Posts, PALS, and Pitfalls: Hard-Won Lessons in Low-Tech Restoration


REID CAMP, SNAKE RIVER SALMON RECOVERY BOARD

MARCH 12, 2026

Grassroots movement to empower locals

Scalable restoration with promising results

Scalable restoration with promising results

Sounds like a dream… what is the problem?

- When applied inconsistently, it leads to uneven support

LOW-TECH PROCESS-BASED RESTORATION PRINCIPLES FOR STRUCTURALLY-STARVED RIVERSCAPES

Riverscapes Principles

1. Streams need space
2. Structure forces complexity and builds resilience
3. The importance of structure varies
4. Inefficient conveyance of water is healthy

Restoration Principles

5. It's okay to be messy
6. There is strength in numbers
7. Use natural building materials
8. Let the system do the work
9. Defer decision making to the system
10. Self-sustaining systems are the solution

LTPBR embraces uncertainty

- When applied inconsistently, it leads to uneven support

LOW-TECH
PRINCIPLES
RIVERSCAP

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Uncertainty is at the heart of LTPBR

Funders, regulators, legislators, public, etc. all desire certainty

Typical Design Expectations

Basis of design report

- Design drawings
- Goals and objectives
- Site characterization
- Alternatives assessment
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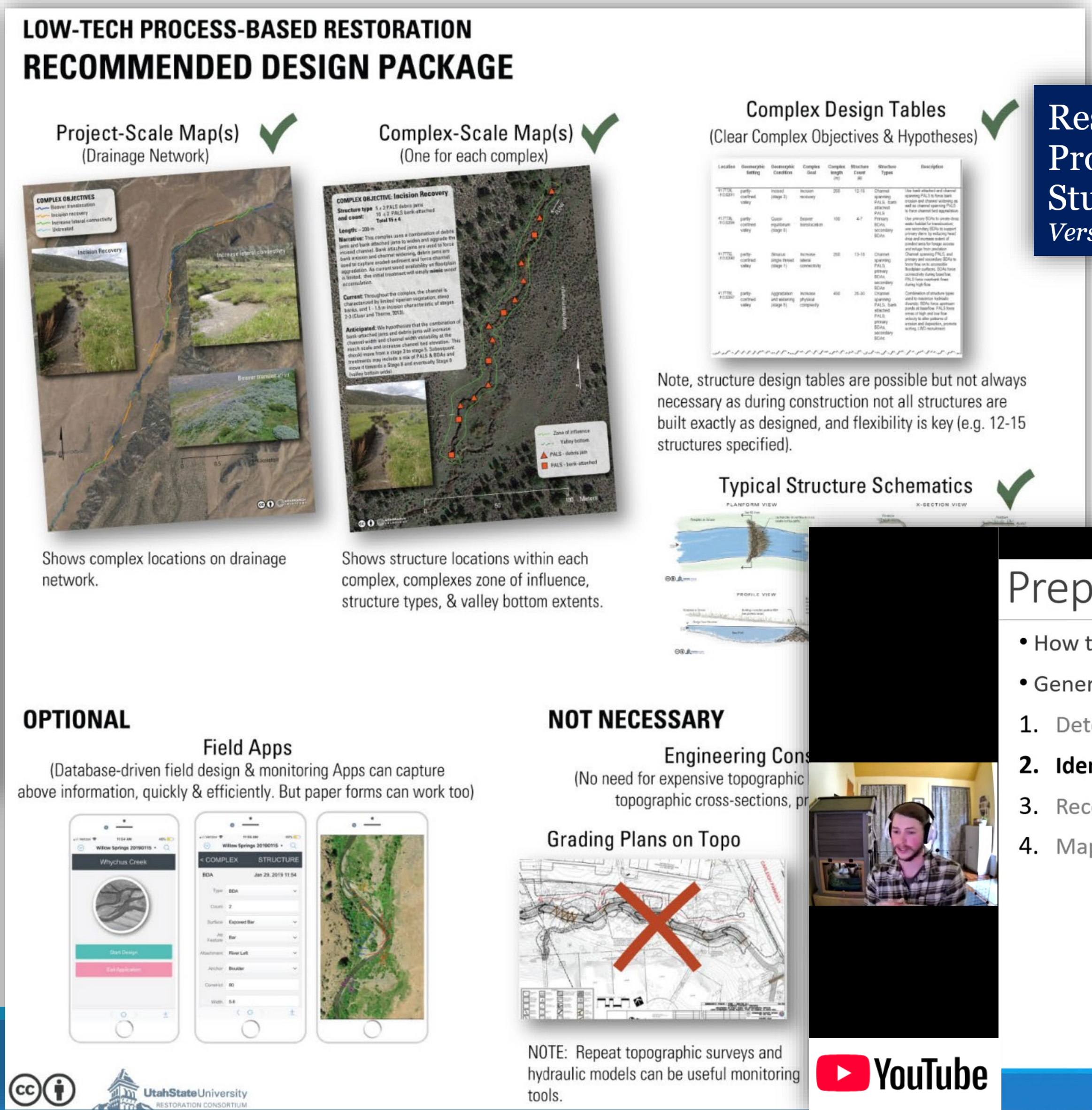
WASHINGTON STATE RECREATION AND CONSERVATION OFFICE Salmon Recovery Funding Board

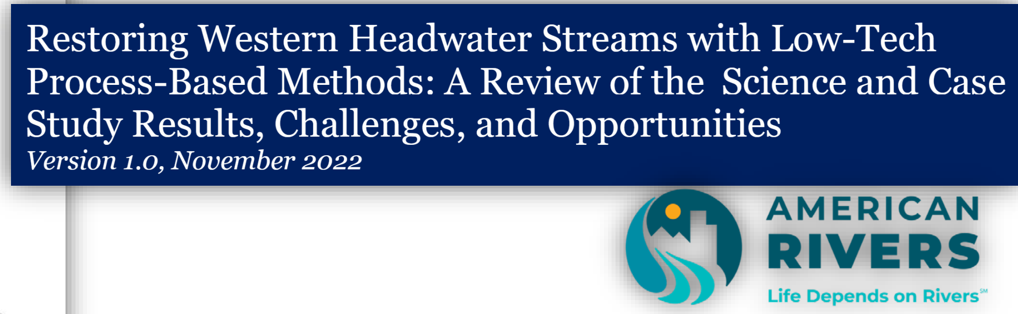
DEPARTMENT OF ECOLOGY State of Washington

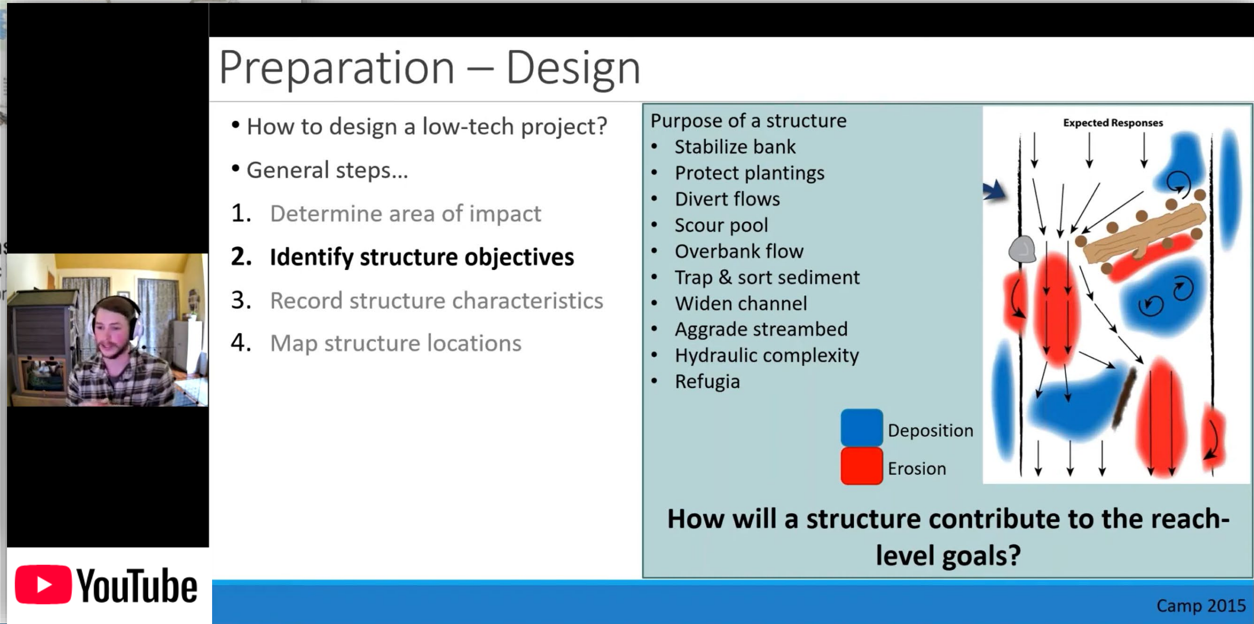
Bonneville POWER ADMINISTRATION

Balancing certainty with LTPBR principles

- Take advantage of available resources








Construct
Design
Planning
Steward

Was the project constructed as designed and built well?

Was the project designed with purpose and intent?

Was an adaptive management plan developed and applied?

Was working at the site and LTPBR technique justified?

Planning

Lesson: Understand fluvial processes

$$F_c = \frac{mv^2}{r}$$

$$d_s = d_m\left(\frac{V_m}{V_c} - 1\right)$$

$$\theta = \omega \sin kx$$

$$\tau = k_t Q^{1/3} S^{2/3}$$

$$\theta_r = \frac{\tau_r}{(\rho_s - \rho_\omega) g d}$$

$$\frac{\partial C}{\partial t} = \omega - \nabla Q_s - k_d \nabla^2 h$$

$$\frac{\partial R}{\partial t} = U - \omega - E$$

$$\tau_{ce} = \alpha {\rho_d}^b$$

$$W = k_c \sqrt{Q}$$

$$QS \sim Q_s D_{50}$$

$$Q_s = k_s W (\tau - \tau_c)(\sqrt{\tau} - \sqrt{\tau_c})$$

$$V = \left(\frac{K}{n}\right) R^{\frac{2}{3}} \sqrt{S}$$

Planning

Lesson: Understand fluvial processes

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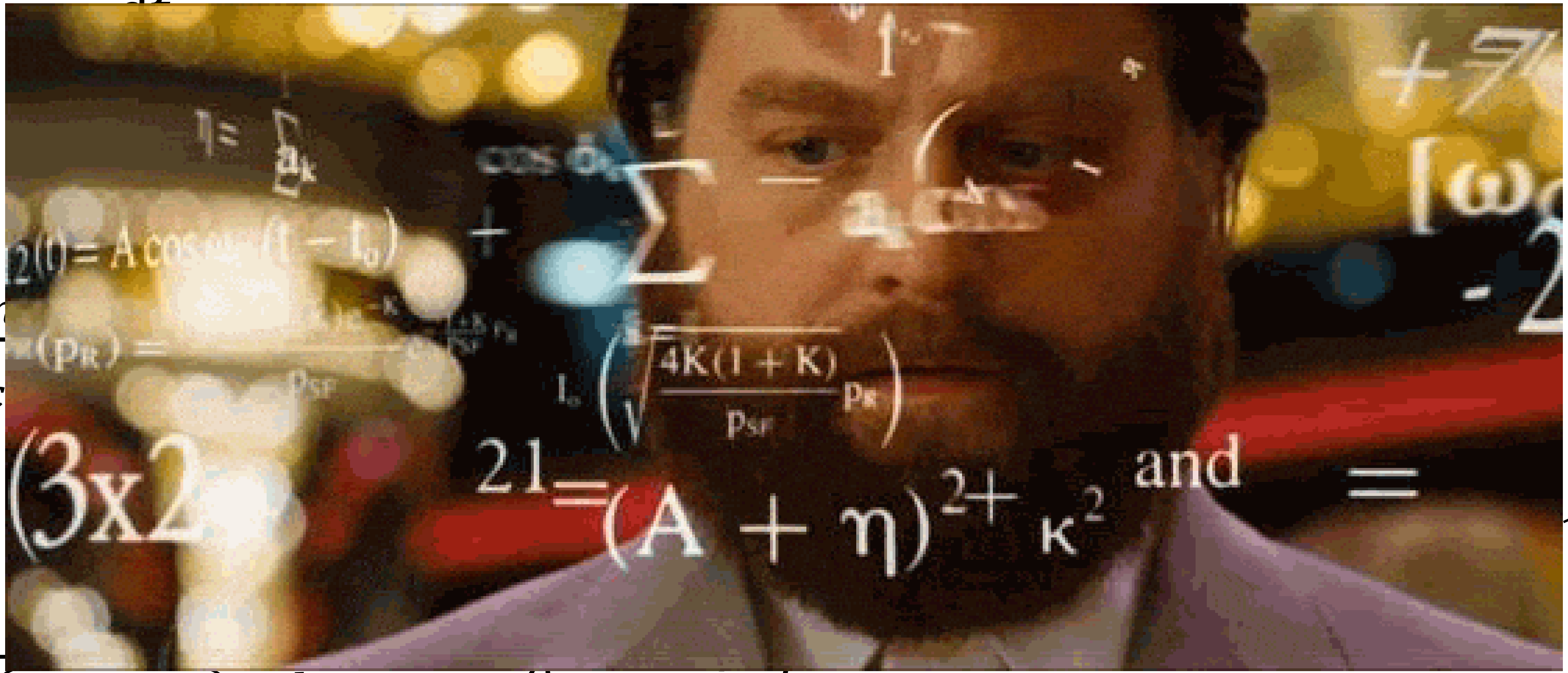
$$QS \sim Q_s D_{50}$$

$$W = k_c\sqrt{Q}$$



$$d_s = d_m\left(\frac{V_m}{V_c}\right.$$

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Planning

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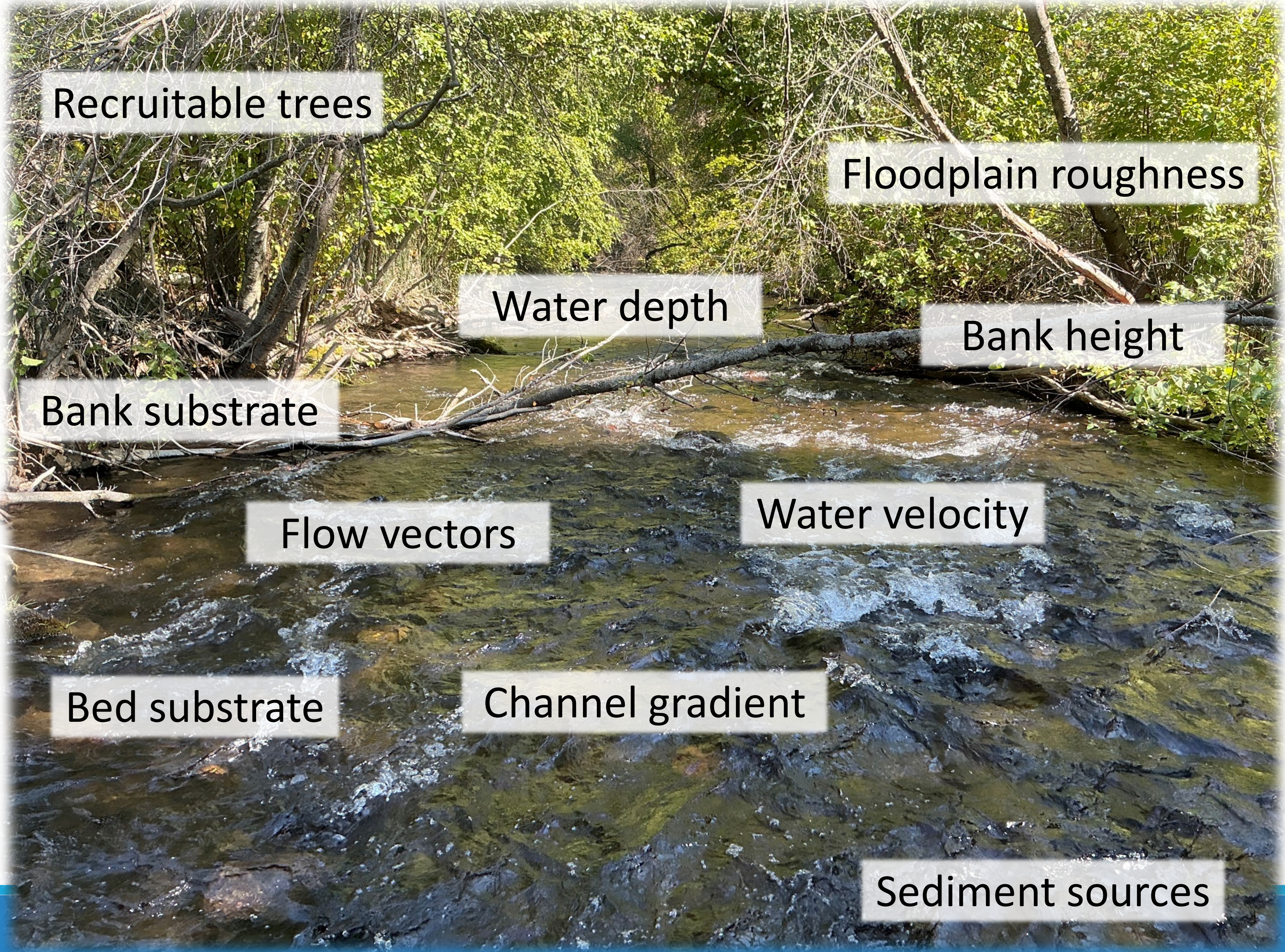
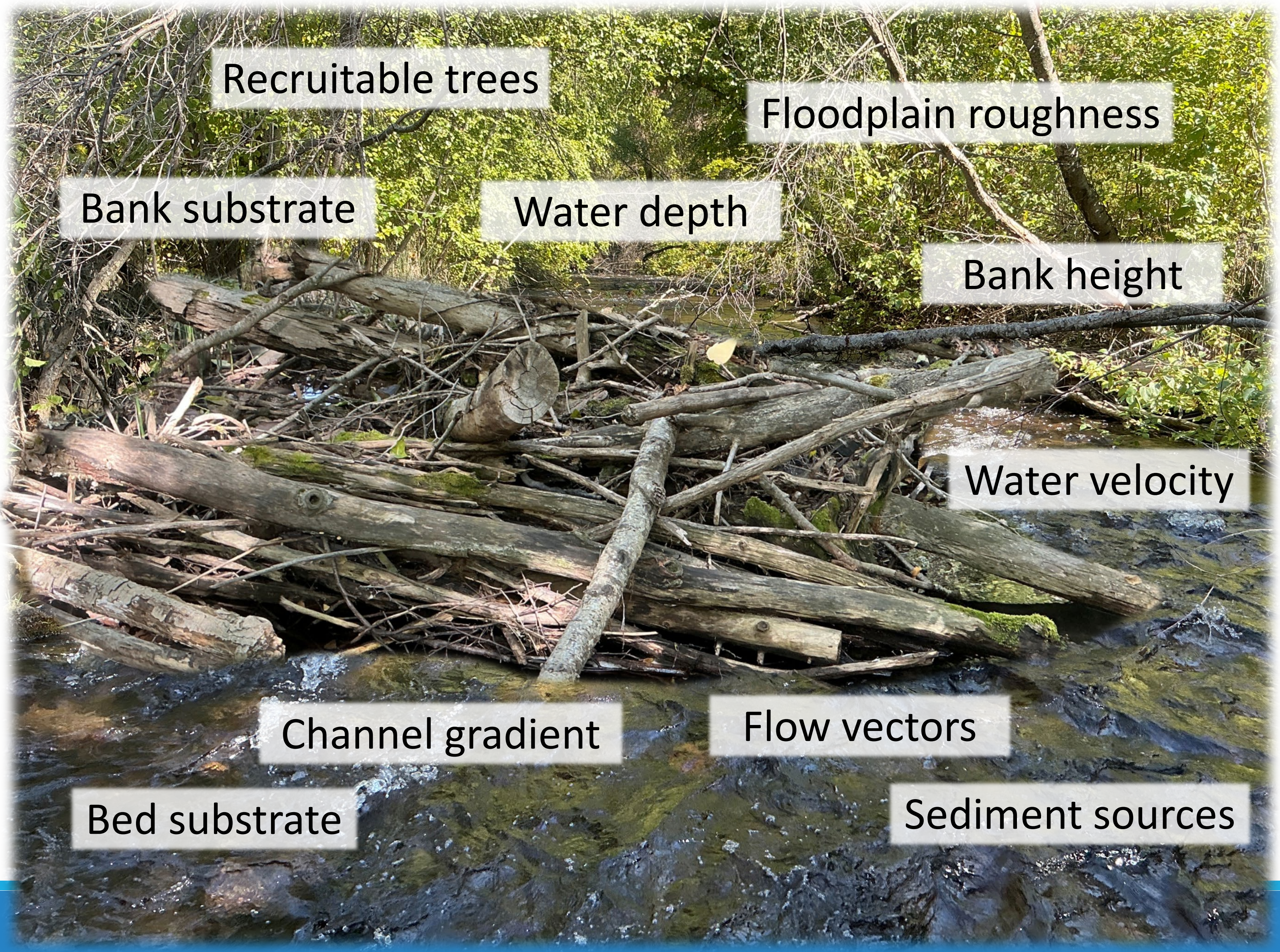
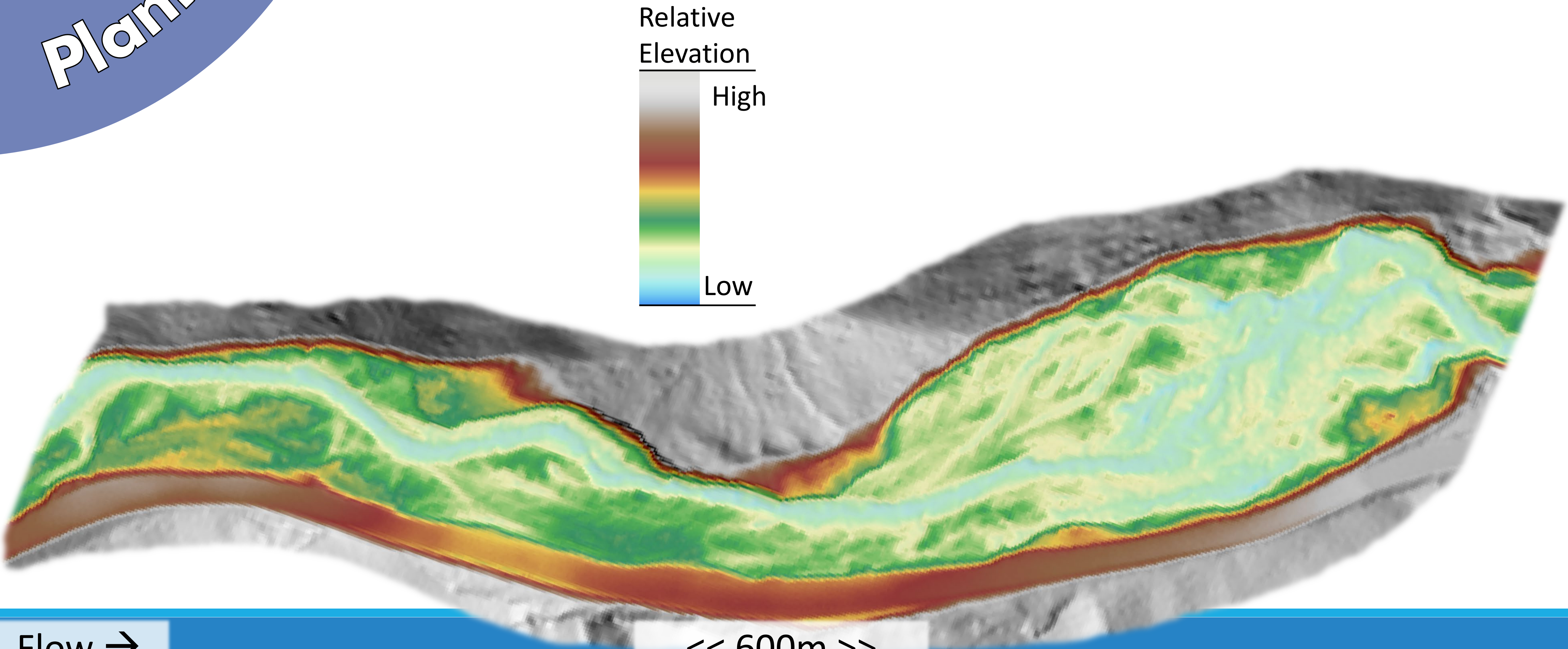


Lesson: Understand fluvial processes



Planning

Lesson: Site selection is important



Flow →

<< 600m >>

Planning

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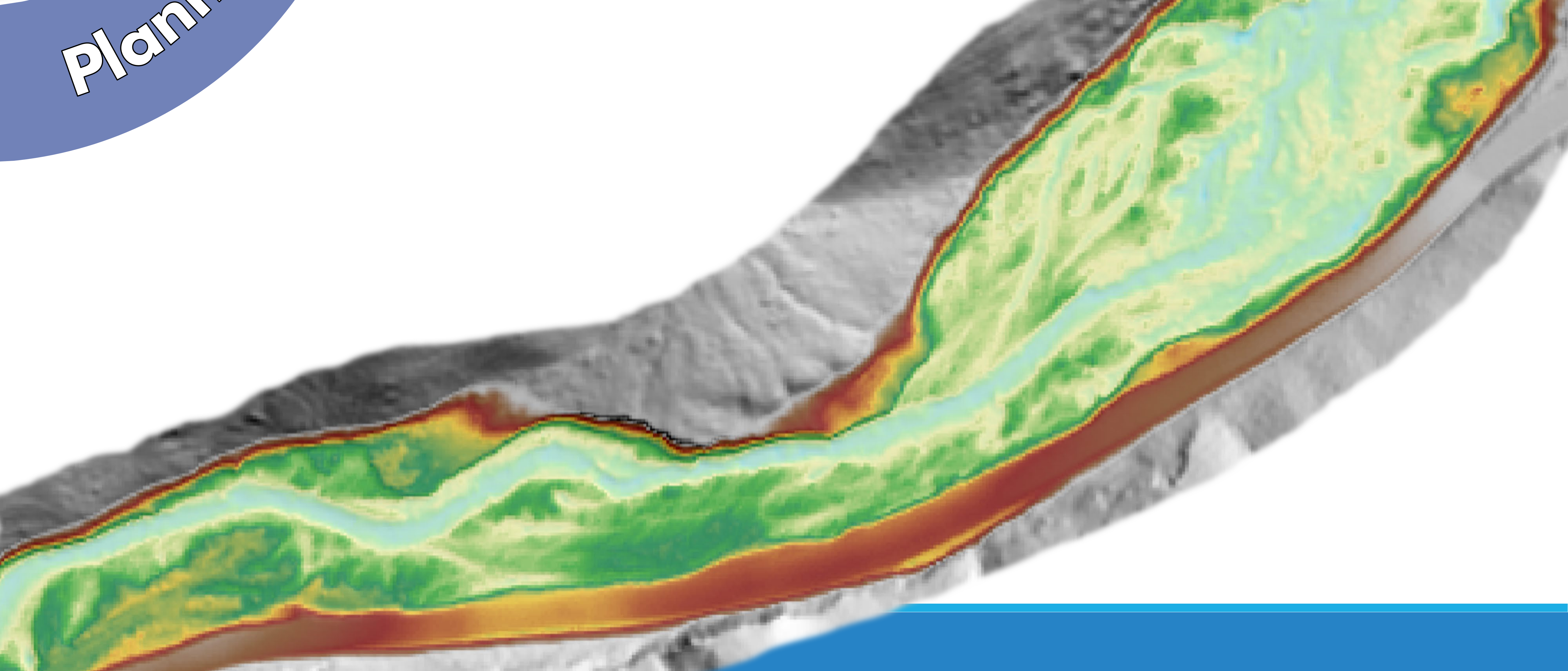
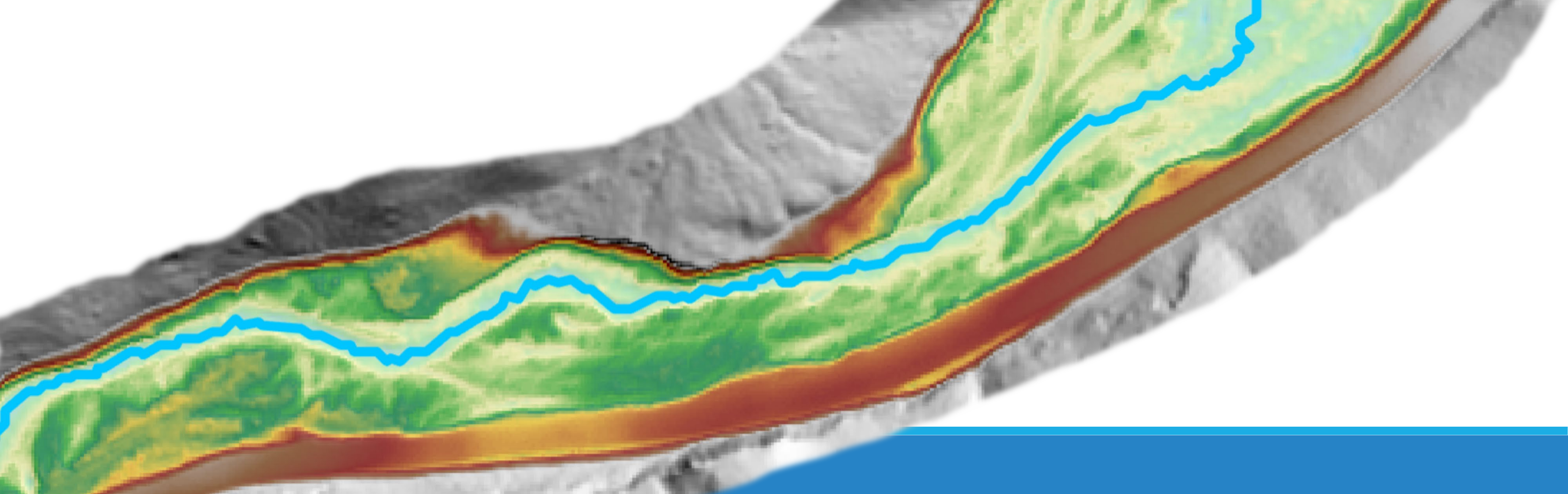


Planning

Lesson: Site selection is important

Mainstem thalweg

- Length
- Slope
- Sinuosity
- Channel units



Planning

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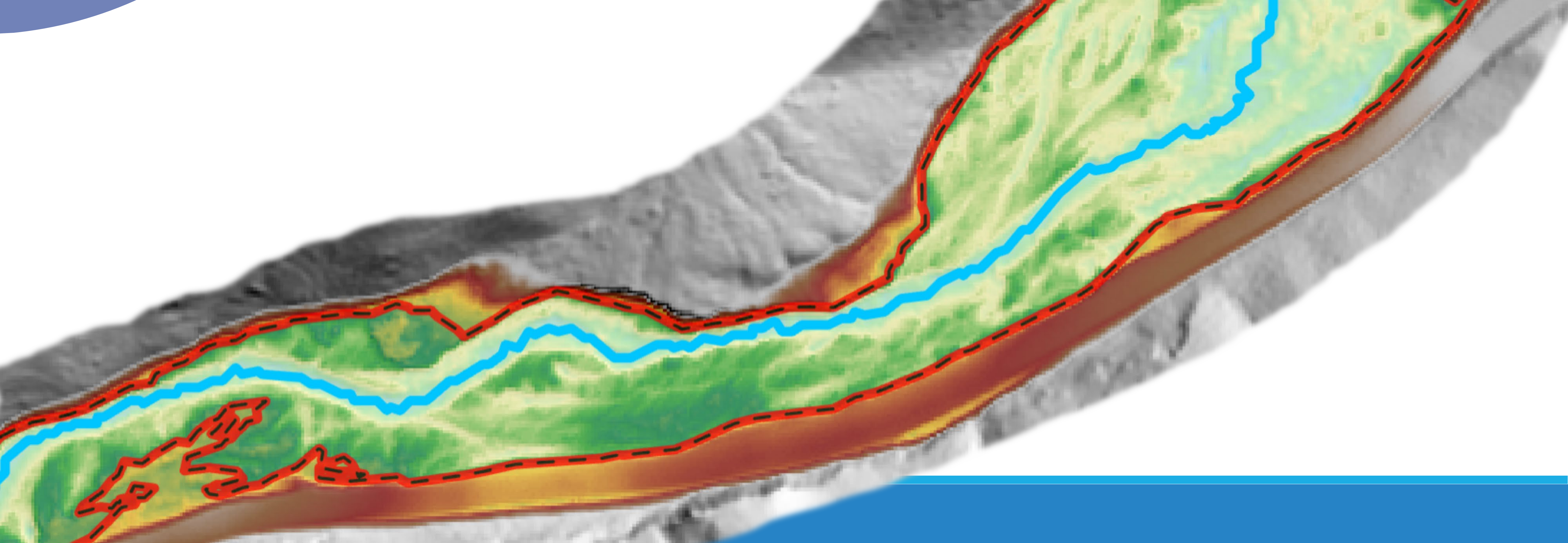
Valley bottom polygon

- Floodplain width
- Valley constriction
- Area of effect



Planning

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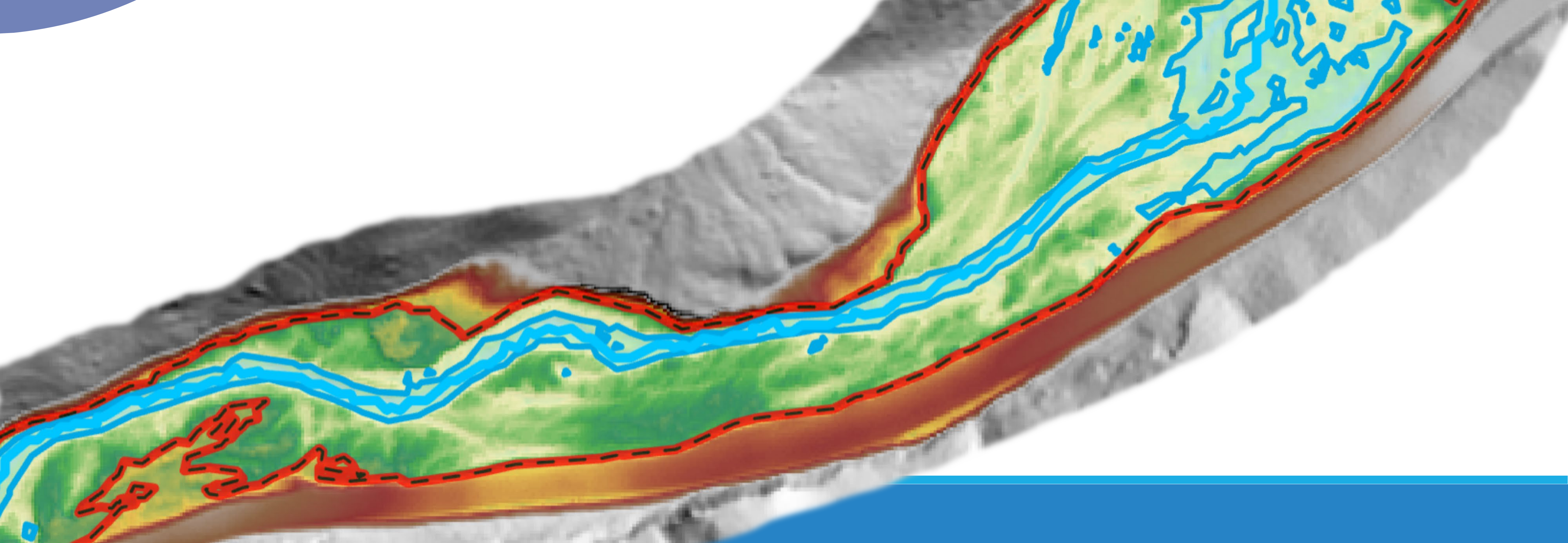
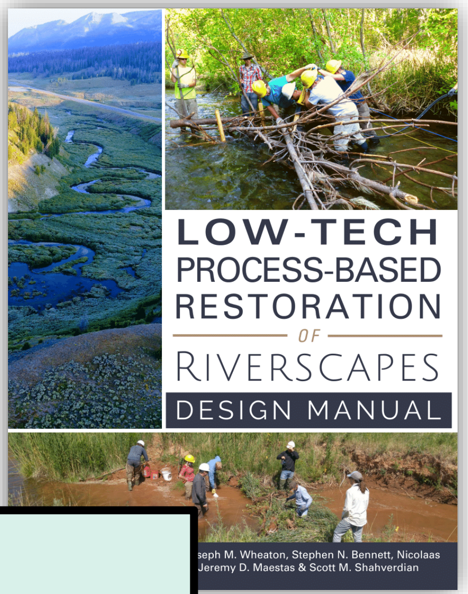
Bankfull polygon

- Channel width
- Incision depth
- Secondary channels



Lesson: Design report is necessary



REMINDER

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Design

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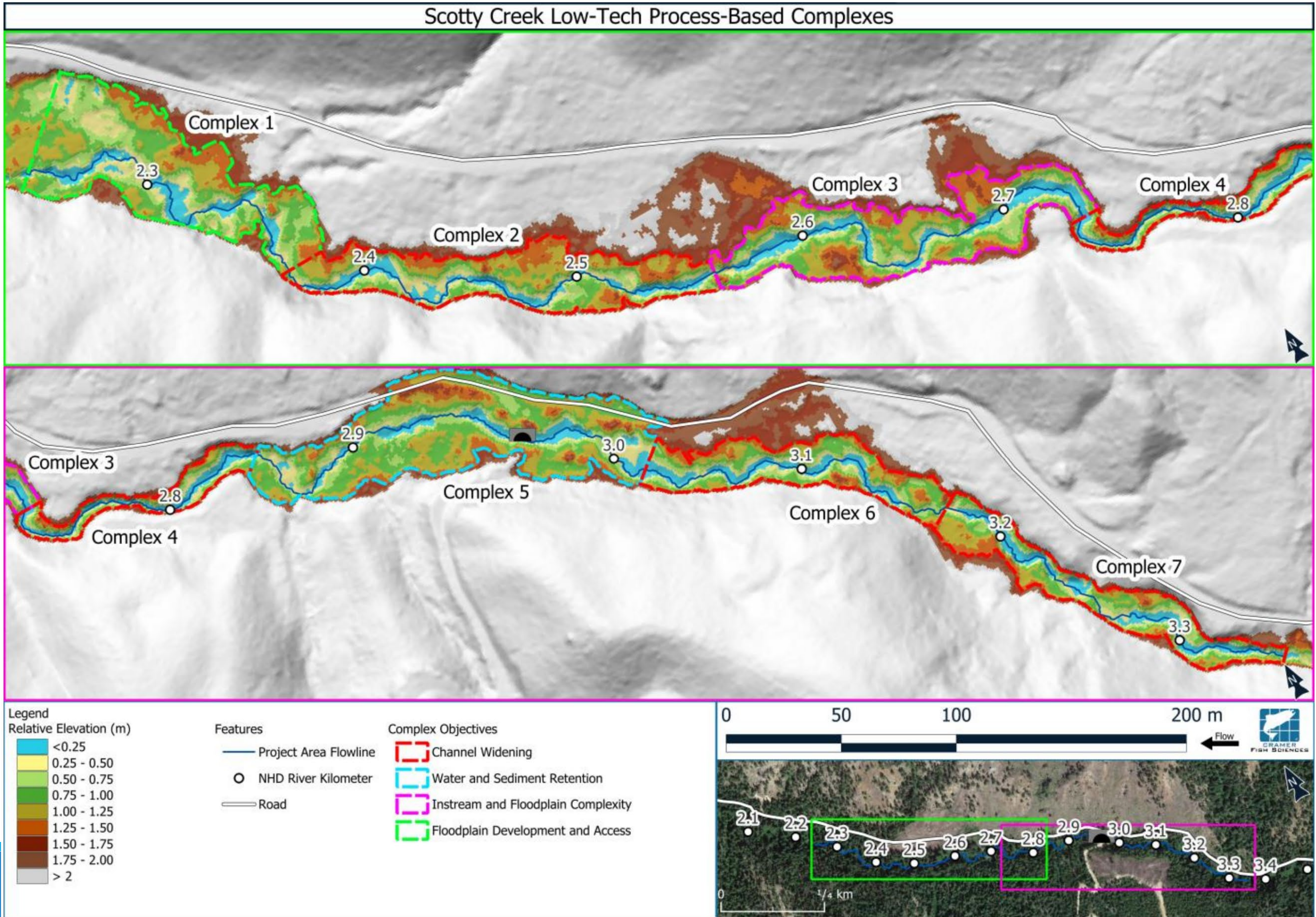
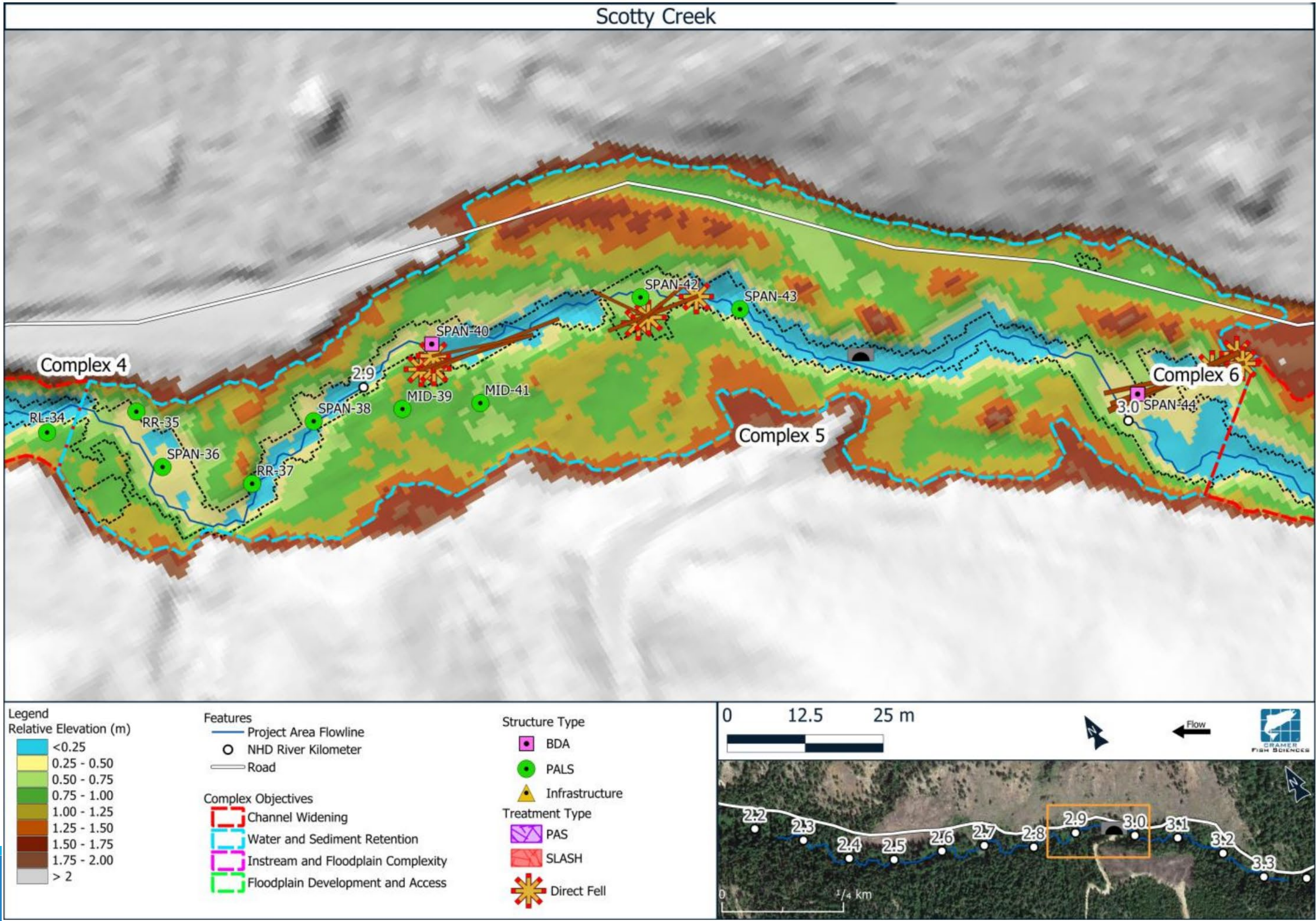
Complex-Level Design



How do the structures work together to meet reach-level objectives?

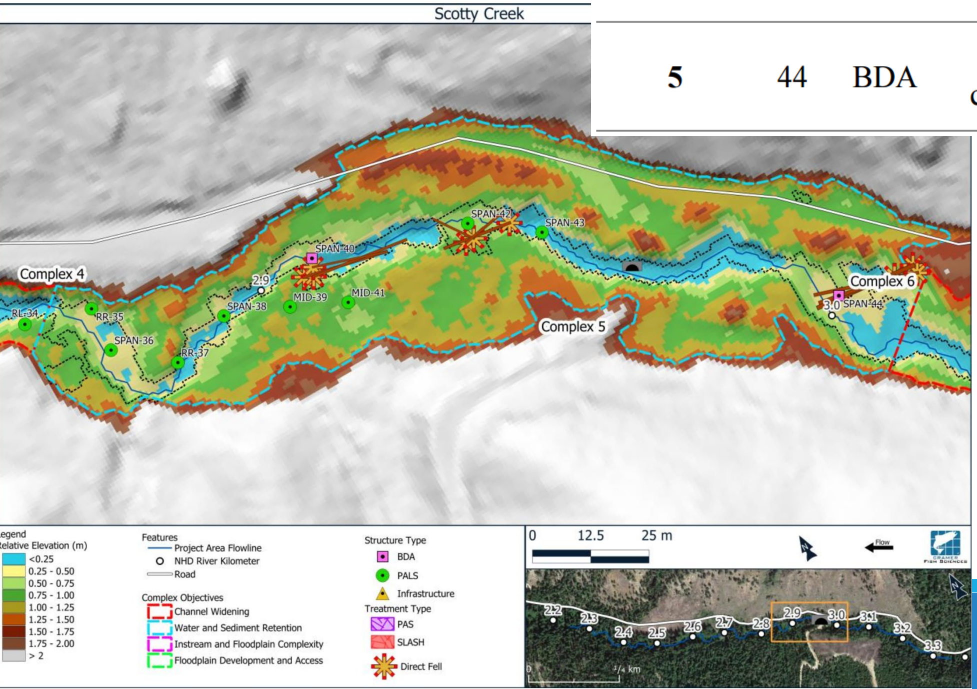
Lesson: Design report is necessary

Where is each structure throughout the project area?



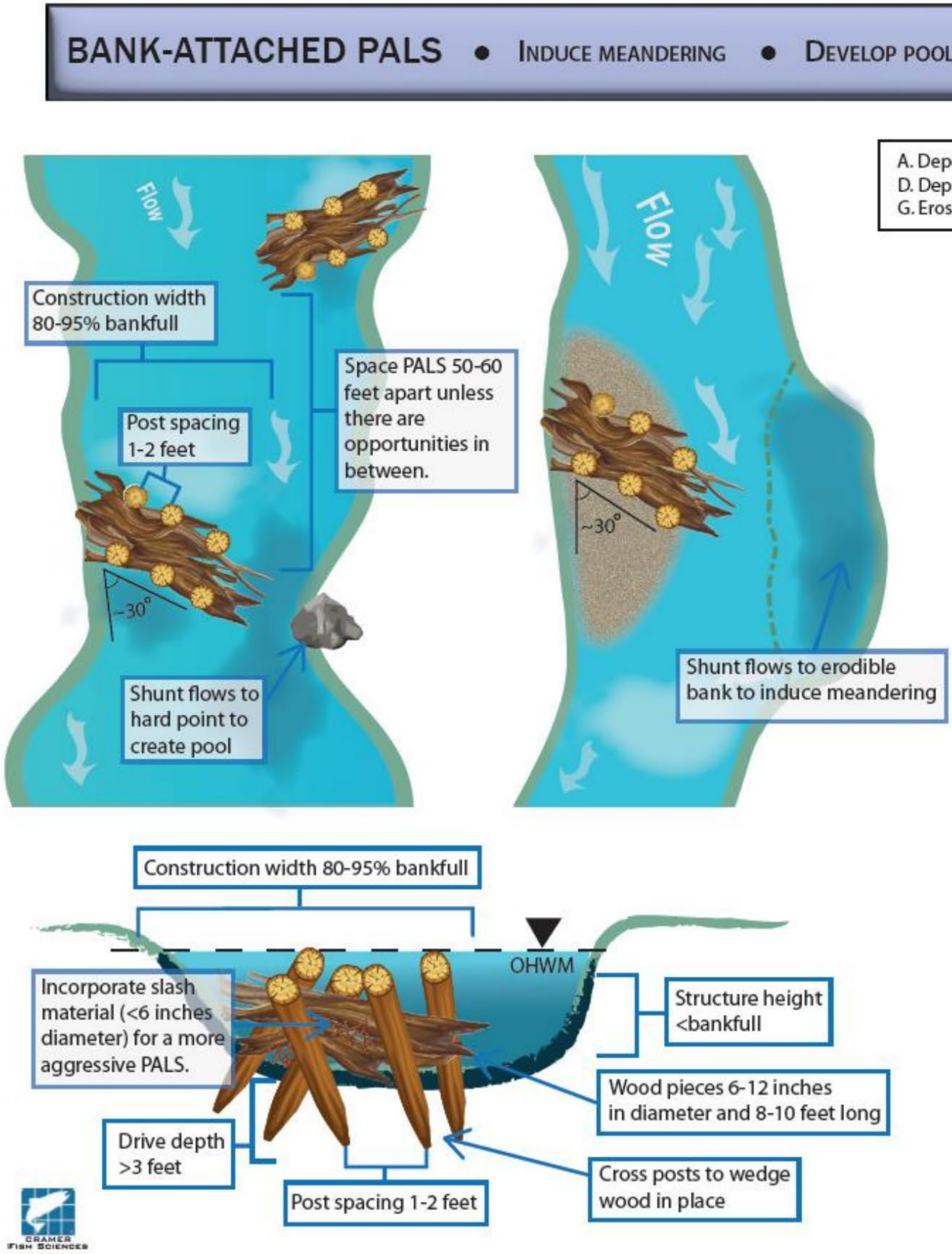
Lesson: Design report is necessary

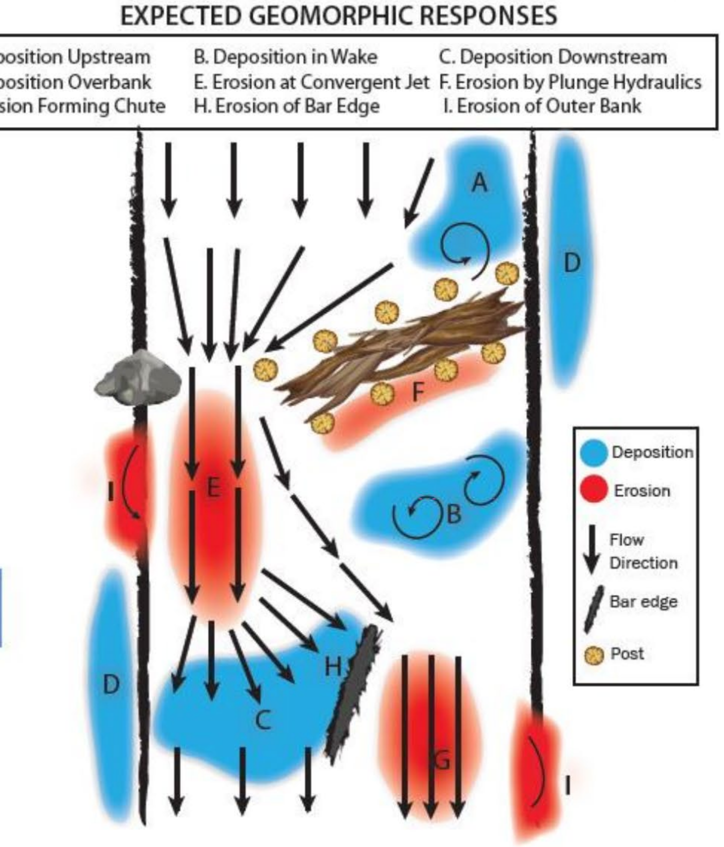
Complex	ID	Type	Description	# of Posts	Wood Count	Attachment	Objectives	x	y
5	38	PALS	pond water upstream; angle side ways to erode through floodplain on RR and RL	12	10	SPAN	Floodplain Connection, Sediment Storing, Pool Development	1609513.9	738894.1
5	39	PALS	add complexity into floodplain	5	5	MID	Create and Maintain Split Flows	1609557.5	738876.4
5	40	BDA	pond water upstream	28	0	SPAN	Pond Development, Sediment Storing, Floodplain Connection	1609587.9	738898.3
5	41	PALS	add complexity into floodplain	5	5	MID	Create and Maintain Split Flows	1609594.5	738858.6
5	42	PALS	direct flow onto RL and RR floodplain	15	15	SPAN	Floodplain Connection, Sediment Storing, Pool Development	1609695.1	738864.6
5	43	PALS	direct flow onto RL and RR floodplain; be cognizant of road prism	12	10	SPAN	Floodplain Connection, Sediment Storing, Pool Development	1609737.1	738833.3
5	44	BDA	pond water upstream and capture debris prior to culvert	35	0	SPAN	Pond Development, Sediment Storing, Floodplain Connection	1609895.7	738690.2



Lesson: Design report is necessary

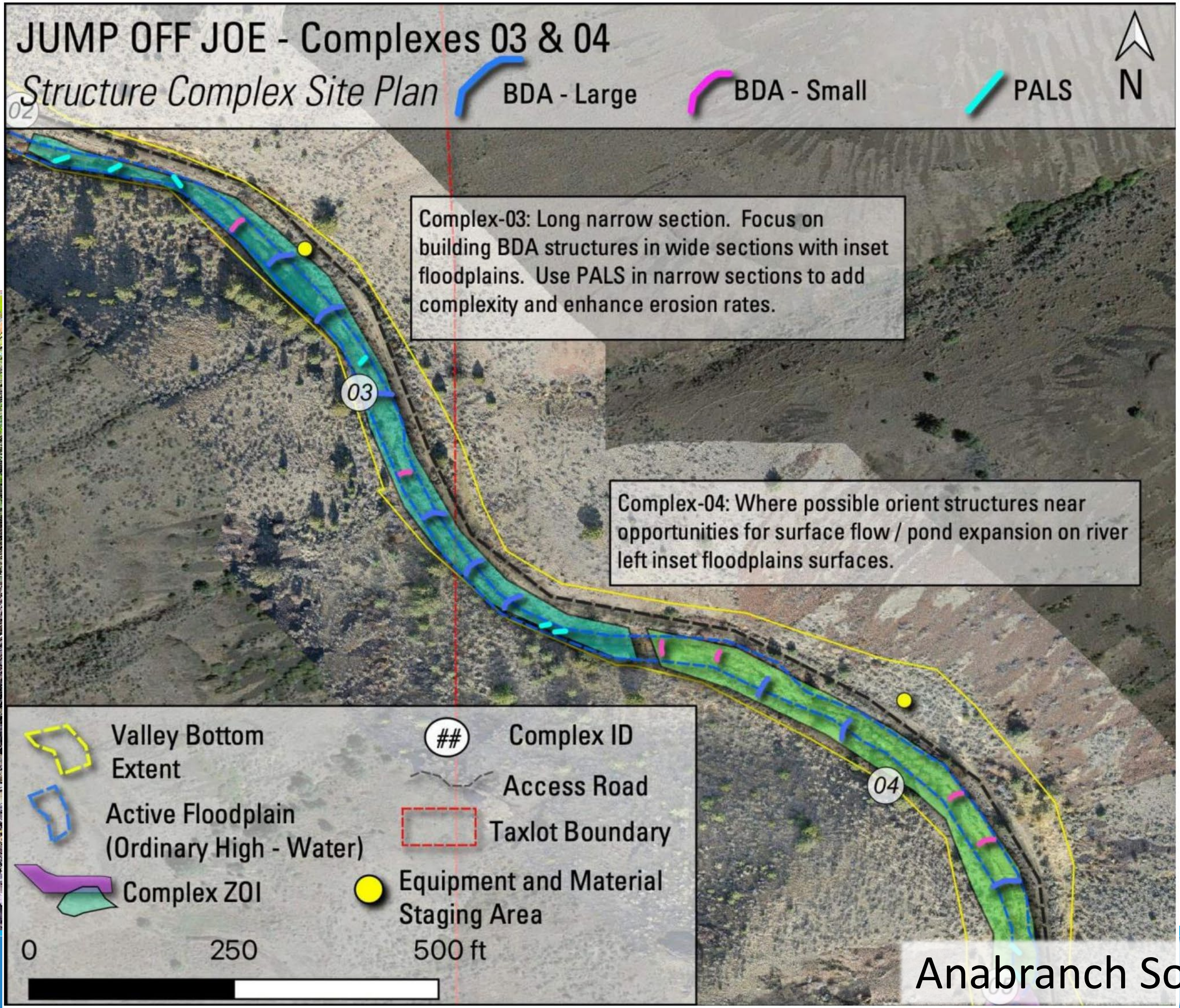
What is each structure intended to do and how do you build it?





Design

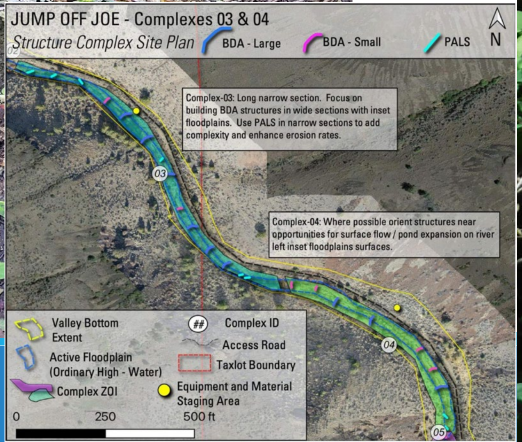
Lesson: Field-fit designs still need justification



Anabranch Solutions, 2021

Lesson: Field-fit designs still need justification

Design



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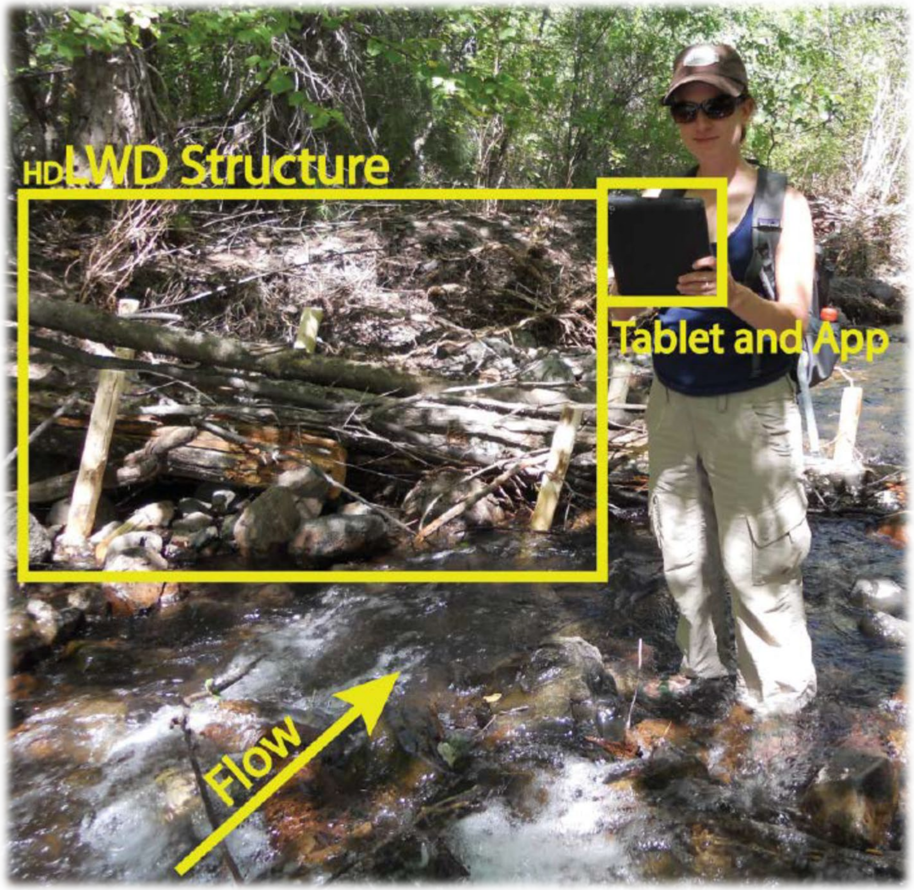

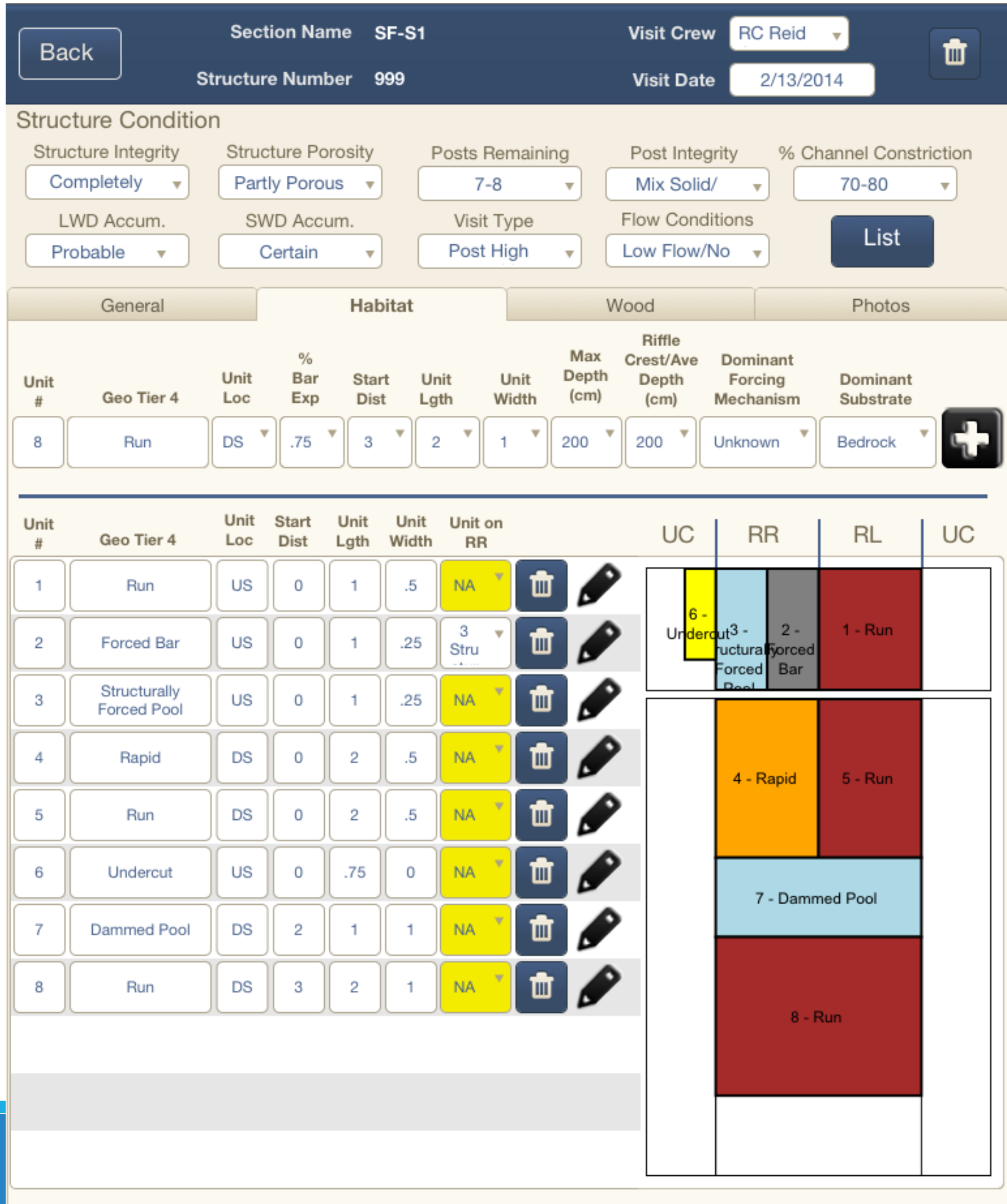

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

Streamlining Field Data Collection With Mobile Apps

Camp and Wheaton, 2014

Lesson: Improvement comes from experience

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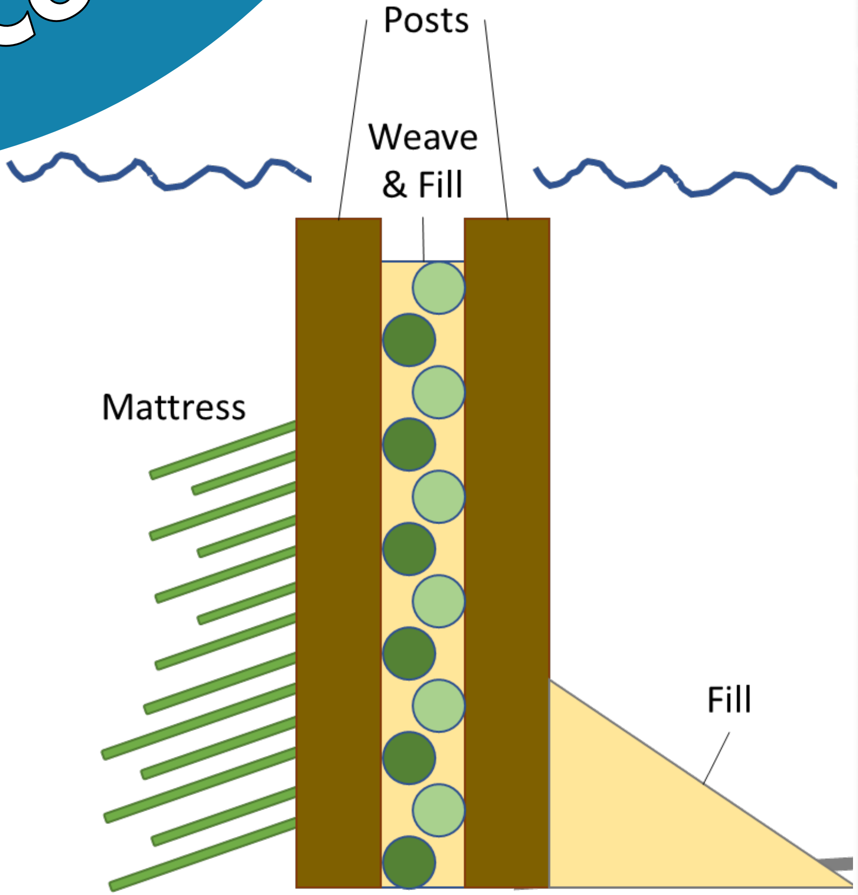
Lesson: Quality BDAs take a lot of time



Construct

Lesson: Quality BDAs take a lot of time

As Built

Start of First Growing Season

2 Years Later

Weave choice matters!

Construct

Lesson: A little extra effort leads to a lot more stability

Chumstick Creek, WA

Charley Creek, WA

Construct

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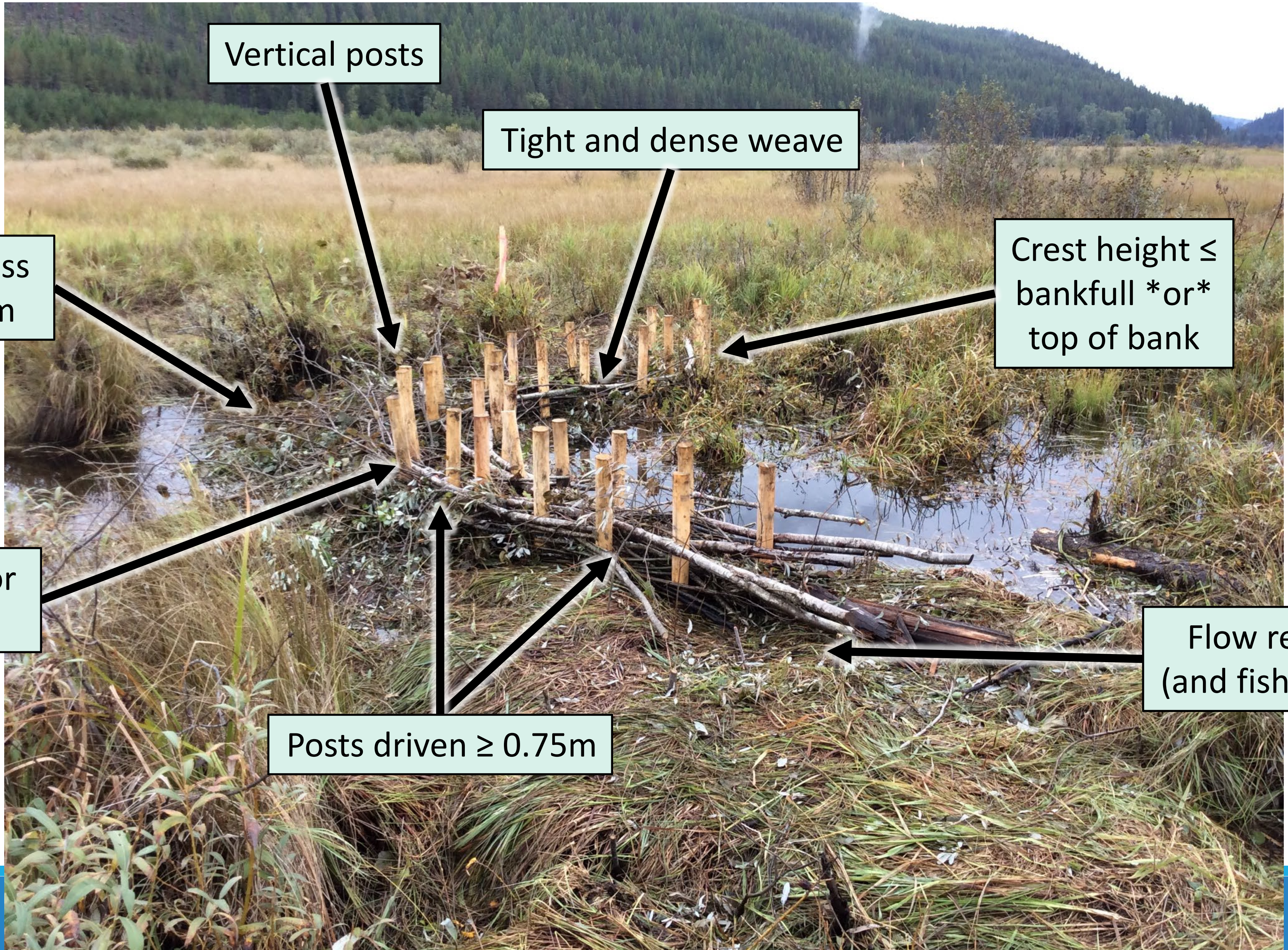
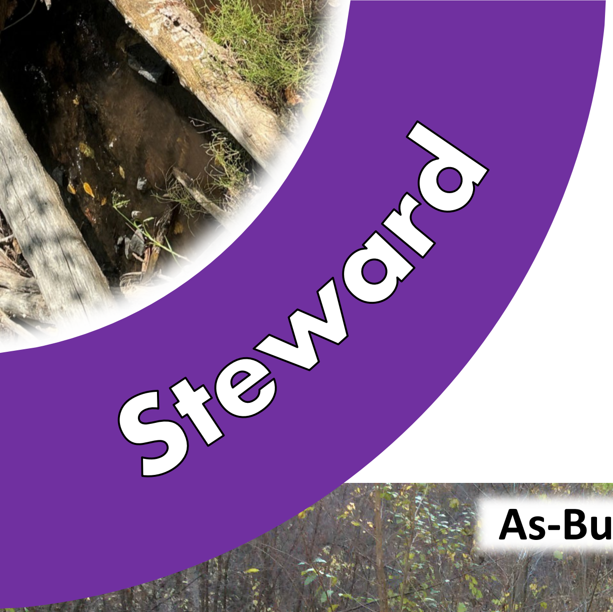
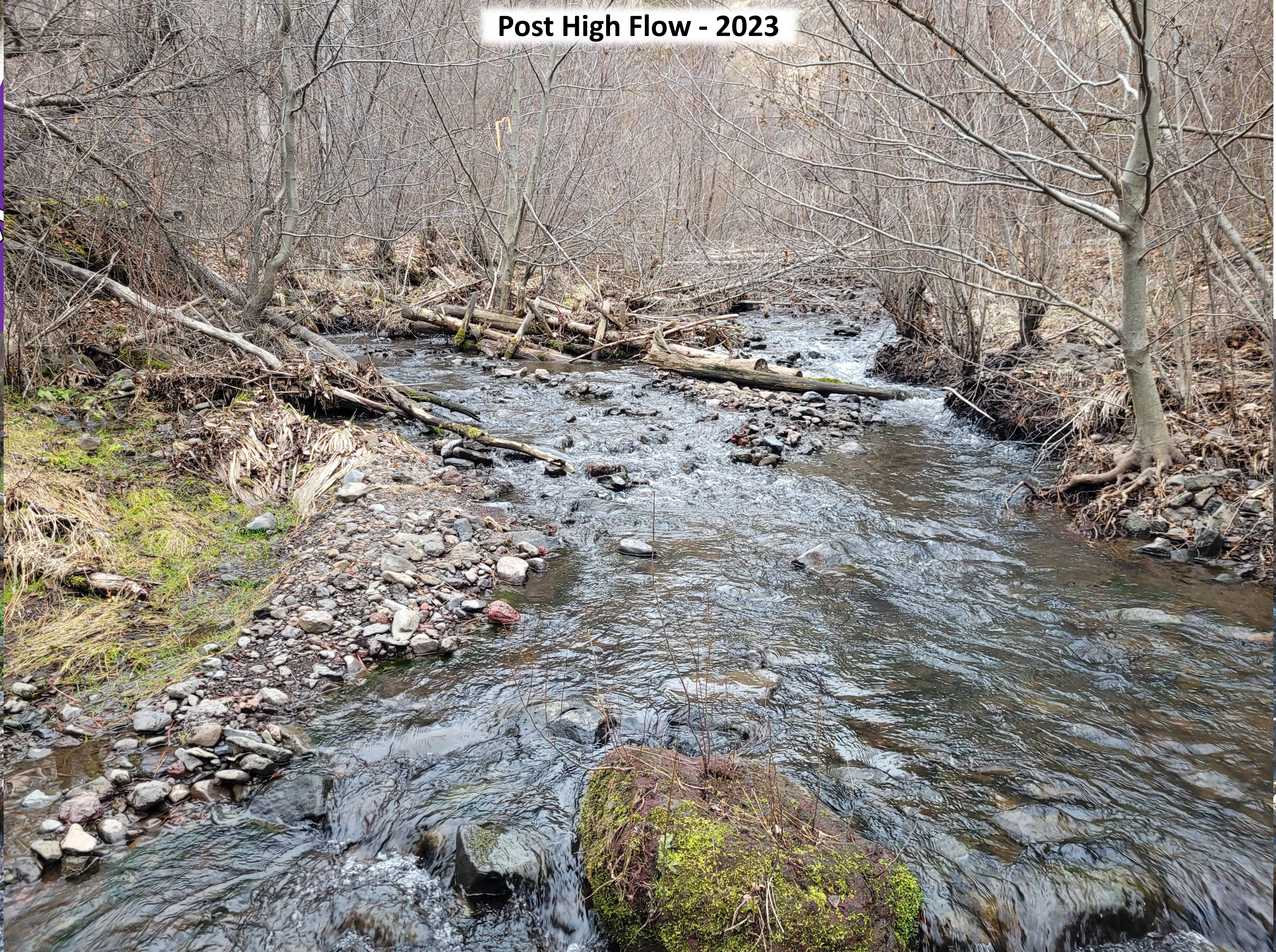




Lesson: Monitoring is essential and can be simple


Stew


Post High Flow - 2023

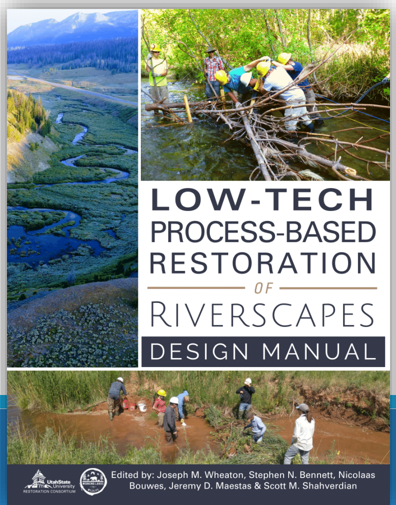
Steward

Lesson: Monitoring is essential and can be simple

Annual Project Monitoring

Questions to consider

- Did individual structures work as intended?
- Is the reach responding as expected?
- What needs to be fixed, replaced, added, or removed?
- Is the project causing harm?
- Are there signs of beavers?
- Am I taking enough photos?



Is the project meeting its goals and objectives?

Lesson: Most projects require maintenance

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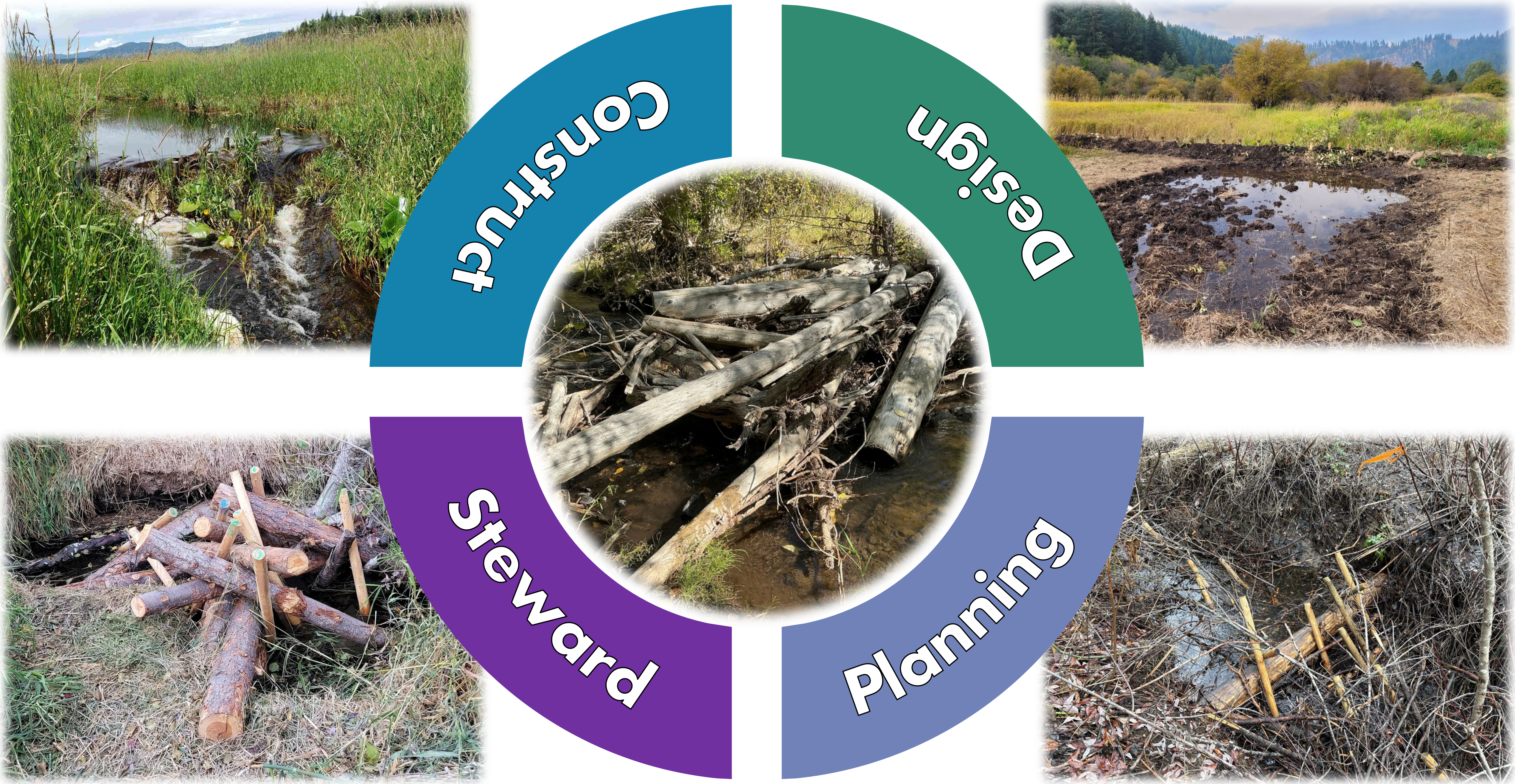
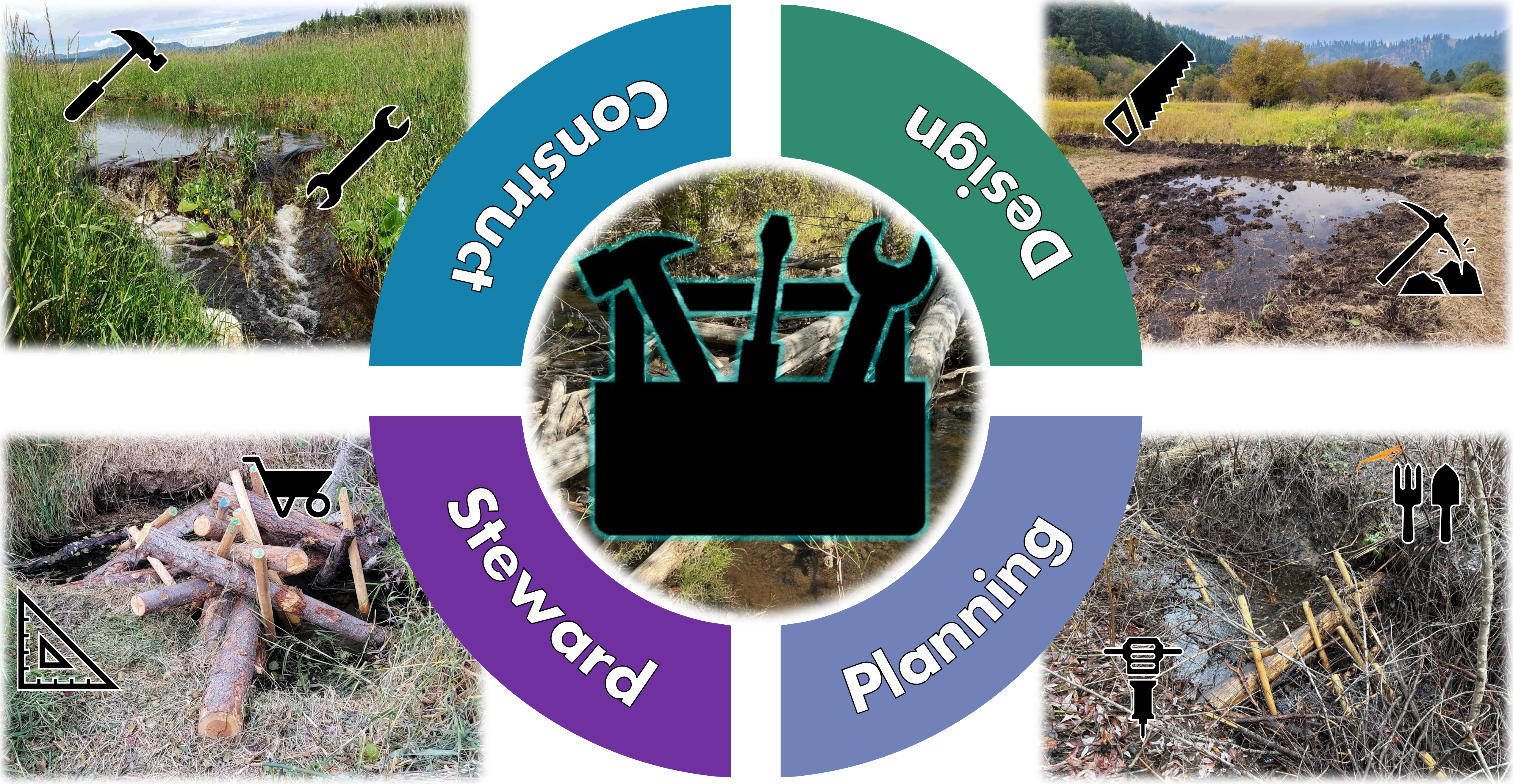
Steward

Lesson: Most projects require maintenance


Construct
Design
Steward
Planning



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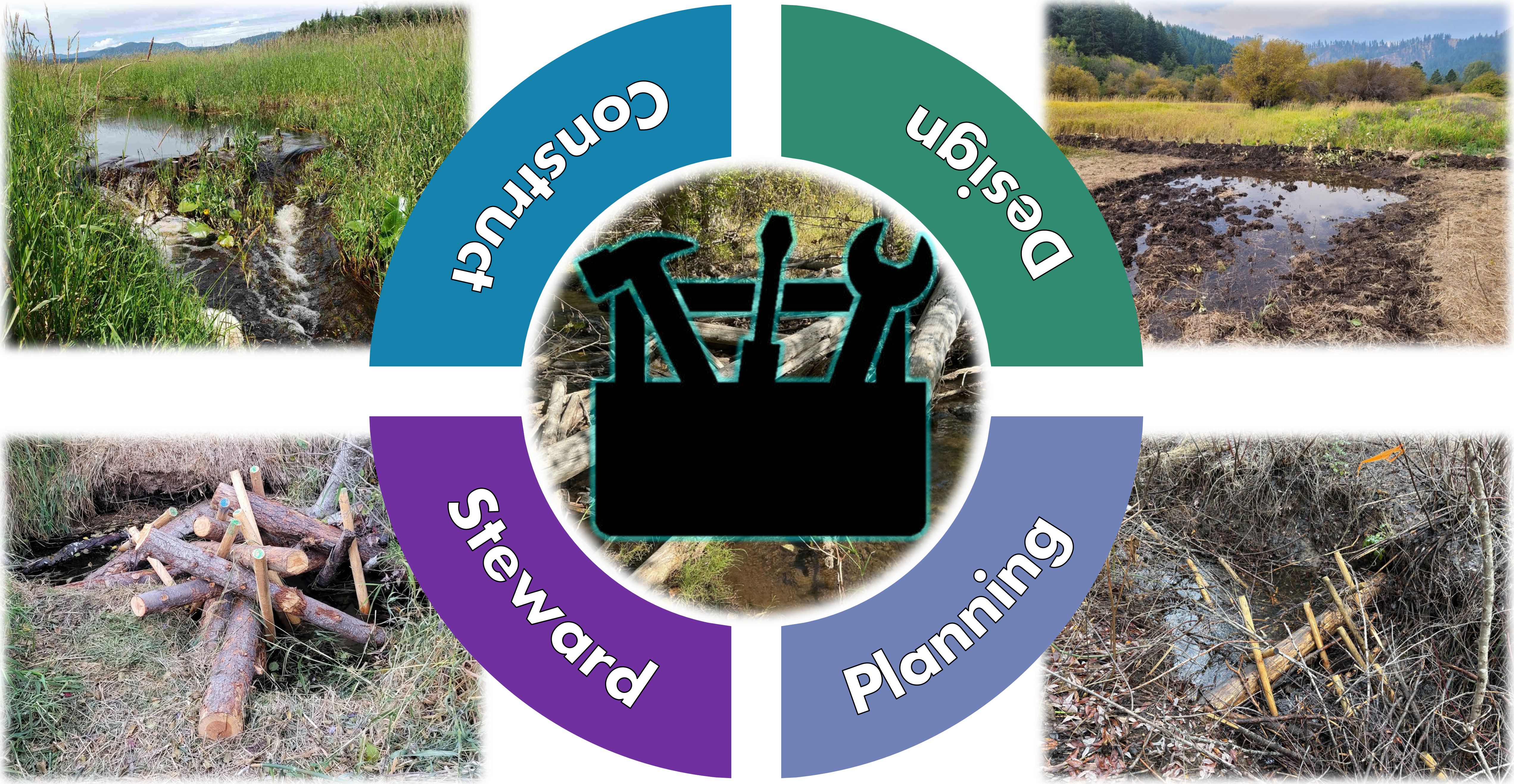
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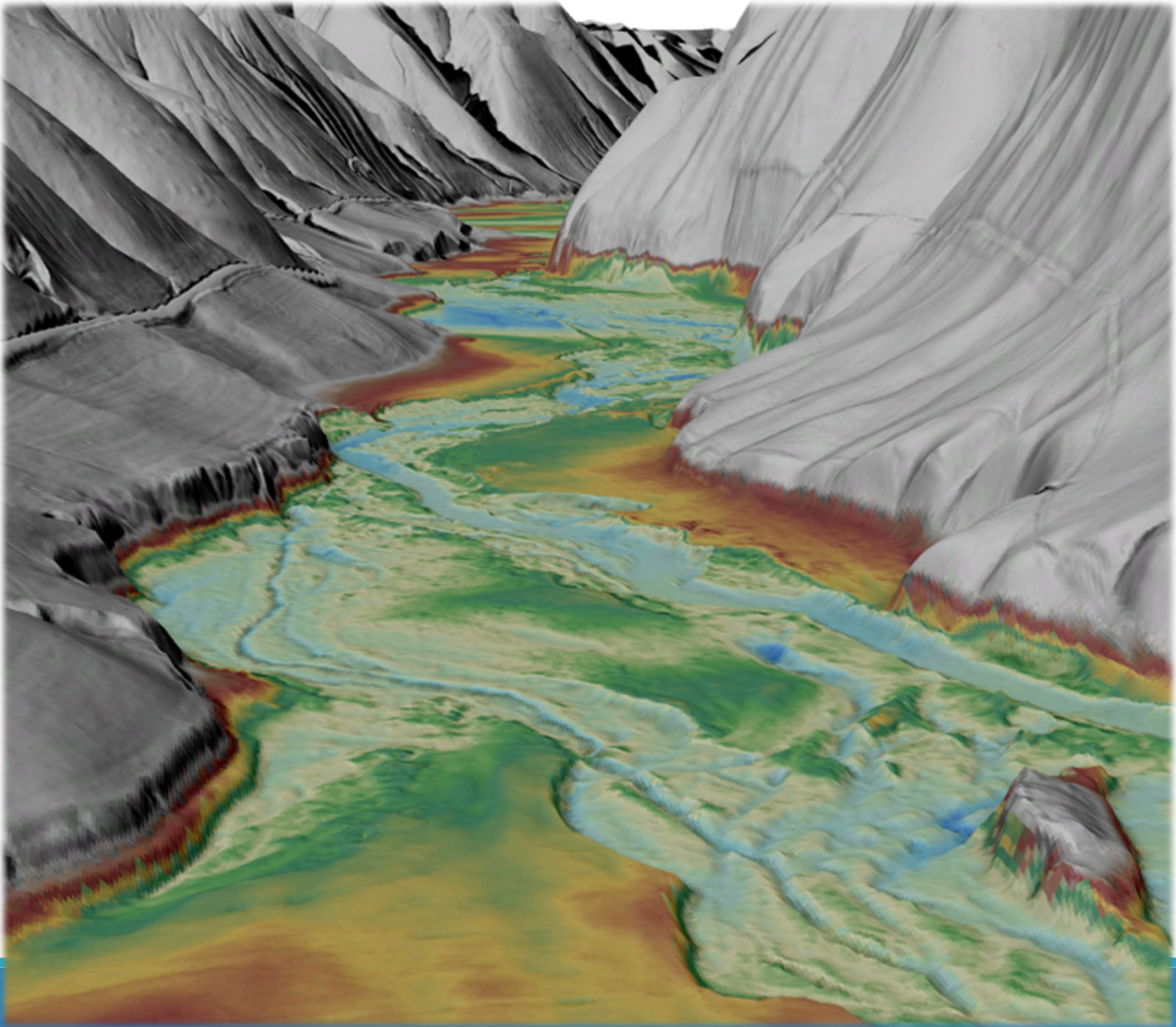

Thank you!

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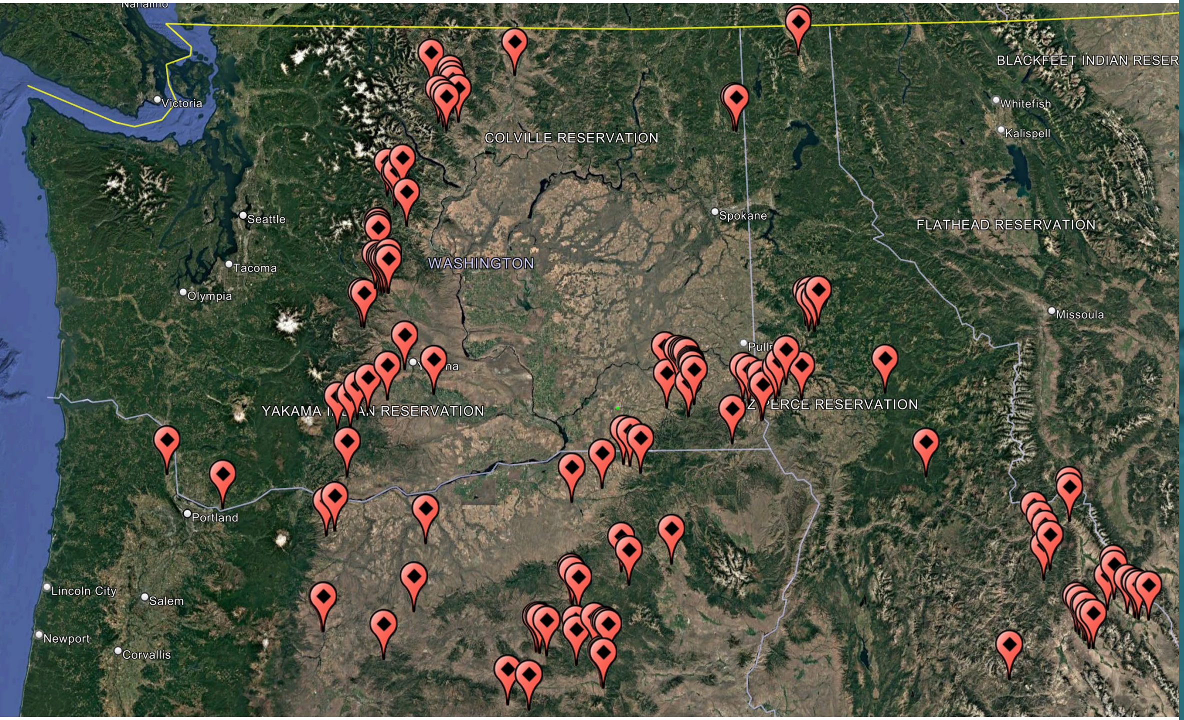
Snake River Salmon Recovery Board
reid@snakeriverboard.org

LTPBR Project Evaluation

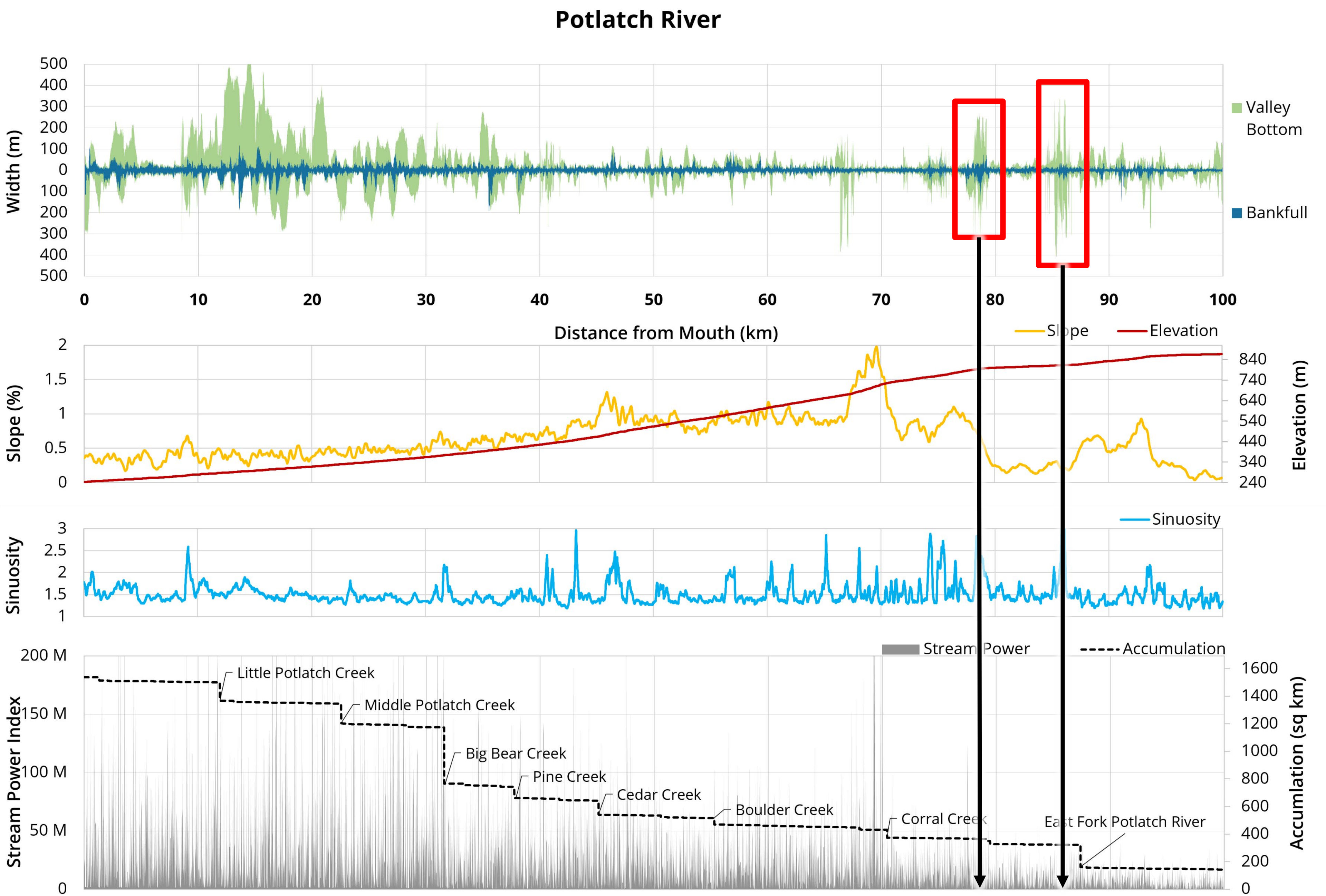
BPA projects with low-tech elements



Focus Regions

Bonneville
POWER ADMINISTRATION

Lesson: Site selection is important

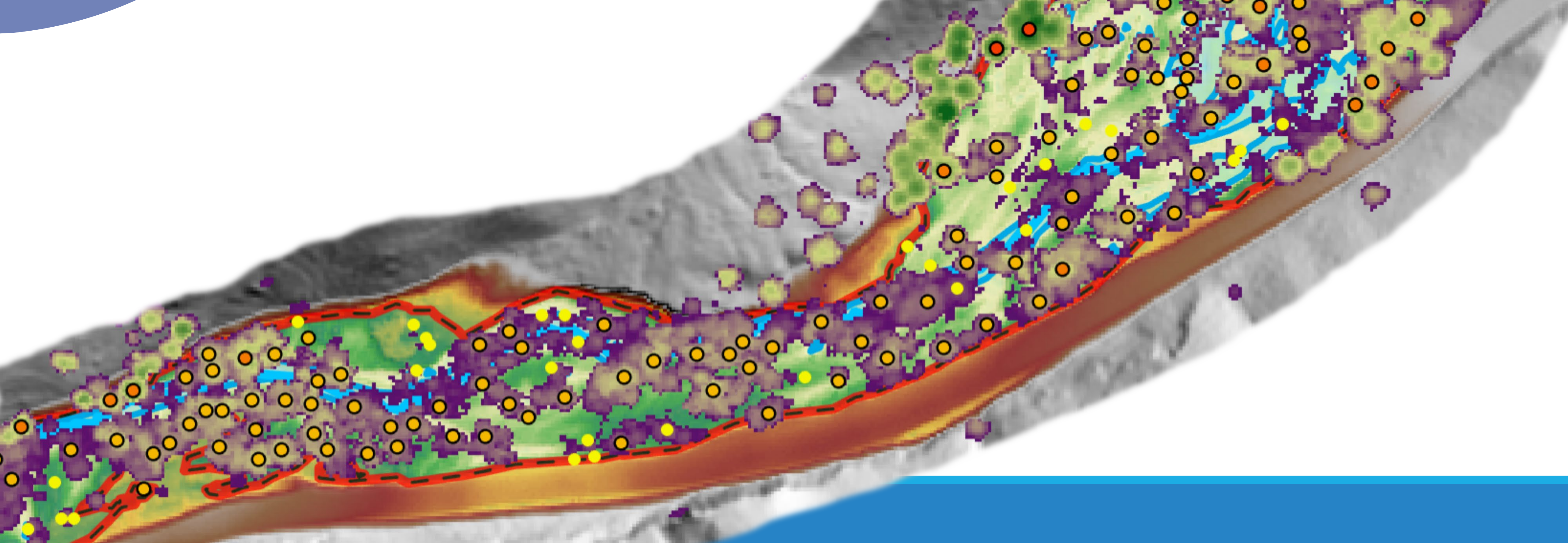


Understand your watershed!

Lesson: Site selection is important

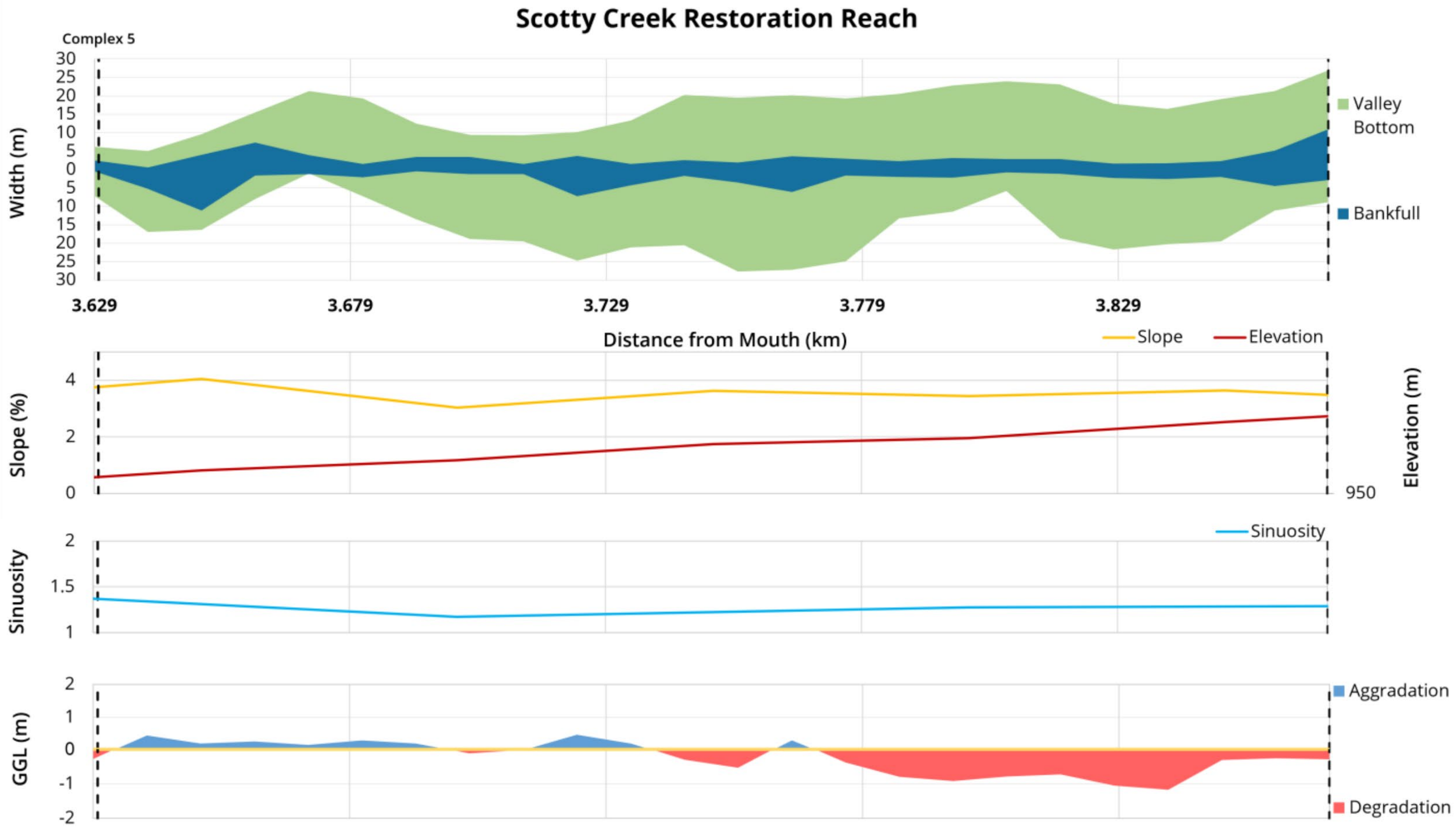
Canopy height model

- Direct felling options
- Planting needs
- Access routes



Lesson: Design report is necessary

Complex 5: Water and Sediment Retention



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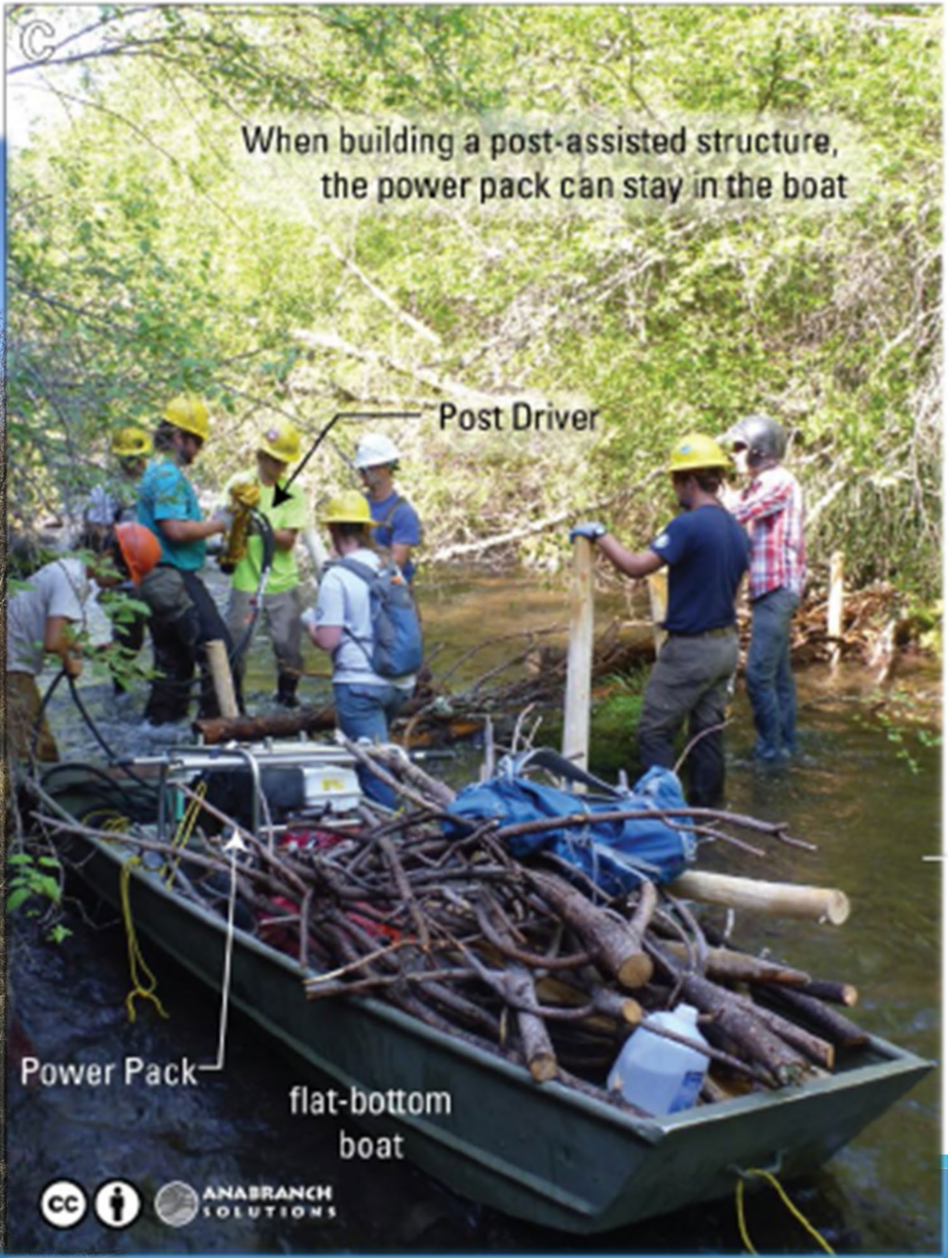

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As-Built

Post High Flow

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