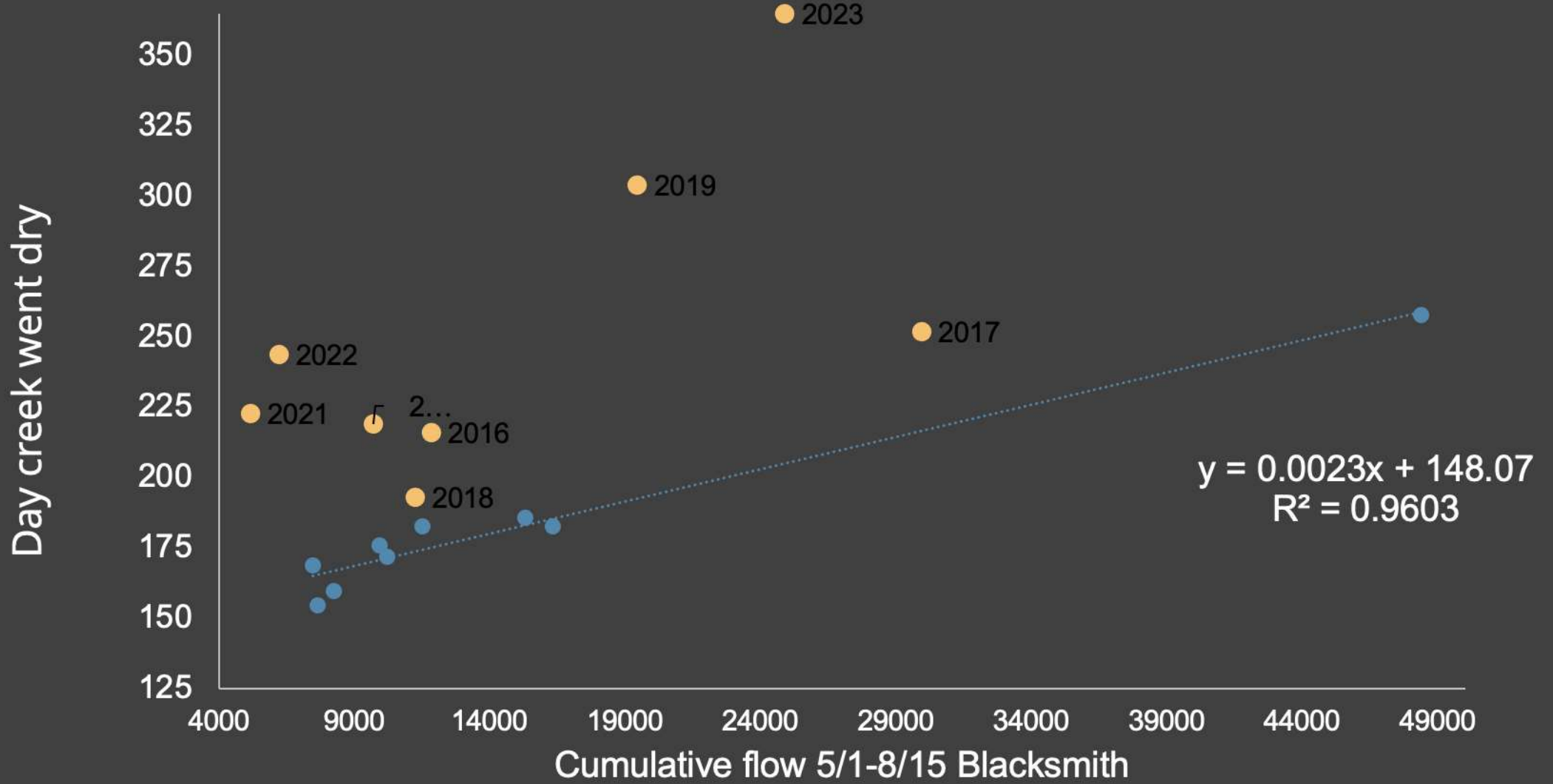
Example: Birch Creek, Idaho –water and fish benefits



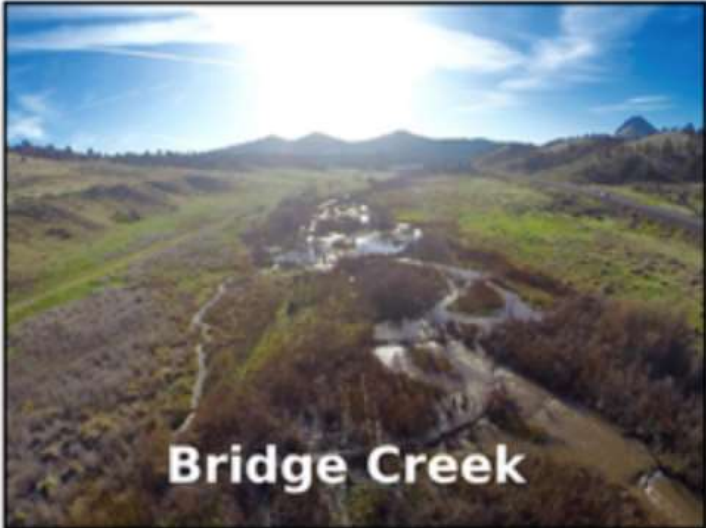
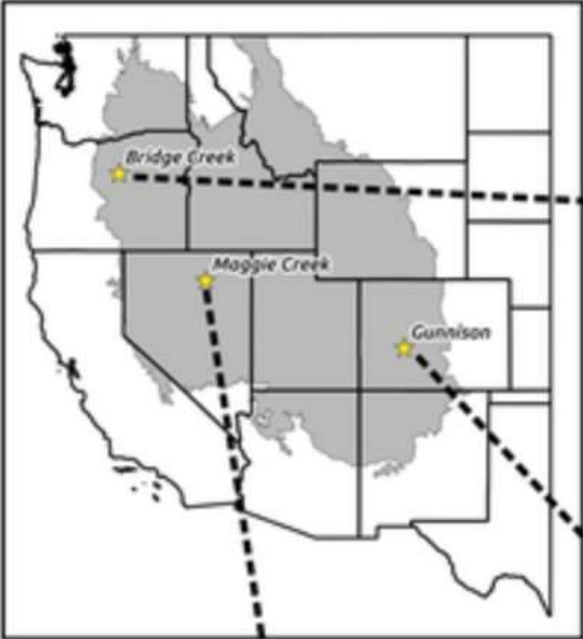
Water response

● pre-beaver

● post-beaver



Low-tech - Resilience



What Does it Mean?

- Benefits of beaver & wood indisputable
- Floodplain connection maximizes productivity
- Long-term commitment
 - Maintenance, enhancement, & adjustment



So What?

- Low-tech PBR method
- Effective
 - Geomorphic/Habitat
 - Fish Response
- Engagement and Scale-able
 - Scope of degradation
 - Climate mitigation



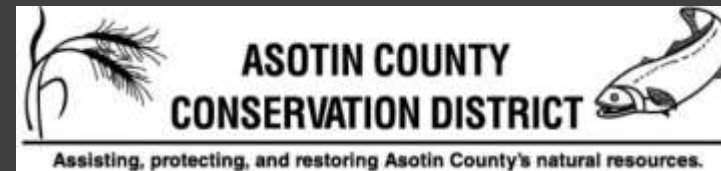
Low-tech Process-based Restoration Resources

- <http://lowtechpbr.restoration.usu.edu>
 - Manual, field guide, past and current workshops
- <https://bda-explorer.herokuapp.com>
 - Repository of LTPBR projects by organization and location
- <https://riverscapes.net>
 - Riverscape data warehouse, planning and assessment GIS tools,

Funding and Administration

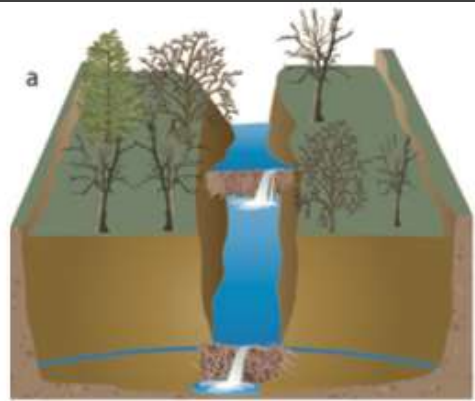


Collaboration & Support



THE END





Post-line Wicker Weave



Building BDAs



Drive posts

Brush, sediment, sod, and mud

Building BDAs

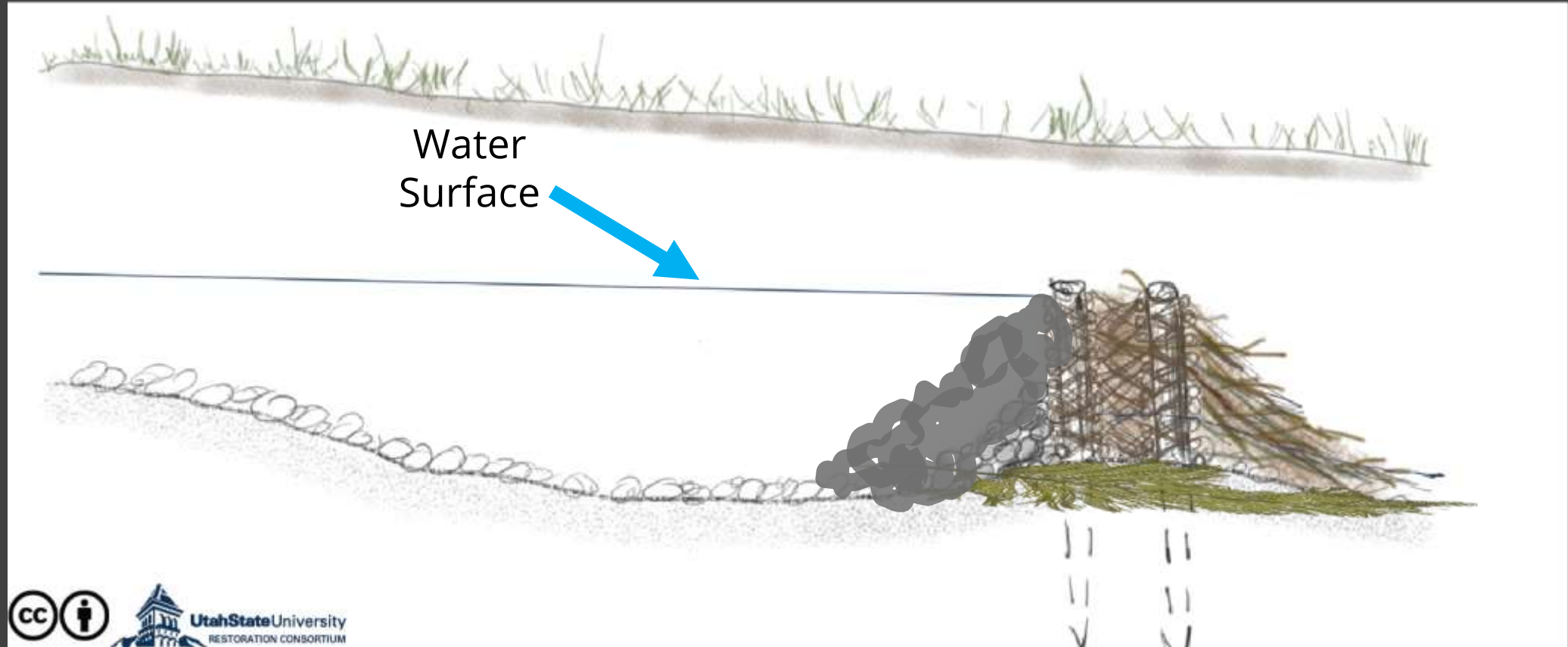


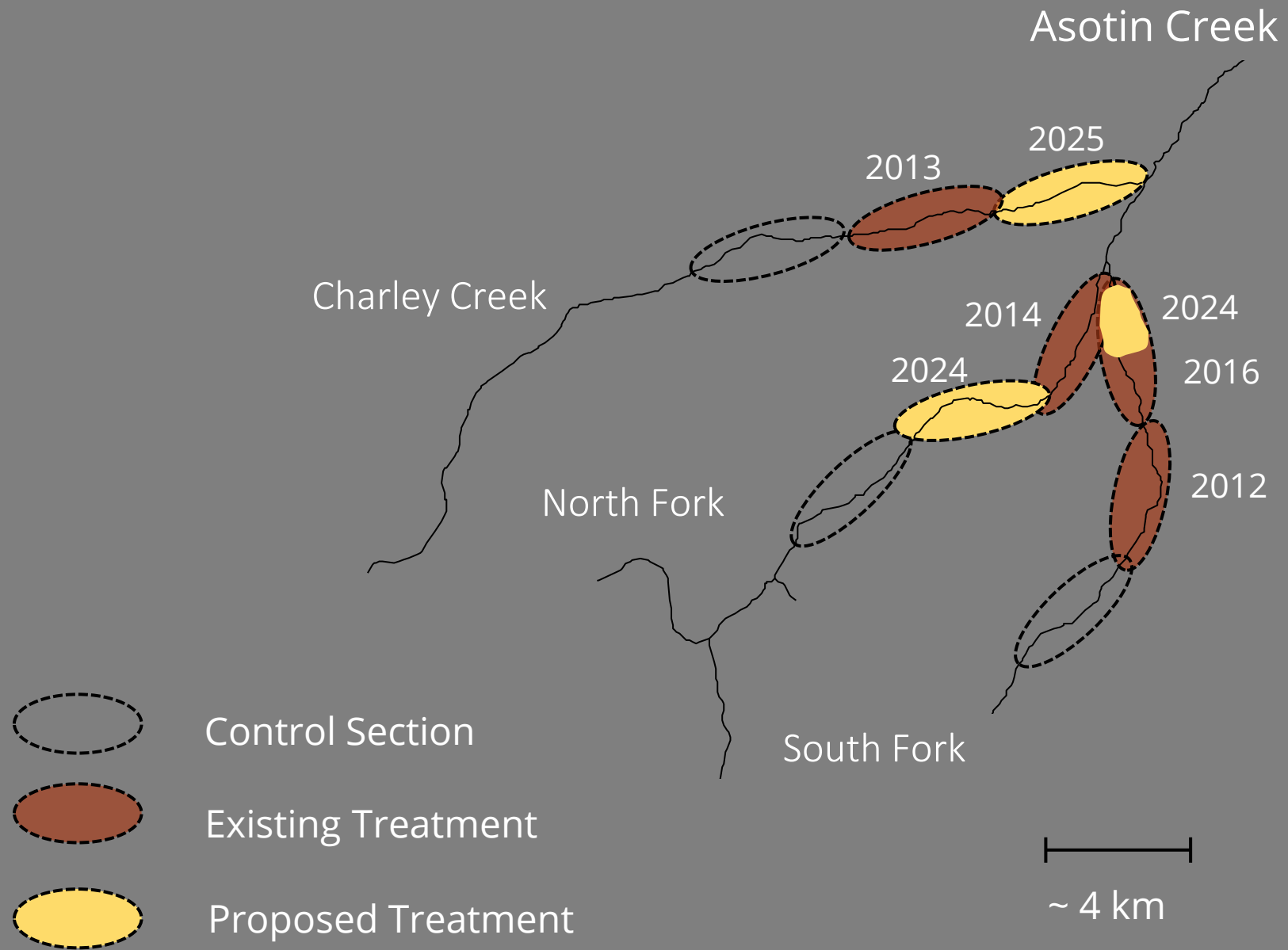
Low flow



High flow

Beaver dam analogues (BDA v.3.0)

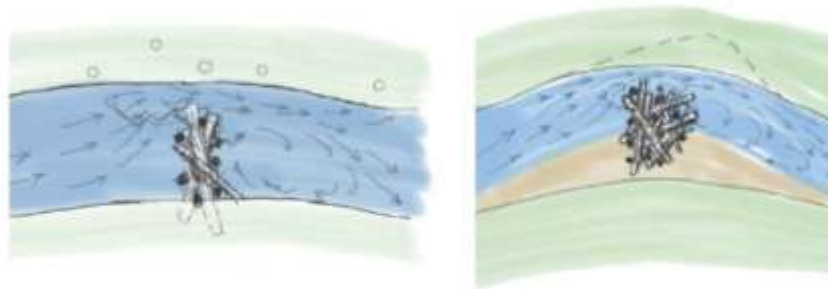




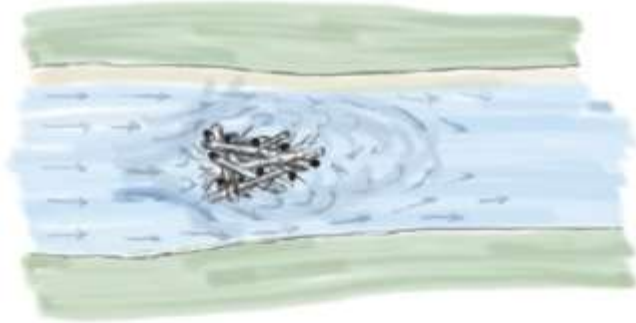
Building PALS



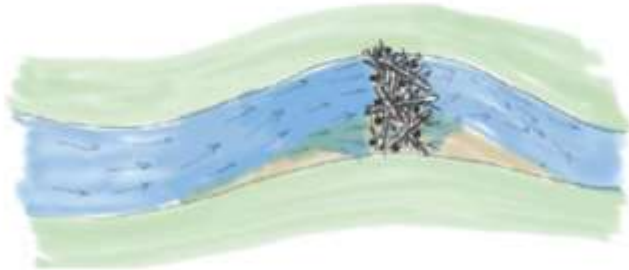
BANK-ATTACHED PALS



MID-CHANNEL PALS



CHANNEL-SPANNING PALS



POSTLESS BDA

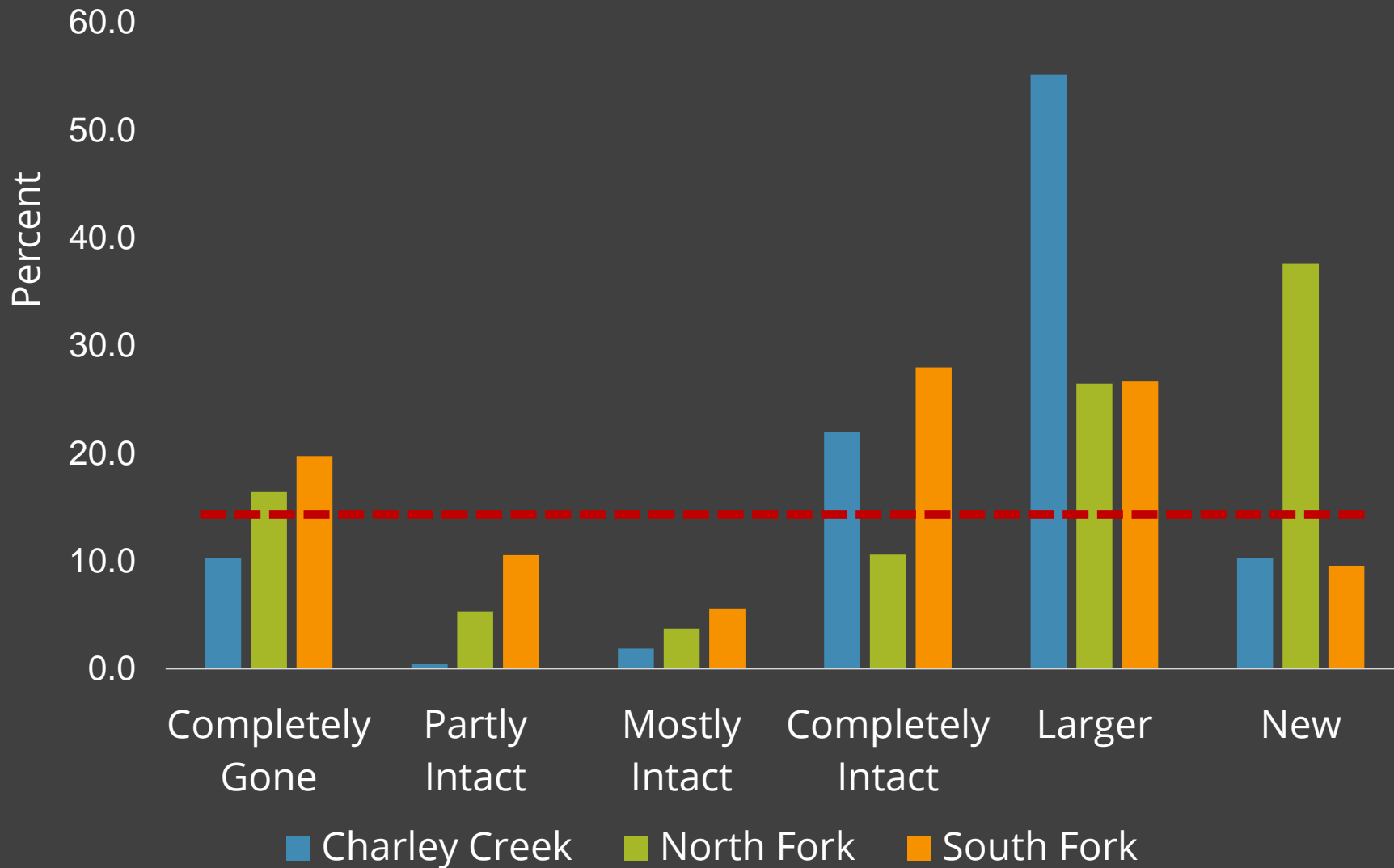


POST-ASSISTED BDA



POST-LINE WICKER WEAVE





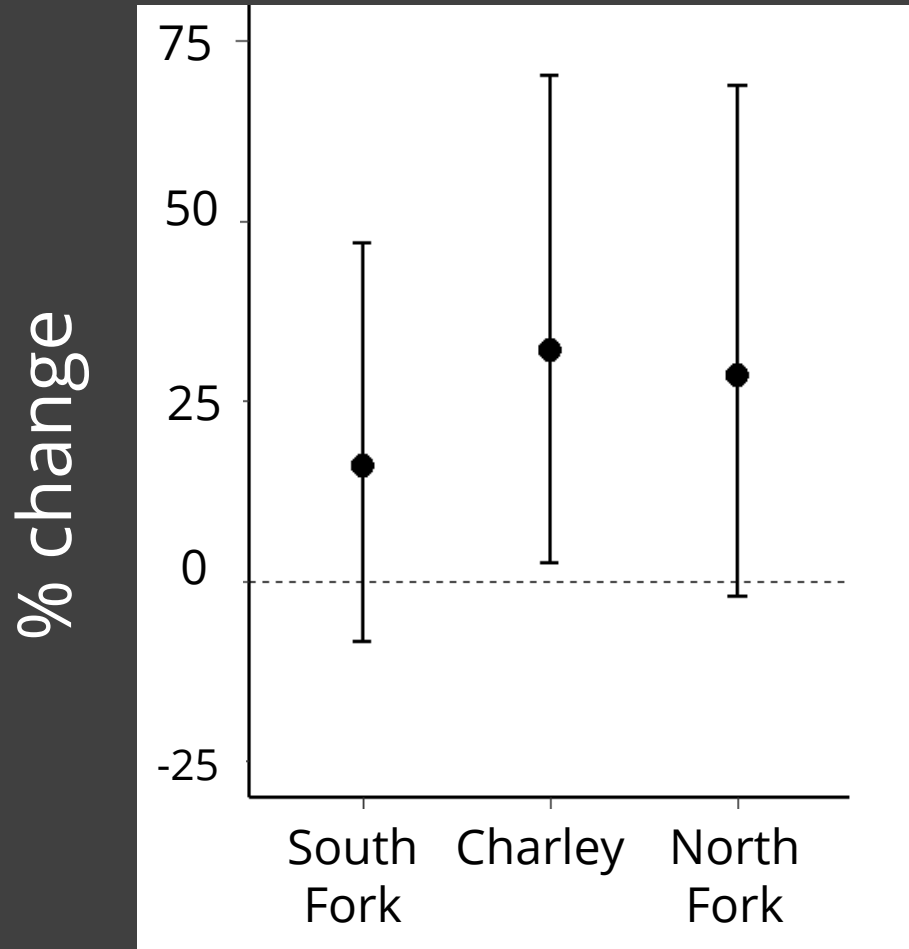
Structure movement and condition after 7 years

Results:
Side-Channel Connection

Stream	Control	Treatment
Charley	0.0	1.1
South Fork	0.2	1.9
North Fork	0.4	2.1
TOTAL	0.6	5.1

Length of new side-channels (km) post-restoration

Short-term
(2008-2017)

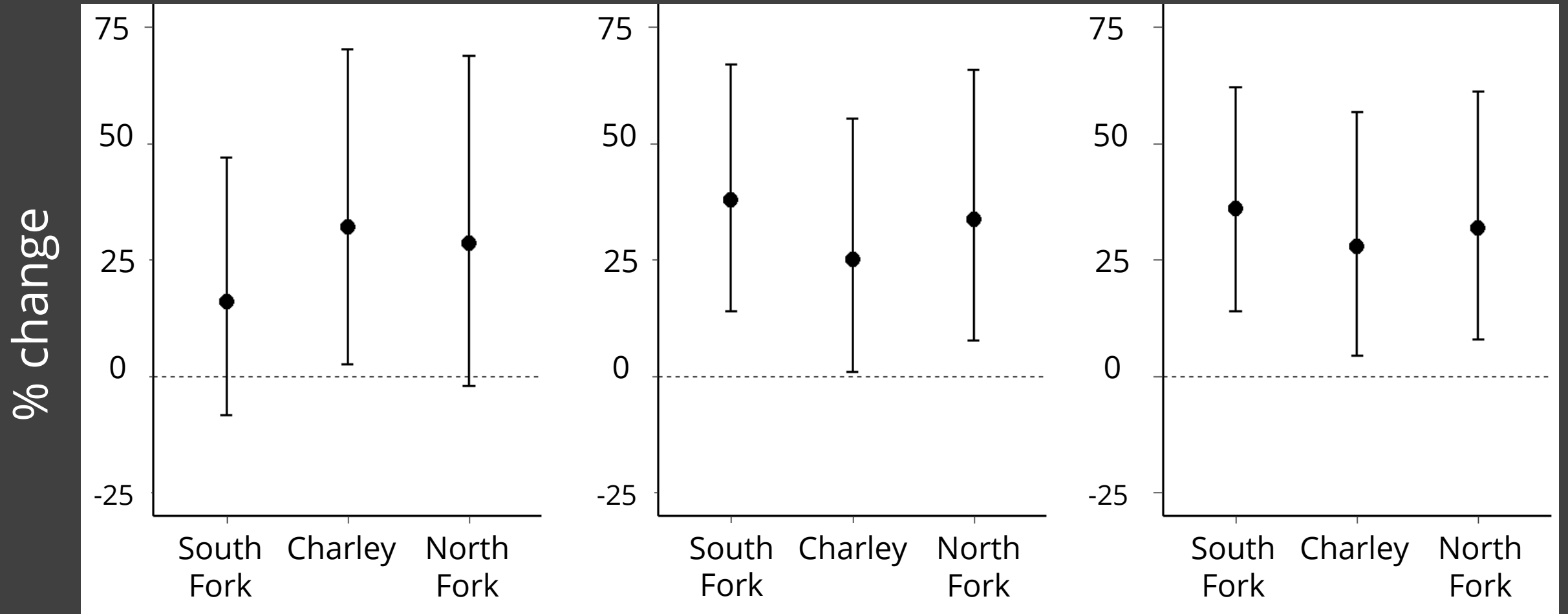


Production (g/km/90 days)

Short-term

Maintenance

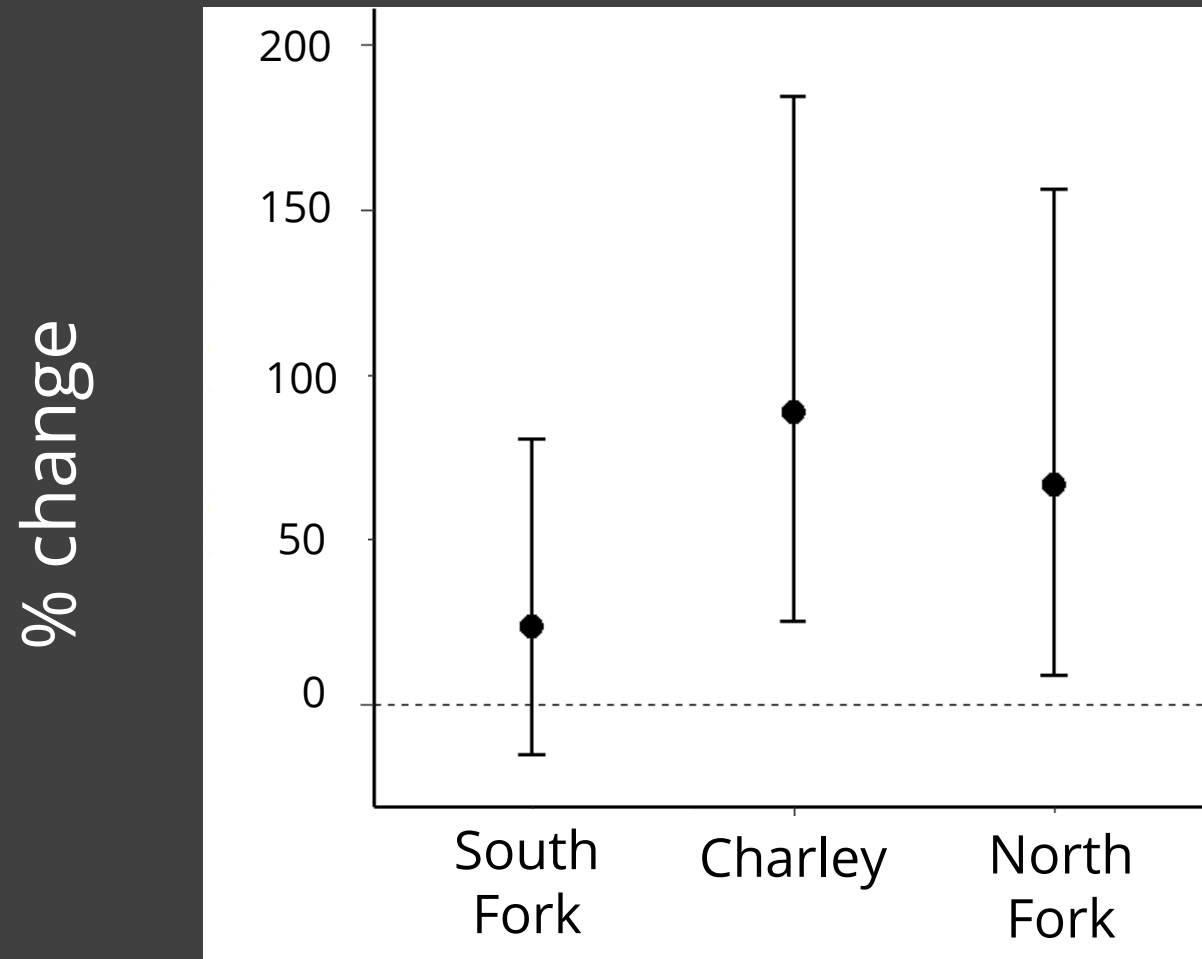
Adj/Fire



Production (g/km/90 days)

Results:
Smolts

Short-term



Percent change in juvenile steelhead smolts



Adjustment: Fire/Sediment



North Fork 2017



North Fork 2023

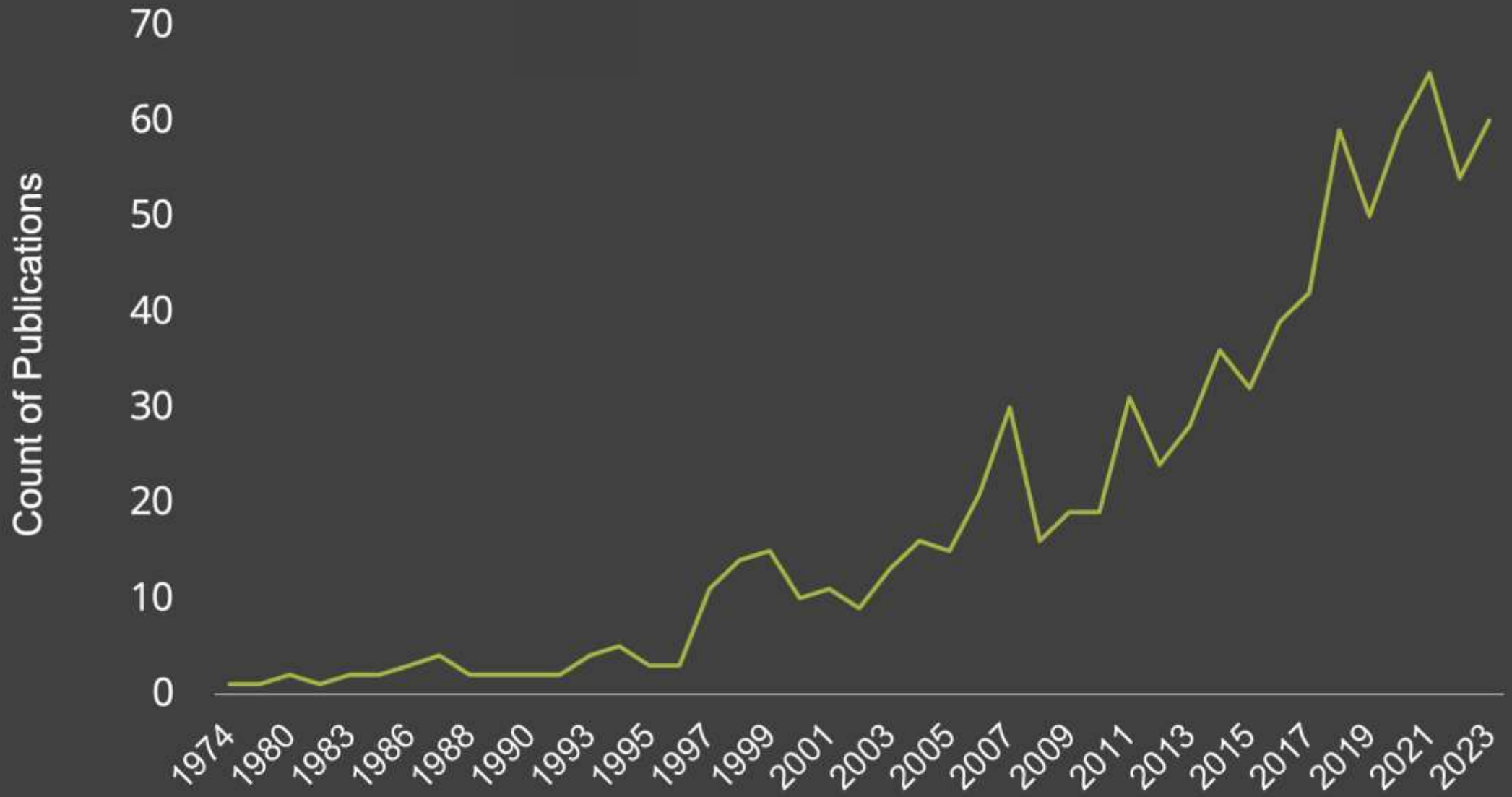








Beaver and Restoration or Ecosystem



The Message

