Riverscapes Consortium

Low-Tech, High Impact:
Process-Based Tools for Salmon Recovery

Low-Tech Approaches for Salmon Habitat Restoration
Knowledge Exchange Workshop

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3/12/2026

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PACIFIC SALMON FOUNDATION

Low-Tech, High Impact?: PB tools

PACIFIC SALMON FOUNDATION

Outline:

- LTPBR Background
- Riverscapes Consortium
- Highlight two tools
  - **PBR Explorer** - *for sharing effort (actions)*
  - **Riverscapes Studio** - *for planning, design, as-builts & action-effectiveness monitoring (assessing impact)*

Purpose:

To share a couple of high-tech, but tractable free tools for capturing & assessing impact

- Impact of effort
- If efforts have desired impacts:
  - *Affects - (v) process*
  - *Effects - (n) outcomes*

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Low-Tech is not New & encompasses a lot of simple techniques

Table 5 – A list of typical low-tech approaches to promoting specific process-based restoration outcomes.

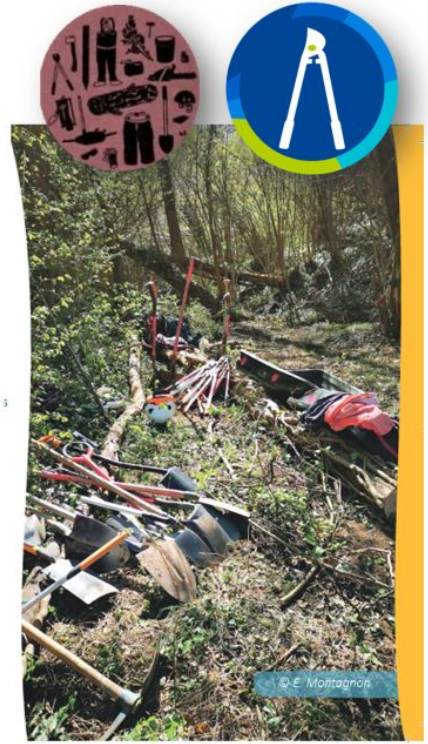
Name	Helpful Reference(s)
Promoting and/or Mimicking Wood Accumulation	
Seeding of Wood – Direct Recruitment of Unanchored Wood	
Direct Felling	Carah et al. (2014)
Grip-Hoisting	Micelston (2014)
Structural Placement of Wood Accumulations	
Post-Assisted Log Structures	Chapter 4 (Shahverdian et al., 2019a)
Improving Supply of Woody Material	
Riparian Plantings	Hall et al. (2011)
Grazing Management	Swanson et al. (2015)
Promoting and/or Mimicking Beaver Dam Activity	
Beaver Translocation	Woodruff and Pollock (2015)
Beaver Dam Analogues	Chapter 4 (Shahverdian et al., 2019a)
Trapping Closures	Figure 9; (Valachovic)
Erosion Control (often for intermittent & ephemeral channels)	
Baffles	Zeedyk and Clothier (2009)
One Rock Dams	Maestas et al. (2018); Zeedyk and Clothier (2009)
Post and Brush Plugs	Kraebel and Pillsbury (1934)
Tree Dam	Kraebel and Pillsbury (1934)
Tree Plug	Kraebel and Pillsbury (1934)
Vanes	Zeedyk and Clothier (2009)
Wicker Weirs	Kraebel and Pillsbury (1934)
Zuni Bowls	Maestas et al. (2018); Zeedyk and Clothier (2009)

From Shahverdian et al. (2019) – Chapter 1 LTPBR Manual
DOI: 10.13140/RG.2.2.14138.03529

FBR vs. PBR

- Notice riverscape width

Tools of the Trade



ARRAA (2025)

À citer comme suit : « Guide de terrain : Régénération Low-Tech Fondée sur les Processus » du Riverscapes Consortium, traduit et adapté au contexte francophone par l'Association Rivière Rhône-Alpes Auvergne, 2025, 84 p.

Meal Preparers:

Ranchers, farmers, volunteer groups, kids and then hand off to beaver…

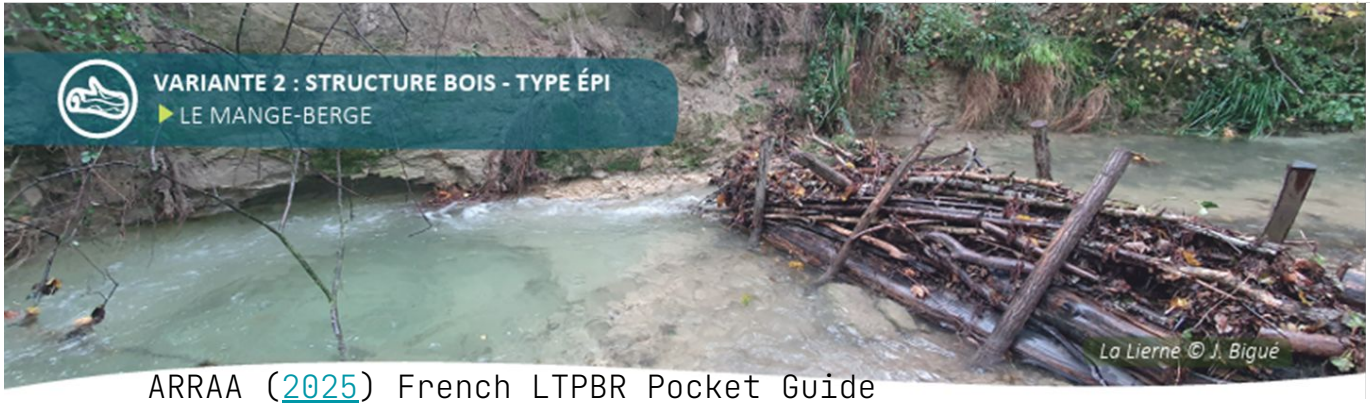
LT is Hand-Built

Quel enfonce-pieux choisir ?

Les enfonce-pieux permettent de planter les pieux en profondeur dans le lit du cours d'eau pour assurer l'**ancrage** et la **stabilité temporaires** des structures low-tech.

Ils existent sous plusieurs formes, chacune d'entre elles présentant un compromis en termes de **coût d'équipement**, d'**expertise requise par l'opérateur**, de **diamètre maximal des pieux** pouvant être plantés (variable selon le substrat), d'**efficacité globale** et bien sûr d'**adaptabilité** lorsqu'il s'agit de construire des dizaines ou des centaines de structures de natures diverses sur des kilomètres de cours d'eau.

	Masse	Enfonce-pieux manuel	Enfonce-pieux thermique	Enfonce-pieux hydraulique
Coût	€	€	€€	€€€
Expertise	Début.	Débutant	Initié	Confirmé
Diamètre	1-5 cm	1-6.5 cm	2.5-6.5 cm	2.5-10.5 cm
Efficacité	Faible	Faible	Moyenne	Forte
Adapt.	Basse	Basse	Modérée	Élevée



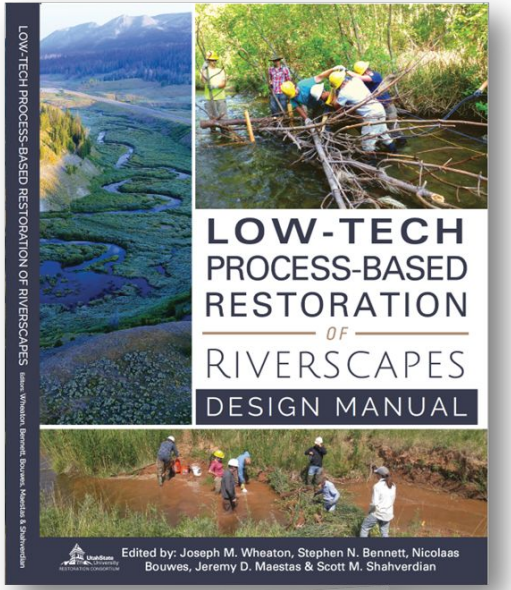
ARRAA (2025) French LTPBR Pocket Guide

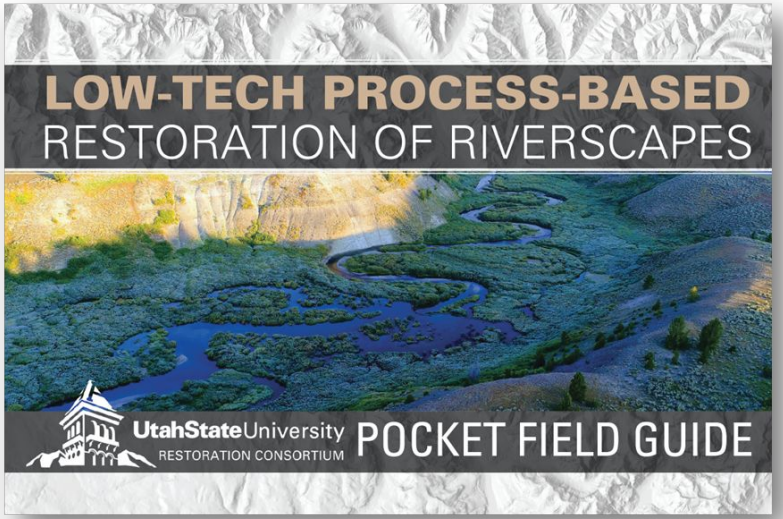
Good intentions do not ensure high impact or effectiveness

- Low-Tech alone is not enough
- Real solution are sustained PROCESSES
- High-Tech tools don’t ensure impact
- But, they position us to learn and objectively evaluate

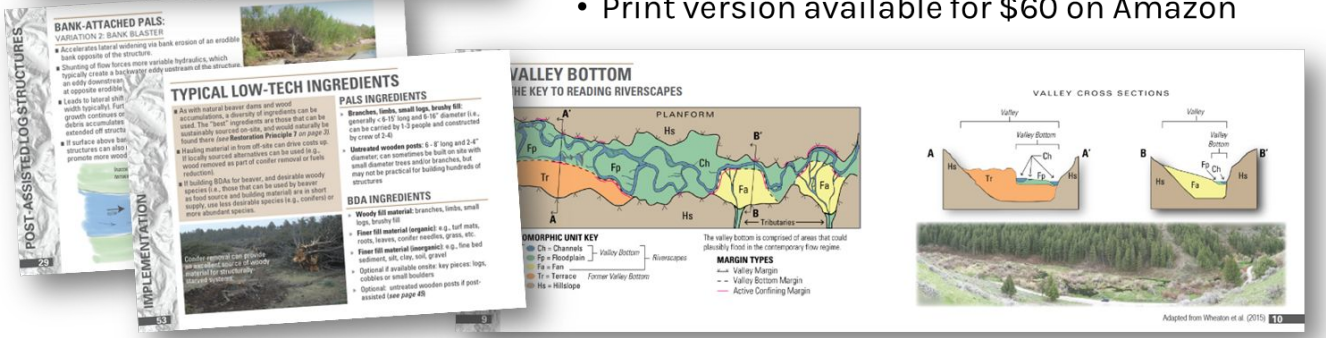
The “P” in Process-Based Restoration (PBR)?

Just a brand or some science?





- Manual defines LTPBR Standard of Practice
- Print version available for $60 on Amazon



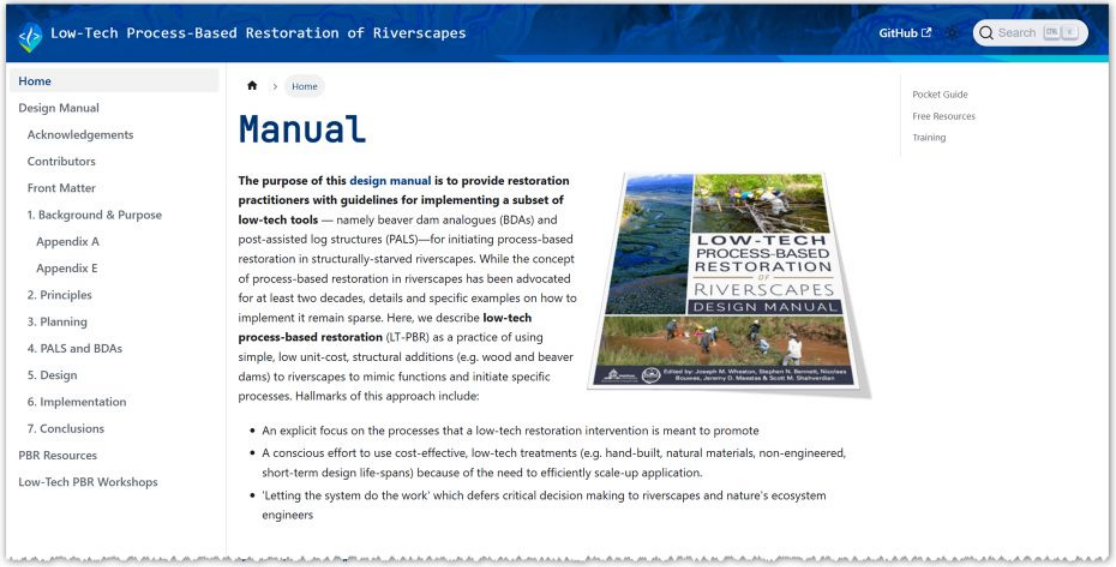
Free Digitally @: http://lowtechpbr.restoration.usu.edu

"What is your history in the LTR world?"

- My interest is in **innovation**, not invention
- With natural process, nothing needs to be invented, just understood enough to work with
- We popularized the latest iterations of these practices into Standards of Practice
- We standardized training
- We did some of the early science to build confidence

LTPBR Website

http://lowtechpbr.restoration.usu.edu

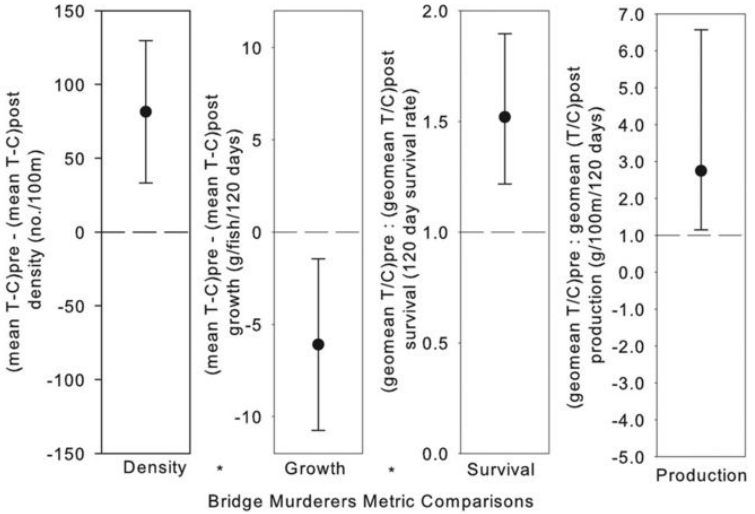


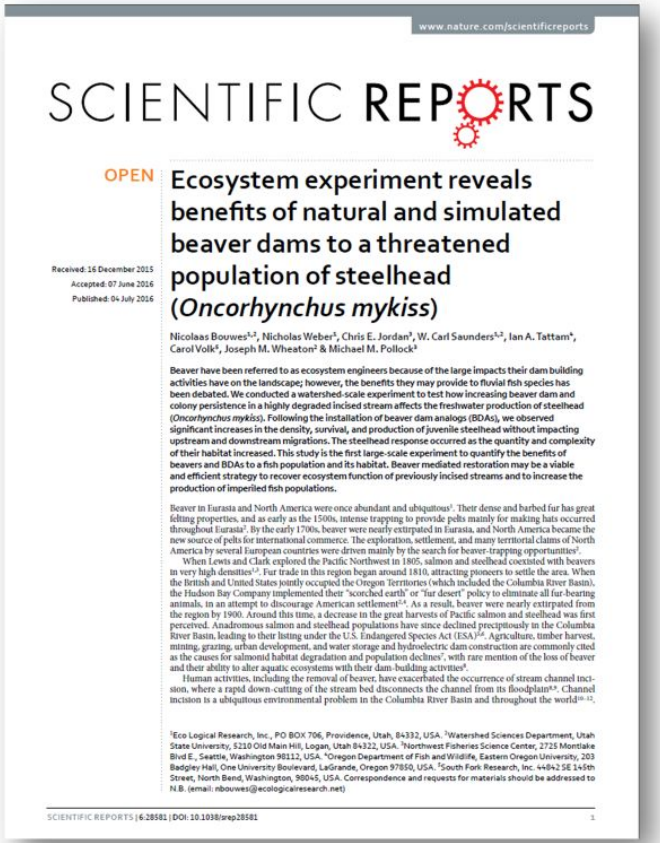
Find:

- Design Manual
- Pocket Guide (better French one now)
- Other Resources
- Workshop Slides
- Links/Videos/ Literature

Why it really got attention…

- Restoration using beaver as restoration agent actually produced a population level increase in density, survival and production of ESA listed salmon





www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN

Ecosystem experiment reveals benefits of natural and simulated beaver dams to a threatened population of steelhead (*Oncorhynchus mykiss*)

Received: 16 December 2015
Accepted: 07 June 2016
Published: 04 July 2016

Nicolaas Bouwes[1,2], Nicholas Weber[1], Chris E. Jordan[3], W. Carl Saunders[1,2], Ian A. Tattam[4], Carol Volk[4], Joseph M. Wheaton[2] & Michael M. Pollock[3]

Beaver have been referred to as ecosystem engineers because of the large impacts their dam building activities have on the landscape; however, the benefits they may provide to fluvial fish species has been debated. We conducted a watershed-scale experiment to test how increasing beaver dam and colony persistence in a highly degraded incised stream affects the freshwater production of steelhead (*Oncorhynchus mykiss*). Following the installation of beaver dam analogs (BDAs), we observed significant increases in the density, survival, and production of juvenile steelhead without impacting upstream and downstream migrations. The steelhead response occurred as the quantity and complexity of their habitat increased. This study is the first large-scale experiment to quantify the benefits of beavers and BDAs to a fish population and its habitat. Beaver mediated restoration may be a viable and efficient strategy to recover ecosystem function of previously incised streams and to increase the production of imperiled fish populations.

Beaver in Eurasia and North America were once abundant and ubiquitous[1]. Their dense and barbed fur has great felting properties, and as early as the 1500s, intense trapping to provide pelts mainly for making hats occurred throughout Eurasia[2]. By the early 1700s, beaver were nearly extirpated in Eurasia, and North America became the new source of pelts for international commerce. The exploration, settlement, and many territorial claims of North America by several European countries were driven mainly by the search for beaver-trapping opportunities[2].

When Lewis and Clark explored the Pacific Northwest in 1805, salmon and steelhead coexisted with beavers in very high densities[1,3]. Fur trade in this region began around 1810, attracting pioneers to settle the area. When the British and United States jointly occupied the Oregon Territories (which included the Columbia River Basin), the Hudson Bay Company implemented their "scorched earth" or "fur desert" policy to eliminate all fur-bearing animals, in an attempt to discourage American settlement[2,4]. As a result, beaver were nearly extirpated from the region by 1900. Around this time, a decrease in the great harvests of Pacific salmon and steelhead was first perceived. Anadromous salmon and steelhead populations have since declined precipitously in the Columbia River Basin, leading to their listing under the U.S. Endangered Species Act (ESA)[5,6]. Agriculture, timber harvest, mining, grazing, urban development, and water storage and hydroelectric dam construction are commonly cited as the causes for salmonid habitat degradation and population declines[7], with rare mention of the loss of beaver and their ability to alter aquatic ecosystems with their dam-building activities[8].

Human activities, including the removal of beaver, have exacerbated the occurrence of stream channel incision, where a rapid down-cutting of the stream bed disconnects the channel from its floodplain[8,9]. Channel incision is a ubiquitous environmental problem in the Columbia River Basin and throughout the world[10–12].

[1]Eco Logical Research, Inc., PO BOX 706, Providence, Utah, 84332, USA. [2]Watershed Sciences Department, Utah State University, 5210 Old Main Hill, Logan, Utah 84322, USA. [3]Northwest Fisheries Science Center, 2725 Montlake Blvd E., Seattle, Washington 98112, USA. [4]Oregon Department of Fish and Wildlife, Eastern Oregon University, 203 Badgley Hall, One University Boulevard, LaGrande, Oregon 97850, USA. [5]South Fork Research, Inc. 4484 2 SE 146th Street, North Bend, Washington, 98045, USA. Correspondence and requests for materials should be addressed to N.B. (email: nbouwes@ecologicalresearch.net)

From:

Bouwes et al. (2016)

DOI: 10.1038/srep28581

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Healthy Riverscapes for All…

Riverscapes Consortium

Our mission

Promoting vibrant, healthy riverscapes for all where thriving ecosystems and human societies can coexist and benefit one another for a more resilient future.

Vision

Explore
Discover data, project and applications to inform river management questions

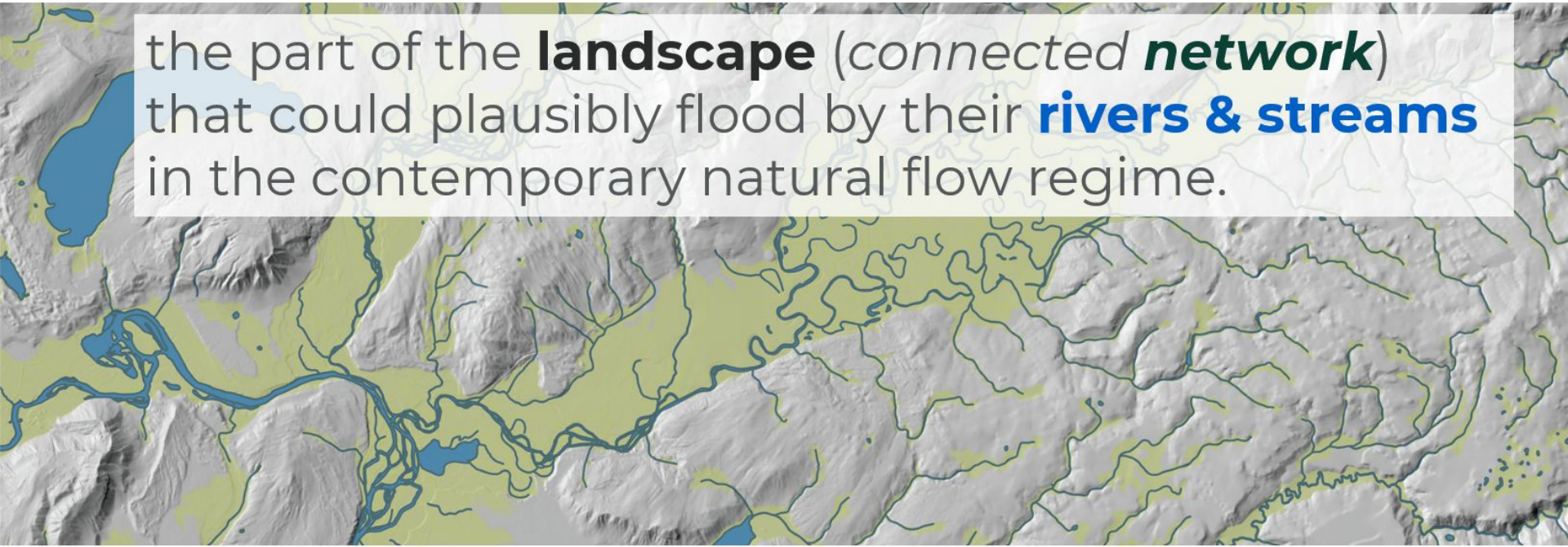
Share
Join the community and contribute your own riverscapes compliant models and data

Solve
Connect with the partners and data needed to support riverscape health

https://riverscapes.net Join Now for Free!

Riverscapes are 20% of the lower 48

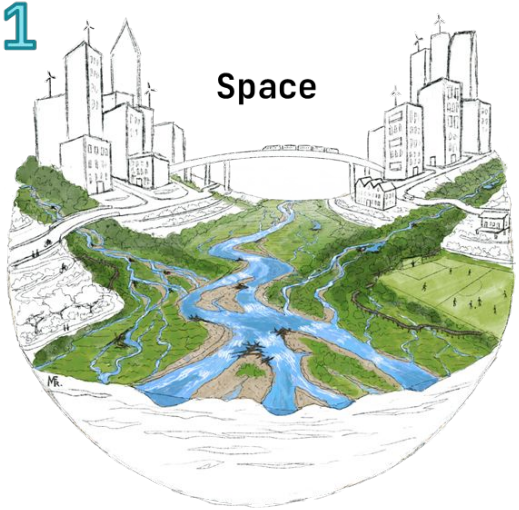
We define a Riverscape as



the part of the **landscape** (*connected* ***network***) that could plausibly flood by their **rivers & streams** in the contemporary natural flow regime.

Principles of Healthy Riverscapes …

1



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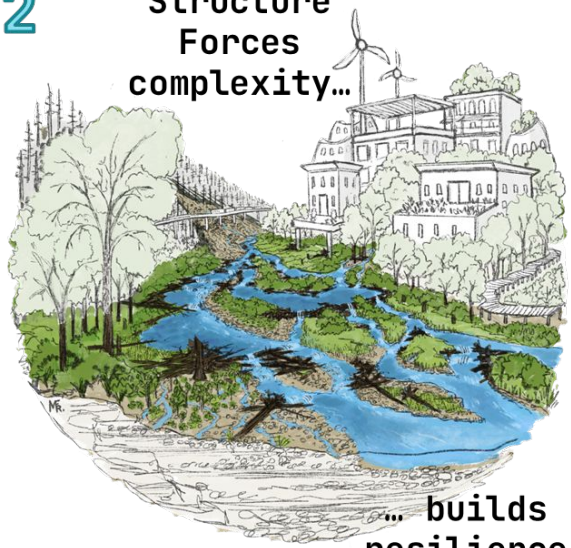
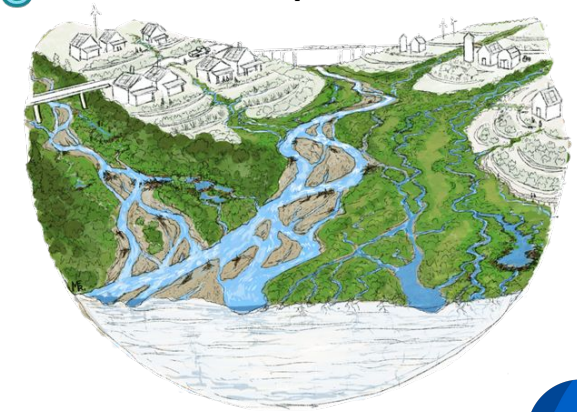


3



Healthy riverscapes:

- Support greater **biodiversity**
- Self-sustaining **natural infrastructure**
- Easier **co-existence** & adaptation

How important are these principles in each riverscape?
It depends… f(?) - Context matters!

Emerging Consensus on what a healthy riverscape is

- 37 Co-Authors
- Many of the major contributors to Riverscapes Consortium
- NGOs, Government Agencies, Universities, Consultancies

Wiley Interdisciplinary Reviews: Water

WILEY

WIREs WATER

OVERVIEW OPEN ACCESS

Principles of Riverscape Health

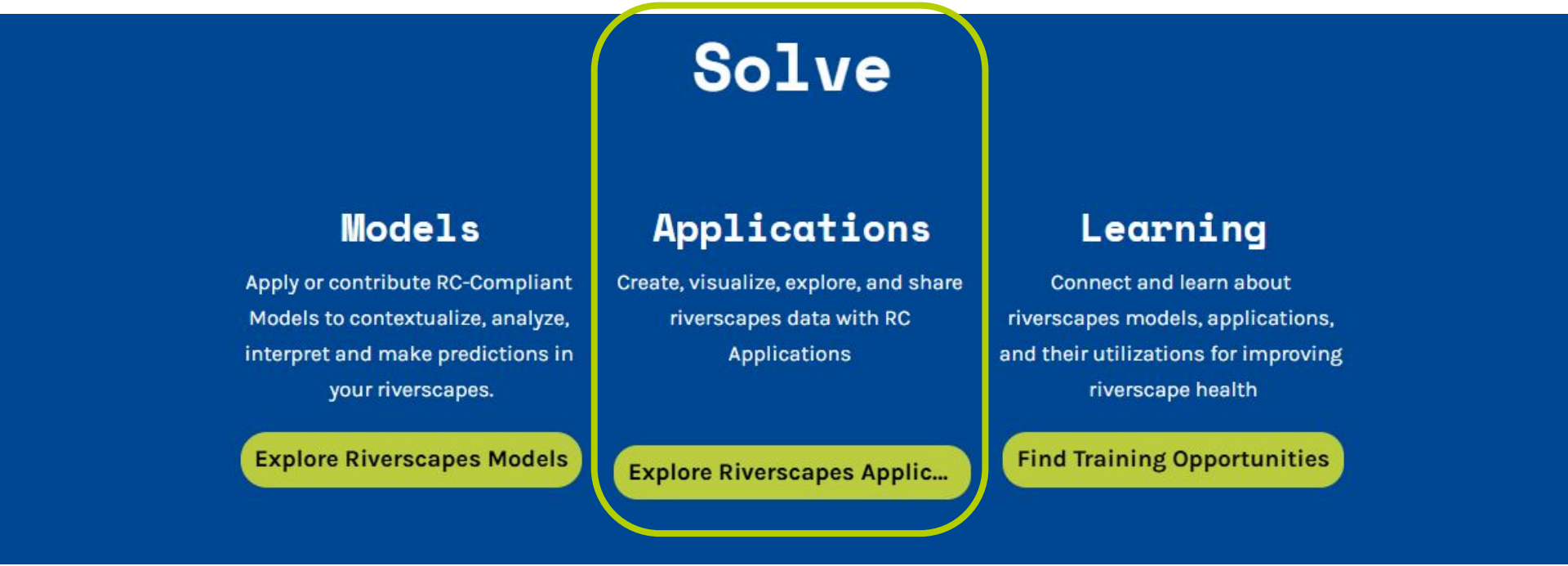
Hayley Corrine Glassic[1] | Robert Al-Chokhachy[1] | Joseph Wheaton[2] | William W. Macfarlane[2] | Chris E. Jordan[3] | Brian Murphy[4] | Scott Shahverdian[2] | Stephen Bennett[2] | Nicolaas Bouwes[2] | Kirstie Fryirs[5] | Gary Brierley[6] | Damion Ciotti[7] | Philip Bailey[8] | Karen Bartell[9] | Barbara Belletti[10] | Simone Bizzi[11] | James Brasington[12] | Reid Camp[13] | Emily Fairfax[14] | Jordan Gilbert[2] | Justin Jimenez[15] | Jeremy Maestas[16] | Timmie Mandish[17] | Amy McNamara[18] | Scott Miller[19] | Baptiste Morizot[20] | Mathias Perle[21] | Hervé Piégay[22] | Helen Reid[23] | Lindsay V. Reynolds[19] | W. Carl Saunders[24] | Alden Shallcross[19] | Peter Skidmore[25] | Rose Smith[26] | Benoît Terrier[27] | Gus Wathen[28] | Nick Weber[28]

[1]U.S. Geological Survey, Northern Rocky Mountain Science Center, Bozeman, Montana, USA | [2]Department of Watershed Science, Utah State University, Logan, Utah, USA | [3]Conservation Biology Division, Northwest Fisheries Science Center, National Marine Fisheries Service, NOAA, Newport, Oregon, USA | [4]River Network, Boulder, Colorado, USA | [5]School of Natural Sciences, Macquarie University, Sydney, Australia | [6]School of Environment, the University of Auckland (Waipapa Taumata Rau), Auckland, New Zealand | [7]Pacific Southwest Region, U.S. Fish and Wildlife Service, Auburn, California, USA | [8]North Arrow Research Ltd., Vancouver, British Columbia, Canada | [9]U.S. Geological Survey, Oregon Water Science Center, Portland, Oregon, USA | [10]CNRS-EVS, University Jean-Monnet, University of Lyon, Saint-Etienne, France | [11]University of Padova, Padova, Italy | [12]Waterways Centre, University of Canterbury, Christchurch, New Zealand | [13]Snake River Salmon Recovery Board, Dayton, Washington, USA | [14]Department of Geography, Environment, and Society and the Saint Anthony Falls Laboratory, University of Minnesota Twin Cities, Minneapolis, Minnesota, USA | [15]USDA Forest Service Northern Region, Missoula, Montana, USA | [16]USDA Natural Resources Conservation Service, West National Technology Support Center, Portland, Oregon, USA | [17]USDA Natural Resources Conservation Service, Western Region, Portland, Oregon, USA | [18]Natural Resources Defense Council, New York, New York, USA | [19]Bureau of Land Management, Denver, Colorado, USA | [20]Aix-Marseille Université, Marseille, France | [21]Upper Deschutes Watershed Council, Bend, Oregon, USA | [22]CNRS, University of Lyon, Ecole Normale Supérieure de Lyon, Lyon, France | [23]Scottish Environment Protection Agency, Stirling, UK | [24]USDA Forest Service, PacFish/InFish Biological Opinion Effectiveness Monitoring Program, Ogden, Utah, USA | [25]Dipper Consulting, LLC, Bozeman, Montana, USA | [26]Sageland Collaborative, Salt Lake City, Utah, USA | [27]Agence de l'eau Rhône Méditerranée Corse, Lyon, France | [28]Anabranch Solutions, Logan, Utah, USA

DOI: 10.1002/wat2.70028

Explore → Share → **Solve**

Riverscapes Consortium

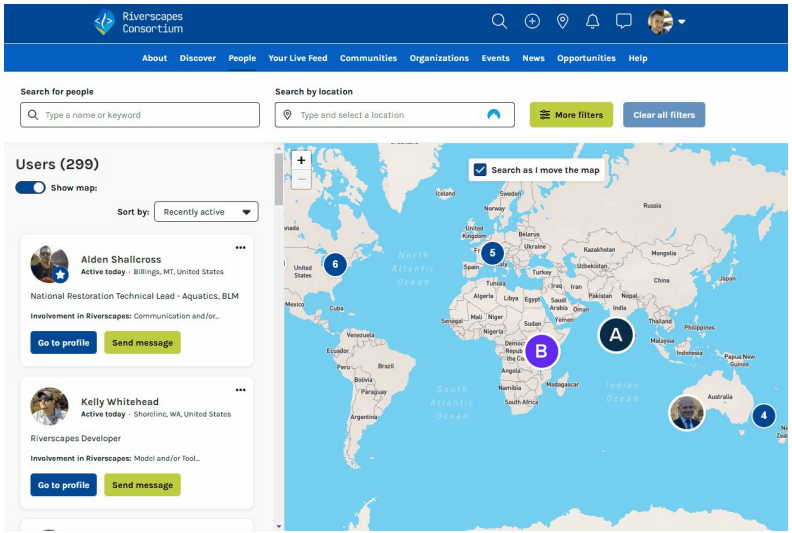


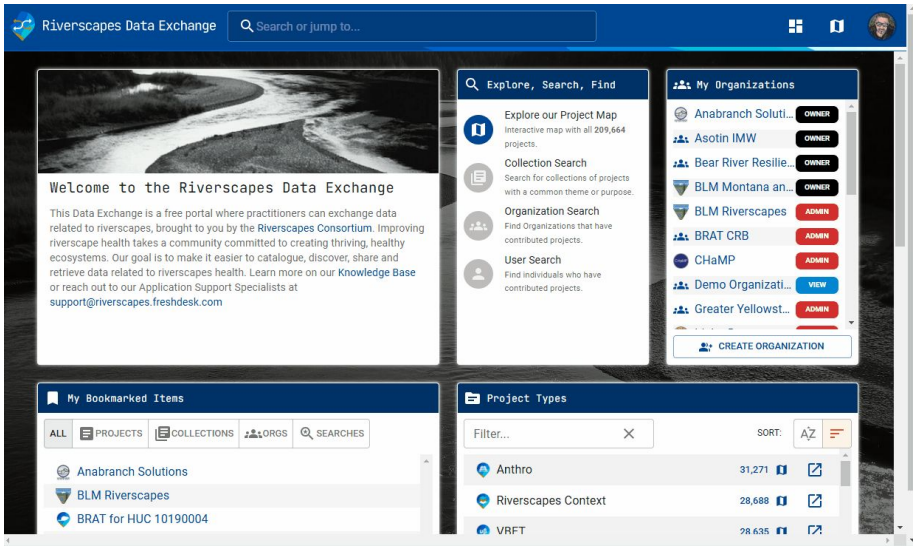
https://tools.riverscapes.net

https://lowtechpbr.restoration.usu.edu

Riverscapes Consortium

Community Platform & Data Exchange





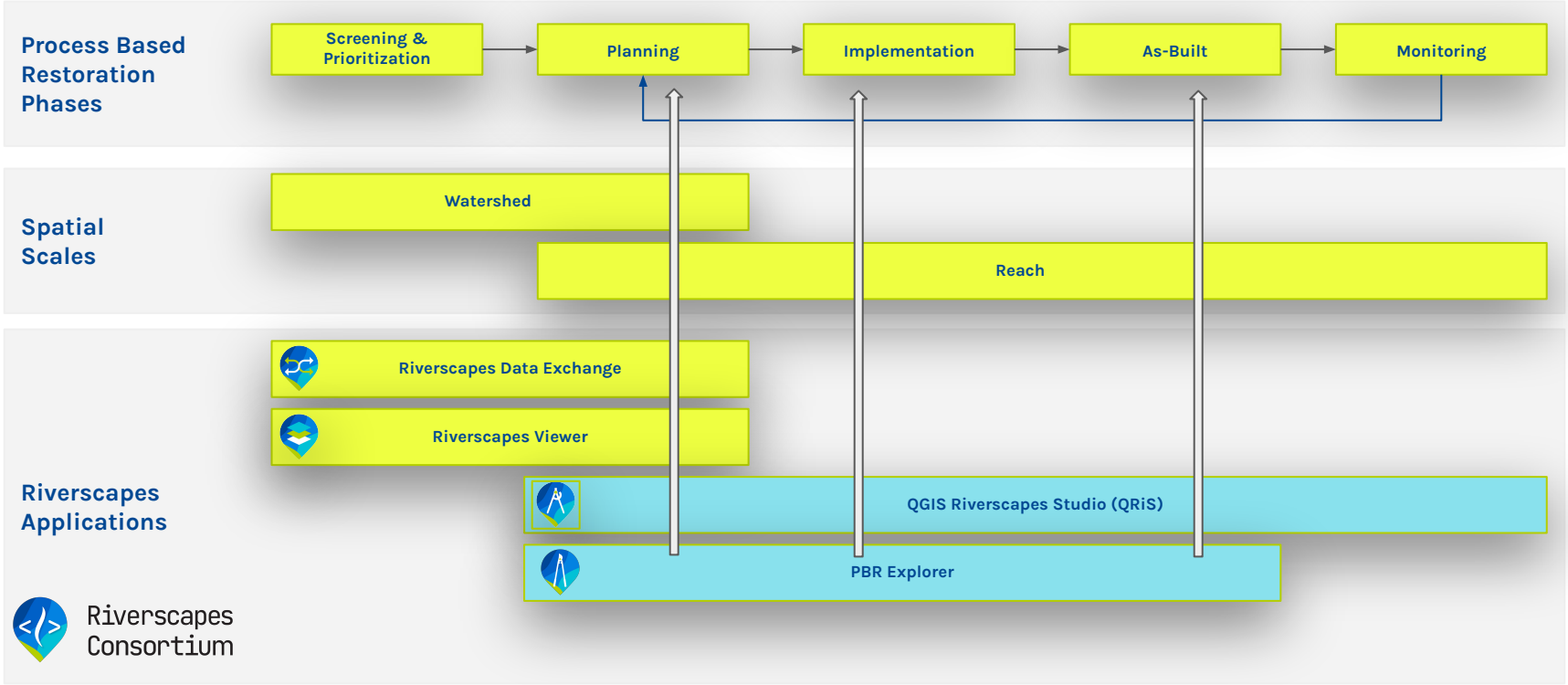
- > 850 users
- 74 organizations
- > 20 communities

https://riverscapes.net

- > 1600 users
- > 215 organizations
- > 400,000 projects

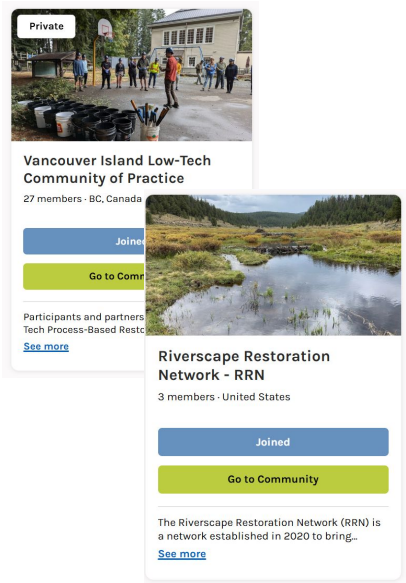
https://data.riverscapes.net

PBR Phases, Scales & Apps



Relationship between different communities

Many Overlapping Communities



RR

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Oh? We are not alone?

Riverscapes Consortium

H2O'Lyon
Université de Lyon

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PBR Explorer

A voluntary, always incomplete (maybe 10-15%), look at effort

Projects
504
Process-based riverscape restoration projects

Organizations
161
Organizations contributing to the PBR Explorer

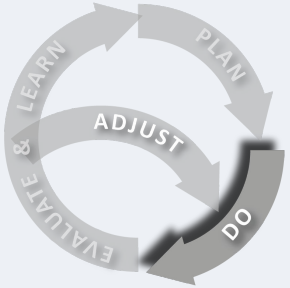
Length
656 mi
Total channel length of riverscape restoration implementation

Structures
32,014
Beaver dam analog (BDA) and post-assisted log structures (PALS)

Continents
2
Continents where restoration projects have been implemented

Countries
5
Countries participating in restoration efforts

Provinces / States
22
Provinces and states involved in restoration



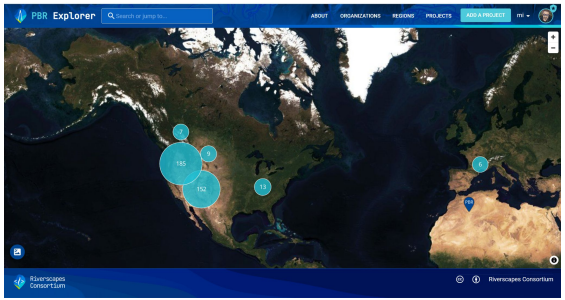
https://pbr.riverscapes.net

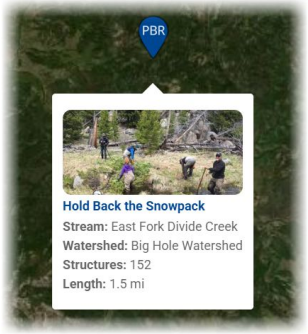
What PBR Explorer IS and What it is NOT

- Let me show off my project (as-built)
- Who is building PBR Projects where?
- What have I (we) built?
- Mileage & Calories (effort)
- Give credit where credit is due (organizations)
- This is about effort (actions), not effectiveness (see QRiS for that)

Discover & Share

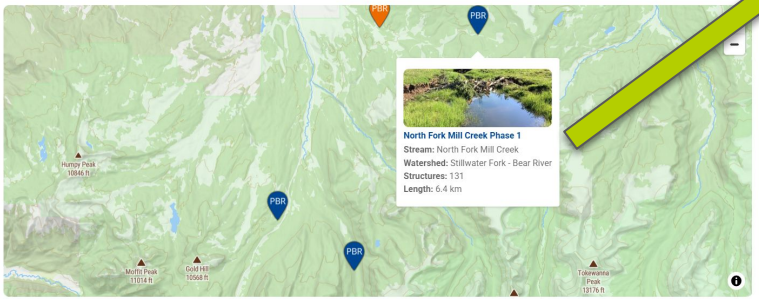
https://pbr.riverscapes.net

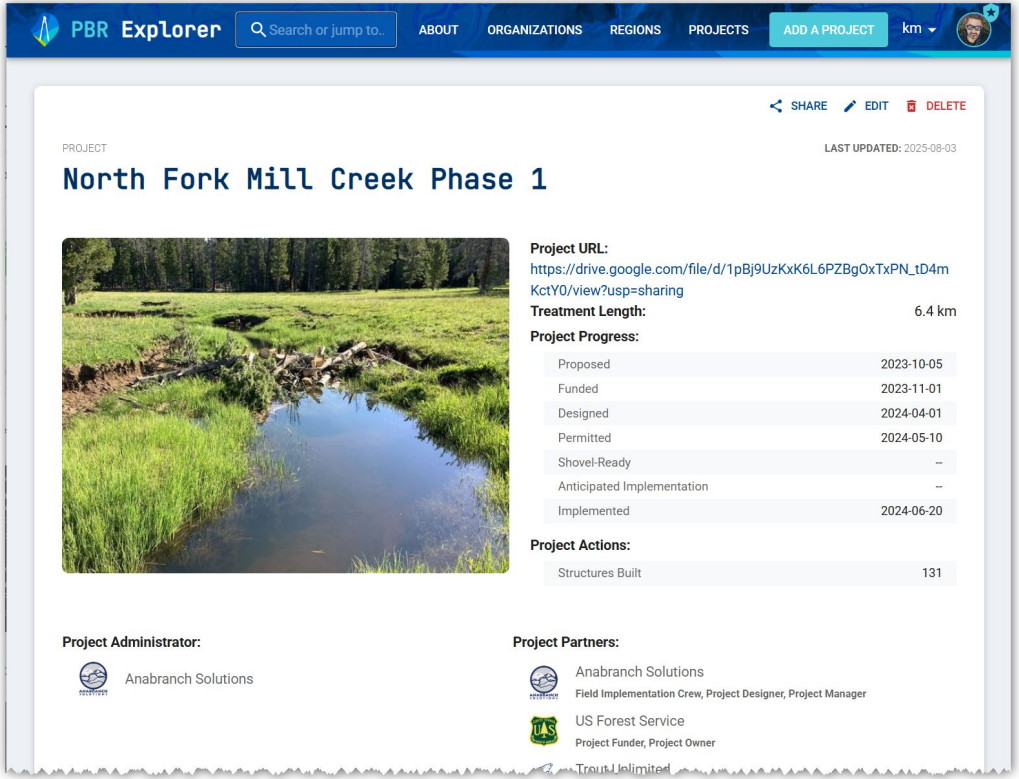




What is a “project”

- A phase of discrete restoration effort and actions at a site
- Not the site





- Who did (orgs and roles)?
- What (project actions)
- When (timelines)
- Where (map)

Project

Who? Administrator (in Explorer) & Partners & Their Roles

Project Administrator:

Anabranch Solutions

Project Partners:

Anabranch Solutions
Field Implementation Crew, Project Designer, Project Manager

US Forest Service
Project Funder, Project Owner

Trout Unlimited
Partner

- An individual or an organization can administer a project in PBR Explorer
- Any organization can be given credit
- If org is in Data Exchange, Stats start accumulating for org

Project
What & When

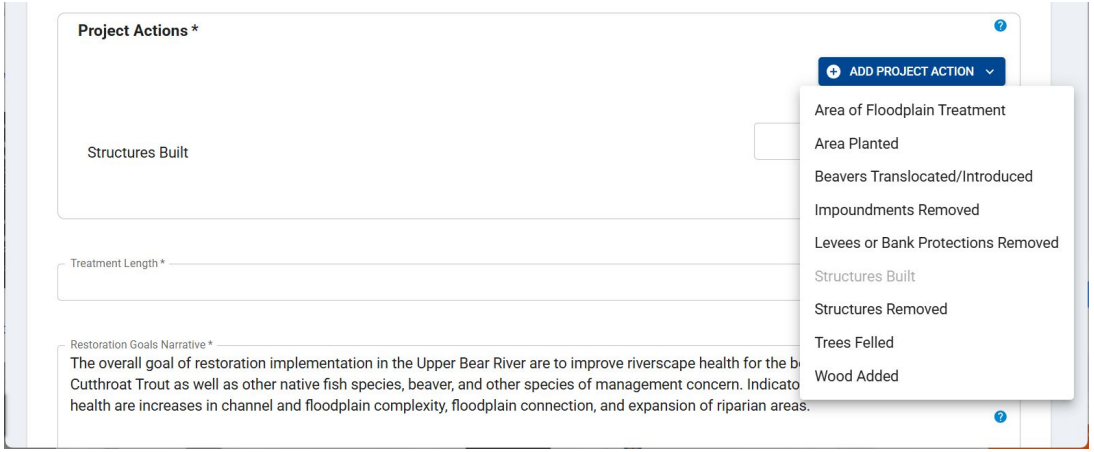
Treatment Length: 6.4 km

Project Progress:

Proposed	2023-10-05
Funded	2023-11-01
Designed	2024-04-01
Permitted	2024-05-10
Shovel-Ready	--
Anticipated Implementation	--
Implemented	2024-06-20

Project Actions:

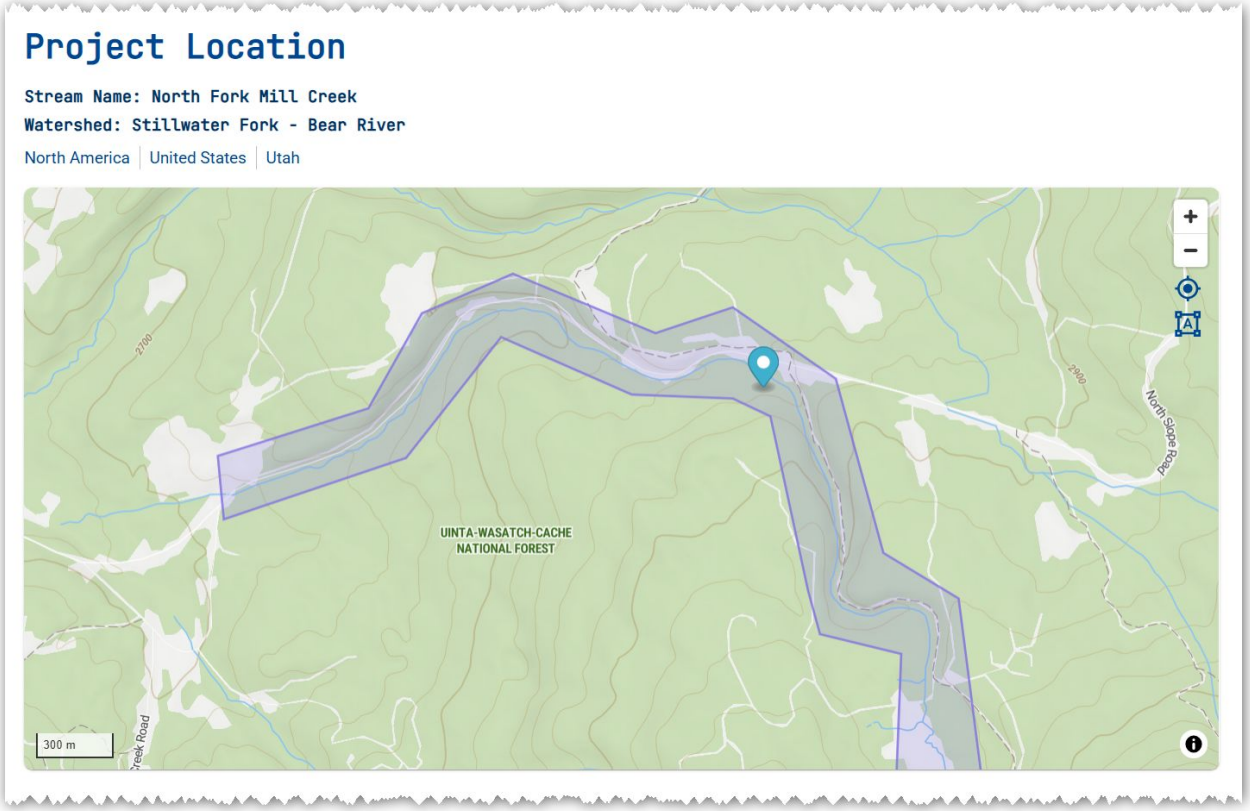
Structures Built	131



- *What* Action: Length of riverscape treated
- Milestones of *when* (only one date required - can post proposed, non-implemented projects

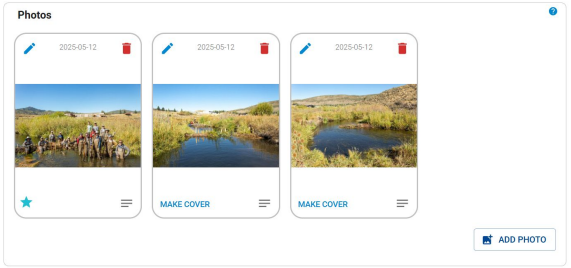
- ***NEW*** *What* Actions:
  - Lots of PBR activities can be reported

Project
Where



- All that is required is a lat/long
- Optional:
  - Stream Name & Watershed
  - Upload a polygon of project bounds

Project
Pictures & Budgets

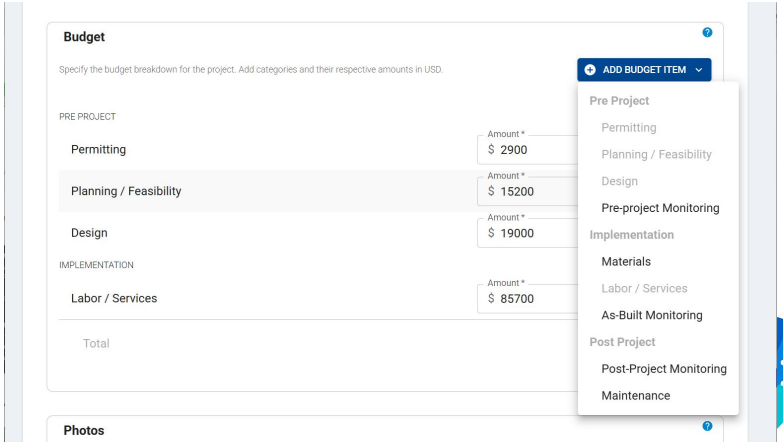


NEW! Add descriptions, dates, and make cover

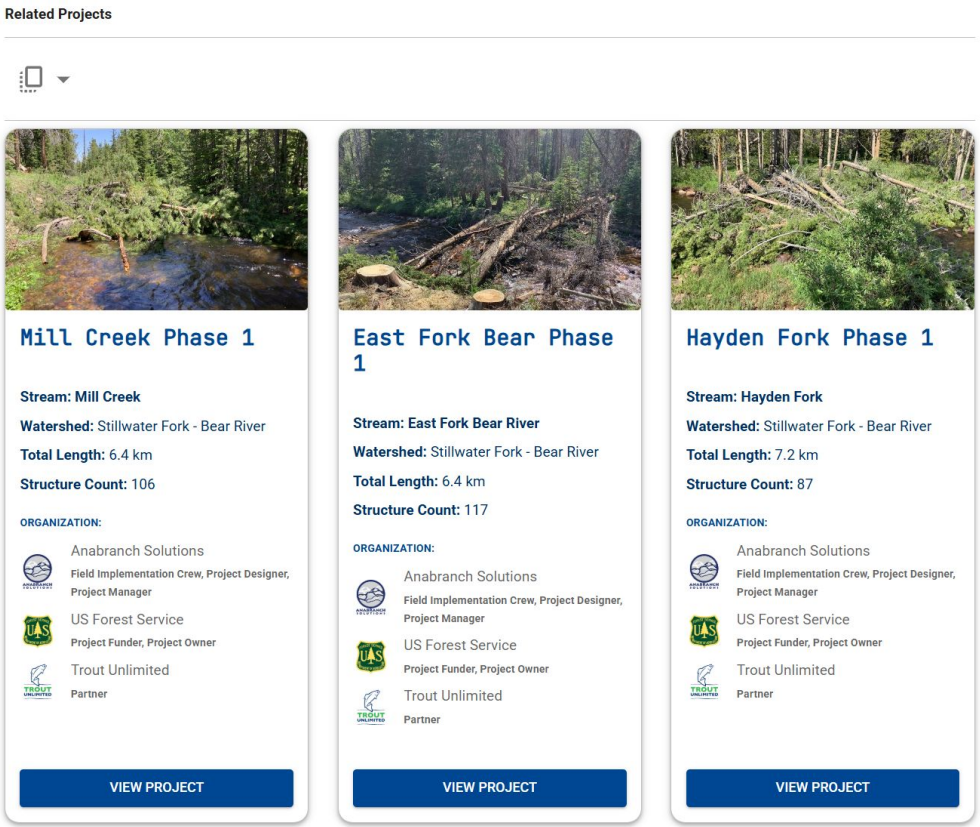
Project Budget

PRE PROJECT	
Permitting	$2,900
Planning / Feasibility	$15,200
Design	$19,000
IMPLEMENTATION	
Labor / Services	$85,700
Total	**$122,800**

- ***NEW!*** Self reporting of budgets in different stages of project and categories

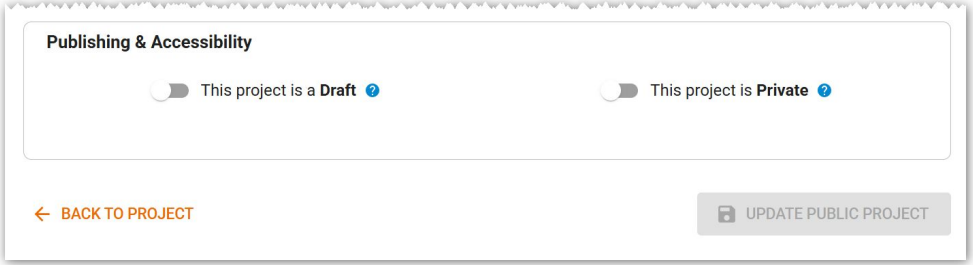


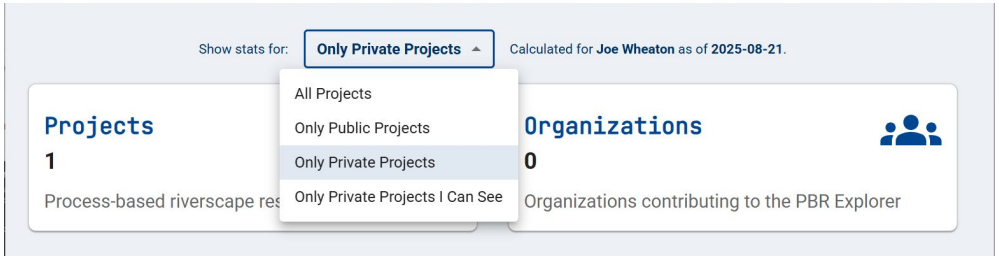
Project
Related Projects



- You can make a reference to any other project in PBR Explorer
- Good way to list related projects:
  - Multiple phases at same site
  - Same local efforts or collection of projects, but at different locations

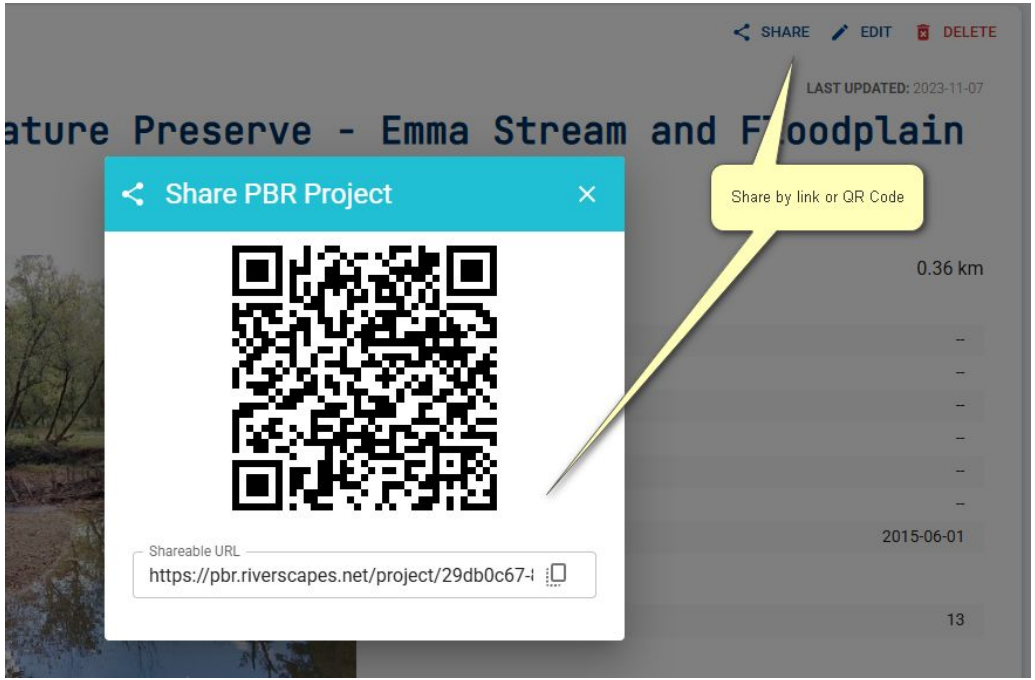
Project
Private & Draft





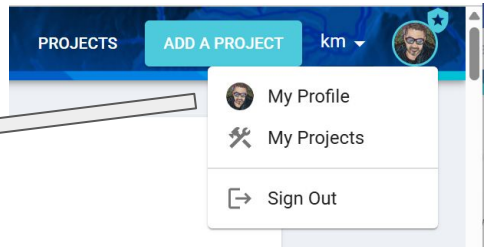
- “I want to keep track of project progress, and collective organization stats, but for private property owners we can’t make information publicly available or identifiable”
- Users can only see private projects if they are a member of the administering organization
- But private projects count towards org and region statistics

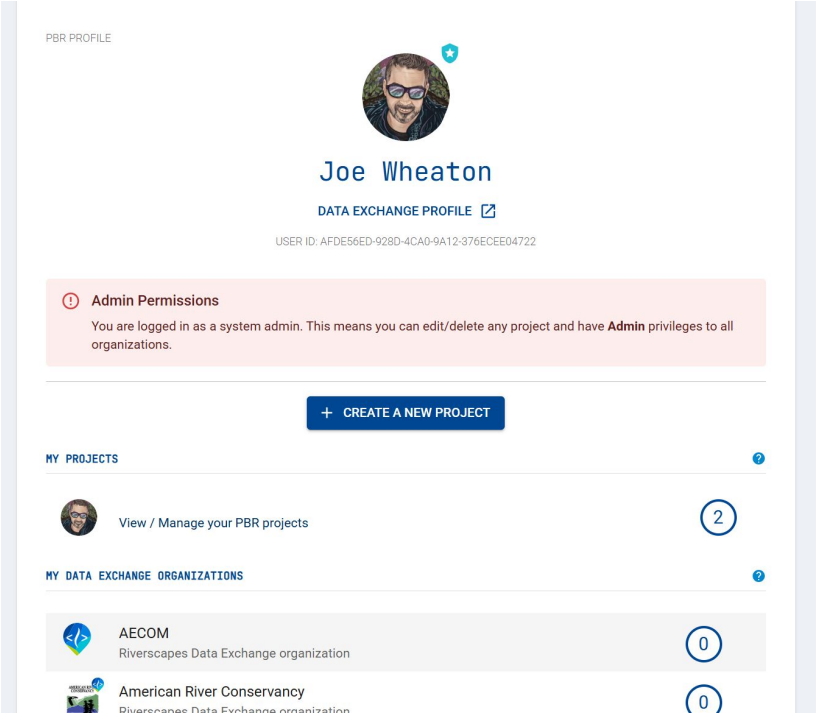
Project
Share with others



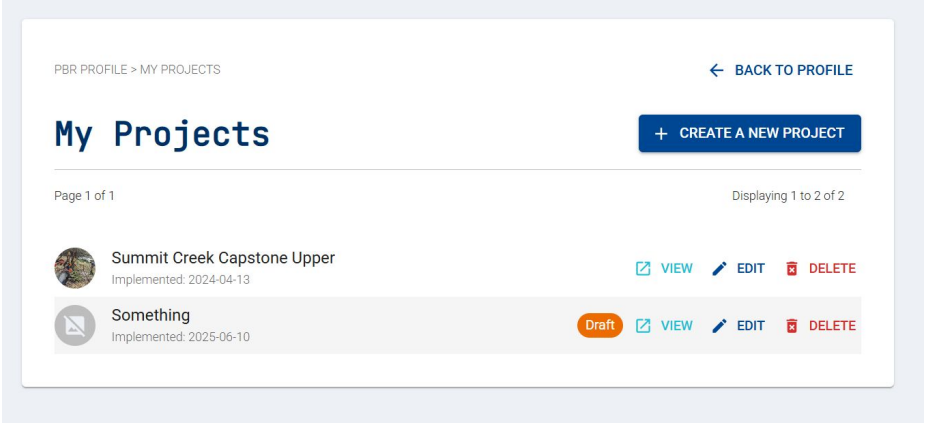
- Easy to share link or QR Code with Share button

It's all about me
My Stuff in PBR Explorer



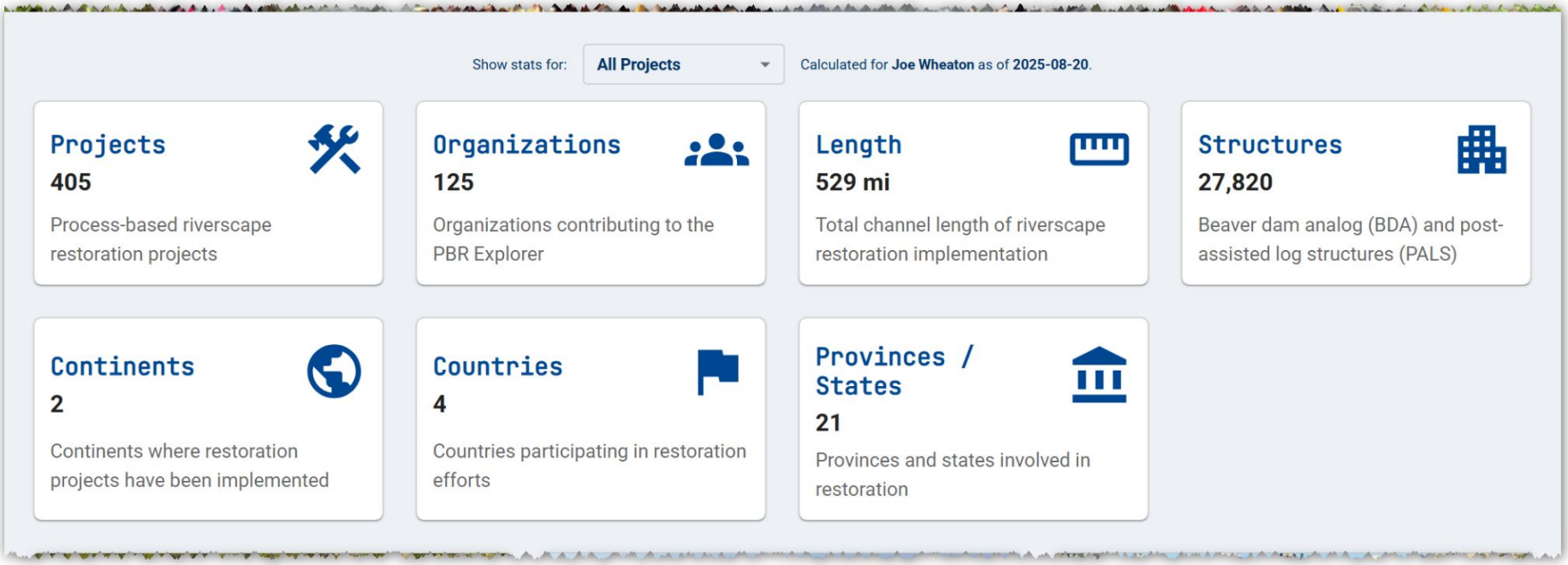


- Manage my projects and see organizations I belong to

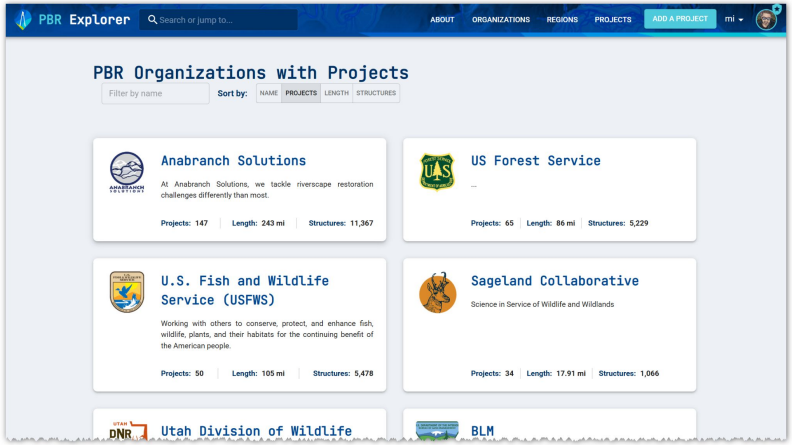


Dashboards - Community Measures of Effort

How much is being done?

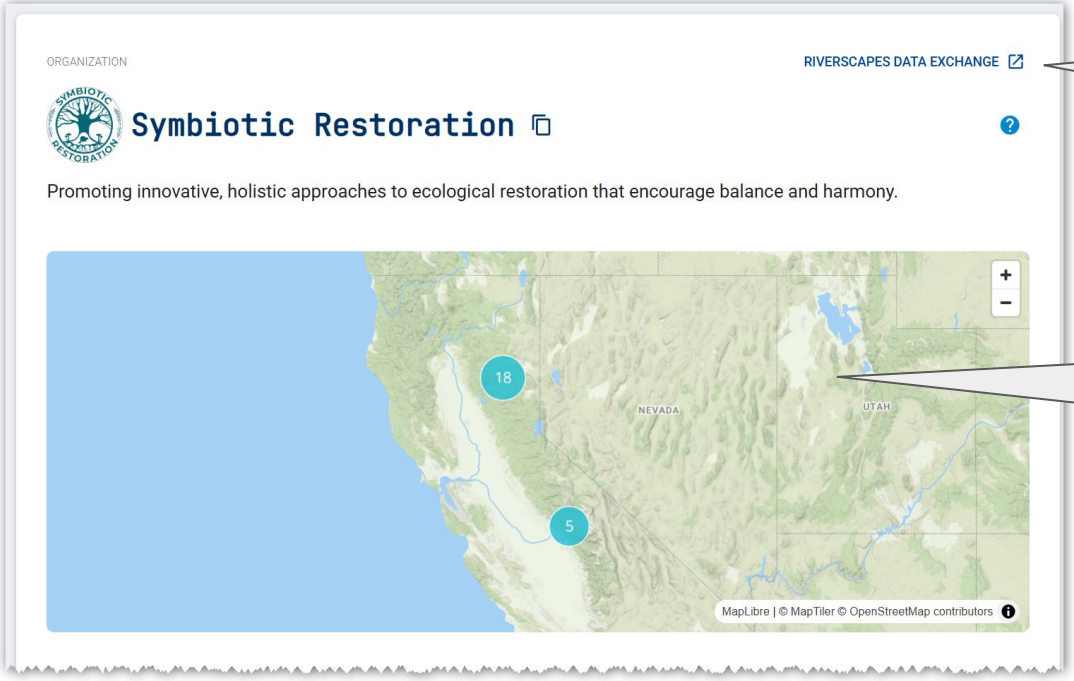


Effort by Organization & Region



- Search
- Sort alphabetically, or by number of projects, length of riverscape treated or number of structures

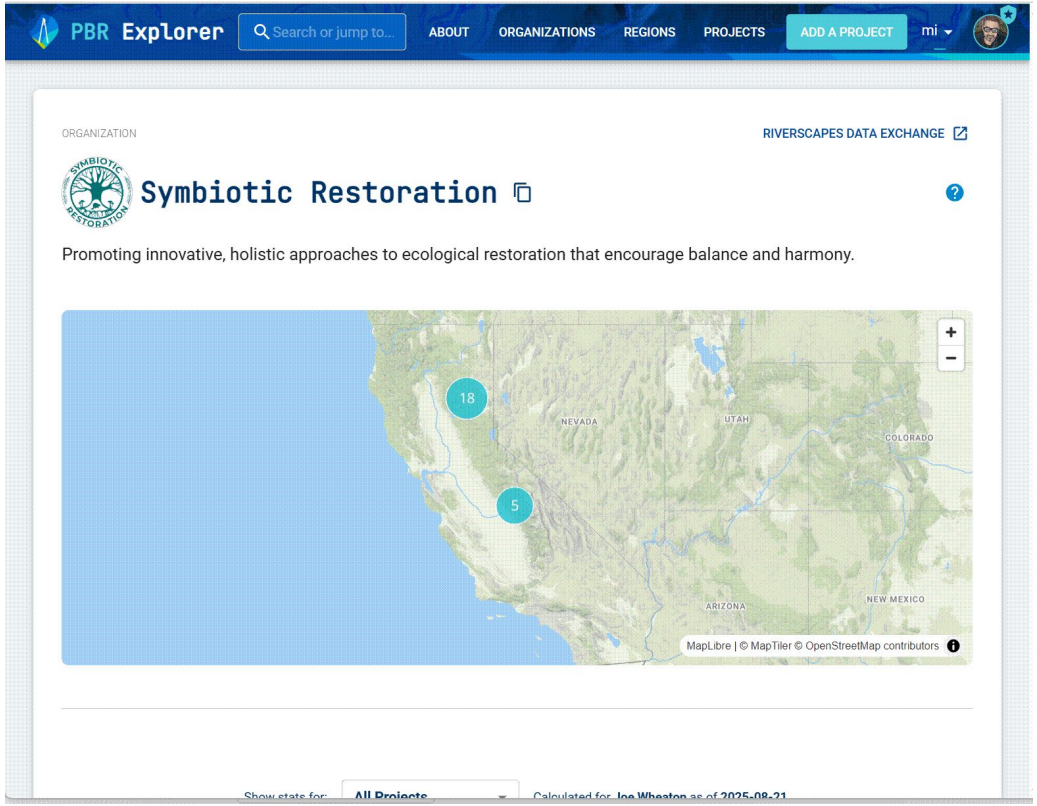
The Region & Org Summaries
By Map



View Org in the Data Exchange

Same interactive map, see extent and zoom to click on individual projects for this Org

The Region & Org Summaries
Stats

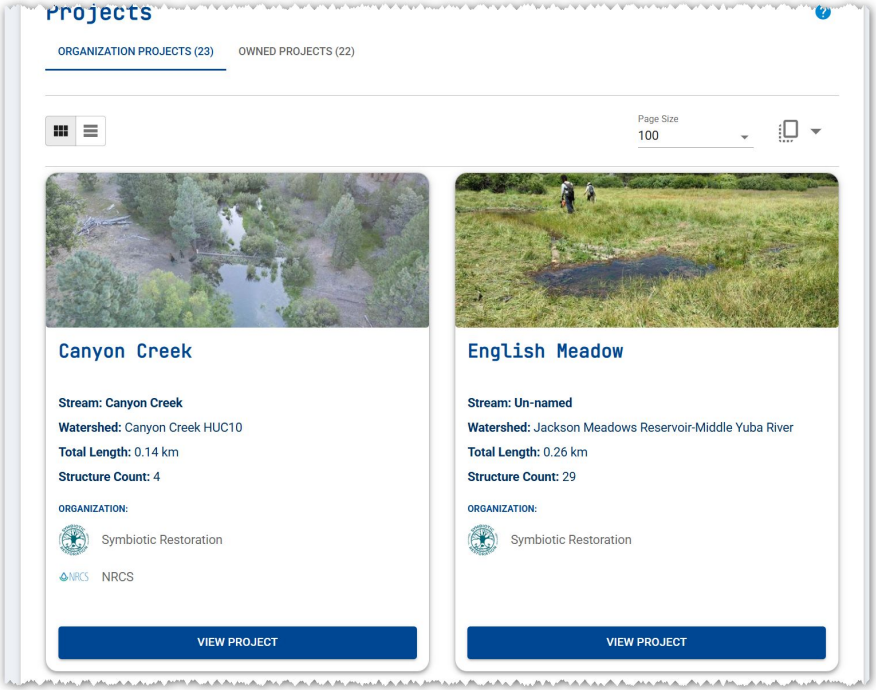


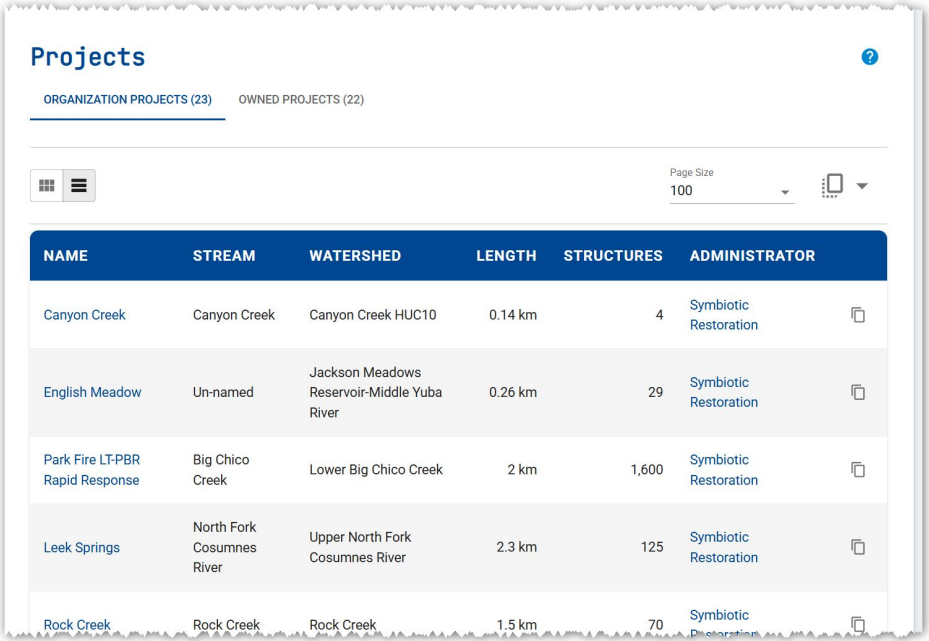
- In this release, just the old LT-PBR stats
  - Project count
  - Length of riverscape treated (note toggle)
  - Structure Count (just LTPBR for now)
- More Stats coming
  - PBR stats
  - Cost where provided

The Region & Org Summaries

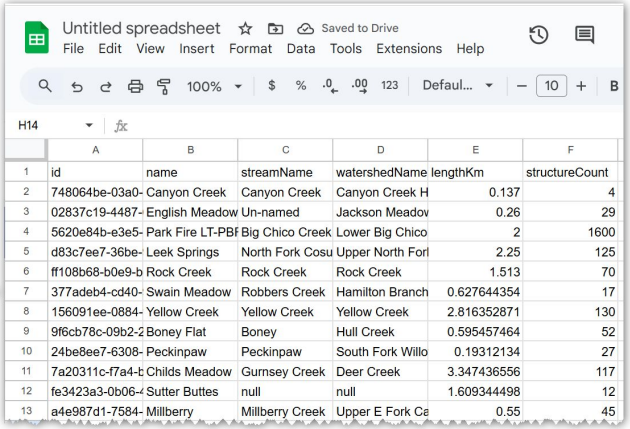
Projects

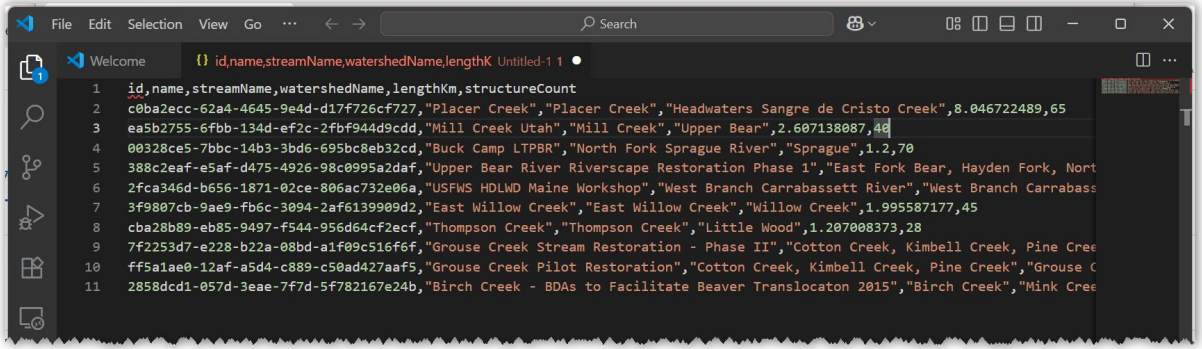
Card View or List View





The Region & Org Summaries
Project Summary Data

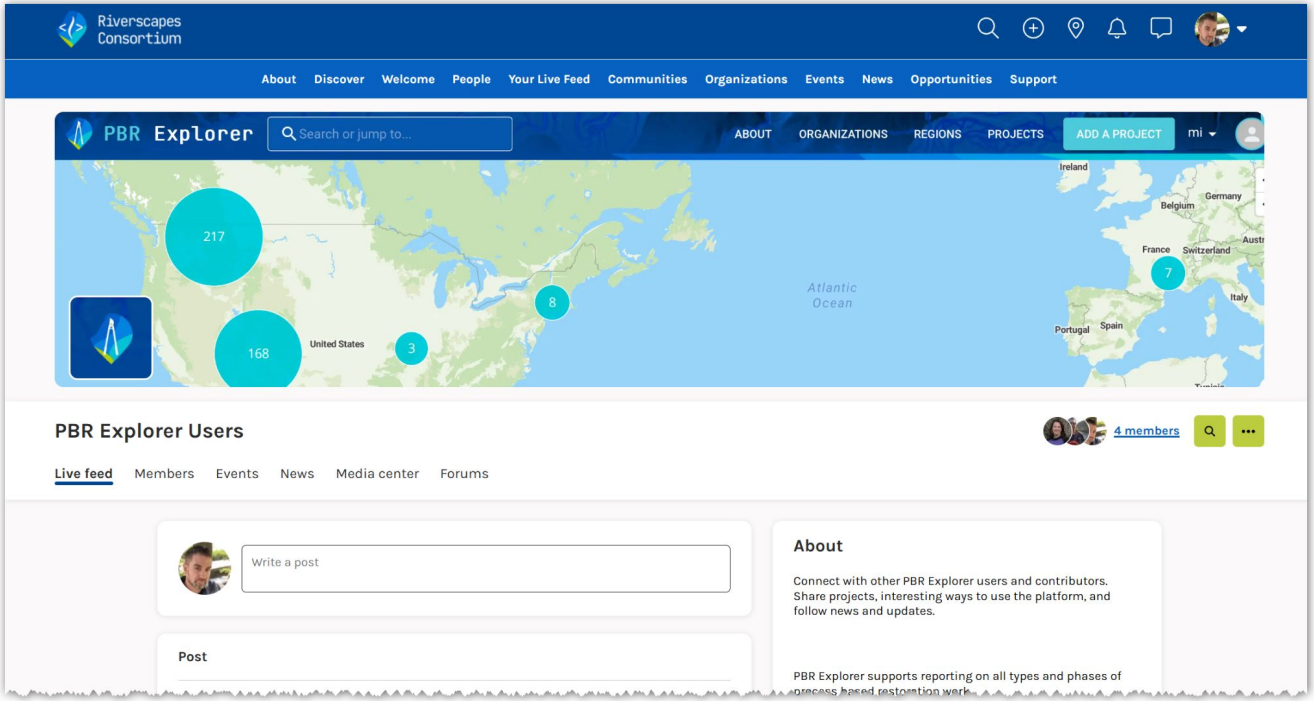




- Get summary data out by org or region
- Run your own stats

PBR Explorer User Community on

Riverscapes Consortium



- Make posts and alert people to your cool PBR Project!
- Post questions in Forums
- Connect with other users
- Track PBR Explorer Events like this one

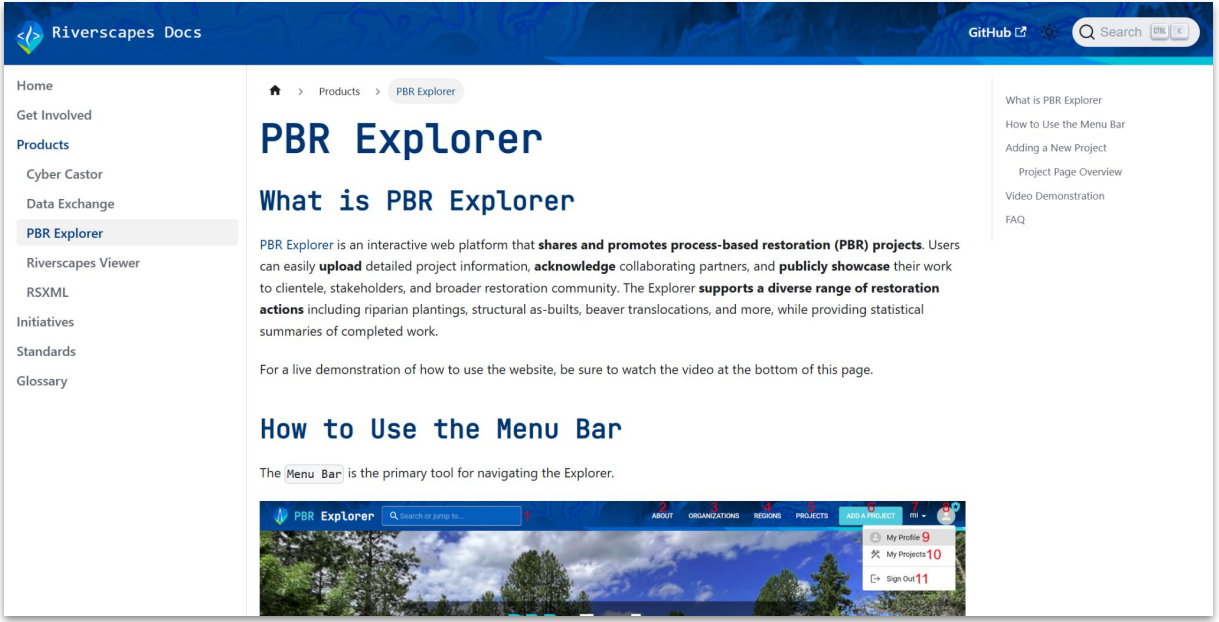
Join for free at: https://www.riverscapes.net/topics/44339/feed

Help Documentation

Basic documentation on how to use PBR Explorer at: https://docs.riverscapes.net/products/pbr-explorer

Including these slides and this webinar recording:

https://docs.riverscapes.net/products/pbr-explorer/BLM_webinar/



Low-Tech, High Impact: PB tools

PACIFIC SALMON FOUNDATION

Outline:

- LTPBR Background
- Riverscapes Consortium
- Highlight two tools
  - PBR Explorer - *for sharing effort (actions)*
  - **Riverscapes Studio** - *for planning, design, as-builts & action-effectiveness monitoring (assessing impact)*

Purpose:

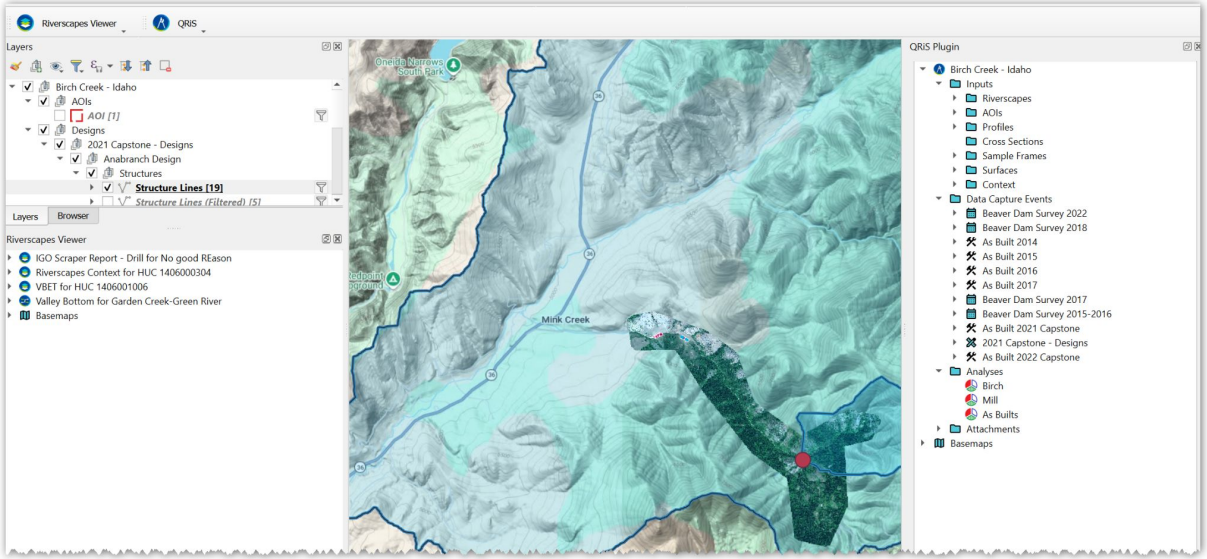
To share a couple of high-tech, but tractable free tools for capturing impact

- Impact of effort
- If efforts have desired impacts:
  - *Affects - (v) process*
  - *Effects - (n) outcomes*

Riverscapes Studio - QRiS

- Free plugin to free QGIS
- Pronounced “curious”

https://qris.riverscapes.net



Intro to LTPBR & Chapter 3 of Manual

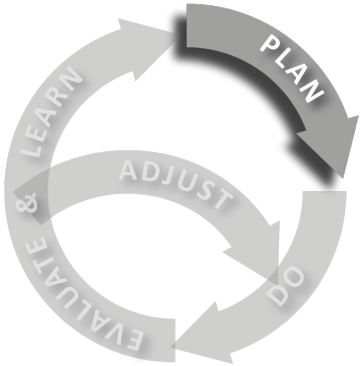
Chapter 3 - PLANNING FOR LOW-TECH PROCESS-BASED RESTORATION

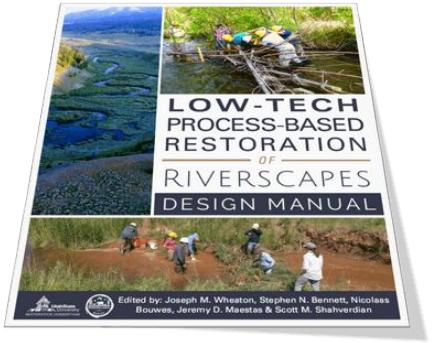
Prepared by:
Stephen N. Bennett, Joseph M. Wheaton, Nicolaas Bouwes, Christopher E. Jordan, William W. Macfarlane, Jeremy D. Maestas, Elijah Portugal, and Scott M. Shahverdian

Recommended Citation:
Bennett, S.N., Wheaton, J.M., Bouwes, N., Jordan, C.E., Macfarlane, W.W., Maestas, J.D., Portugal, E. and Shahverdian, S.M., 2019. Chapter 3 – Planning for Low-Tech Process-Based Restoration. In: J.M. Wheaton, S.N. Bennett, N. Bouwes, J.D. Maestas and S.M. Shahverdian (Editors), Low-Tech Process-Based Restoration of Riverscapes: Design Manual. Utah State University Restoration Consortium, Logan, Utah. pp. 54.

IMPLICATIONS FOR PRACTICE

- Planning for low-tech process-based restoration is similar to planning for other forms of restoration.
- We adapt the Conservation Planning Process to show what aspects of the process are distinctive to low-tech process-based restoration. The Conservation Planning Process follows an adaptive management framework and has three phases: i) a Collection and Analysis Phase (focused on planning), ii) a Decision Support Phase (focused on design), and iii) an Application and Evaluation Phase (focused on implementation).
- For low-tech restoration, we pose four screening questions in the process to identify exit points where and if low-tech process-based restoration may not be appropriate.
- Out of the Collection and Analysis Phase, current conditions of the riverscape (valley bottom), constraints and recovery potential are identified to help frame appropriate and realistic treatments and targets in the design.
- Low-tech restoration to reverse structural starvation of riverscapes frequently takes more than one treatment (and design), and out of the design phase expectations are set for what progress towards long-term restoration goals will be made and how many treatments might be necessary.
- The implementation of a design involves an iteration between carrying out an individual treatment of structural additions and evaluation. Ultimately, it is assumed project goals will be met if the processes of wood accumulation and/or beaver dam activity make the transition from being mimicked and promoted by treatments to occurring on their own in a self-sustaining fashion. As such, the need for additional treatments

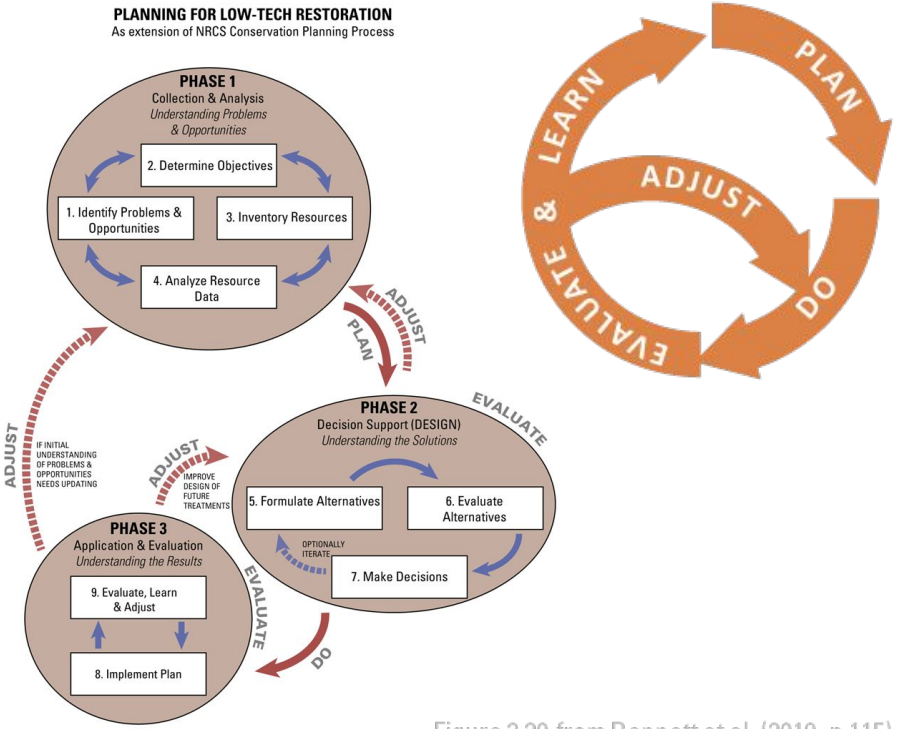




QRiS operationalizes standards of practice defined in Chapters 3 & 4 of Design Manual:

https://lowtechpbr.restoration.usu.edu/manual/

NRCS Conservation Planning Process & LTPBR Project Process



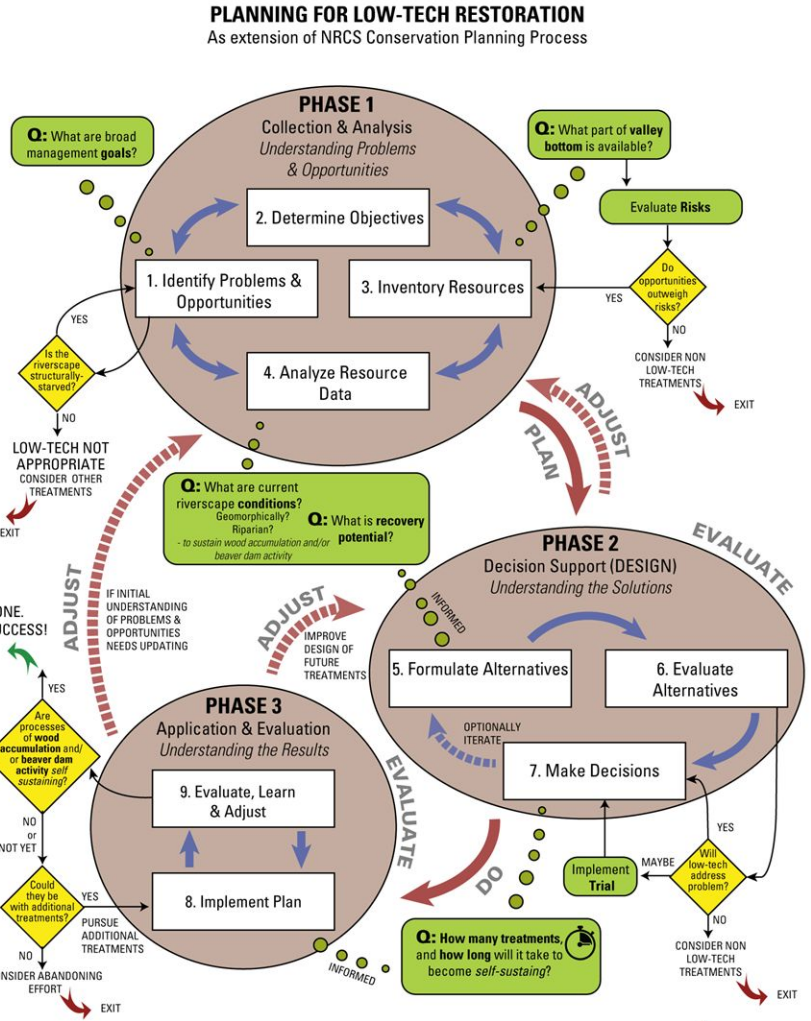
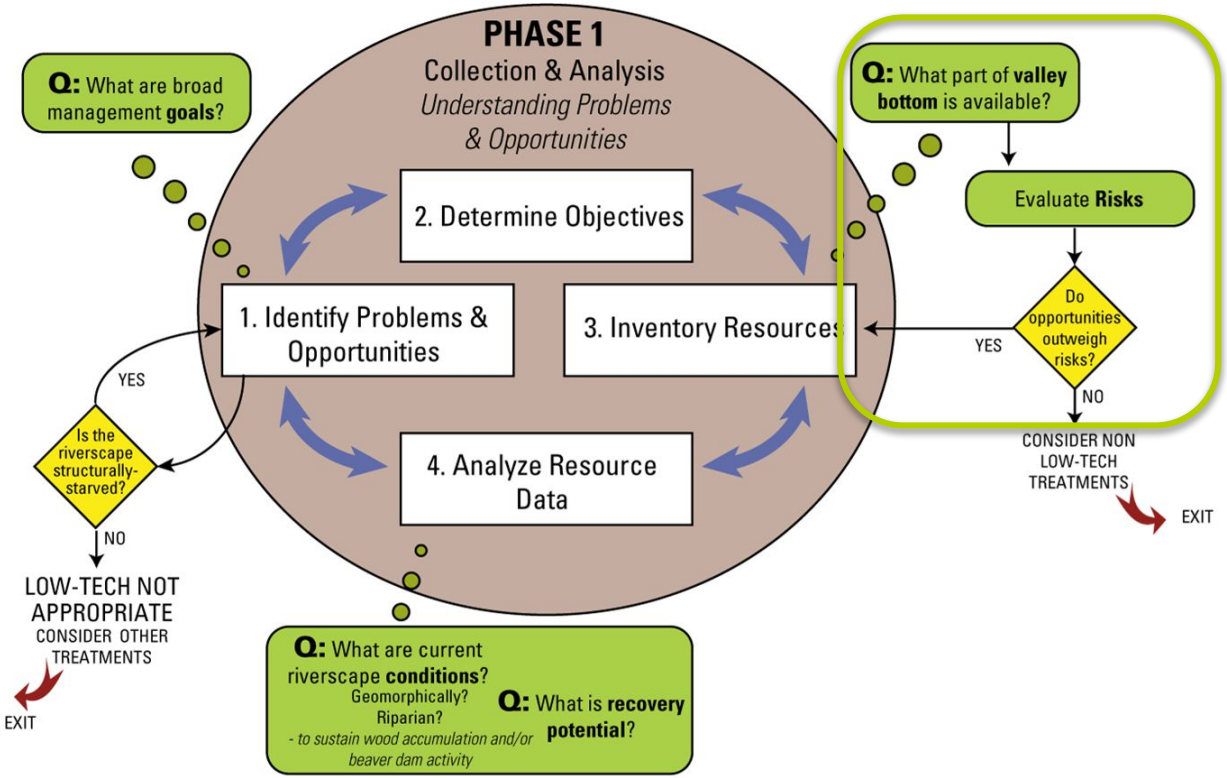


Figure 3.20 from Bennett et al. (2019, p 115)
Chapter 3 LTPBR Manual
DOI: 10.13140/RG.2.2.15815.75680

Phase 1 of LTPBR (Chap 3) - But in QRiS what is this?



Lots of ways to do things… like LTPBR
We want room for flexibility, creativity & curiosity (QRiS)

BUT, Standards Matter

Protocols & Riverscapes Studio is really all about standards, repeatability, F-A-I-R principles and extensibility

Share

Our platforms lower the barriers to creating, contributing, and sharing riverscape analysis products. We have developed tools to automate the collection of disparate public datasets, making it easier for researchers, restoration practitioners, scientists, and students to find and share riverscapes-compliant data. All datasets available in the Riverscapes Data Exchange meet the data standards for organizing and visualizing common river datasets.

Standards and Compliance

https://docs.riverscapes.net/standards

Value Proposition - Do your work in QRiS &

https://qris.riverscapes.net/tutorials/Webinars/data_exchange

QRiS offers :

- Takes care of housekeeping
- Contribution over time at a site
- Supports analysis
- Allows you to share individual projects in Data Exchange
- Meta-Analysis across projects
- Flexibility

The way we deliver that ‘flexibility’, but with necessary consistency is protocols

Riverscapes Studio

QRiS offers :

- Takes care of housekeeping
- Contribution over time at a site
- Supports analysis
- Allows you to share individual projects in Data Exchange
- Meta-Analysis across projects
- **Flexibility**

What is a protocol?

Many examples in riverscape world are field protocols

A protocol is often associated with a monitoring program

3 **a :** a code prescribing strict adherence to correct etiquette and precedence (as in diplomatic exchange and in the military services)

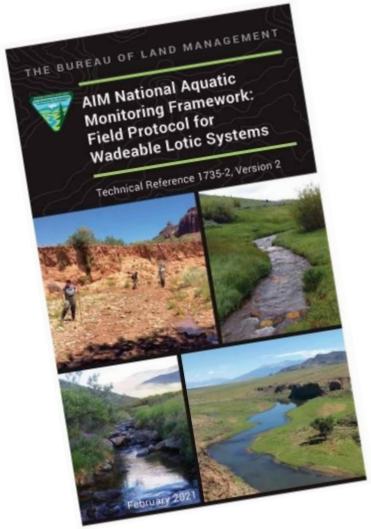
a breach of *protocol*

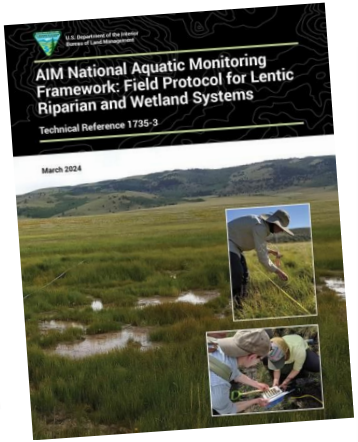
b : a set of conventions governing the treatment and especially the formatting of data in an electronic communications system

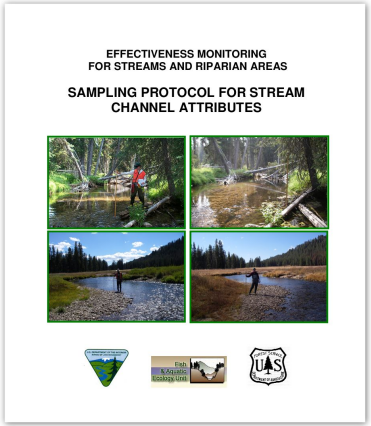
network *protocols*

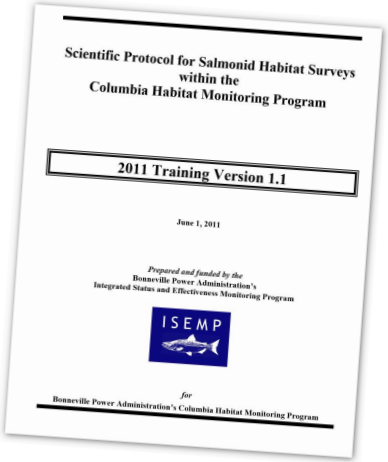
c : **CONVENTION sense 3a,b**

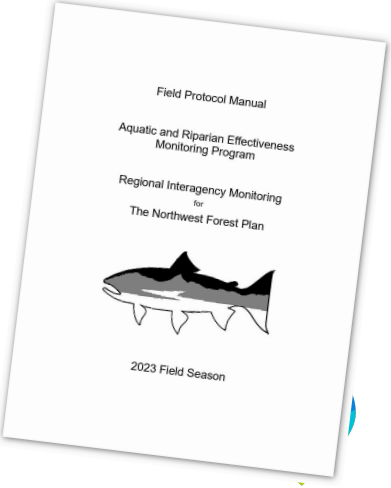
4 **:** a detailed plan of a scientific or medical experiment, treatment, or procedure





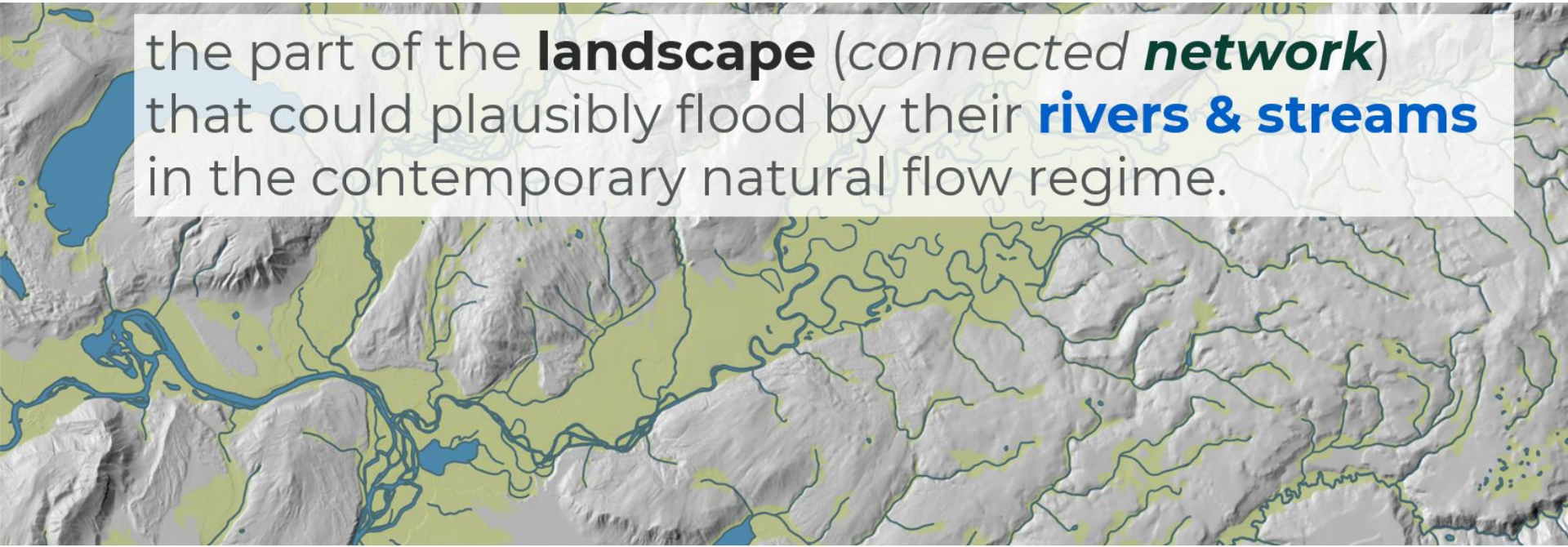






We want protocols that speak to whole riverscape!
Not just channel or remnant riparian.

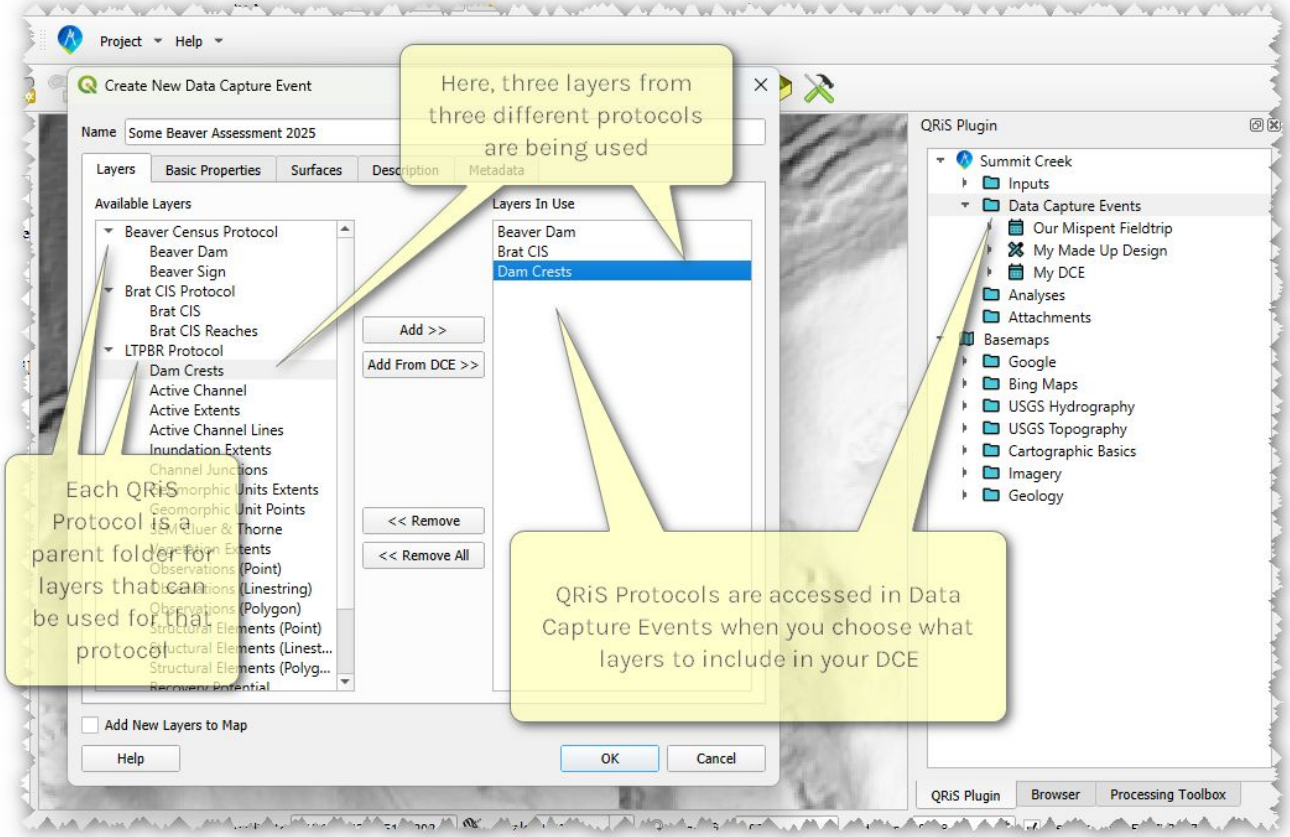
We define a Riverscape as



What is a QRiS Protocol?

Accessed in Data Capture Events (DCEs)

- Layer Definitions
  - Type (point, line, polygon)
  - Symbology
  - Attributes
- Metric Definitions
- Supporting Documentation

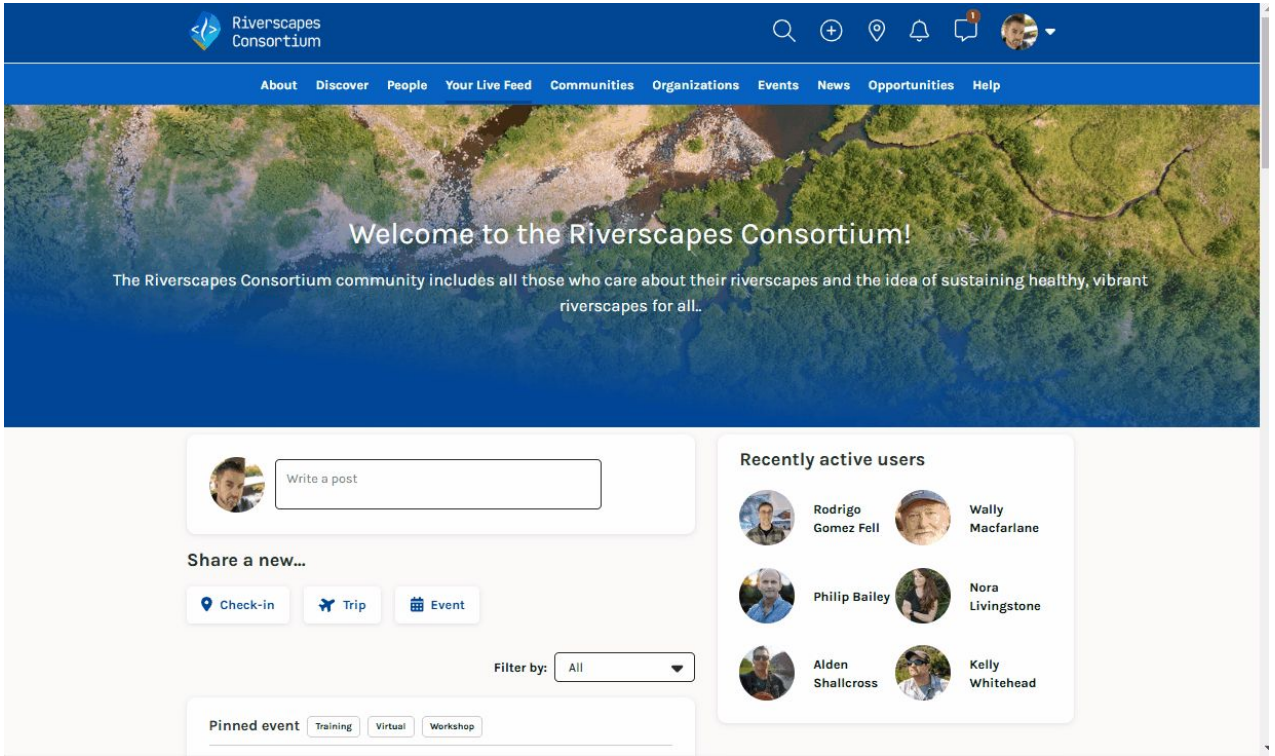


https://qris.riverscapes.net/technical-reference/protocols/#what-is-a-qris-protocol

e.g., LTPBR V2 Protocol

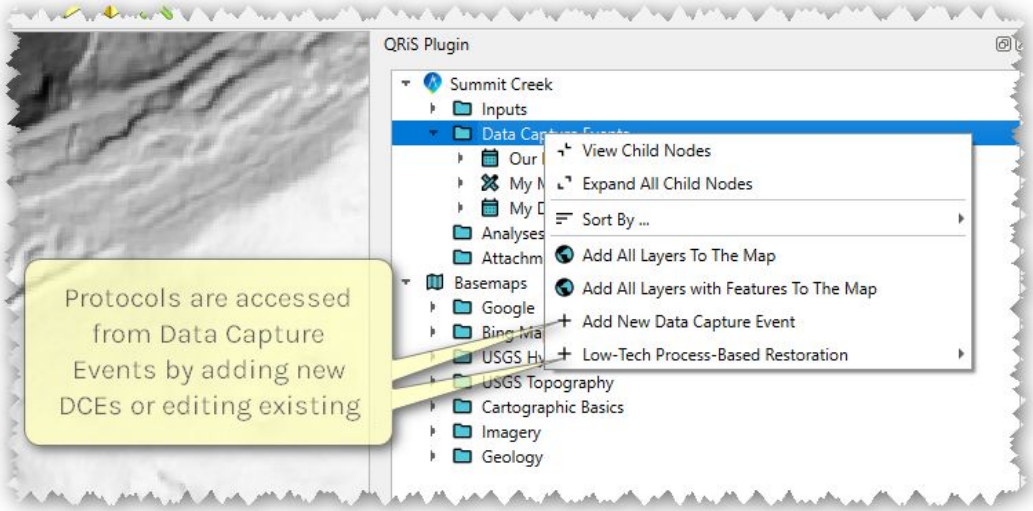
https://zenodo.org/records/13769899
https://qris.riverscapes.net/technical-reference/protocols/protocol-library/dce-protocols/ltpbr-dce-protocol

- Protocol for tying LTPBR to riverscape health
- Action Effectiveness Protocol
- Covers
  - Planning
  - Design
  - As-Builts (phases)
  - DCEs - monitoring riverscape health
- First protocol plumbed into QRiS



How do I access protocols in QRiS?

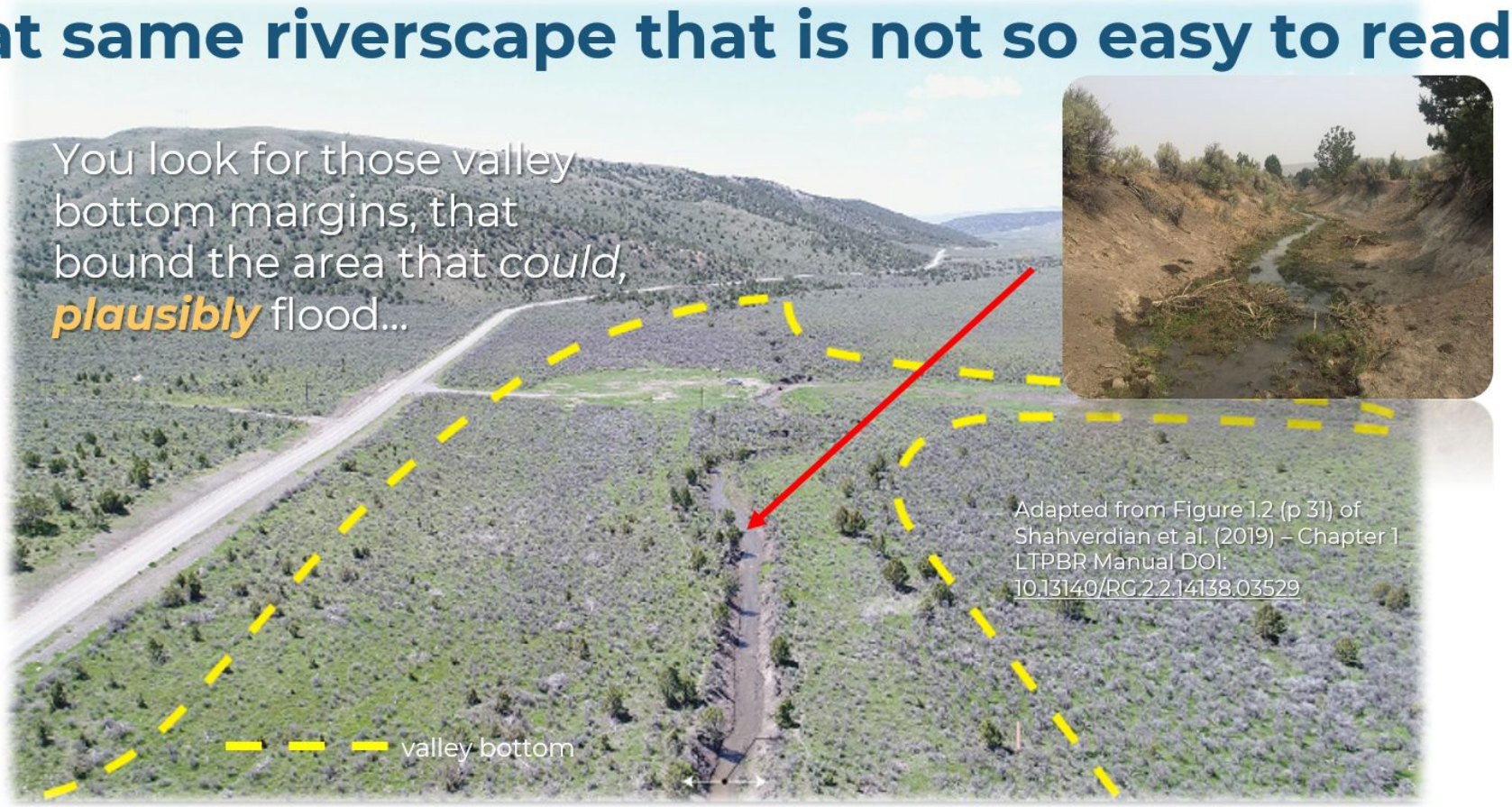
Protocols control how regular Data Capture Events, as well as LTPBR Designs & As-Builts



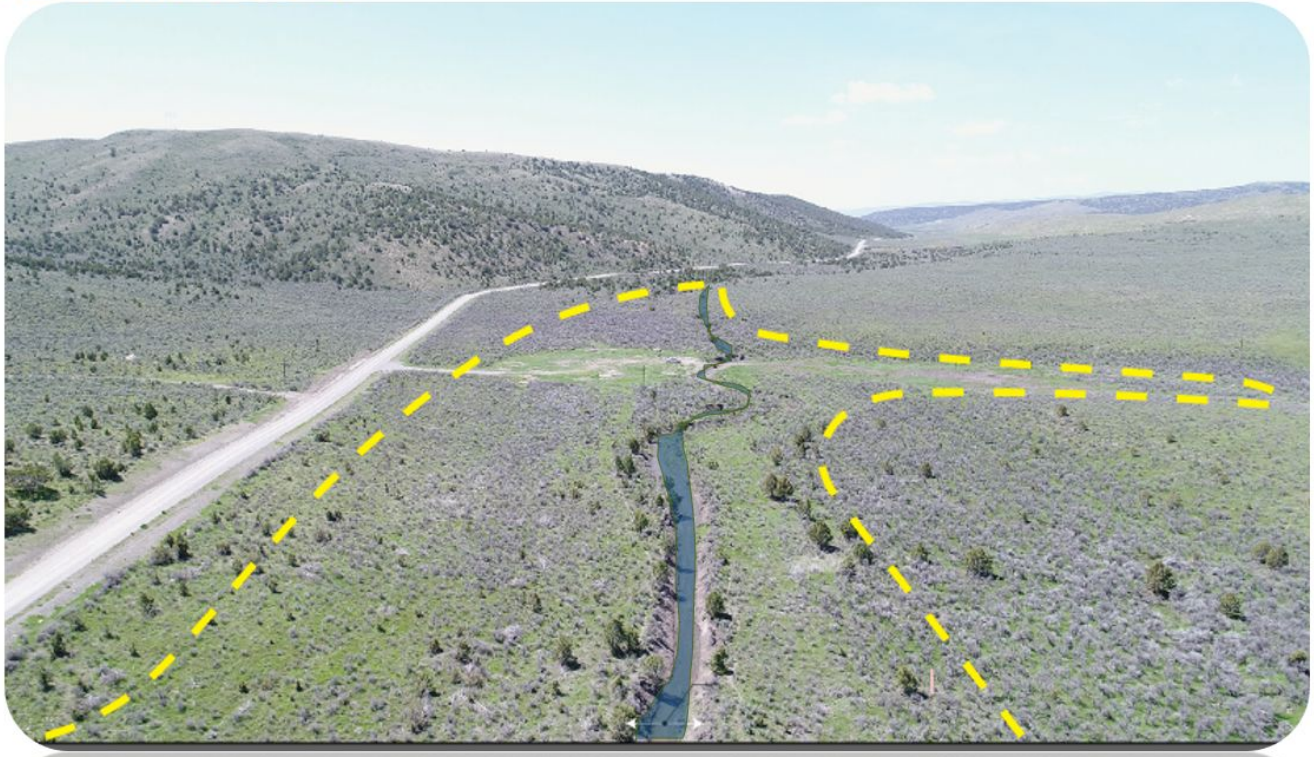
Overused Example of Motivation

Riverscapes need space…

That same riverscape that is not so easy to read

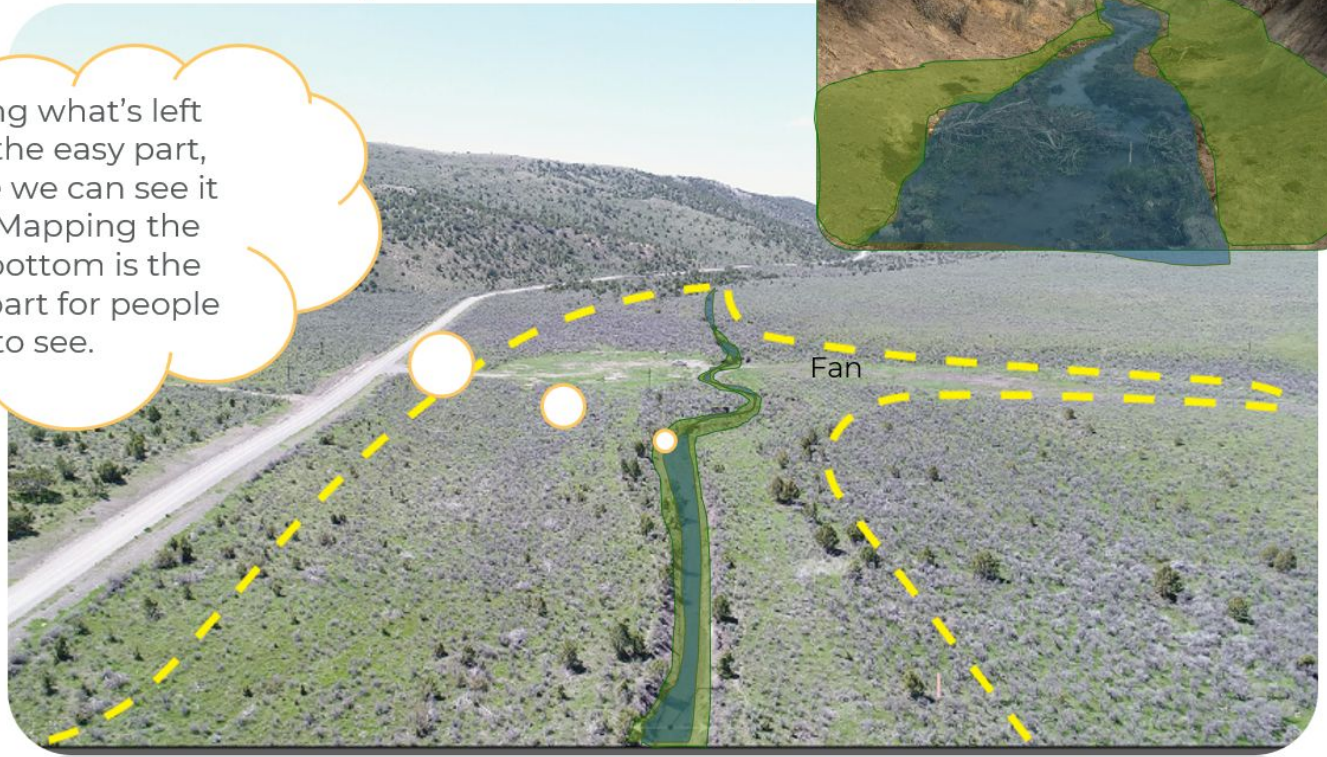


What's been lost?



Map what's there (or left over)

Mapping what's left over is the easy part, because we can see it today. Mapping the valley bottom is the harder part for people to see.



Valley bottom

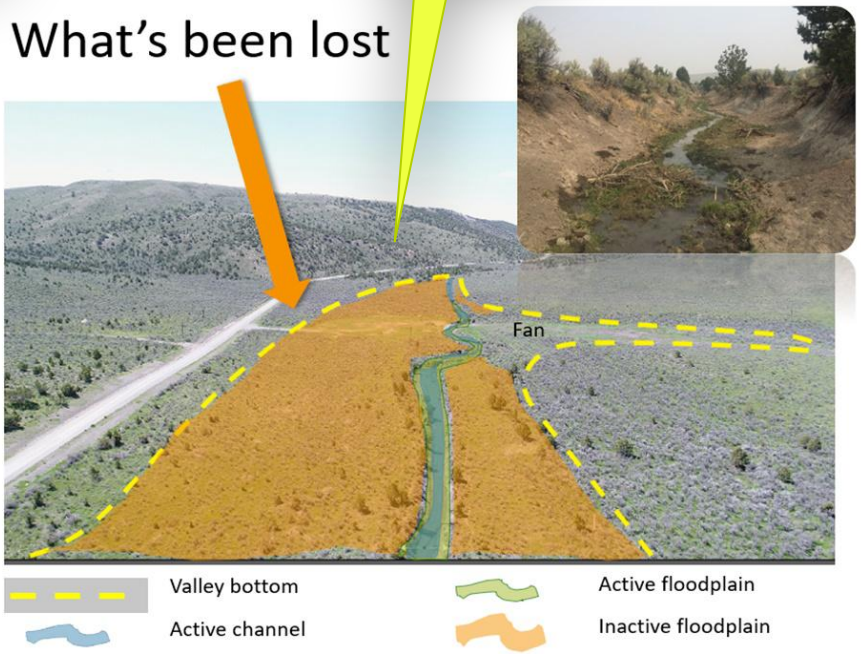
Active channel

Active floodplain

What's been lost?

Some context helps...

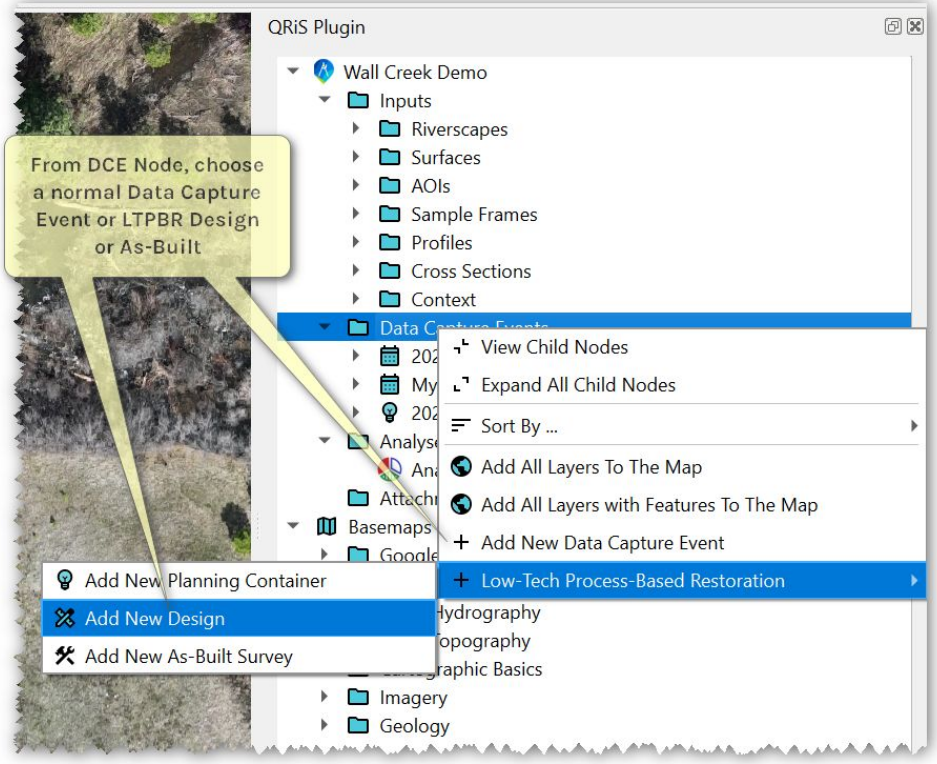
Goal is to help BLM get MORE of this and LESS of this!
How to quantify and map that?



- Hydrologically inefficient – high storage
- Riparian area – Entire Valley Bottom!
- High Resource Values

- Hydrologically efficient (100% free flow)
- Desiccated sponge VS Riparian
- Low Resource Values

Step 1 - Get your Container DCE (Data Capture Event)

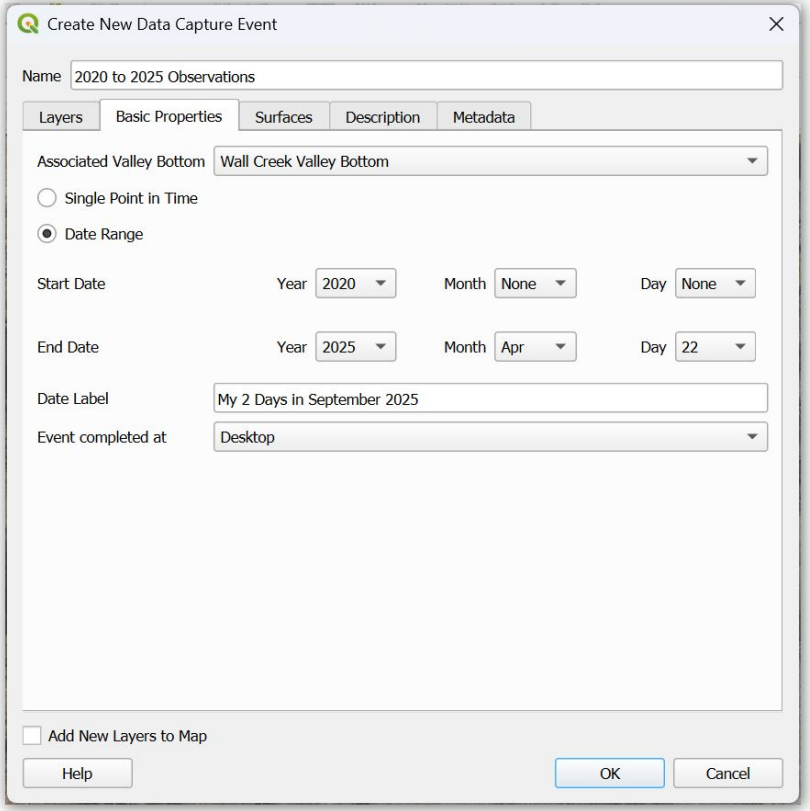


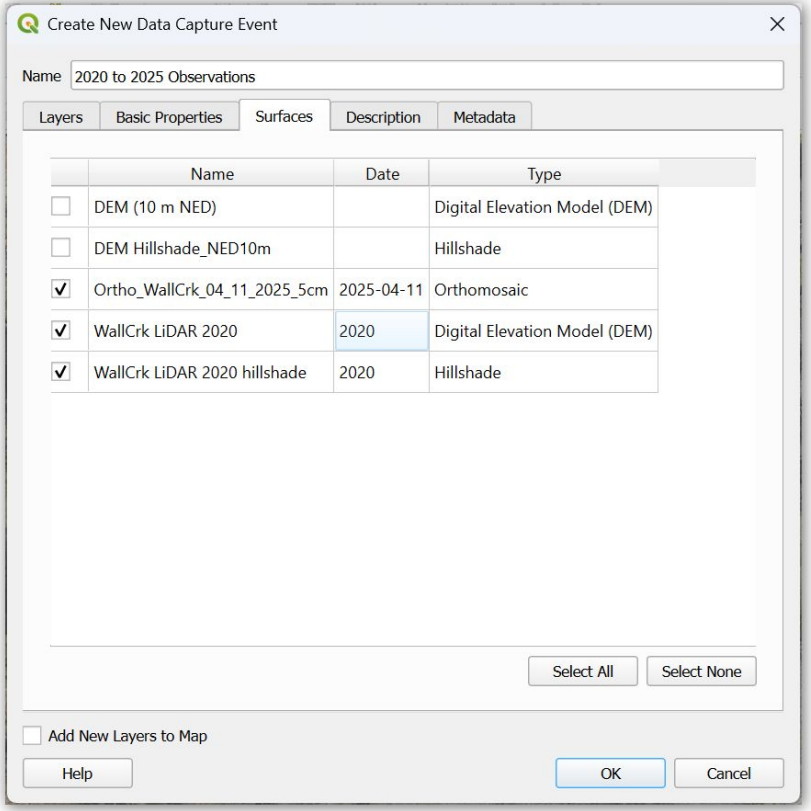
- A snap shot or a window of time
- Place to store observations (of a geospatial nature)

Note: Difference between more temporally frequent at-a-station observations (e.g. deploying a stage or depth sensor) as well as say satellite imagery (e.g. bi-weekly; Climate Engine)

Step 2: Contextualize DCE- What Evidence, When, Who?

Context Matters!

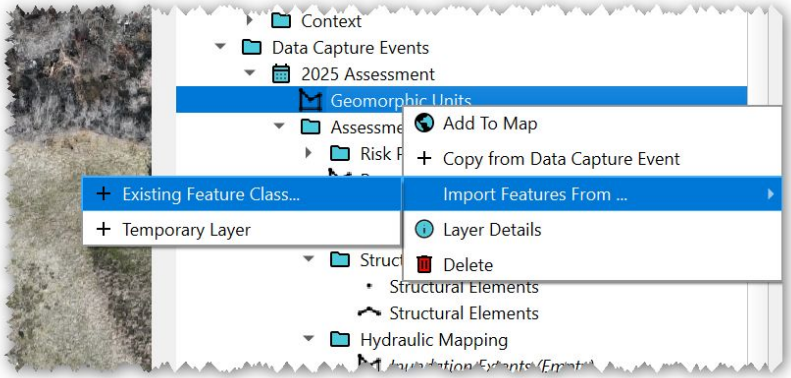


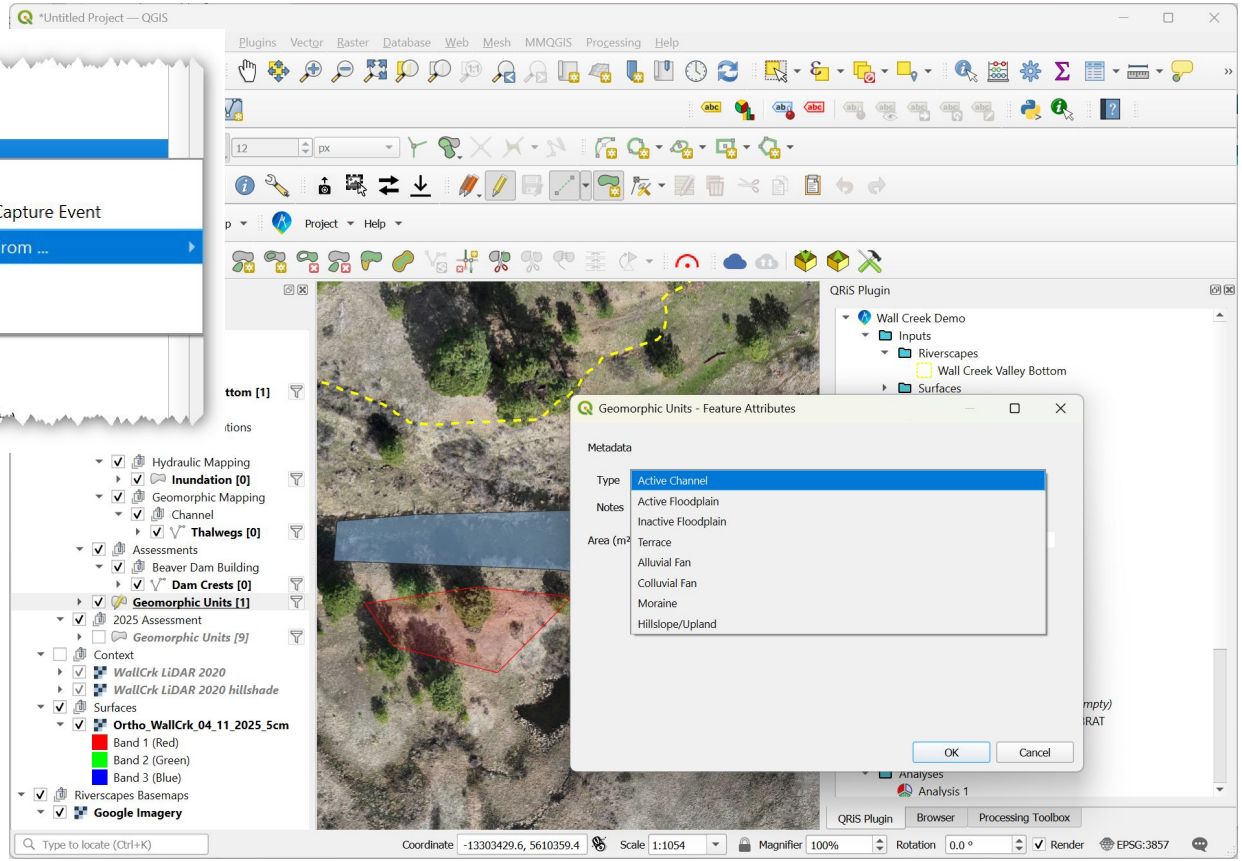


Step 3: Pick and Choose What to Capture

Mix & Match from Protocols

Step 4: Import Features or Edit & Draw & Attribute

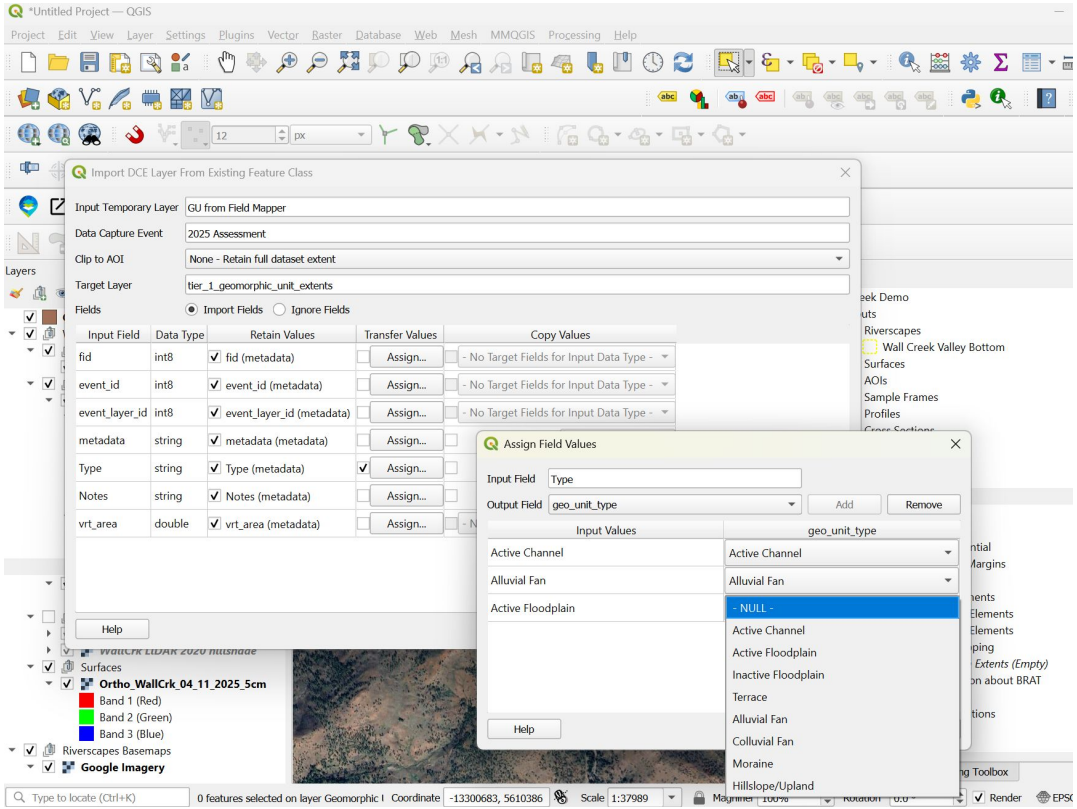




Protocol determines:

- Feature type (point, line, polygon)
- Attributes
- Attribute choices (if categorical)
- Form Layout

Importing with Attribute Field “Mapping”



- Allows import from existing feature classes of features (or selection)
- Allows retention of all original data
- Allows “mapping” or conversion of attribute types into protocol’s convention
- Allows mixing & matching of imported & digitized

Motivation: Track change in indicators of Riverscape Health through time

SMART INDICATOR TABLES

		TIME HORIZON				
INDICATOR	GOAL	HISTORIC	EXISTING (Current)	AS-BUILT (0 Years)	MEDIUM (3 – 5 Years)	LONG (5 – 10 Years)
VALLEY BOTTOM ACTIVE (% of Valley Bottom Area)	GOAL 1: ACTIVE FLOODPLAIN	90% ± 10	20%	25 ± 5%	40 ± 10 %	90% ± 10
CEM STAGE (% of Valley Bottom Length)	GOAL 1: CEM STAGE COMPOSITION	S0: 80% ± 20 S8: 15% ± 10 S7: 5% ± 5 S5: 0% S2: 0%	S0: 0% S8: 25% S7:35% S5: 10% S2: 20%	S0: 0% S8: 25% S7: 35% S5: 10% S2: 20%	S0: 0% S8: 75% ± 10 S7: 15% ± 10 S5:<5% S2: <5%	S0: 80% ± 20 S8: 15% ± 10 S7: 5% ± 5 S5: 0% S2: 0%
LWD ACCUMULATIONS (Jams / mile)	GOAL 2: LTPBR PRINCIPLES	300 ± 50 (Natural)	2 / mi.	100 (PALS)	200 ± 25 (PALS + Natural)	250 ± 50 (Natural > PALS)
BEAVER DAM DENSITY (Dams / mile)	GOAL 2: LTPBR PRINCIPLE	75 ± 20 (Natural)	0 / mi.	50 (BDAs)	60 ± 10 (BDAs + Natural)	75 ± 20 (Natural > BDAs)
WETTED CHANNEL LENGTH (miles)	GOAL 3: FISH HABITAT QUANTITY AND QUALITY	4.0 ± 0.5	1.8	2 ± 0.2	3 ± 0.5	3.5 ± 0.5
SPAWNING HABITAT QUANTITY (Riffles / mi.)	GOAL 3: FISH HABITAT QUANTITY AND QUALITY	30 ± 10	10	10	20 ± 5	25 ± 10

See if:

- Good conditions are maintaining
- Conditions recovering
- Restoration actions leading to improvement

Rows are metrics calculated from layers in DCEs

Columns are time (i.e. DCEs)

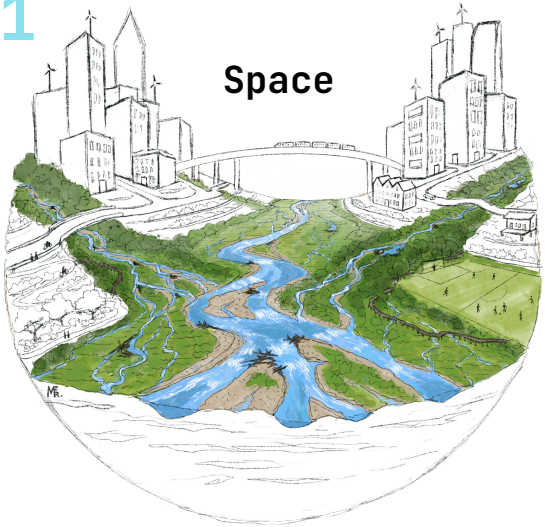
From Module 3F LTPBR Intro Series: https://lowtechpbr.restoration.usu.edu/workshops/2020/SGI/Modules/module3

DOI: 10.1002/wat2.70028

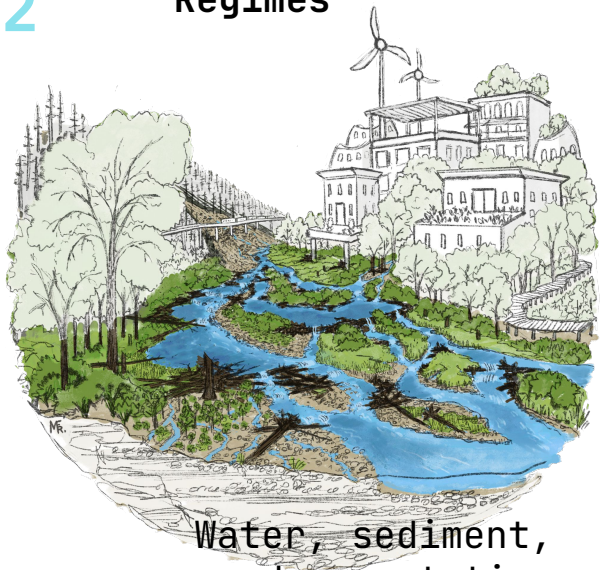
Principles of **Healthy Riverscapes** …

"Riverscapes need:

1 **Space**

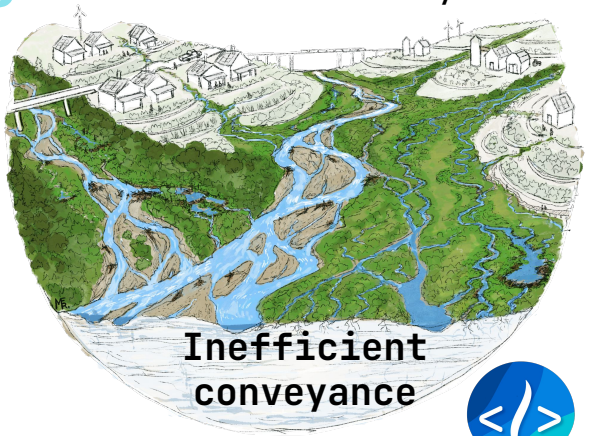


2 **Regimes**



Water, sediment, wood, vegetation

3 **Structure** to force diversity



Inefficient conveyance

Healthy riverscapes:

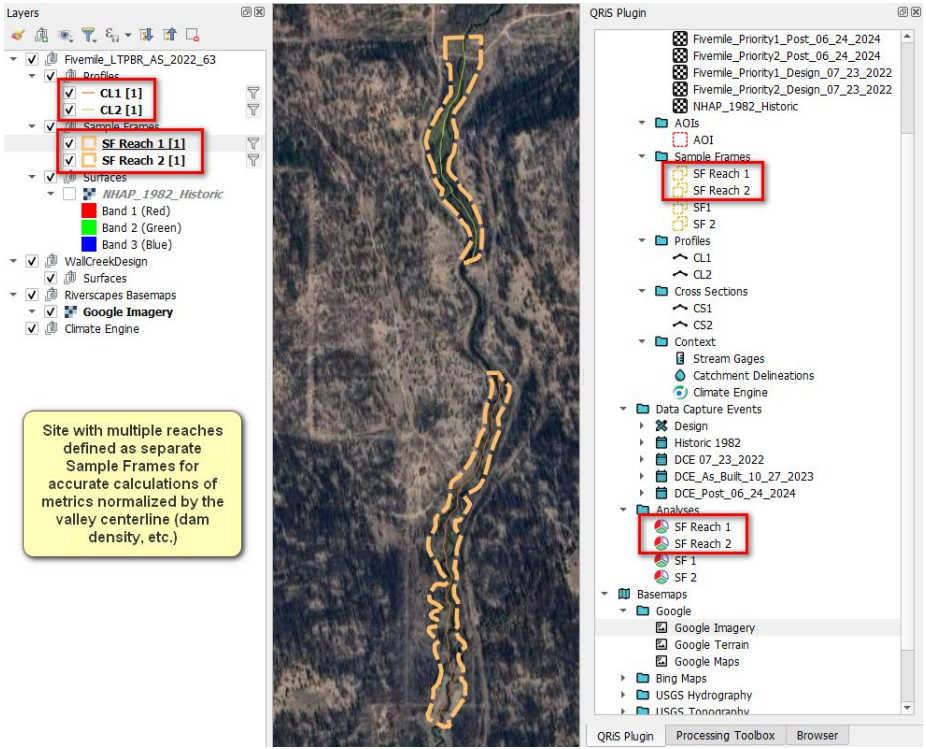
- Support greater **biodiversity**
- Self-sustaining **natural infrastructure**
- Easier **co-existence** & adaptation

How important are these principles in each riverscape?

It depends… f(?) - Context matters!

Analyses

The calculation of metrics from DCEs within Sample Frame(s)

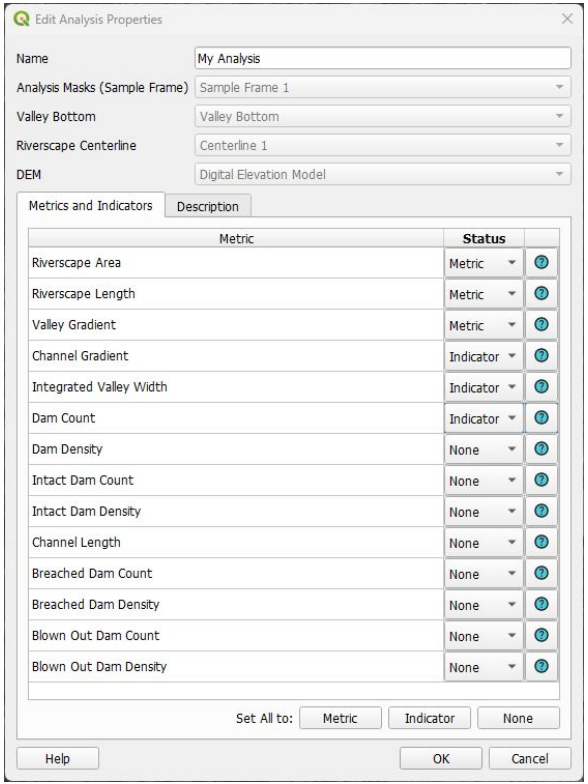


- Needs at least one DCE
  - Mulitple DCEs allow looking at changes through time
- And Sample Frame(s)

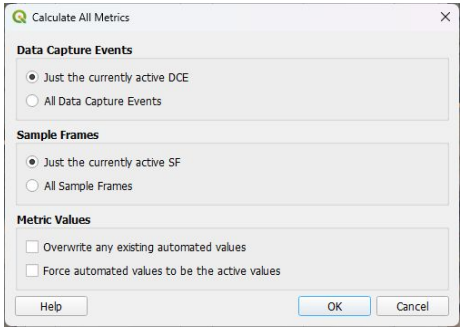
Documentation: https://qris.riverscapes.net/software-help/analyses

Analyses

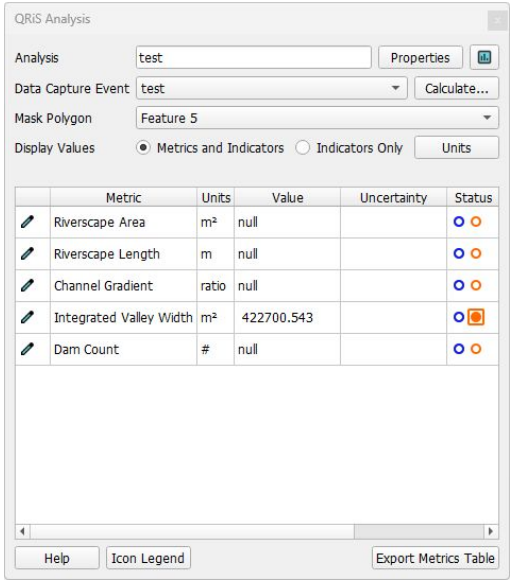
1. Set up Analysis



2. Calculate



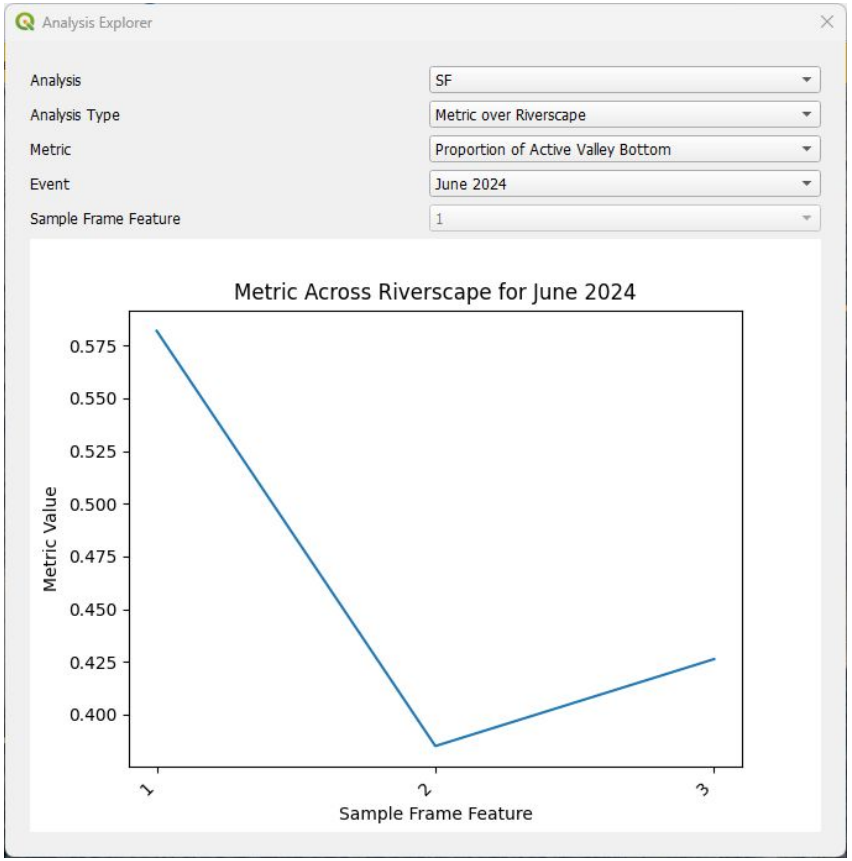
3. Interrogate

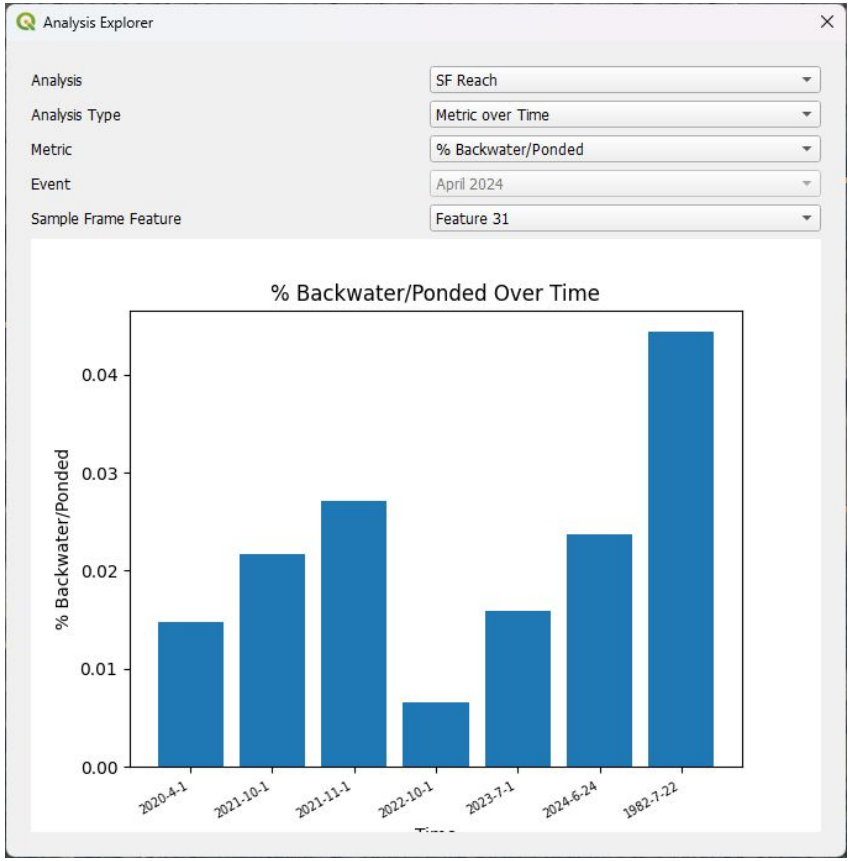


- Needs at least one DCE
  - Multiple DCEs allow looking at changes through time
- And a Sample Frame

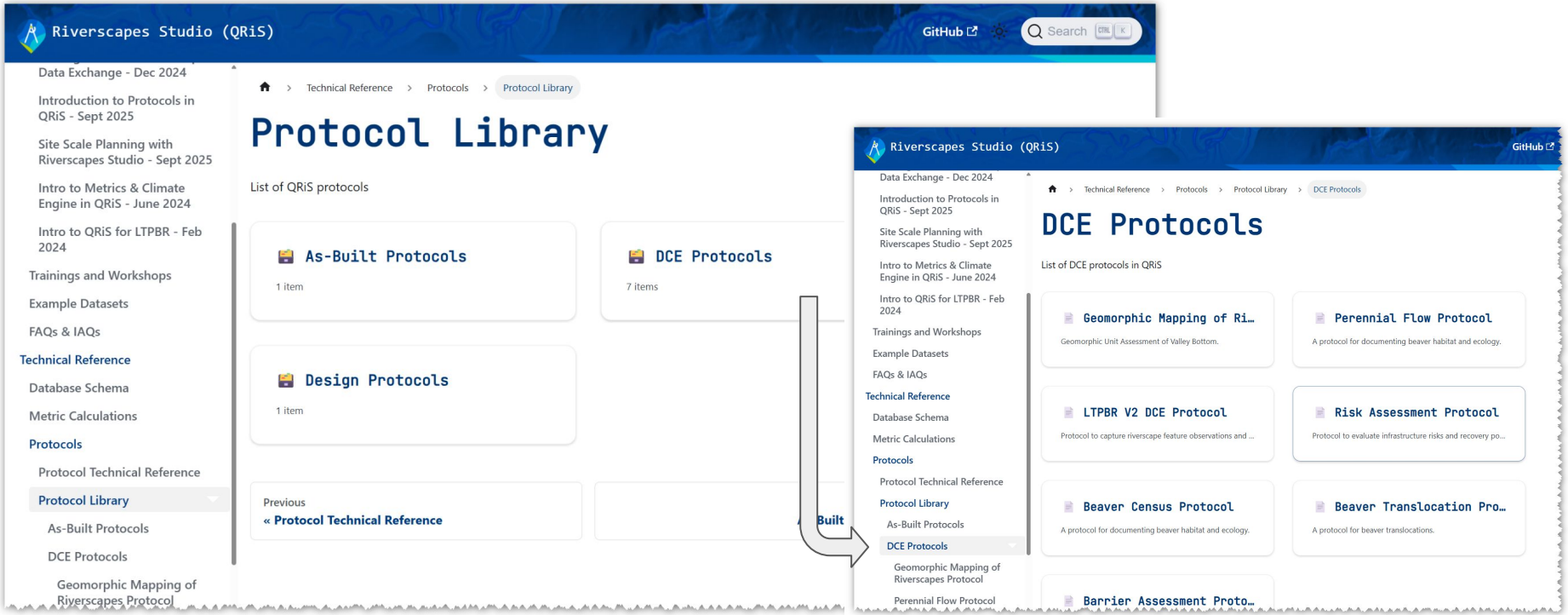
Documentation: https://qris.riverscapes.net/software-help/analyses

Visualize through Space (single DCE) or Time





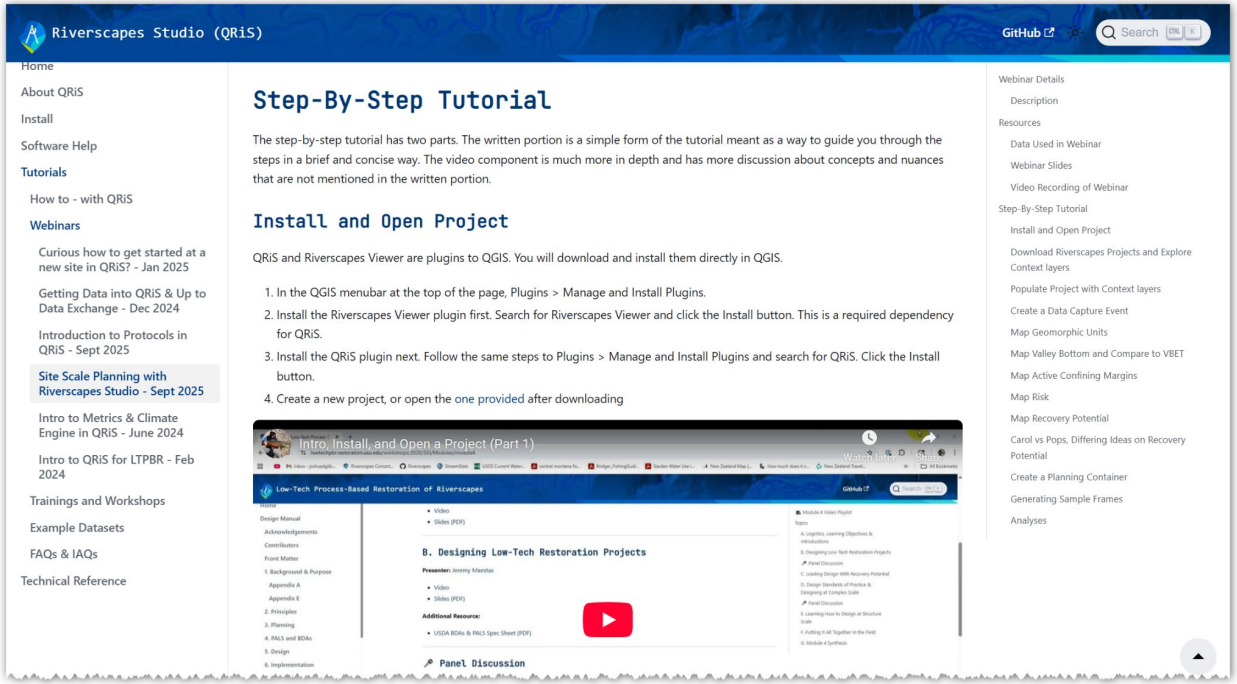
Always Evolving Protocol Library Docs



Protocol LibraryRef: https://qris.riverscapes.net/protocols/protocol-library

Each protocol *should* have full documentation page

We have lots of step by step tutorials as well as classes



https://qris.riverscapes.net/tutorials/

Low-Tech, High Impact: PB tools

PACIFIC SALMON FOUNDATION

Outline:

- LTPBR Background
- Riverscapes Consortium
- Highlight two tools
  - PBR Explorer - *for sharing effort (actions)*
  - **Riverscapes Studio** - *for planning, design, as-builts & action-effectiveness monitoring (assessing impact)*

Purpose:

To share a couple of high-tech, but tractable free tools for capturing impact

- Impact of effort
- If efforts have desired impacts:
  - *Affects - (v) process*
  - *Effects - (n) outcomes*

When we are *working* at our best

we *learn* from the ecosystem engineer

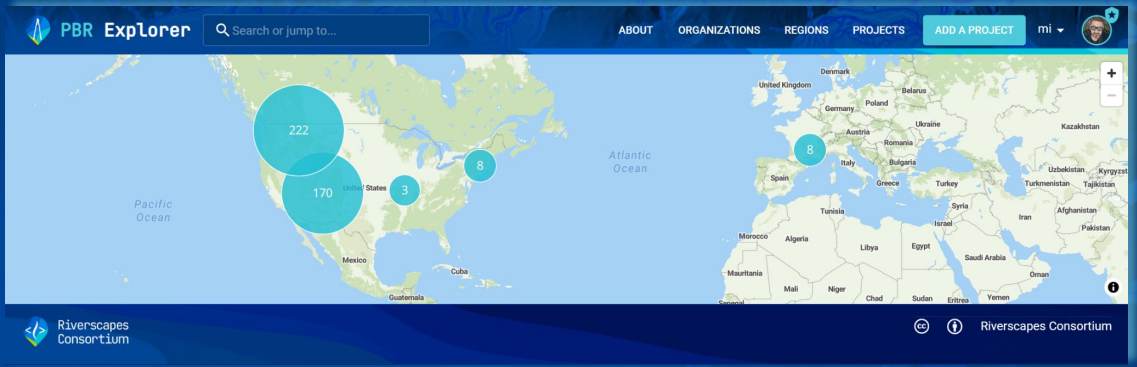
Riverscapes Consortium

PACIFIC SALMON FOUNDATION

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Thank you!

Keep Exploring & Sharing PBR Efforts!



Some Questions from Laura & Greer

What excites you about LTR? Why should we care?

What is your history in the LTR world?

What's the big deal with LTR?? cost/benefit, footprint of possibility, etc.

How can low-tech achieve watershed goals?

What about risk? Don't these projects just wash out??? How do we redefine success and failure?

What roles do geomorphology and engineering play in the low-tech space?

How can we translate broad goals (eg, reconnecting floodplain, arresting incision…) into specific project objectives and actions.

What tools do we have now to inform our LTR work?