

LTPBR WORKSHOP



Learning to Design[®] @ Structure-Scale



Remember Carol?

Proportion Active 50%

Recovery Potential: 63 ac. (76%)

Uplift 22 ac. (53%)

4 ac. (5%)

37 ac (45 %)

41 ac. (50%)



AC - Active channel



AF - Active floodplain



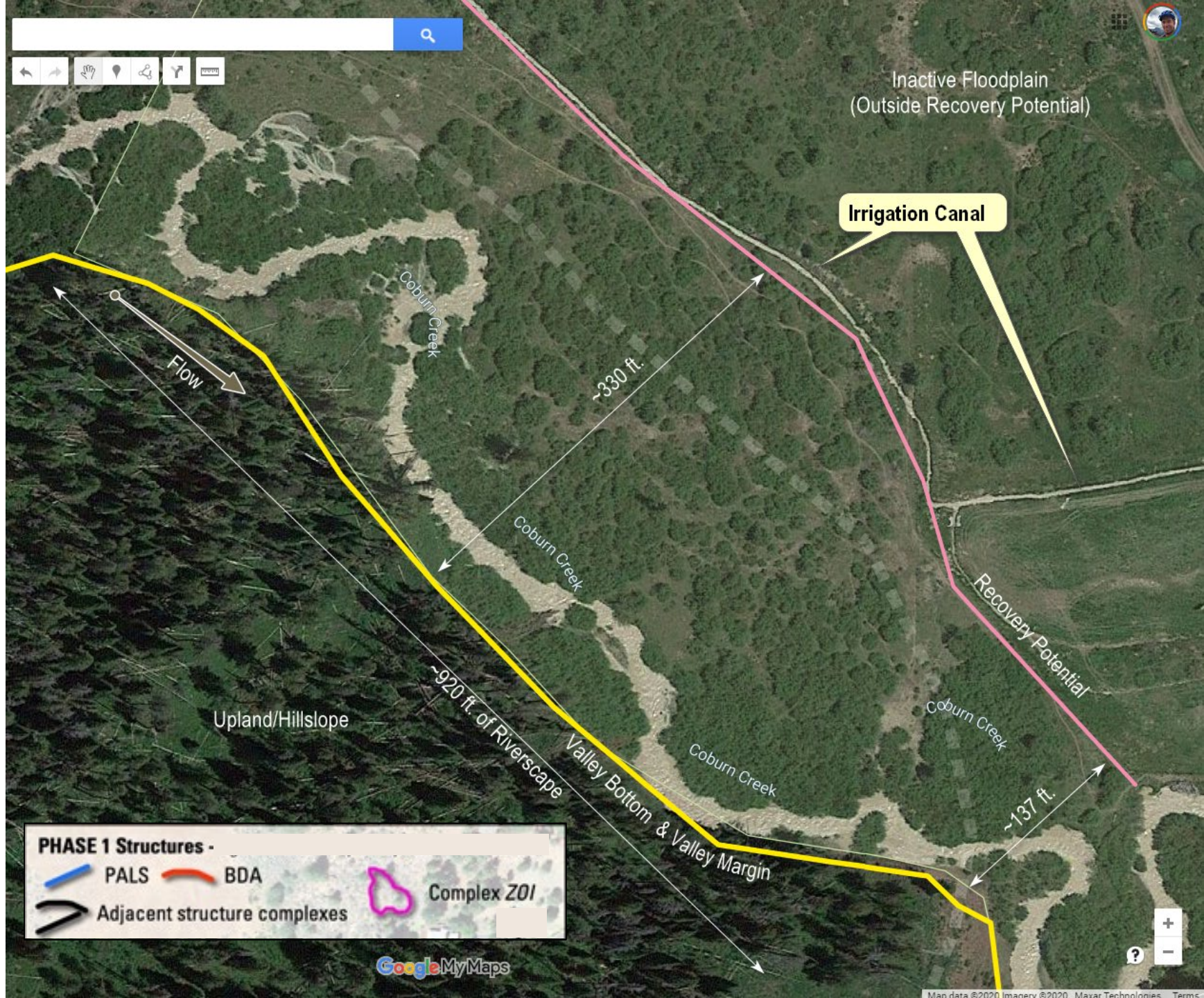
IF - Inactive

Acres of Coburn Creek Valley Bottom

We'll focus our design up top here...

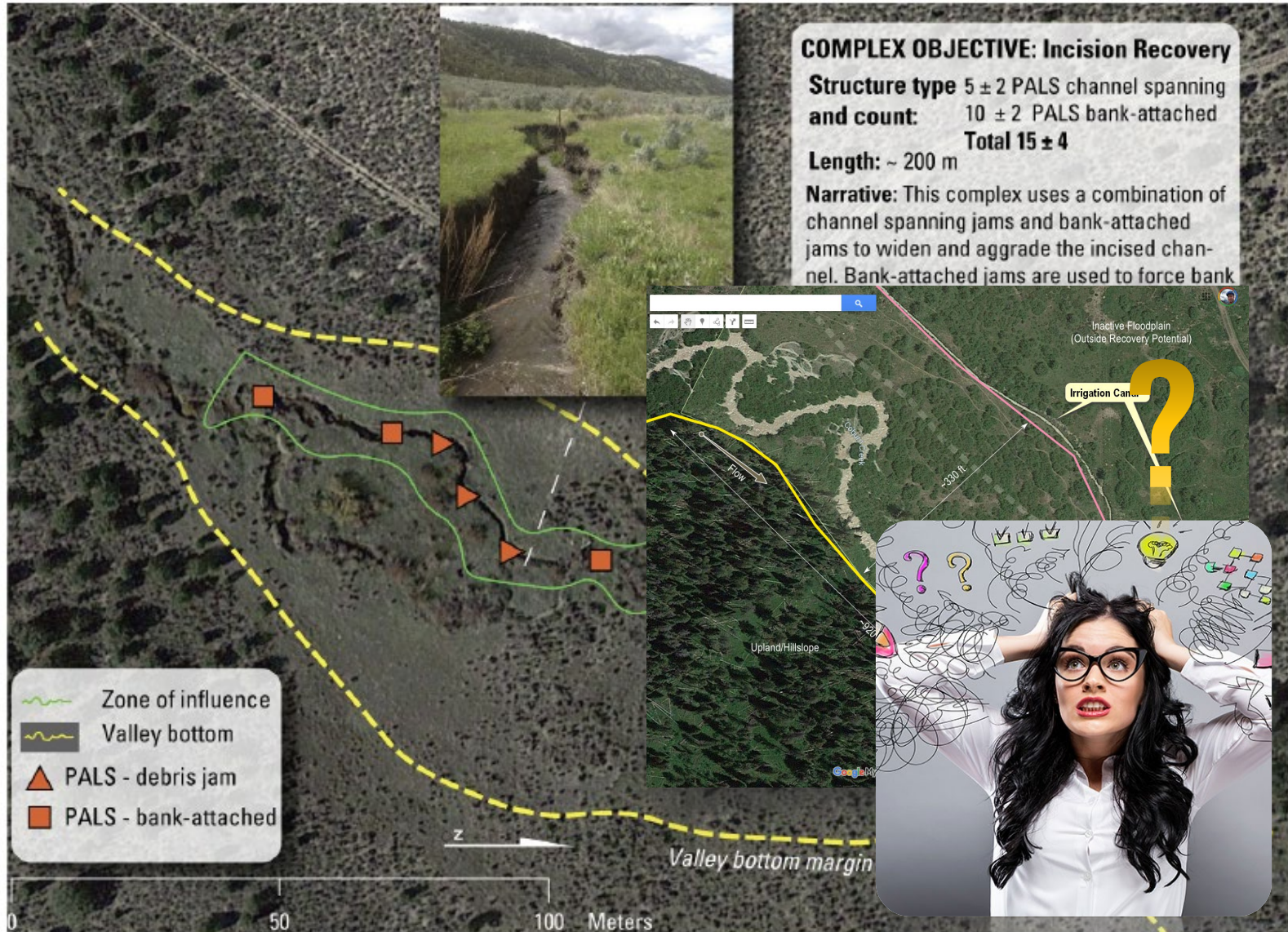


Complex Design



Complex Design – Where do I start?

- zone of influence, valley bottom, narrative, ... structure locations?



Complex Design – Where do I start?

~~zone of influence, valley bottom, narrative, ... structure locations?~~

Recovery Potential: 63 ac. (76%)
Uplift 22 ac. (53%)

COMPLEX OBJECTIVE: Incision Recovery

Structure type 5 ± 2 PALS channel spanning
and count: 10 ± 2 PALS bank-attached
Total 15 ± 4

Length: ~ 200 m

Narrative: This complex uses a combination of channel spanning jams and bank-attached jams to widen and aggrade the incised channel. Bank-attached jams are used to force bank

Oh yeah,
recovery
potential!

Zone of influence
Valley bottom
▲ PALS - debris jam
■ PALS - bank-attached

z

Valley bottom margin

0 50 100 Meters



Carol (Pops' Daughter):

Proportion Active 50%

Recovery Potential: 63 ac. (76%)

Uplift 22 ac. (53%)

4 ac. (5%)

37 ac (45 %)

41 ac. (50%)



AC - Active channel



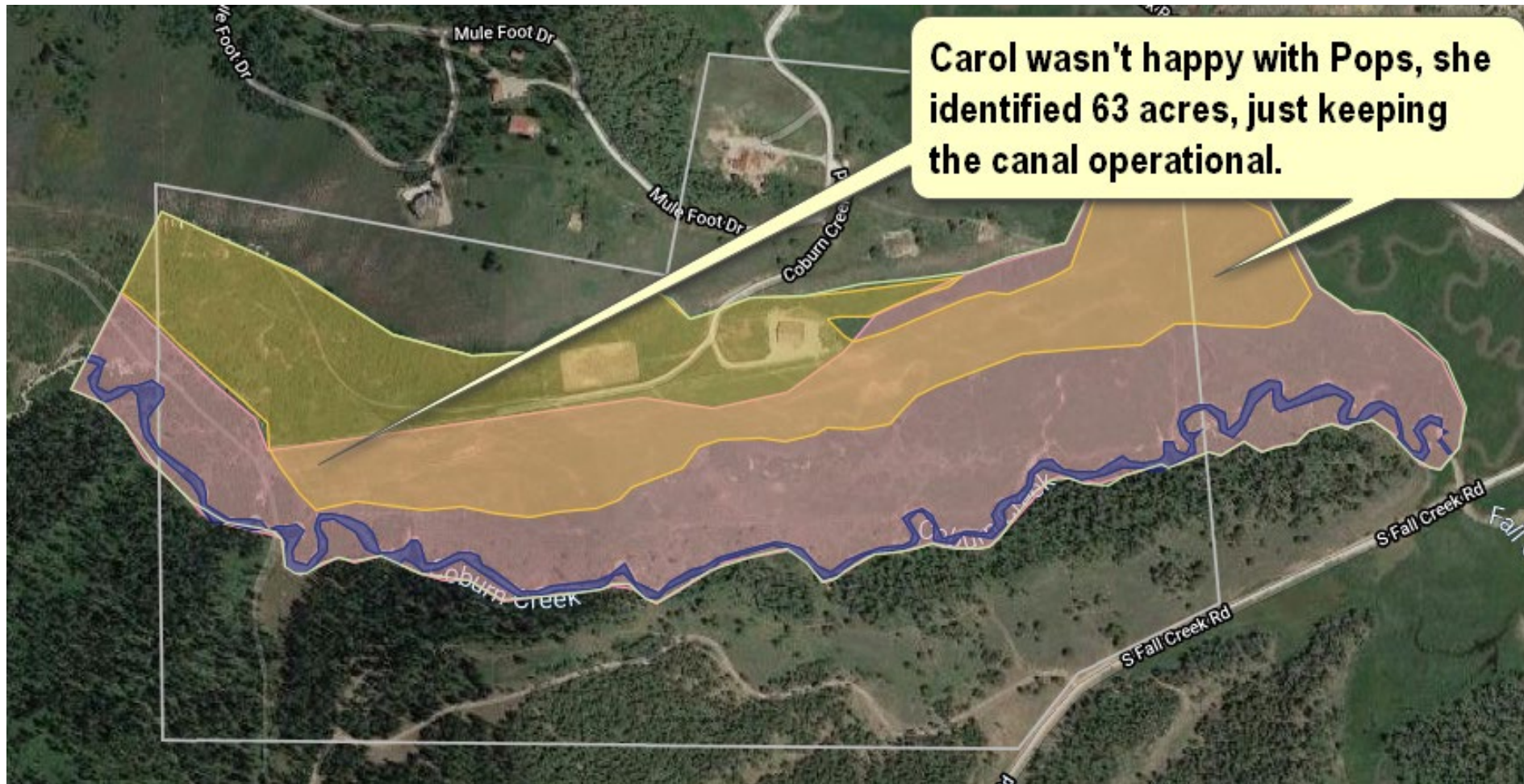
AF - Active floodplain



IF - Inactive

Acres of Coburn Creek Valley Bottom

Carol wasn't happy with Pops, she identified 63 acres, just keeping the canal operational.



What could Carol's reach of Coburn be?

Recovery Potential: 63 ac. (76%)

Uplift 22 ac. (53%)

AND: Stage 7 → Stage 8 / 0 😊

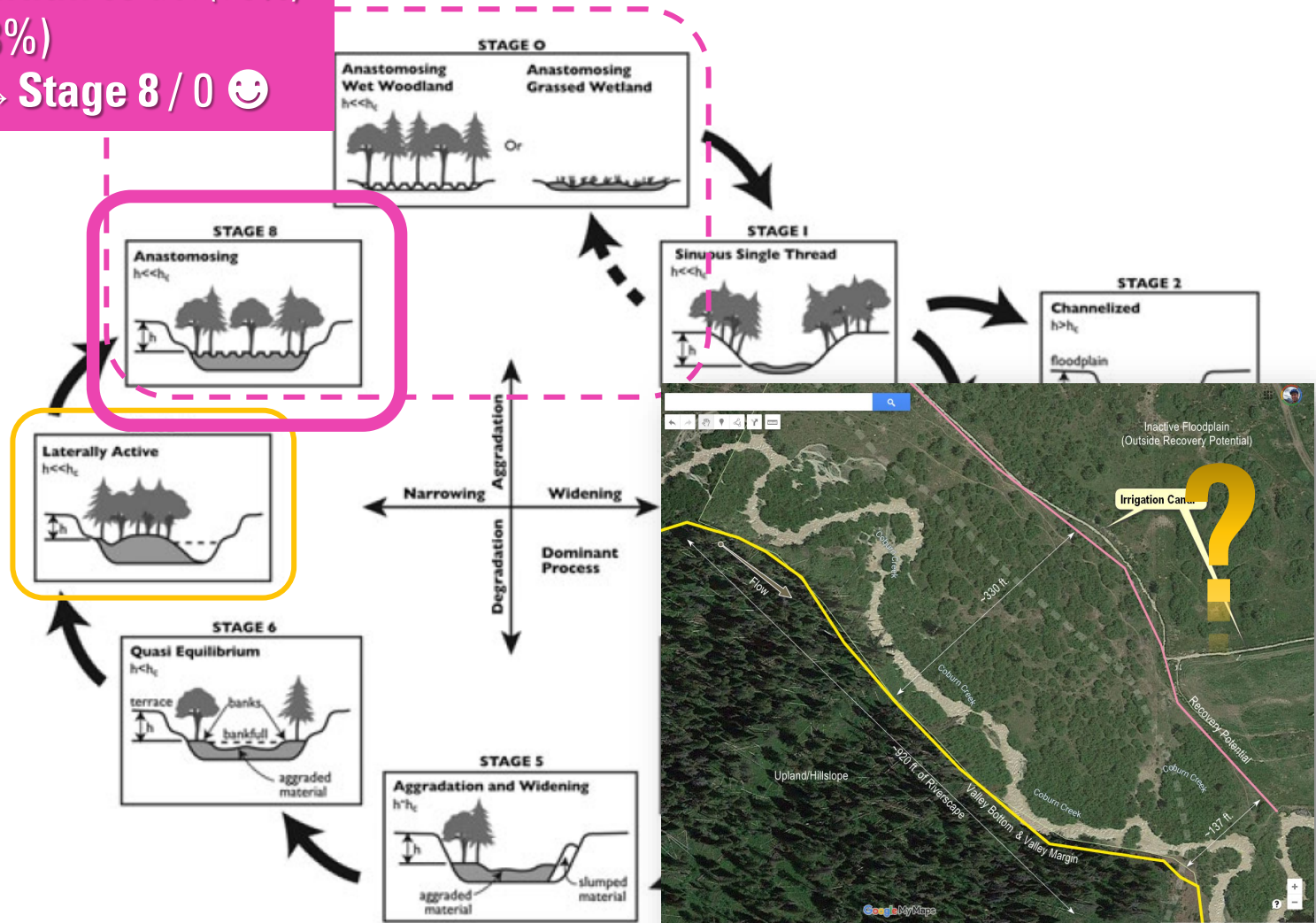
Q: What are current riverscape conditions?

Geomorphically?

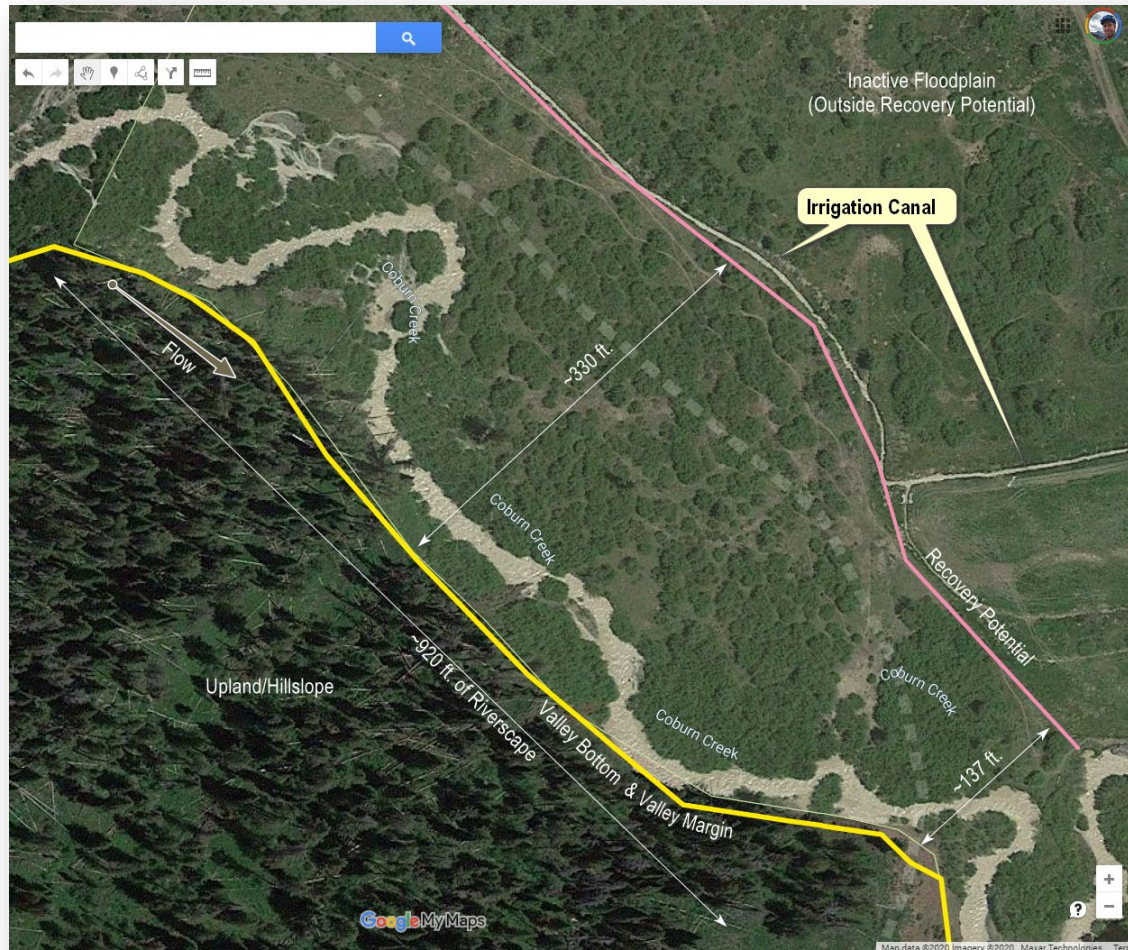
Riparian?

- to sustain wood accumulation and/or beaver dam activity

Q: What is recovery potential?



Okay, what's my primary complex objective for this design?



COMPLEX OBJECTIVE:

Structure type and count:

Length: ~ 100 m **Total** 15 ± 4

Narrative:

This complex uses a combination of channel spanning jams and bank-attached jams to widen and aggrade the incised channel. Bank-attached jams are used to force bank erosion and channel widening, channel spanning jams are used to capture eroded sediment and force channel aggradation. As current wood availability on floodplain is limited, this initial treatment will simply mimic wood accumulation.

- Increase instream complexity?
- Incision recovery (widen and aggrade channel)?
- Beaver Translocation?
- Increase channel-floodplain connectivity?

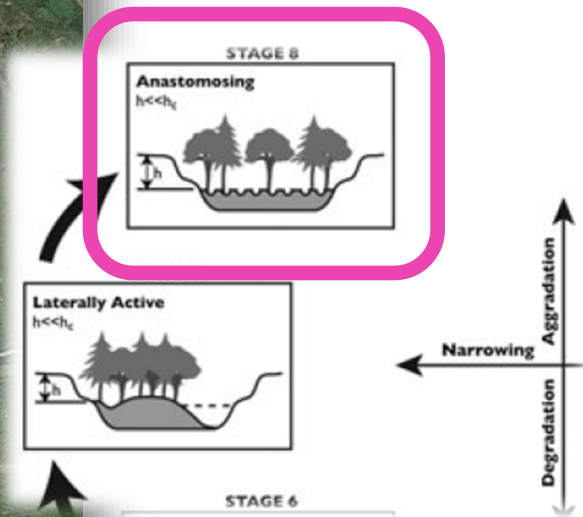
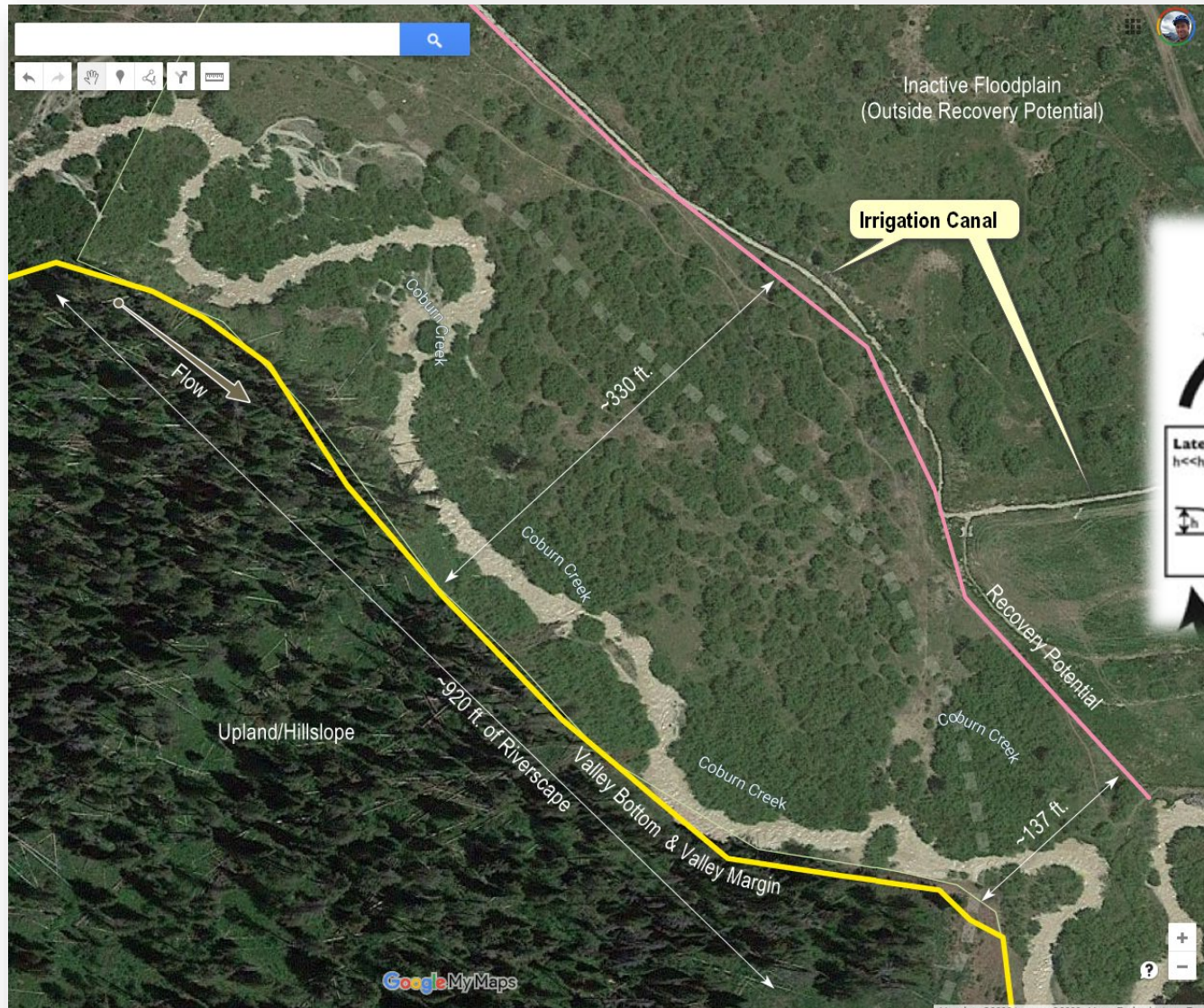
Well, maybe easier to answer:
“What’s my outer limit or long-term target?”

Recovery Potential: 63 ac. (76%)
Uplift 22 ac. (53%)



Okay, so not **valley bottom**-wide.
But **anastomosing** within **recovery potential**

How far towards that **RP** target can I get in this phase?



This is just a design for first phase of implementation

Addressed during Phase 1

Q: What are current
riverscape **conditions**?

Geomorphically?
Riparian?

- to sustain wood accumulation and/or
beaver dam activity

Q: What is **recovery
potential**?

How much will **this
phase**, close the gap
between **Condition &
Recovery Potential**?

TIMING
IS EVERYTHING

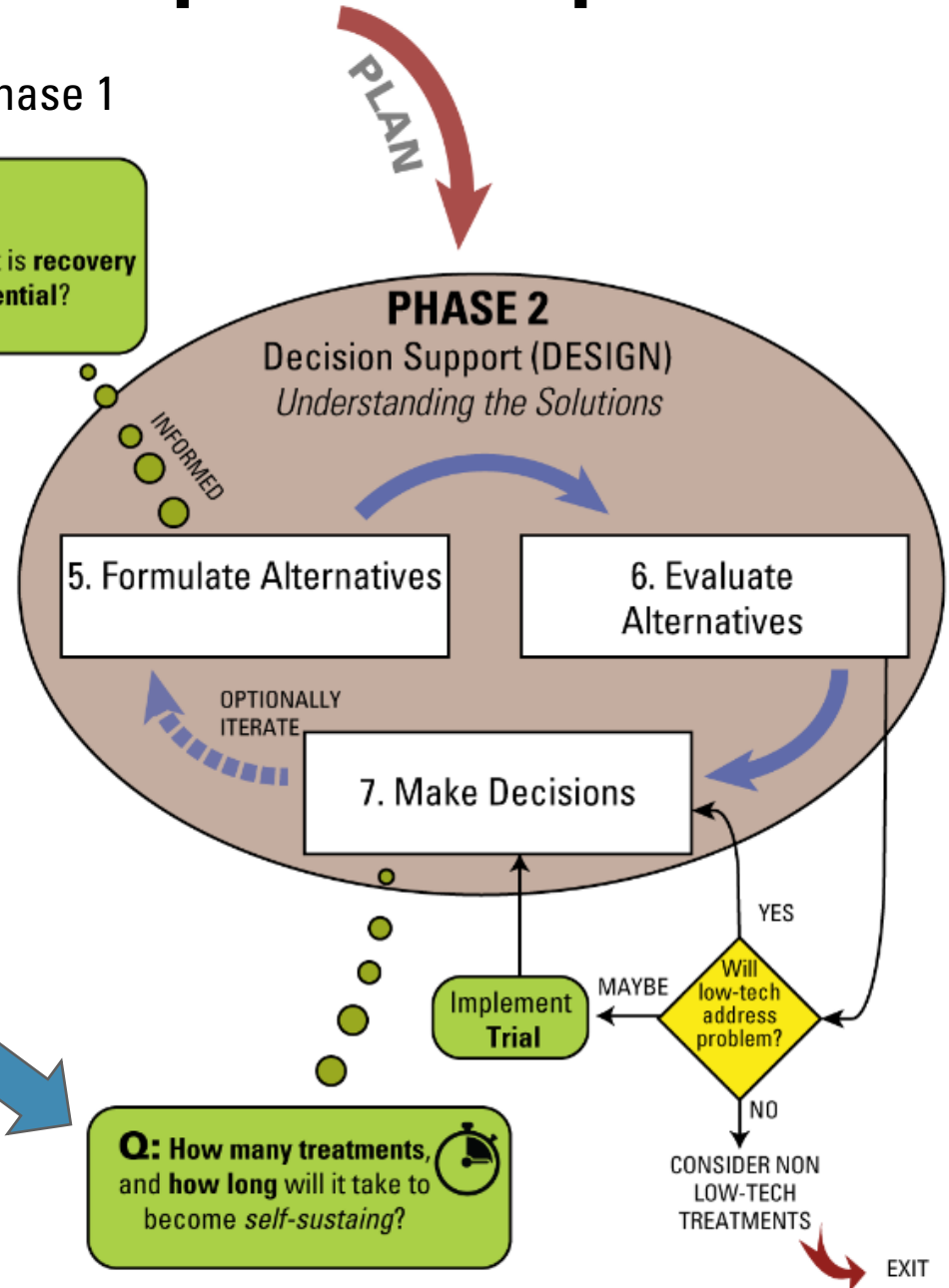
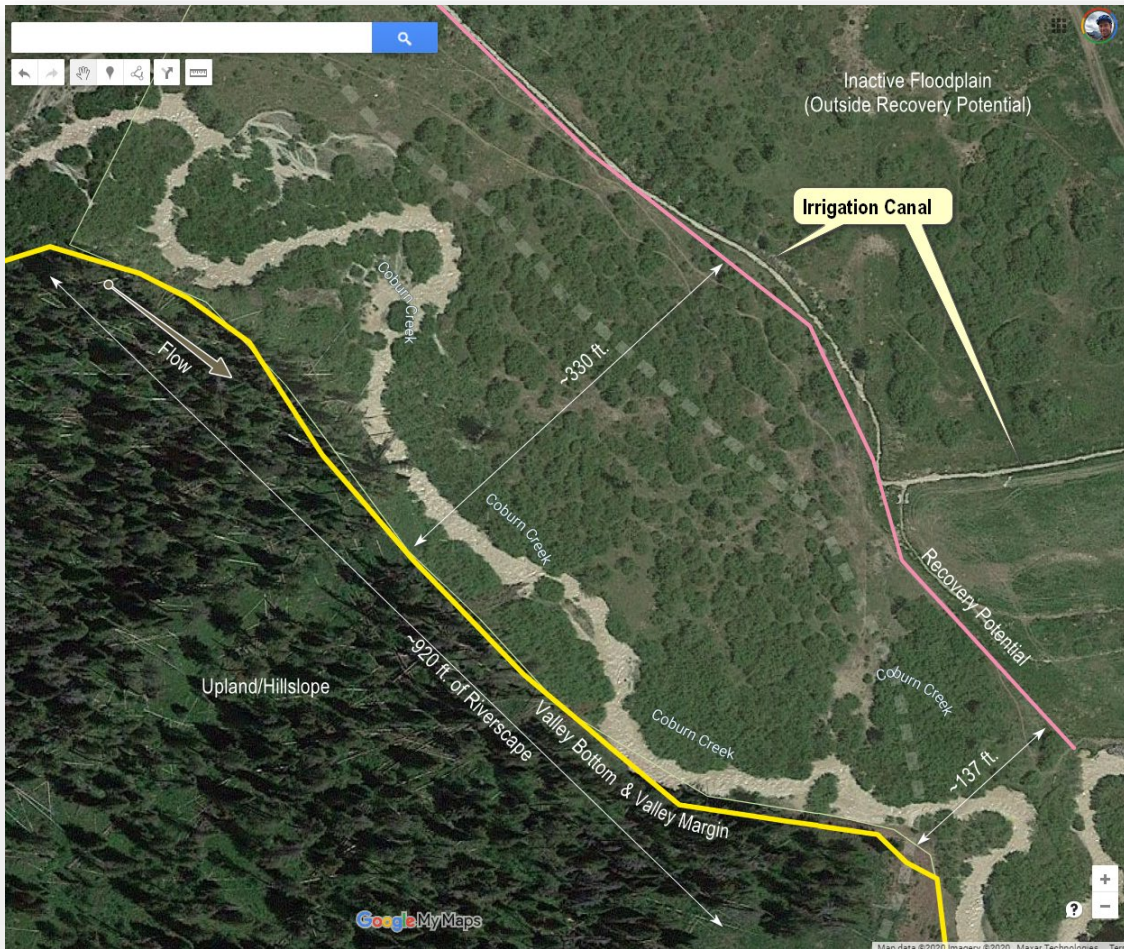


Figure 5.1 from Chap 5: Shahverdian et al. (2019)

DOI: [10.13140/RG.2.2.11621.45286](https://doi.org/10.13140/RG.2.2.11621.45286)

Okay, what's my primary complex objective for this design?



COMPLEX OBJECTIVE:

Structure type and count: 10 ± 2 PALS channel spanning
Total 15 ± 4

Length: ~ 200 m

Narrative: This complex uses a combination of channel spanning jams and bank-attached jams to widen and aggrade the incised channel. Bank-attached jams are used to force bank erosion and channel widening, channel spanning jams are used to capture eroded sediment and force channel aggradation. As current wood availability on floodplain is limited, this initial treatment will simply mimic wood accumulation.

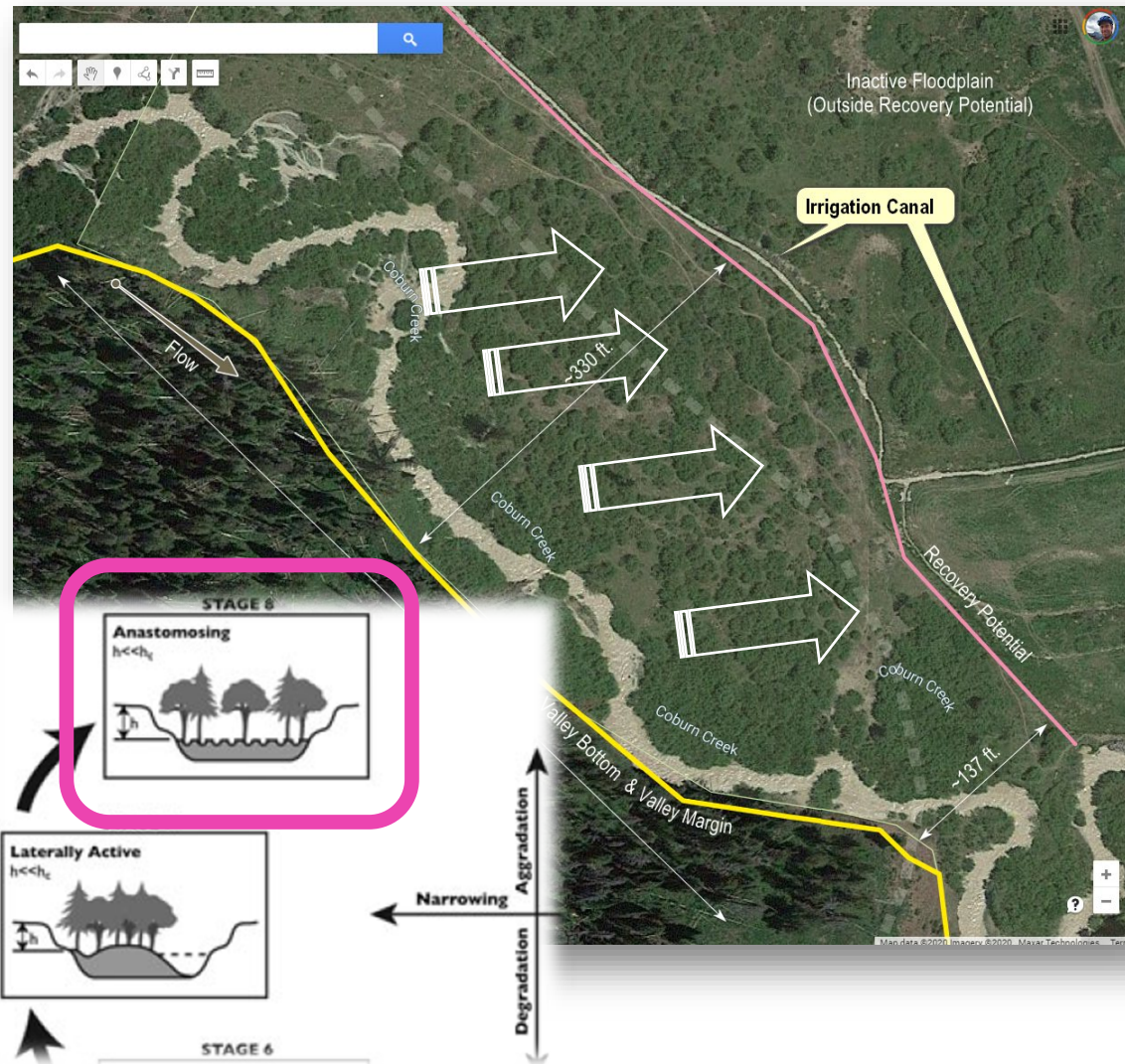
- Increase instream complexity? ✓
- Incision recovery (widen and aggrade channel)? ✗
- Beaver Translocation? ?
- Increase **channel-floodplain connectivity?**



Now I'm ready to design some structures...

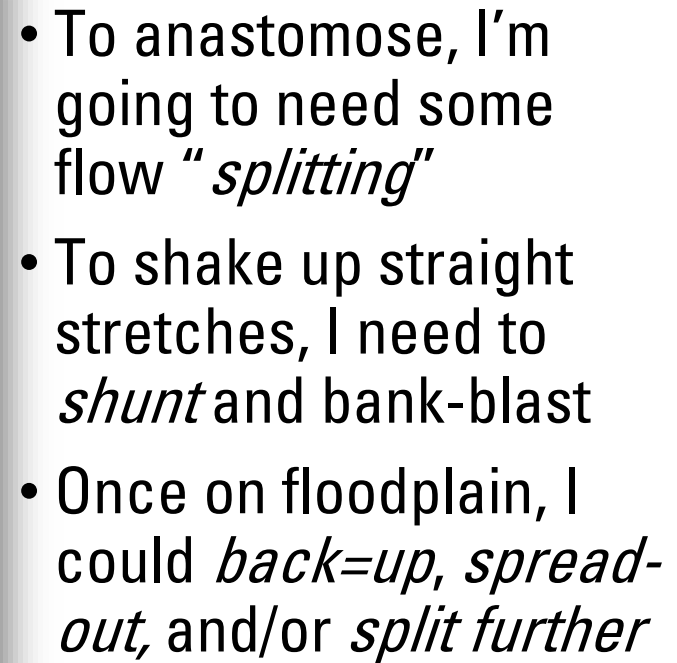
Where could I target to make **my way** riverscape-left?

i.e. active channels



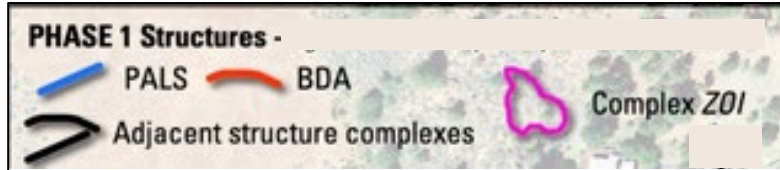
- To anastomose, I'm going to need some flow "*splitting*"
- To shake up straight stretches, I need to *shunt* and bank-blast
- Once on floodplain, I could *back=up*, *spread-out*, and/or *split further*

What weaknesses can be broken up?

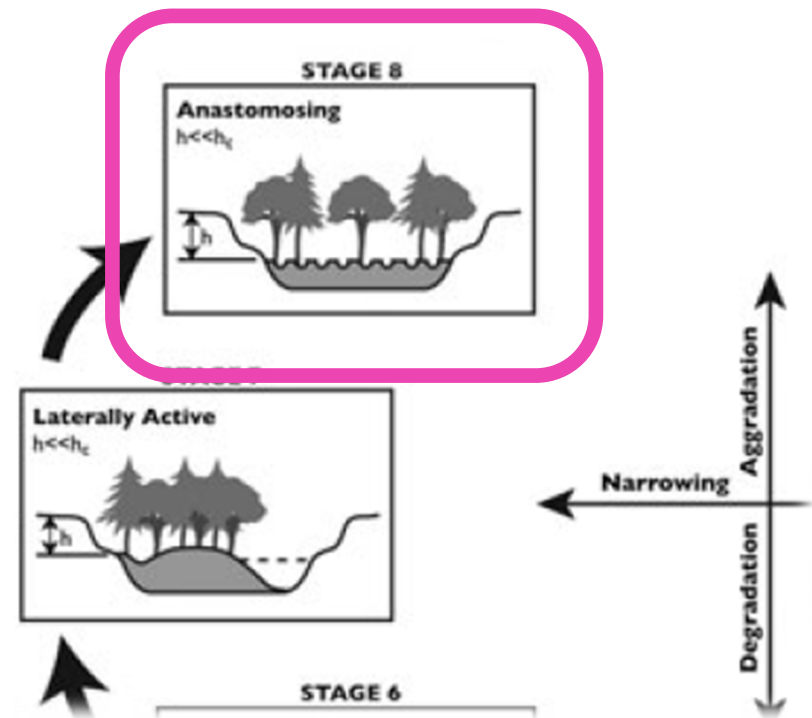


Get your Design Ducks in a Row

Get your legend (design pallet)



- Decide symbols and types.
- Decide whether to do points for structures or design crests
- **Most importantly** – WHAT are you trying to achieve?



Let's pick off an easy one...

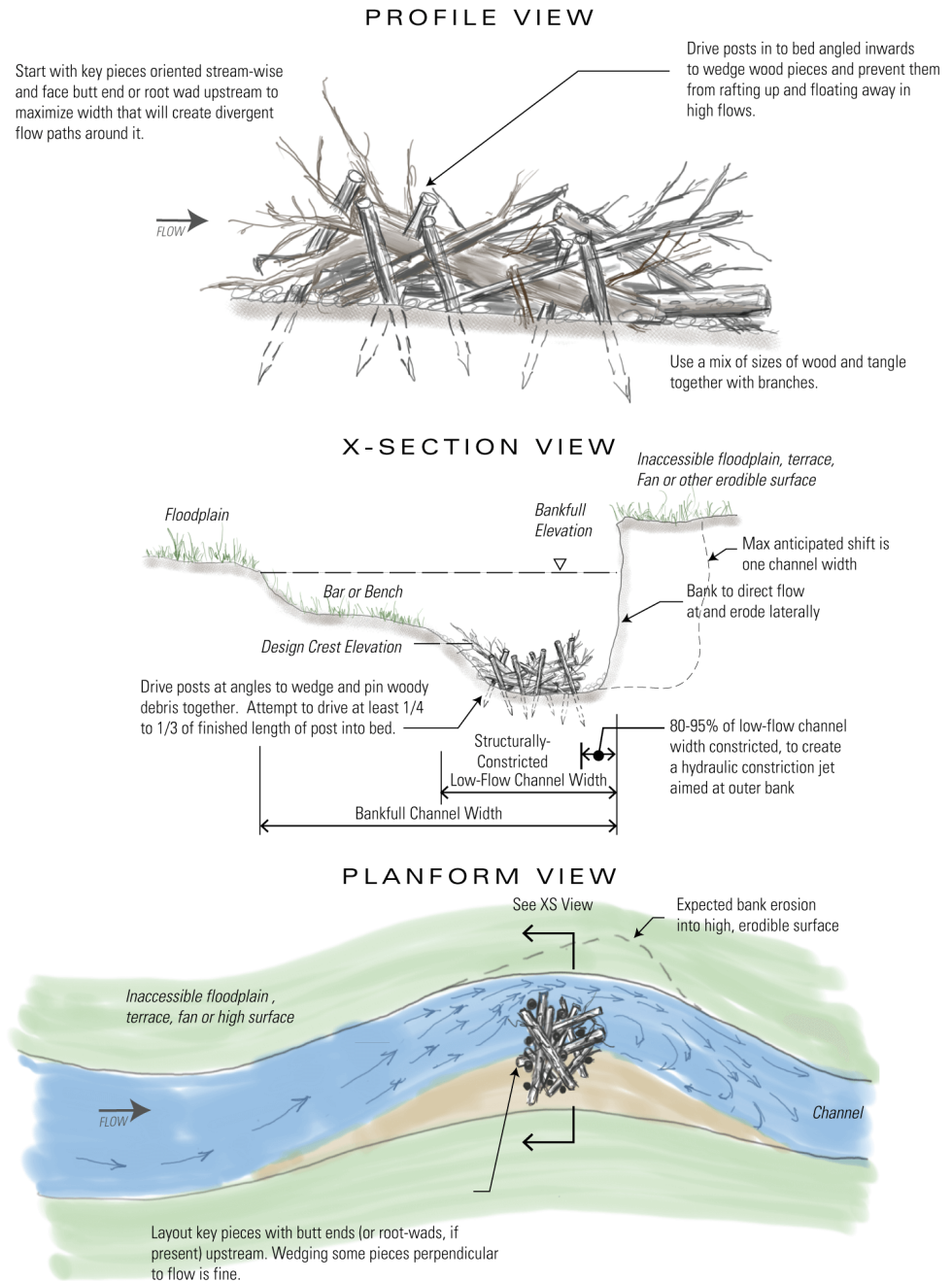
PALS – Bank Blaster & ZOI

1. Draw crest
2. Draw ZOI



Hey, I gotta' structure that might do just that

- Position it and draw crest



See Appendices D & E from Chap 4:
Shahverdian et al. (2019; p 184-207)

DOI: [10.13140/RG.2.2.22526.64324](https://doi.org/10.13140/RG.2.2.22526.64324)

YOU DID WHAT? A BANK BLASTER?



Photo from Joshua White, 2019 (USFWS)

Make process intent explicit as part of design – with a ZOI



Start with key pieces oriented stream-wise and face butt end or root wad upstream to maximize width that will create divergent flow paths around it.

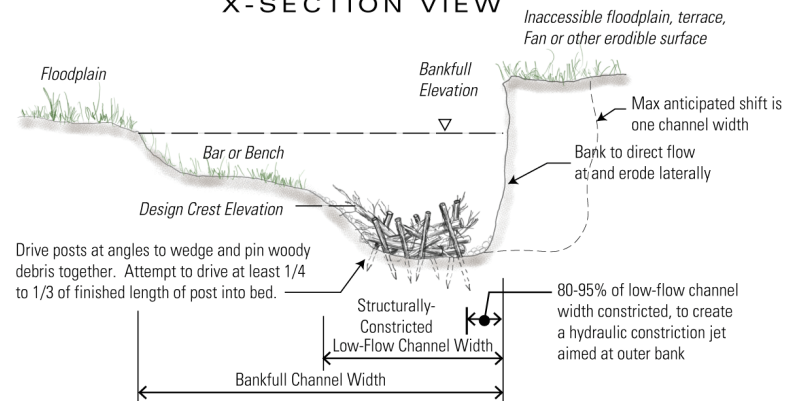
FLOW →



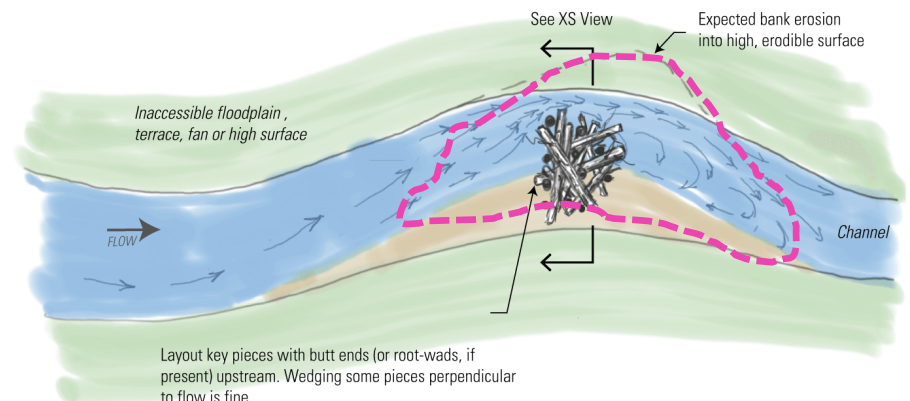
Drive posts in to bed angled inwards to wedge wood pieces and prevent them from rafting up and floating away in high flows.

Use a mix of sizes of wood and tangle together with branches.

X-SECTION VIEW



PLANFORM VIEW



From Wheaton et al. (2019) – LTPBR Manual

DOI: [10.13140/RG.2.2.19590.63049/1](https://doi.org/10.13140/RG.2.2.19590.63049/1).

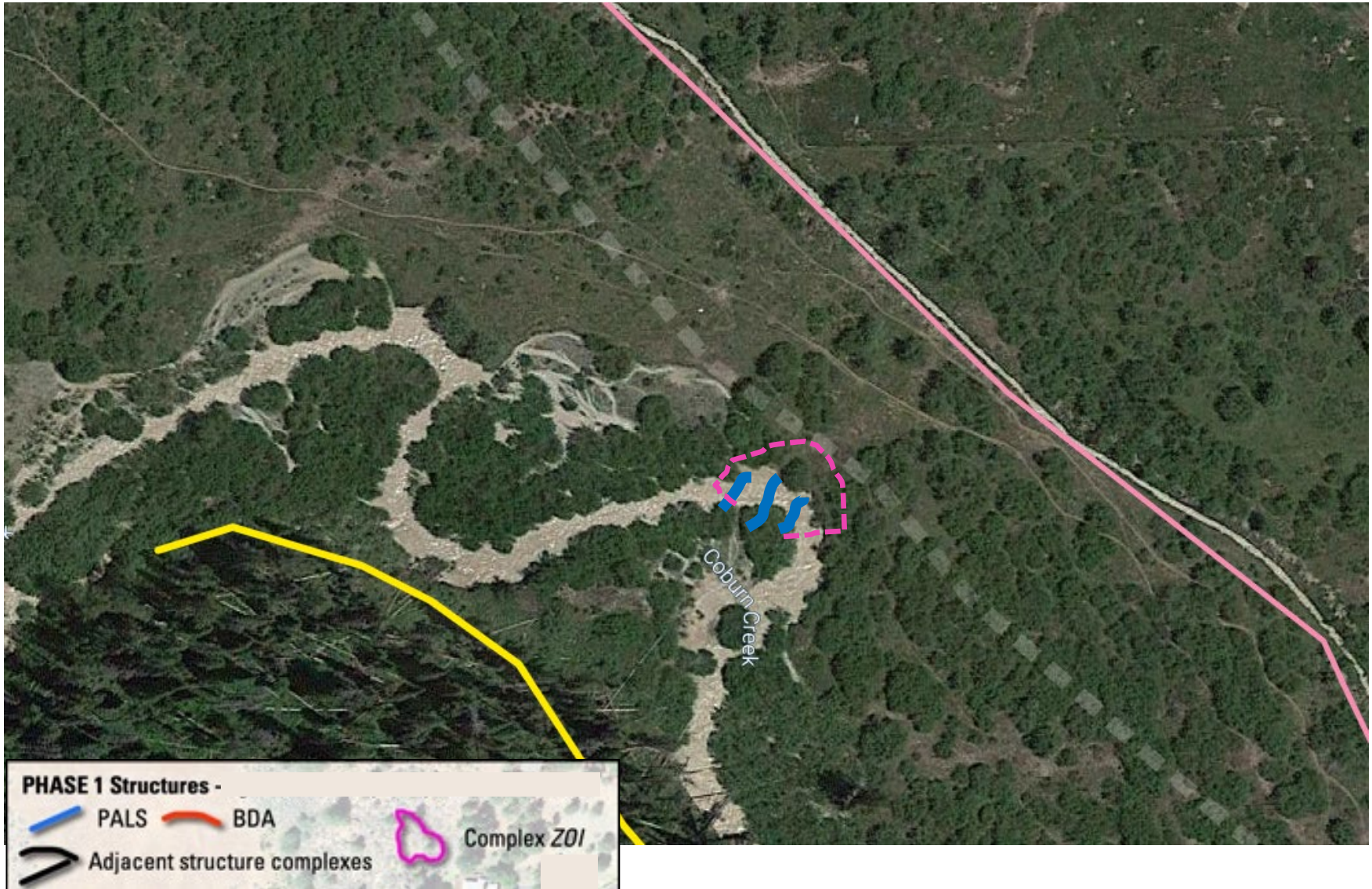


NOT-TO-SCALE

Draw Crest First...

PALS – Bank Blaster & ZOI

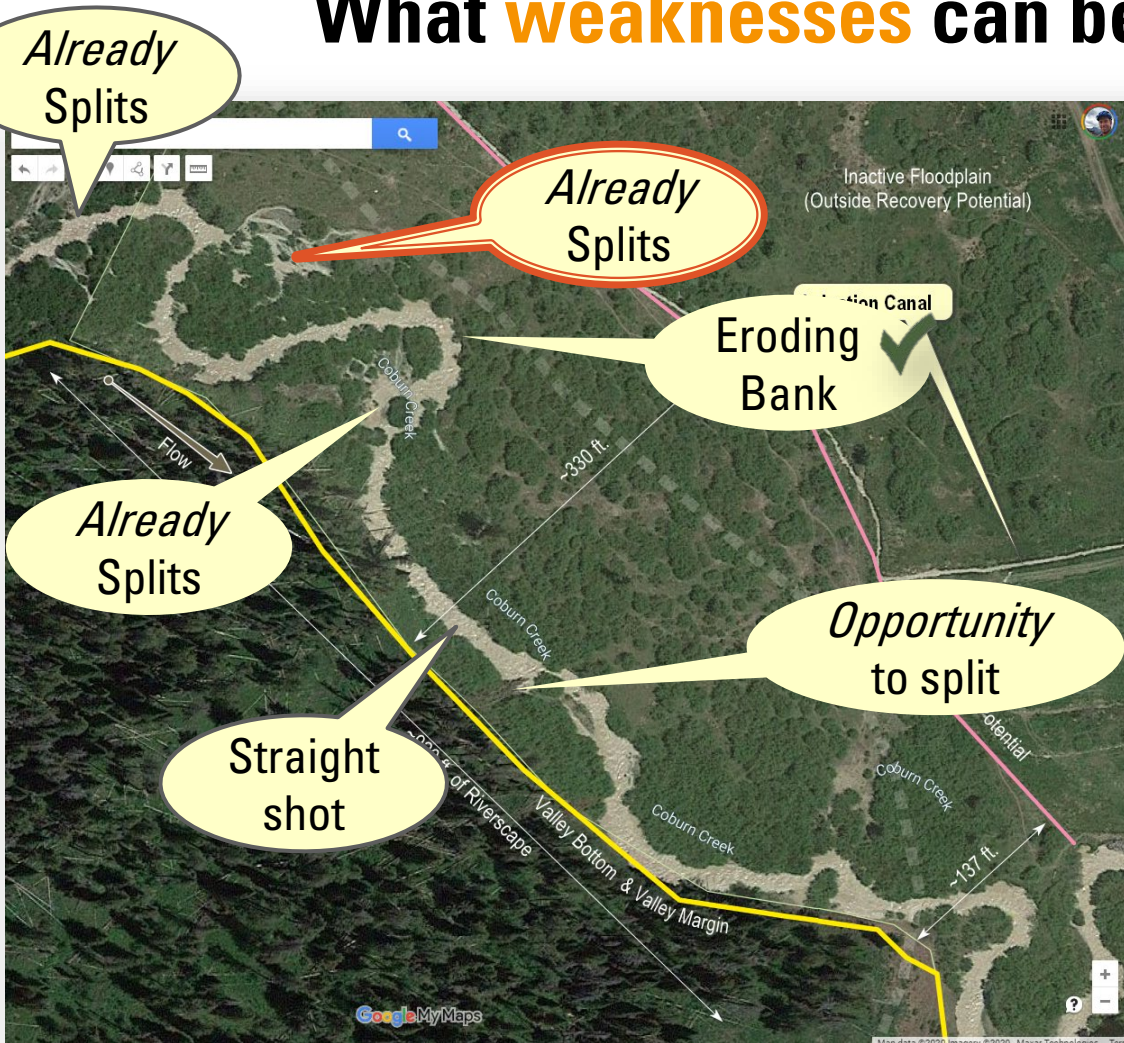
1. Draw crest
2. Draw ZOI



Reading Riverscape Locally

What **opportunities** can be accentuated?

What **weaknesses** can be broken up?

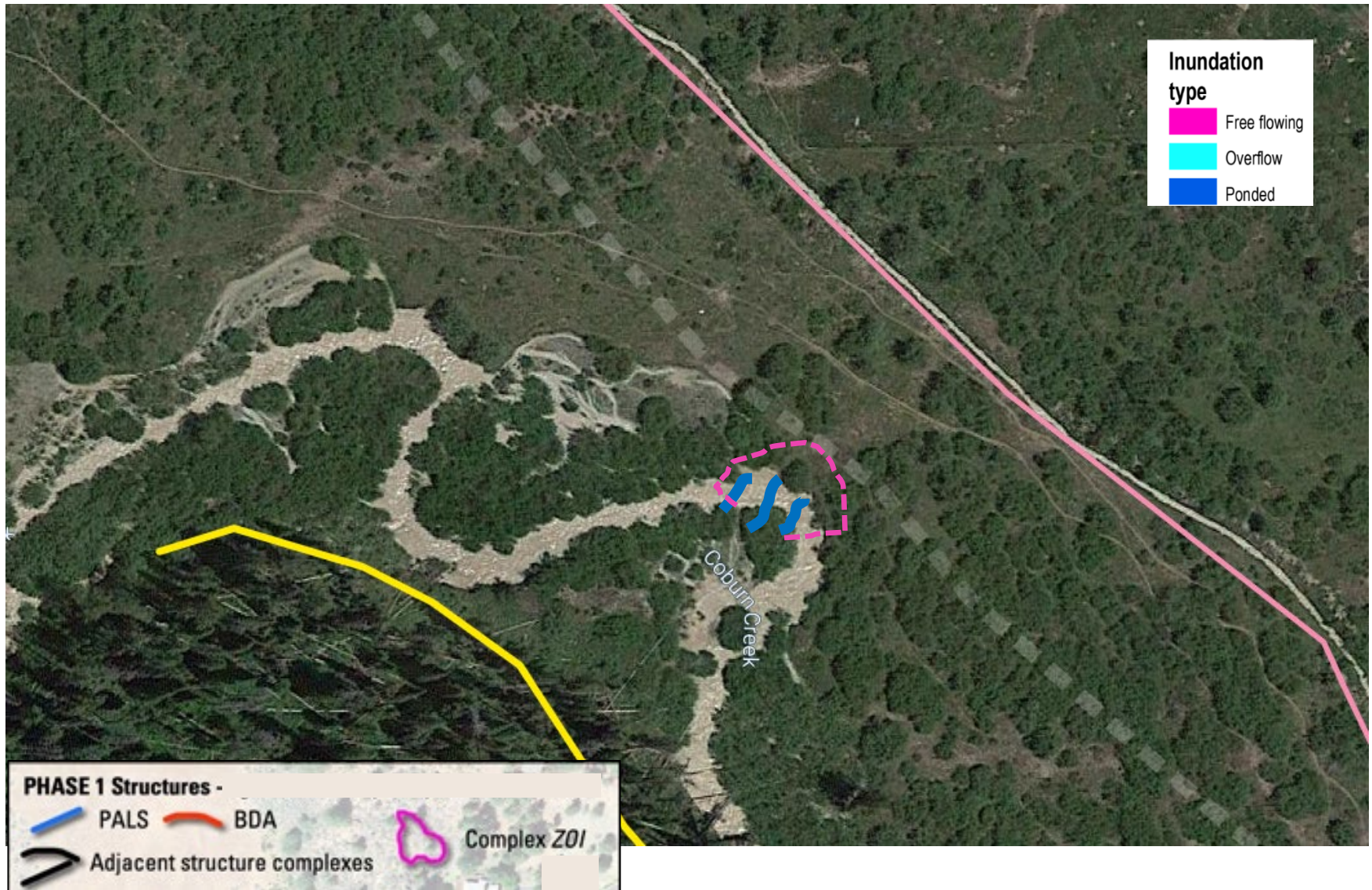


- To anastomose, I'm going to need some flow "*splitting*"
- To shake up straight stretches, I need to *shunt* and bank-blast
- Once on floodplain, I could *back=up, spread-out*, and/or *split further*

How about a Primary & Secondary BDA?

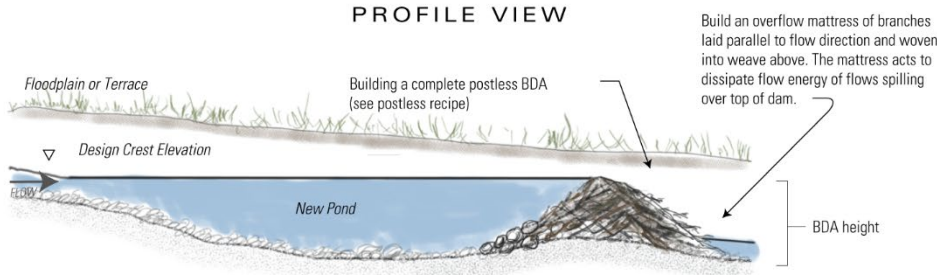
PALS – Bank Blaster & ZOI

1. Draw crest
2. Draw ZOI

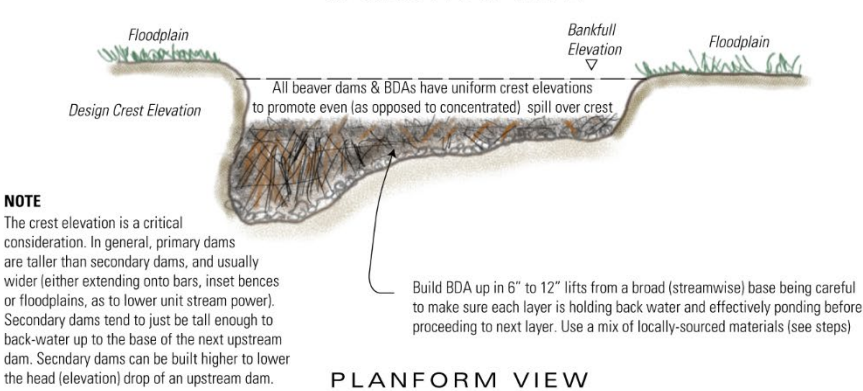


Some BDA Structure Schematics

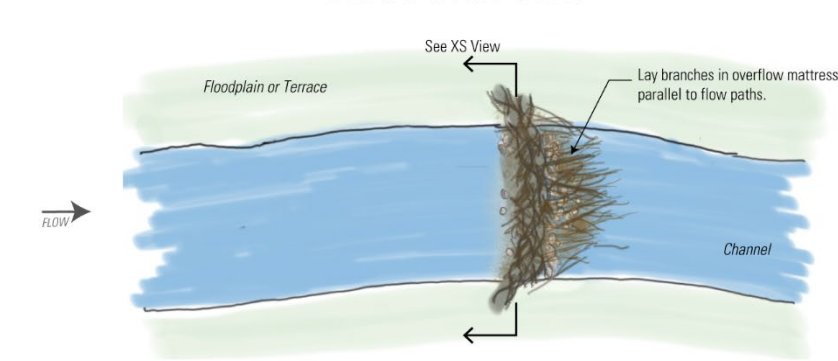
PROFILE VIEW



X-SECTION VIEW

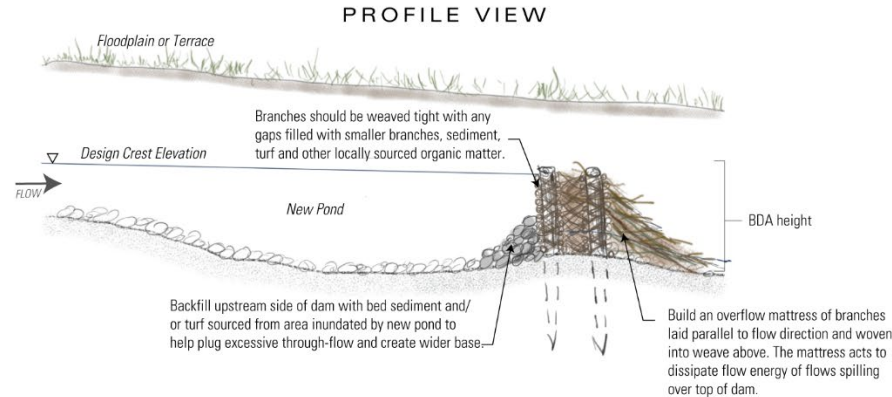


PLANFORM VIEW

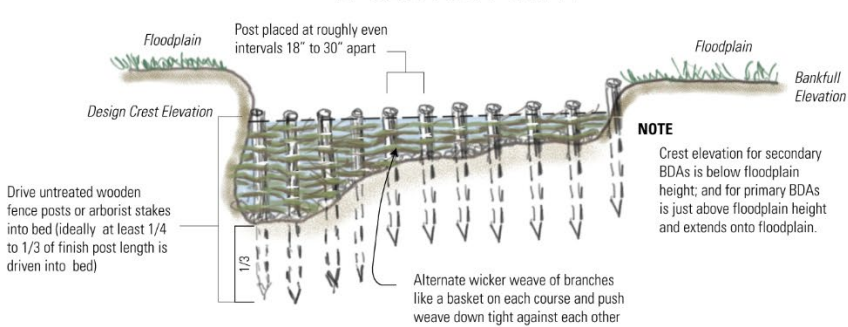


NOT-TO-SCALE

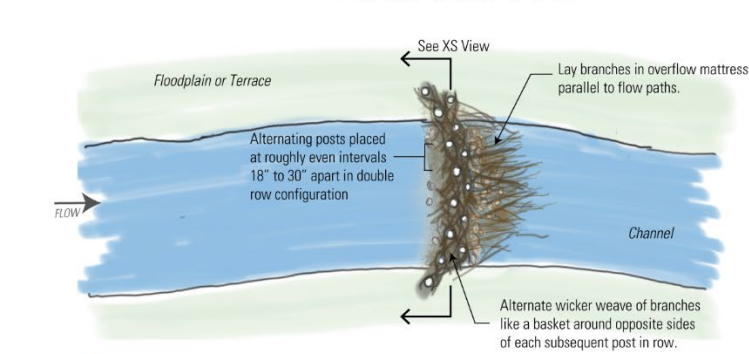
PROFILE VIEW



X-SECTION VIEW



PLANFORM VIEW

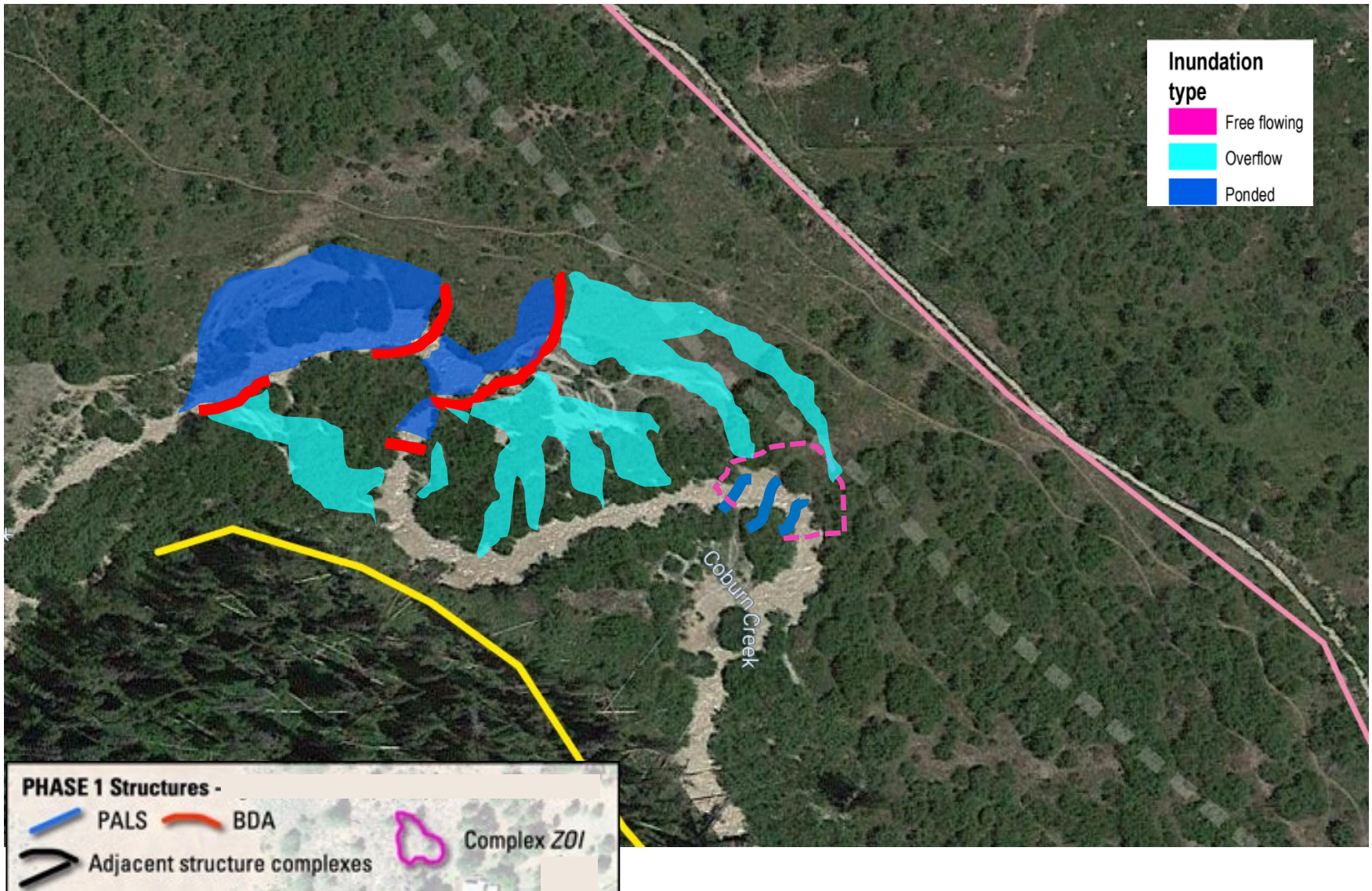


NOT-TO-SCALE

How about a Primary & Secondary BDA?

PALS – Bank Blaster & ZOI

1. Draw crest
2. Draw ZOI



Structure Types Driven by Condition and Objectives

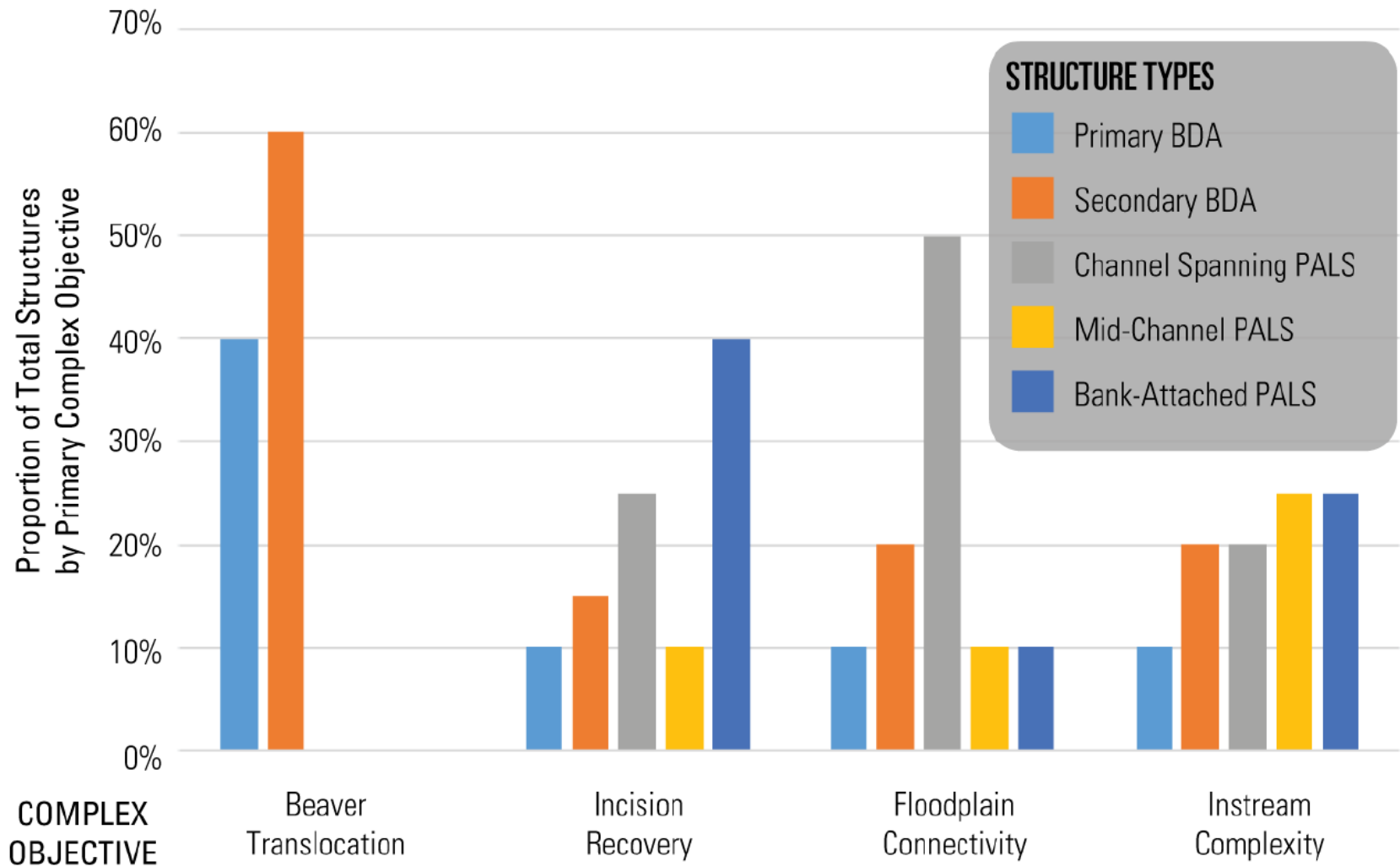


Figure 5.5 from Chap 5: Shahverdian et al. (2019, p 221)

DOI: [10.13140/RG.2.2.11621.45286](https://doi.org/10.13140/RG.2.2.11621.45286)



Temptation is to use BDAs everywhere...

Use sparingly where best opportunities are to support beaver dam activity in short term...



Photo from Joshua White, 2019 (USFWS)

Simpler PALS & ALS can do trick for cheaper



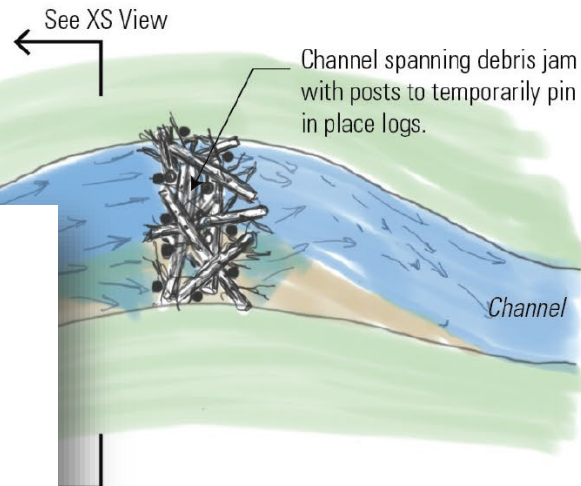
Photo from Joshua White, 2019 (USFWS)

CHANNEL-SPANNING PALS

- Bank-attached on both sides, such that even at low-flow there is some hydraulic purchase across most of the channel, acting to back-water flow behind it. Unlike a beaver dam (with a uniform crest elevation), channel-spanning PALS can have a variable crest elevation and rougher finish, and are generally built with much greater porosity.
- Over time, increased water depth and decreased velocity upstream of PALS encourages more wood accumulation, organic accumulation and sediment deposition, all of which can act to stabilize the structure.
- If crest elevations are higher than adjacent floodplain(s), it can increase frequency of floodplain inundation, force new diffluences, and/or promote avulsions.
- Can be used to widen the channel around (one or both sides of) the structure.

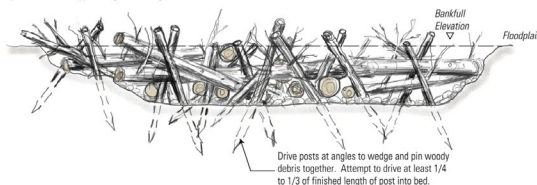


PLANFORM VIEW



Design height for channel-spanning structures is important. If it is intended Structure can protrude above typical high flow stages.

CROSS SECTION VIEW



PROFILE VIEW

Start with key pieces oriented stream-wise and face butt end or root end upstream to maximize width that will create divergent flow paths around it.



See Figure 4.26 of the LTPBR Design Manual 34

From Pocket Guide & Wheaton et al. (2019)

DOI: [10.13140/RG.2.2.19590.63049/1](https://doi.org/10.13140/RG.2.2.19590.63049/1)

Example from BAER USFS Project on Gance Fire in Nevada

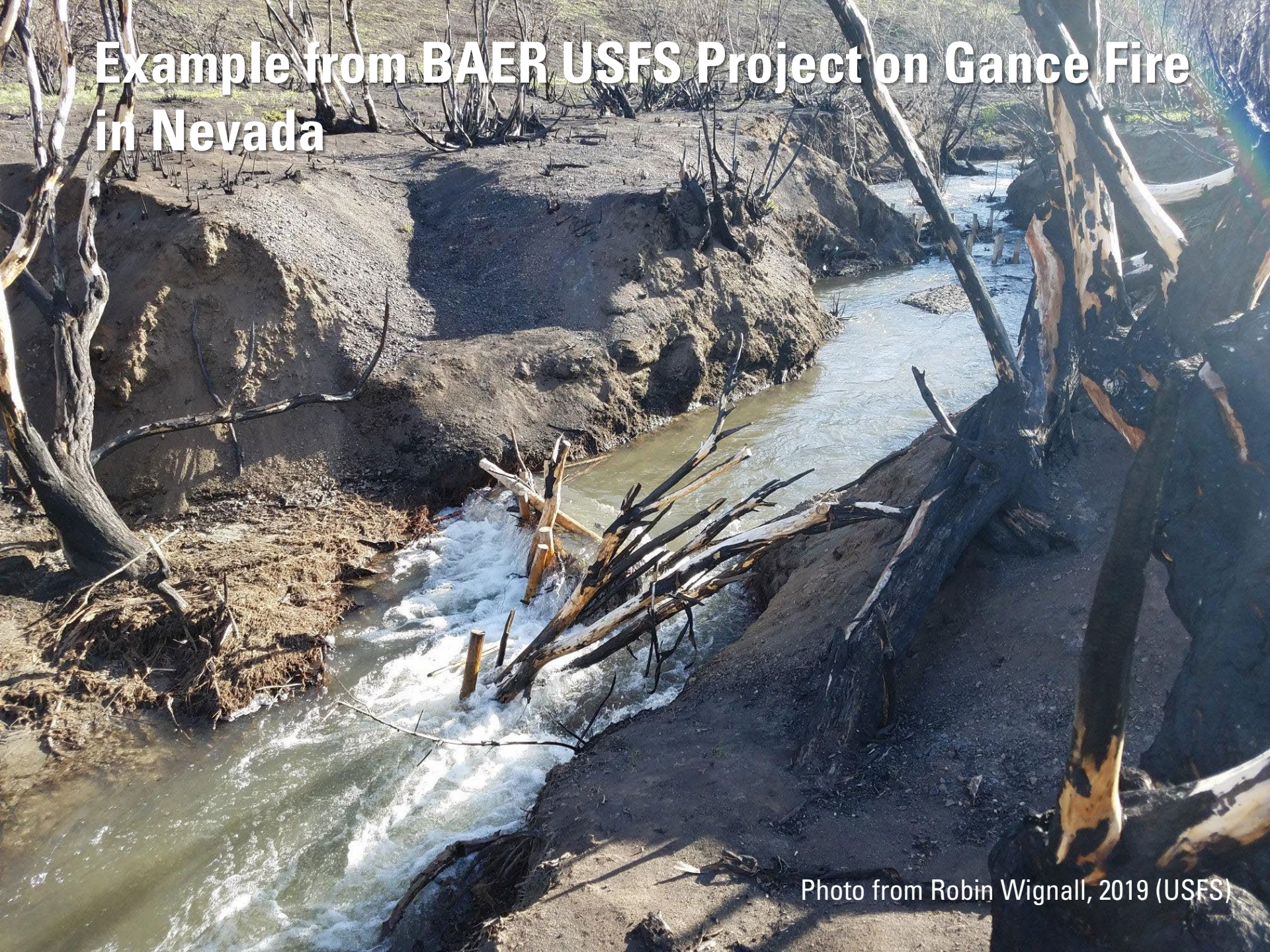


Photo from Robin Wignall, 2019 (USFS)

← Robin J -FS Wignall



A NEVADA LOW-TECH TRIAL...

Friday, May 3 • 7:54 PM



Have some gap teeth after the main part of the flooding this past month but everything is functioning to plan :)



Text message



Super excited about this anchored log that functioned way better than I imagined



New meander and inset flood plain developing as intended



Text message



The gully didn't deepen and it might have gotten wider 😊



Nice clean gravel for the lct



Text message

Head-Cuts on Return Flows Good!

- Head-cuts get a bad name... not all are indicative of “runaway” incision
- This example indicative of floodplain connectivity!

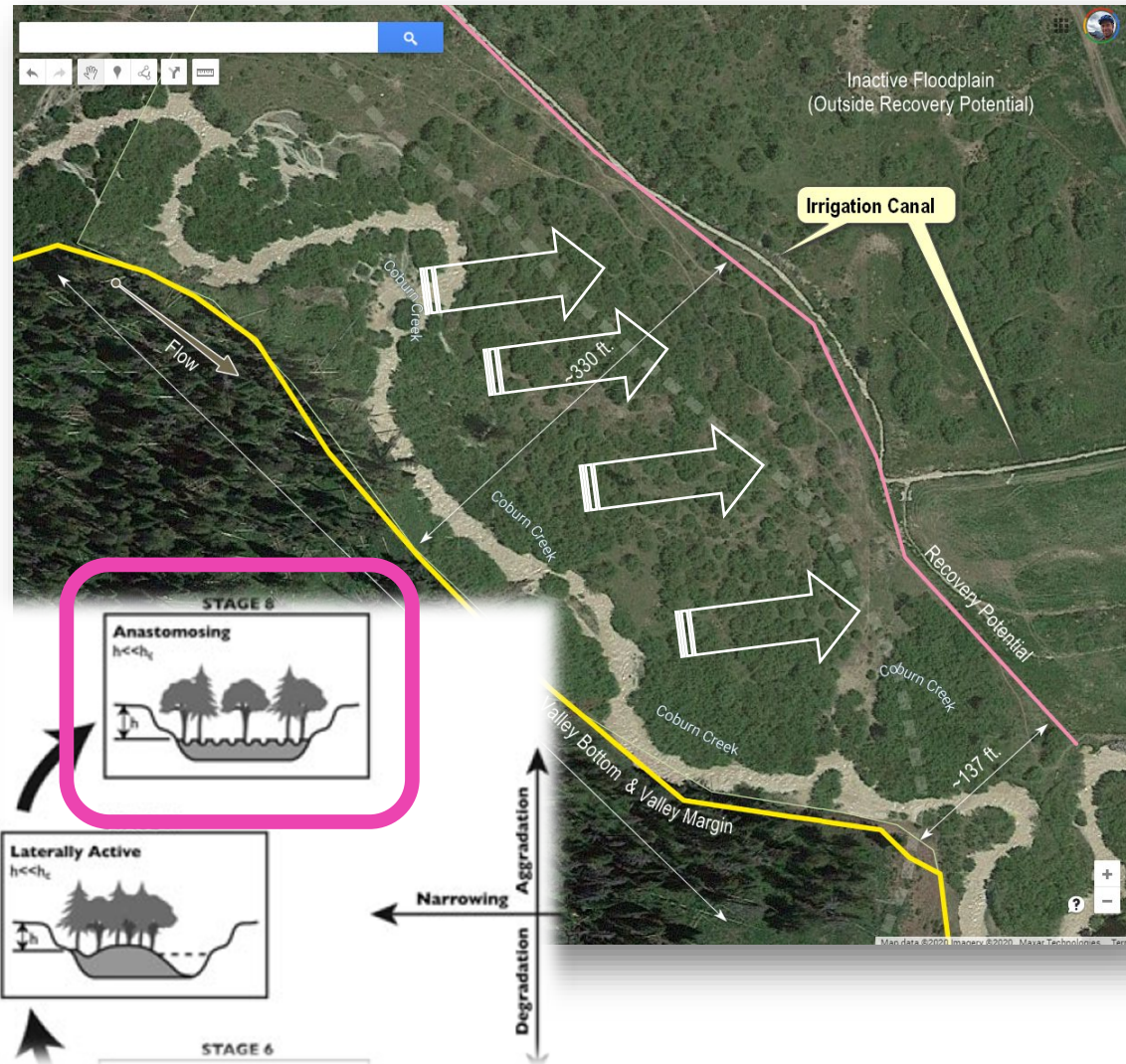


Photo from Joshua White, 2019 (USFWS)

No Single Correct Design... Many things can work

Where could I target to make **my way** riverscape-left?

i.e. active channels



- To anastomose, I'm going to need some flow "*splitting*"
- To shake up straight stretches, I need to *shunt* and bank-blast
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Another Design Example



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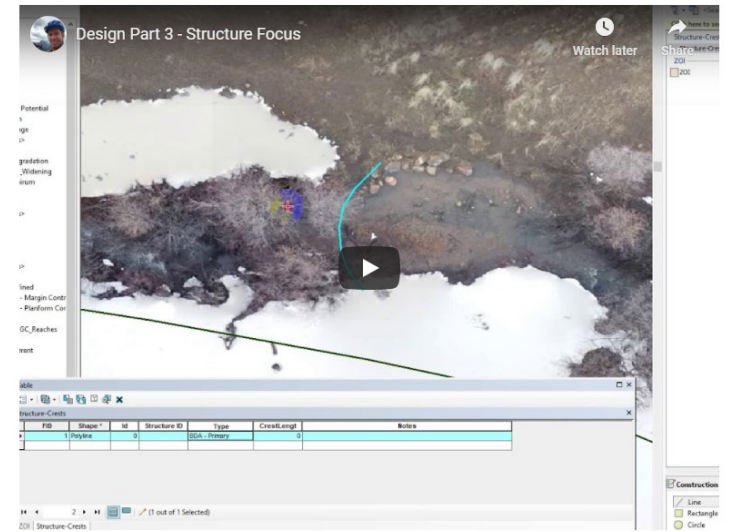
This page walks you through getting started in the **Design Phase** of the **low-tech Conservation Planning Process**. We continue to use the example of **Birch Creek, Idaho**, but the process is generic to application to any riverscape.

Part 3 - Structure Focus

Although in the report and communication we talk about a "complex focus", ironically the thing we do is when learning the design process, it is easiest to think very specifically about each structure. In this 40 you through a complete design for a complex and what the GIS steps are (we can just sketch these on a field we have an App we use to help us capture this process). When you get good, typical structures take design and a complex typically takes 20 to 30 minutes to design.

Although not necessary for reporting, it is easiest to conceptualize by designing each individual structure complex (collection of structures) as follows:

This video holds your hand (in an appropriate socially-distanced sort of way) through those steps.



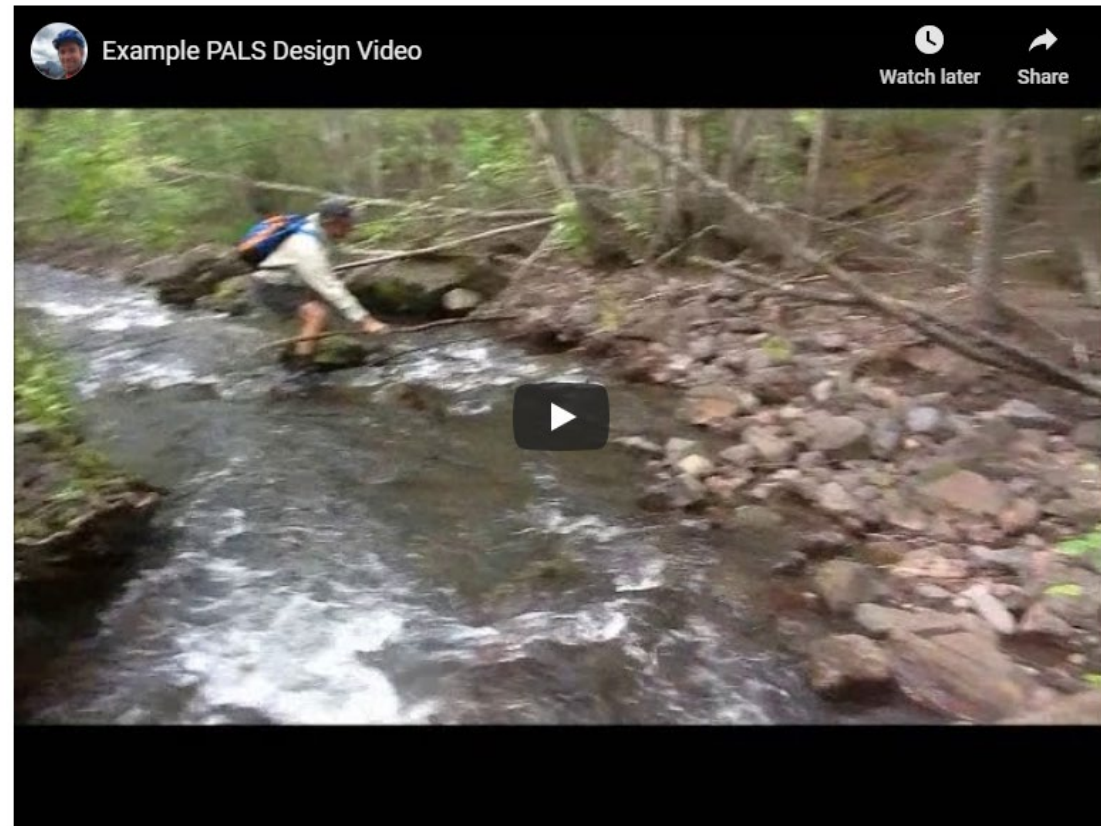
Steps Summarized

1. Read local riverscape for opportunities to achieve some specific processes (i.e. hydraulic or geomorphic or ecological response), that will contribute to achieving complex objectives.
2. Choose an appropriate **structure type** to help immediately mimic or quickly promote that (those) process(es).
3. **Locate the structure** specifically, by drawing its crest position. This will explicitly force you to think about orientation (perpendicular, streamwise, diagonal), position (channel spanning, margin attached, mid-channel, floodplain), crest length (e.g. channel spanning, floodplain spanning, proportion of active channel) and crest height.
4. Articulate your expected structure **design hypothesis** with a **zone of influence polygon**. You can make this for immediate (e.g. low flow) or future (e.g. high flow) hydraulic and/or geomorphic response. Literally what space will this structure force hydraulic and or geomorphic interaction with. In the video below, I explain some ways of thinking about this in very specific terms. With BDAs that back-water up, think about what areas will be *ponded*, versus those areas that might be *overflow* surfaces (e.g. floodplains or exposed bars). This contrasts with areas that will be left as *free flowing* and are not directly influenced by the structure. With PALS, you can think about hydraulic responses of *shunting*, *splitting*, and *backing-up* flow and what the upstream (backwater) and downstream zone of influence is associated with this.
5. **Combine** your individual structure responses (zone of influence) into one **complex zone of influence** (the union of all structure ZOIs and interior areas), to summarize at complex scale.

Design in Field... Easier – Record a Video

How its done in field

In the field, we often use design videos (optional) to capture a bunch of information quickly that would otherwise take much longer to map and document. It allows us to keep the design agile and quick (i.e. what am I building where to do what), but convey a lot more in terms of how things are to be done on the ground. Here is an example design video (one of over 750) from a project in Washington:



Typical design videos are between 15-45 seconds, and simply show what is meant by build this type of structure here. It allows us to use simple flagging or paint to denote location (in addition to a dot or line in GIS), and we have built apps that