Colorado & Wyoming AFS

Low-tech Process-based Restoration Workshop

Process Based Restoration LOW TECH

Utah State University RESTORATION CONSORTIUM

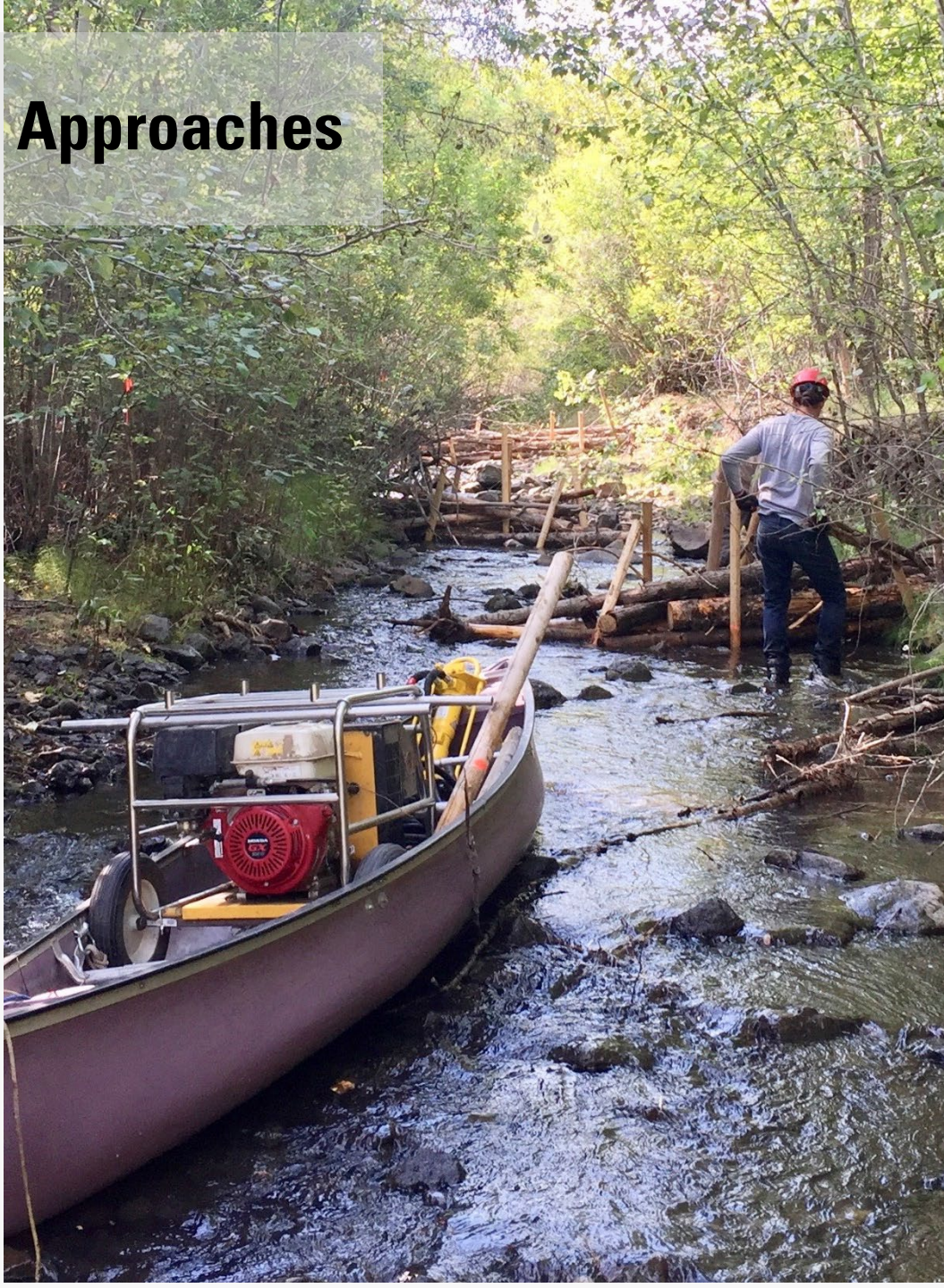
ANABRANCH SOLUTIONS

Workshop Agenda

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

3. Low-tech Restoration Approaches

- Mimicking Beavers
- Mimicking Wood Accumulation



PALS and BDAs Defined

PALS

POST-ASSISTED LOG STRUCTURES

- PALS are handbuilt structures that mimic and promote the processes of **wood accumulation.**
- Woody material of various sizes pinned together with untreated wooden posts driven into the substrate.

BDAs

BEAVER DAM ANALOGUES

- BDAs are handbuilt structures that mimic and promote the processes of **beaver dam activity.**
- BDAs are a permeable, channel-spanning structure with a constant crest elevation, constructed with a mixture of woody debris and fill material to promote temporary ponding of water.

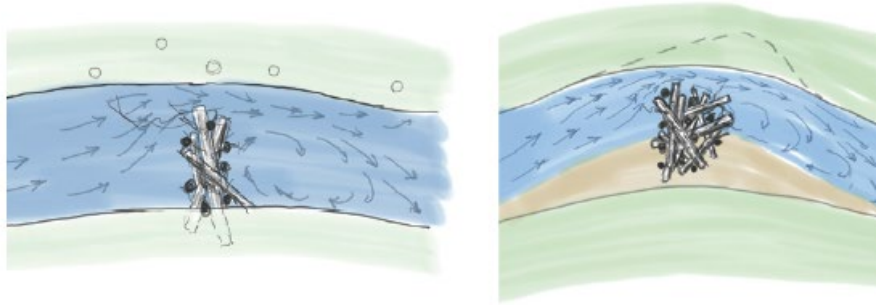
Taking Cues from Natural Wood Accumulations

Deflector

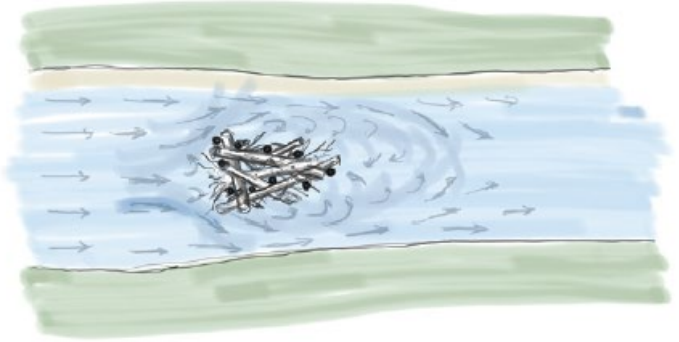
Mid-channel

Types of Post-Assisted Log Structures (PALS)

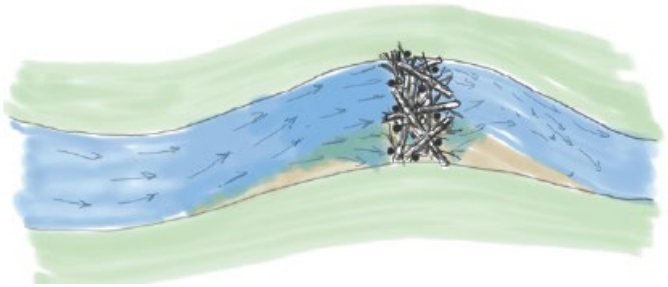
BANK-ATTACHED PALS



MID-CHANNEL PALS



CHANNEL-SPANNING PALS



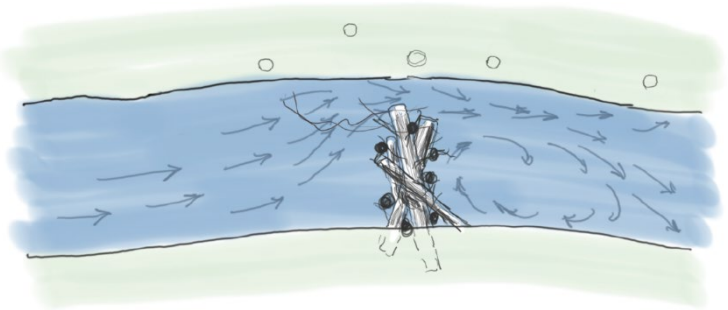
Where did the idea for PALS come from?

BDAs

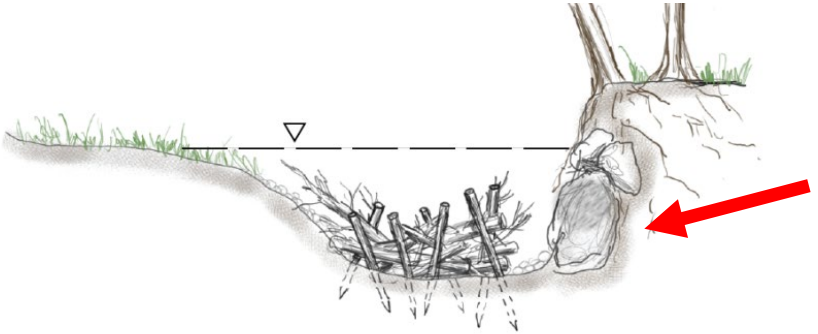
PALS

Bank-attached PALS - Constriction Jet

Planform



Cross-section



Profile

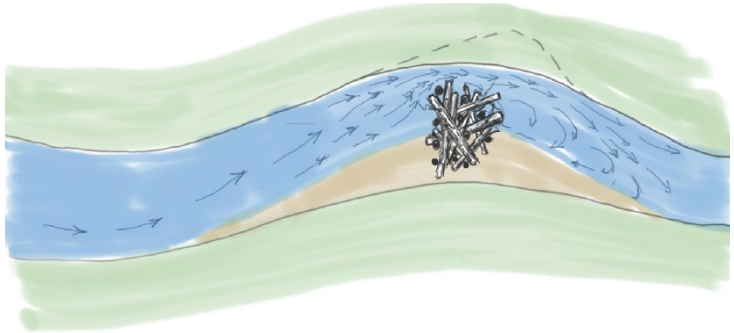
Flow

Adapted from Figure 4.23 of Appendix D of Shahverdian et al. (2019) – Chapter 4 LTPBR Manual DOI: 10.13140/RG.2.2.22526.64324

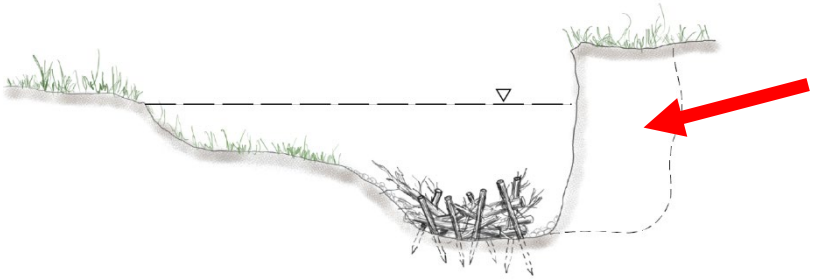
Bank-attached PALS - Constriction Jet

Bank-attached PALS – Bank Blaster

Planform



Cross-section



Profile

Flow

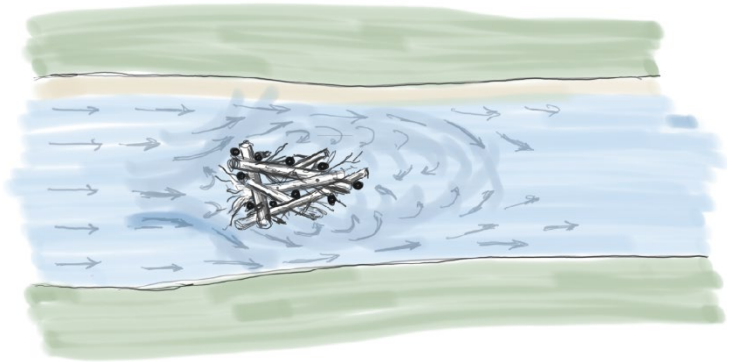
Adapted from Figure 4.24 of Appendix D of Shahverdian et al. (2019) – Chapter 4 LTPBR Manual DOI: 10.13140/RG.2.2.22526.64324

Bank-attached PALS – Bank Blaster

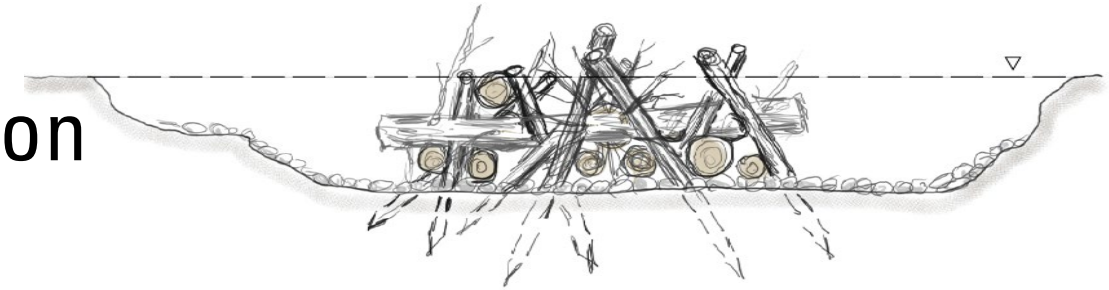
Bank-attached PALS – Bank Blaster

Mid-channel PALS

Planform



Cross-section



Profile

Flow

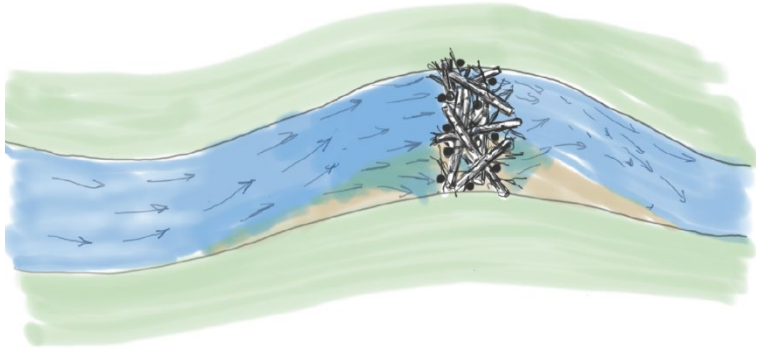
Adapted from Figure 4.25 of Appendix D of Shahverdian et al. (2019) – Chapter 4 LTPBR Manual DOI: 10.13140/RG.2.2.22526.64324

Mid-channel PALS

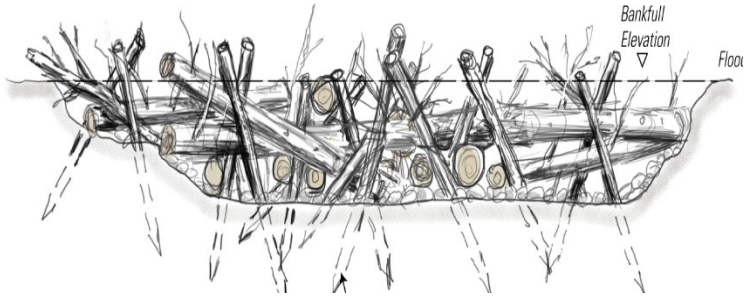

Mid-channel PALS
ELR – Steve Bennett

Channel spanning PALS

Planform



Cross-section



Profile

Flow

Adapted from Figure 4.26 of Appendix D of Shahverdian et al. (2019) – Chapter 4 LTPBR Manual DOI: 10.13140/RG.2.2.22526.64324

Mimic wood accumulations – Channel spanning PALS

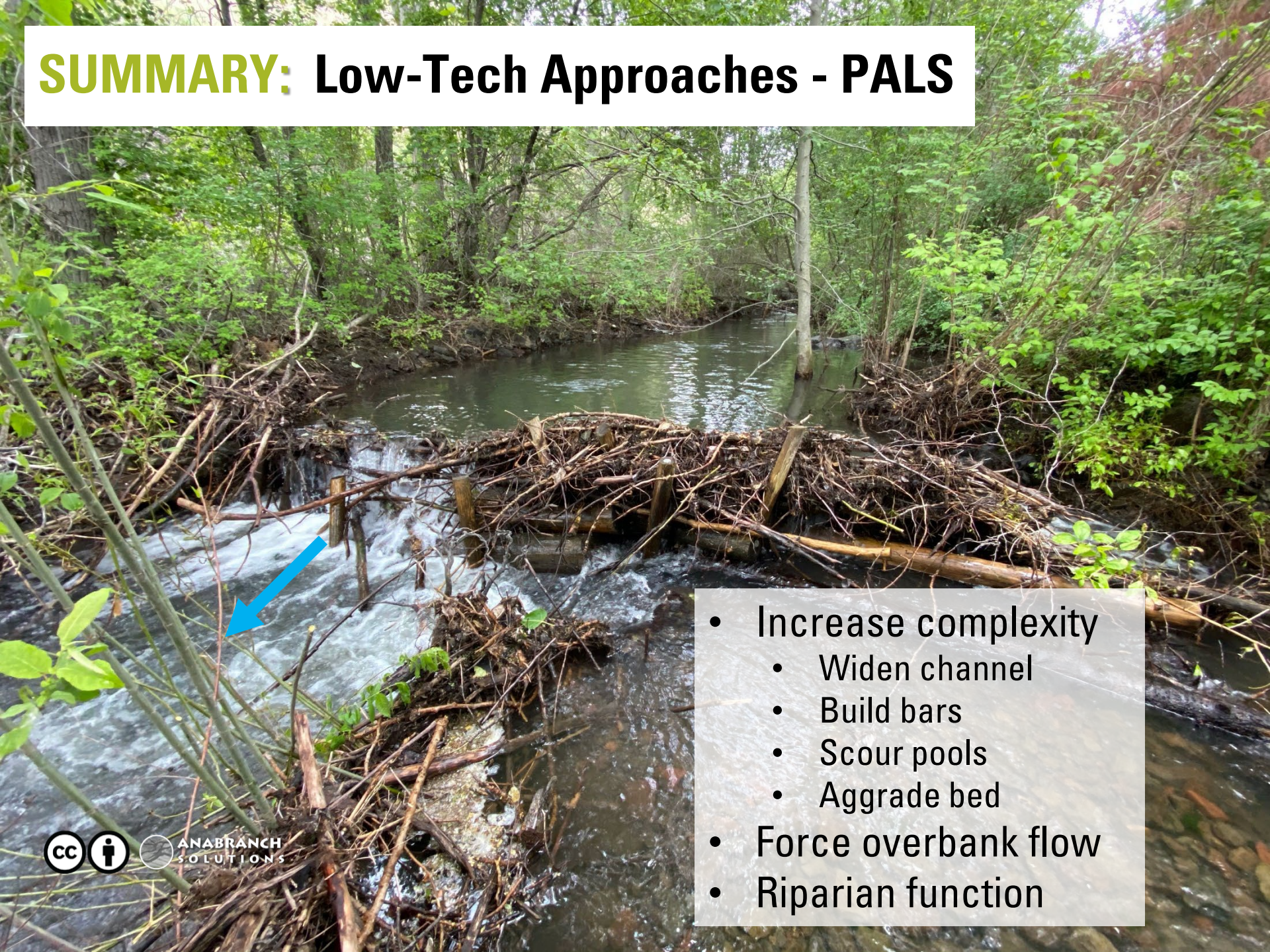
Mimic wood accumulations – Channel spanning PALS

Mimic wood accumulations – Channel spanning PALS

Structure “Type” Can Change

PALS - Do most work at higher flows

SUMMARY: Low-Tech Approaches - PALS



- Increase complexity
  - Widen channel
  - Build bars
  - Scour pools
  - Aggrade bed
- Force overbank flow
- Riparian function

PALS and BDAs

PALS

POST-ASSISTED LOG STRUCTURES

- PALS are handbuilt structures that mimic and promote the processes of **wood accumulation.**
- Woody material of various sizes pinned together with untreated wooden posts driven into the substrate.

From Page 23 of Pocket Guide: Wheaton et al. (2019)
DOI: 10.13140/RG.2.2.28222.13123/1

BDAs

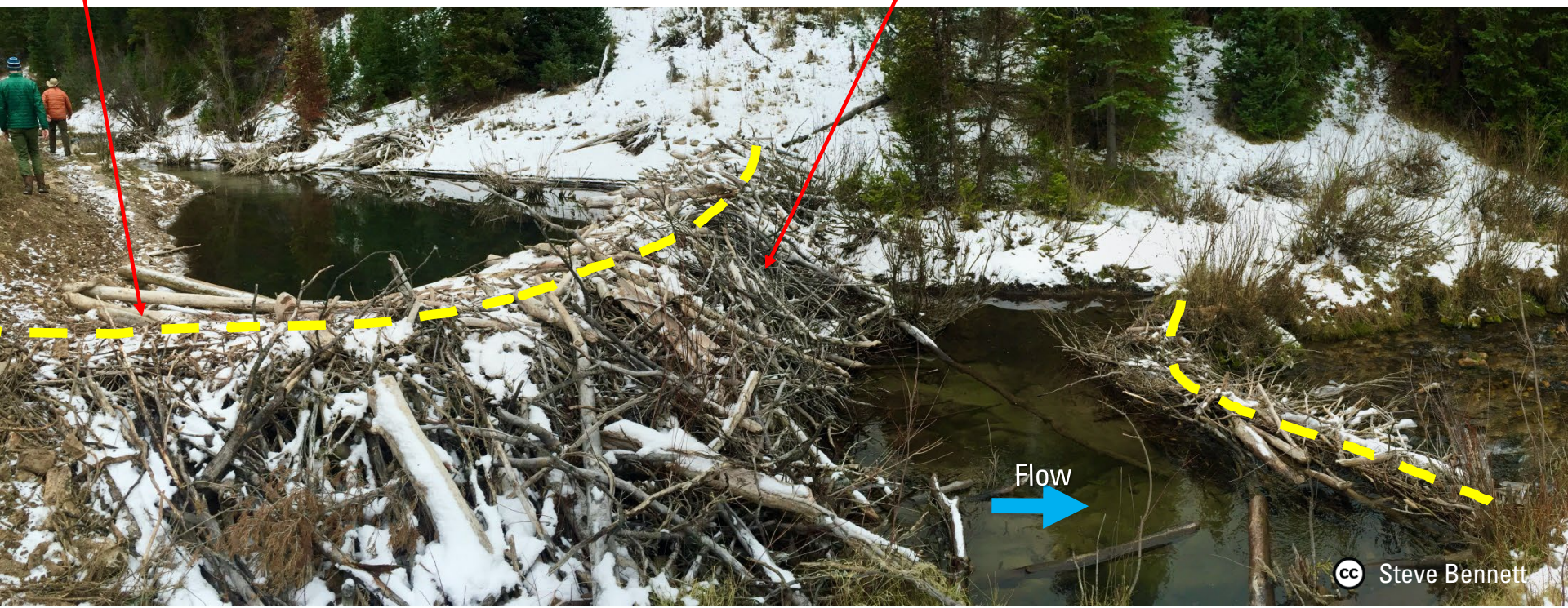
BEAVER DAM ANALOGUES

- BDAs are handbuilt structures that mimic and promote the processes of **beaver dam activity.**
- BDAs are a permeable, channel-spanning structure with a constant crest elevation, constructed with a mixture of woody debris and fill material to promote temporary ponding of water.

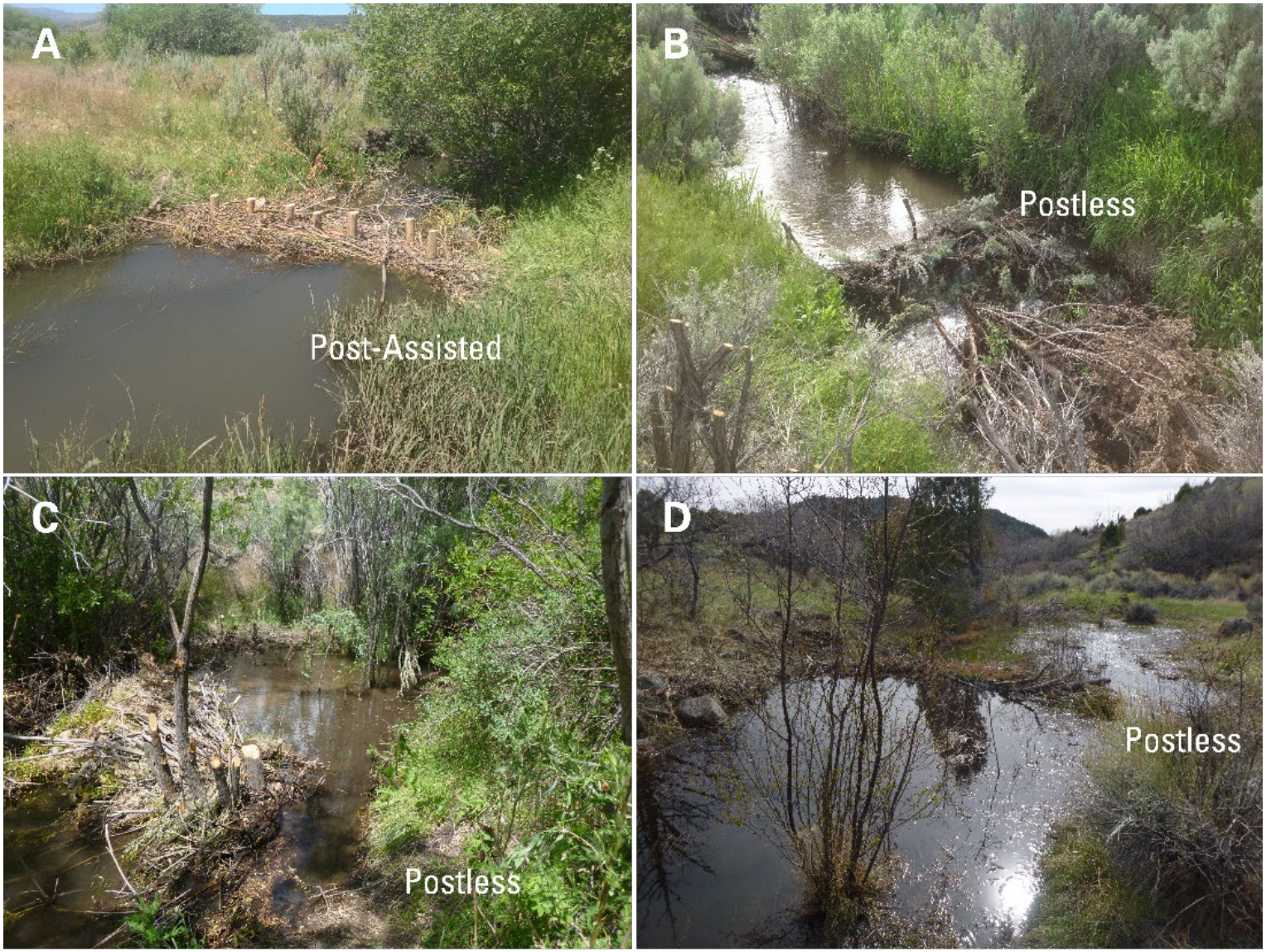
Taking Cues from Beaver Dam Complexes

Floodplain connection, ponds, side-channels, diversity of depths and flow paths (aka complexity)

Beaver dam anatomy

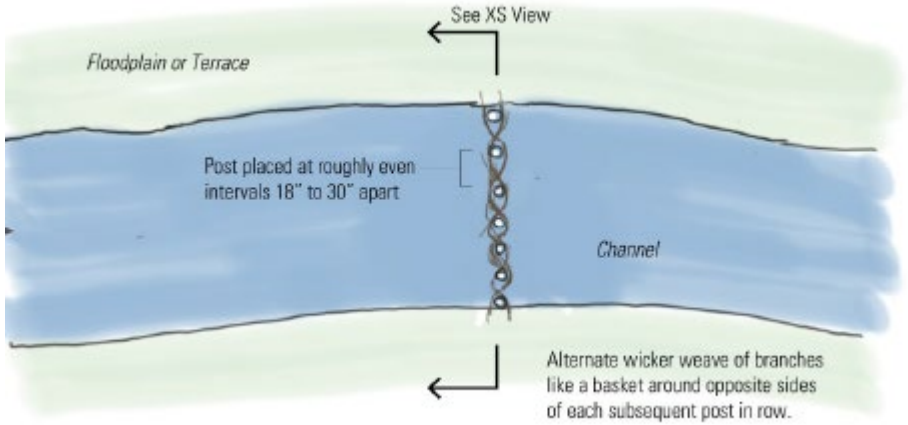


BDAs: Different Shapes, Sizes, Materials

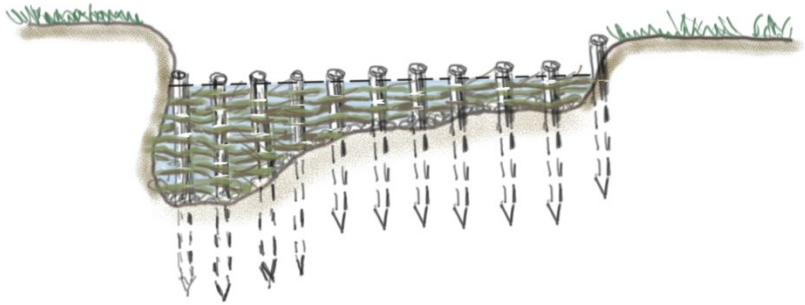


Post-Line Wicker Weave (BDA v.1)

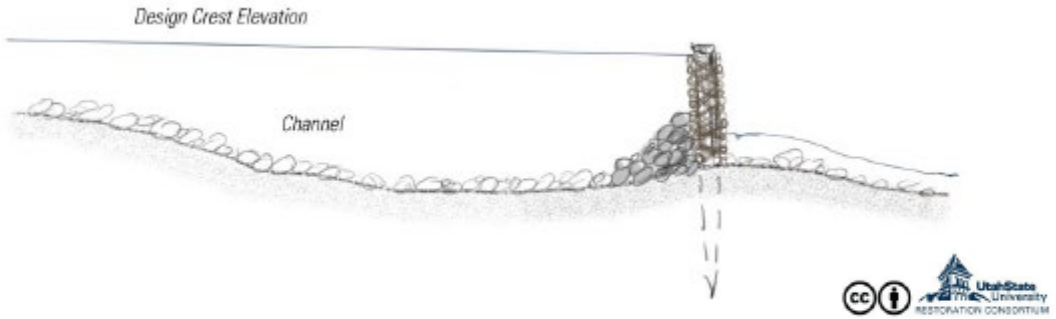
Planform



Cross-section



Profile



Flow

Post-Line Wicker Weave + Mattress (BDA v.1.1)

Post-Line Mixed Material (BDA v.2.0)

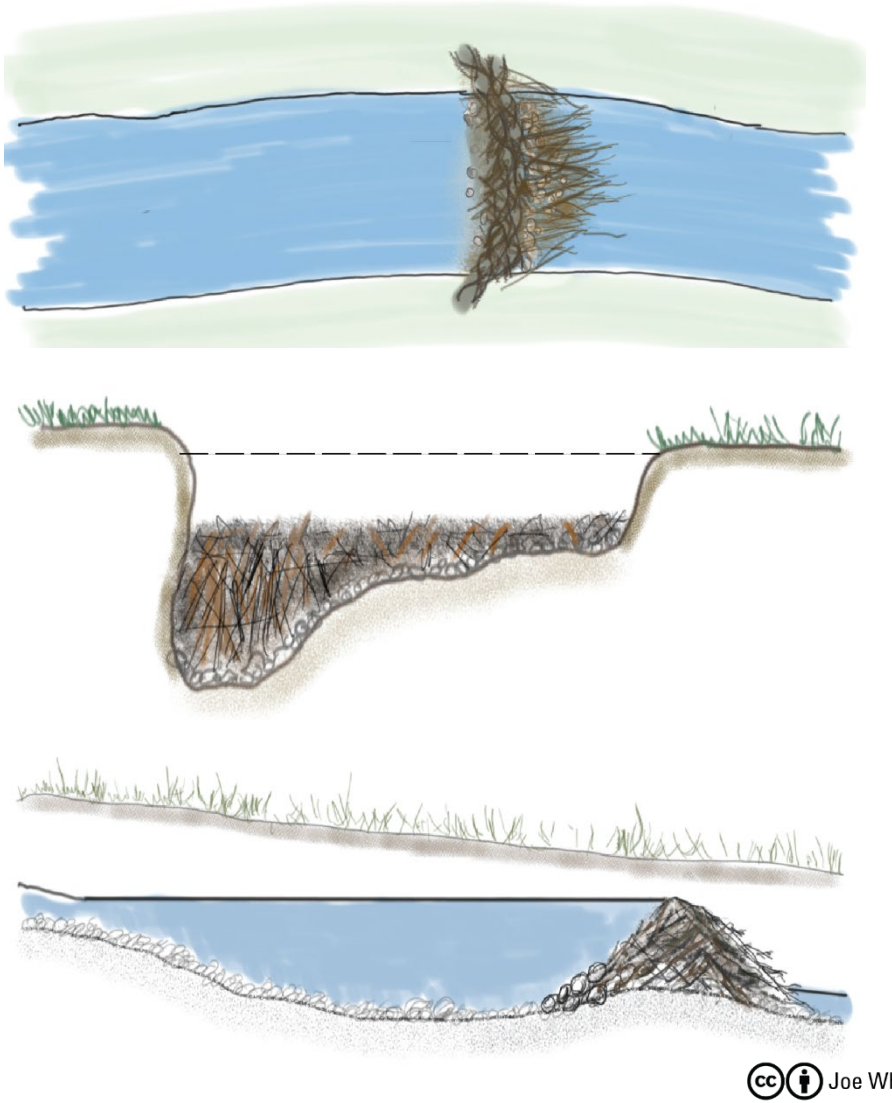
Postless BDAs (BDAs v.2.1)

Beaver dam analogues (BDA v.3.0)

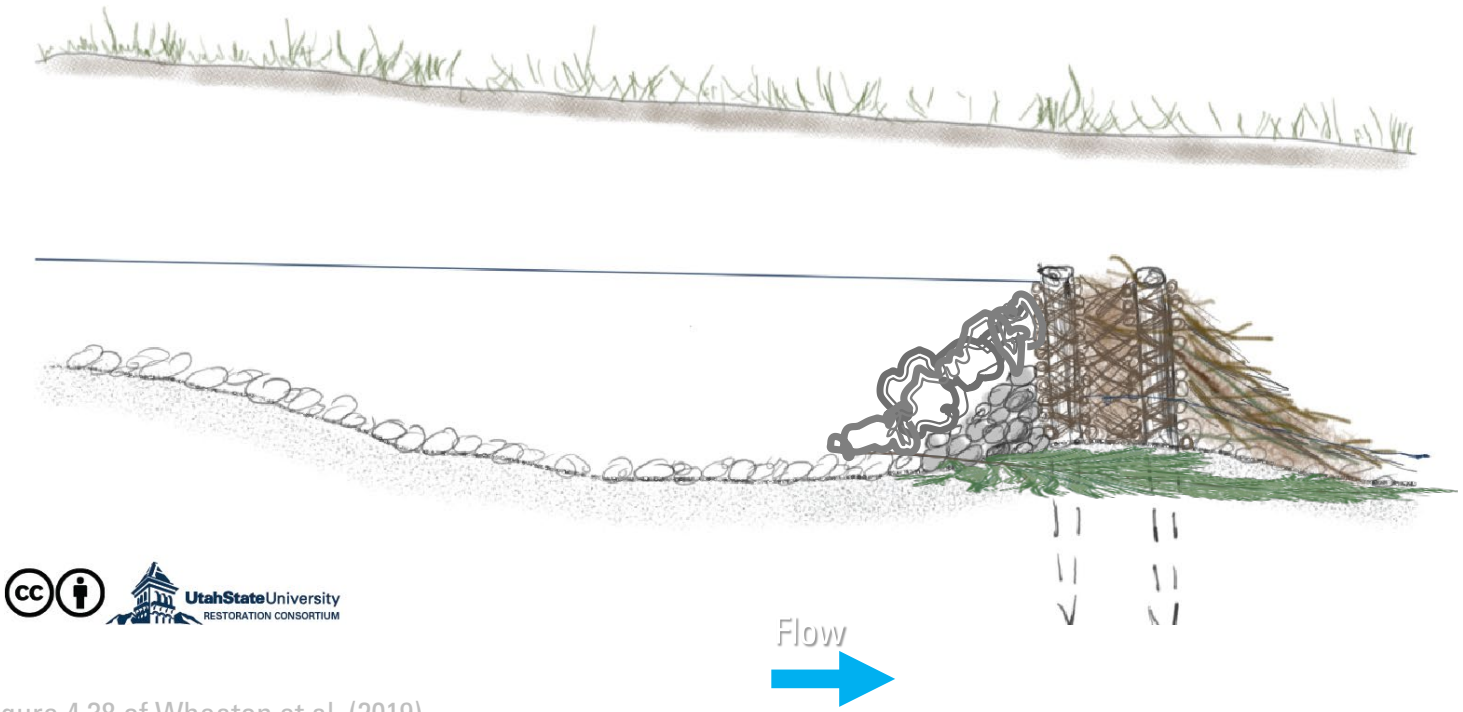
Planform

Cross-section

Profile



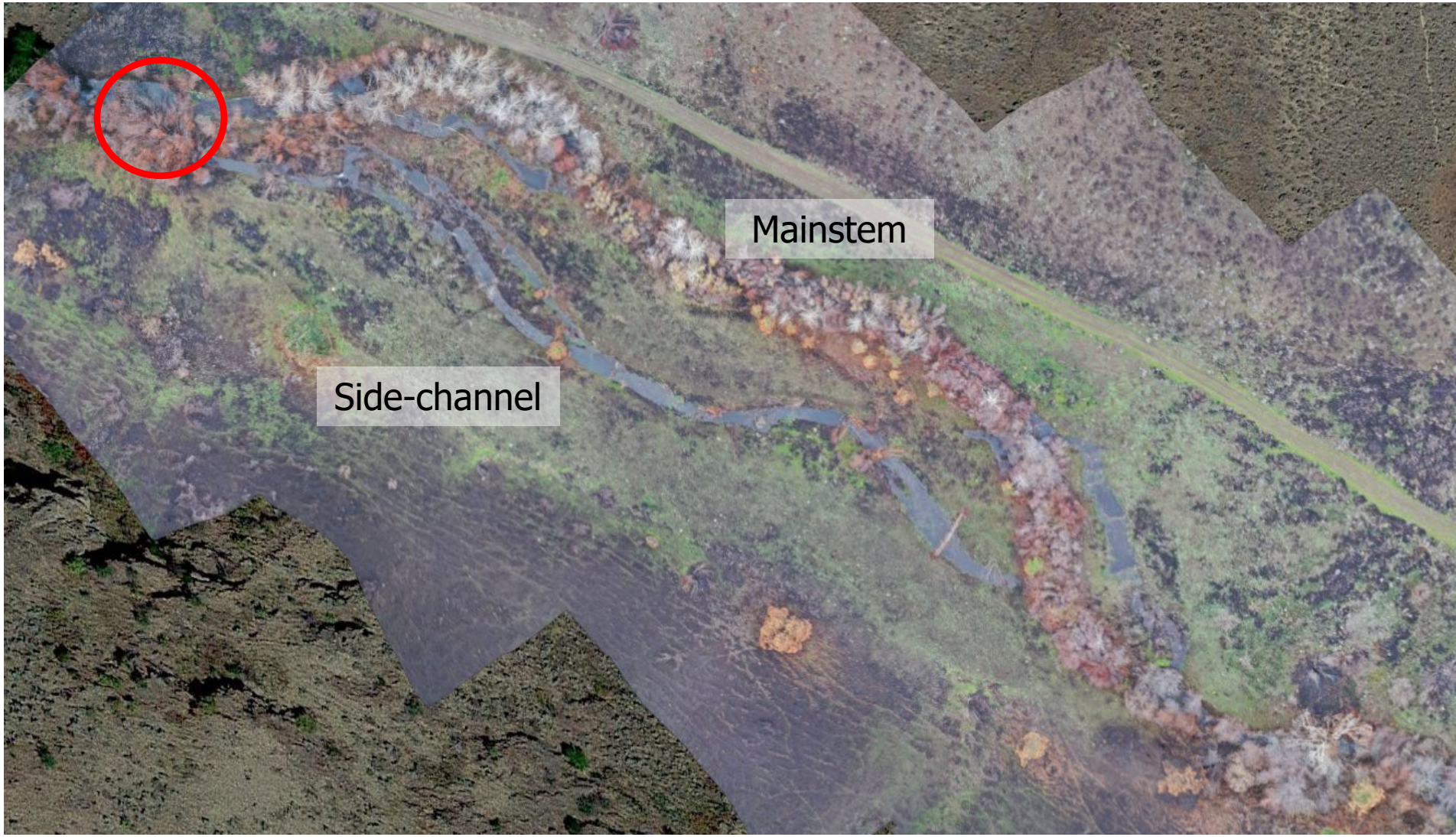
Beaver dam analogues (BDA v.3.0)



Adapted from Figure 4.38 of Wheaton et al. (2019) LTPBR Manual. DOI: 10.13140/RG.2.2.19590.63049/1

How many to build? ; Where to Build?

How many to build?




How many to build? Where to build?

SUMMARY: BDAs

- Increase complexity
- Force upstream ponding
- Range of sizes, shapes, materials
- Typically used to:
  - Immediately mimic beaver dam
  - Promote recolonization by beaver
  - Improve site for translocated beaver

**See Module 5E online for step-by-step PALS and BDAs construction tips

SUMMARY: LTPBR Implementation Lessons

Post-assisted Log Structure

- Orientation flexible
- Form shape with large pieces
- Interlock layers then drive posts
- Width > height
- Large constriction
- Irregular shape; be messy
- Crest elevation variable
- Depend on high flows

Beaver Dam Analogue

- Perpendicular or convex orientation
- Build in layers; be messy
- Matrix of branches & fill
- Width > Height
- Level crest elevation
- Mattress
- Work at range of flows

Approaches and Implementation – Questions/Discussion