

Welcome to Riparian Book Club

Process-Based Restoration (PBR) Umbrella



- Coalitions & Collaboratives (COCO) & Colorado Riparian Association (CRA) are teaming up with special co-host Water Education Colorado (WEco) to "book club" the:
 - We will explore on-the-ground projects from opposite ends of the PBR spectrum and why different approaches are appropriate in different scenarios
 - Riparian Book Club helps bridge the gap between academic research on stream and wetland systems and applied restoration design in Colorado





There's a lot of talk about the benefits of beavers in stream restoration, but Colorado's riparian systems are complex—when it comes to restoring stream systems, there isn't one tool that works in all situations. Rather, there are many tools in the restoration toolbox.

Process-based restoration (PBR) is an important category of restoration work that targets the root causes of ecosystem change and aims to restore a river's natural processes so the area can begin to self heal. But under the PBR umbrella, there is a spectrum of restoration approaches, which

Welcome | Riparian Book Club Hosts

PBR matches the watershed context and human setting of ulia A ala DE I E alu a autions 0. Outfue and b O autor

Julie Ash, FE | Education & Outreach Com

estoration design in order to remove sources structures, often mimicking beavers, to slow a stream's flow and allow it to connect with its natural floodplain.

To promote the conservation, restoration, and preservation of Colorado's riparian areas and wetlands.

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ONSIDERATIONS WHEN SELECTING RESTORATION APPROACHES AND TREATMENTS

When selecting a restoration approach and treatment, water managers and restoration practitioners weigh the following factors. Passive recovery and low-tech active recovery projects fall toward the left and middle of these spectrums, while high-tech active recovery work is on the right side.

TRUST INVESTMENT FILE SECURITY

	Common level of design and
	 No design required for system Design for sale removal of the be required

- Typically low risk areas with low or no intrastructure edjacency to accommodata floods covering full width of the valley bottom
- Access to full floodplain may currently be impractical

the natural system

Julie Ash, PE | Education & Outreach Committee Lead | Colorado Riparian Association (CRA)

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proportional to risk

time to see resulu

PROJECT rtainty and/or time to reach goals ut anchoring (LT)

Floodplain reconnection (LT, HT)

Channel work a recipied chaning met

Wood structures-e.g. large wood structu ballast or piles (HT)

Stage Zero Full Valley Reset [HT]



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PASSIVE RECOVERY: Typically requires no

Maria Brandt | Outreach & Development Director | Coalitions & Collaboratives (COCO)

removal allows the river to self heal.

HIGH-TECH PBR (HTPBR): Typically uses more costly treatment APRROACH) planning and detailed engineering analysis to design for disturbance, with

To advance healthy and resilient communities through collaborative conservation and restoration.

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Channel work-e.g. resizing, shaping, overflo

Wood structures-e.g. large wood structu ballast or piles [HT]

Stage Zero Full Valley Reset [HT]



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When set

LOWER

HIGHER

LONGER

THE HEALTHY HEADWATERS ISSUE

RESTORING AND RELYING ON COLORADO'S SOURCE STREAMS

SUMMER 2023

LEVEL OF DESIGN ANALYSIS REQUIRED FO anger investment in design analysis warranted to address risk, unit

COST INVESTMENT FOR DROVEDT

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 Typically low risk areas with low or no intrastructure adjacency to accommodate floods covering full width of the valley bottom.

- Engineering design enalvais var between LTPBR and HTPBR
- Analysis required to determine t

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Caitlin Coleman | Publications and Digital Resources Managing Editor | Water Education Colorado (WEco)

To ensure Coloradans are informed on water issues and equipped to make smart decisions that guide our state to a sustainable water future.

Wood structures-e.g. large wood struct ballast or piles (HT)

Stage Zero Full Valley Reset [HT]

Floodplain reconnection (LT, HT)

Dam removal with analysis & desig

PROJECT reainty and/or time to reach goals



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Scan the QR code or enter menti.com into your computer's web browser

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> Enter the code given in the QR box or info bar above

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LEVEL OF DESIGN ANALYSIS REQUIRED FOR PROJECT Larger investment in design analysis warranted to address risk, uncertainty and/or time to reach goals

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the natural custom

 Applies to most systems and causative stressors because customized datailed analysis addresses site-

 Beavier engineering design anal compared to other approaches,

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ut anchoring (LT)

Floodplain reconnection (LT, HT)

HIGH-TECH (HT

Channel work-e.g. resizing, shaping, overflo

Wood structures-e.g. large wood structu ballast or piles (HT)

Stage Zero Full Valley Reset [HT]



Polling is anonymous. Please be respectful and professional.

> Please reserve GoToWebinar to raise your hand.

If called upon, you will be unmuted by host.

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- Discussions, Polling, Q&A,



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PBR matches the watershed context PASSIVE RECOVERY: Typically requires no restoration design in order to remove sources of disturbance or causes of degradation. This removal allows the river to self heal.		BR (UT	22 temporar			
		ral flood PBR (H detaile made o				
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What geographic location are you joining us from?

46



HTP8RI: Typically uses more costly treatnin APRROACH):

Arkansas

River Basin

6

allast or piles (HT)

Outside Colorado

2

Rio Grande

River Basin

0





September 12, 2023 Riparian Book Club:

Process-Based Restoration (PBR) Umbrella

Building from the 1st Book Club on pivotal scientific papers on PBR, we will "book club" the PBR Umbrella graphic included in the Summer 2023 issue of WEco's Headwaters publication



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	roach.	Developed for or applicable to	Limitations.	Common level of design analysis required.
Passi	ive Recovery (P)	Any system	 Not height, when causative stressor (cause of degradation) cannot be removed (e.g., a dam o diversion structure) 	
Post	IR & other beaver mimicry (LT), ding Beaver Dam Analogs (BDAa), Assisted Log Structures (PALs), lated Beaver Structures (SBS)	 Wadeable streams (aka low-order, often headwaters streams) Systems where degradation is caused by structural starvation of wood and beaver dame Targeted where beavers existed historically Typically requires adaptive management 	 Not intended for non-wadeable, higher order is where causetive stressor is other than loss of and beaver dems If beaver can't be expected to move in to the m area, beaver mimicity structures may be built 	wood LTPER Manual 2019 provides "guidelines for implementing a subset of low-tech tools (i.e., BD)
Stage requi	e Zero Design (LT or HT) e Zero falls between LT & HT in ired analysis and construction cost. lier Stage Zero efforts may have varacteristics, but a larger project as work covering a full valley, is ir to HT.	 Most successful in depositional areas with wide valleys and mild slepes to promote deposition Often is small, incised streams in well meadows headwaters, but can be up-scaled to larger rivers Promote processes that will nudge the system back toward a Stage Zero condition May need sedment supply from upstream to fill incised channels over time Works best with adaptive management, but not negared 	 Typically low risk areas with low or no intrastr adjacency to accommodate floods covering ful of the valley bottom Access to full floodplain may currently be impr due to anthropogetic constraints—Stage Eight work well instead with restoration to an extent then the full floodplain width 	i width between LTPBR and HTPBR Analysis required to determine target slopes at minimum might Full valley reset approach requires significant
HTPS	BR (HT)	 Detailed analysis allows PSR application on a rare- by-case basis to any system Works best with adaptive management 	 Applies to most systemic and causable stress because customized detailed analysis address specific constraints Higher cost of analysis and often construction 	es site compared to other approaches, but varies great across specific projects
		(NOTING OVERLAP ACROSS RESTORATION	ON APPROACH):	
	MPLES OF TREATMENTS	(NOTING OVERLAP ACROSS RESTORATI	ON APPROACH):	
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		ACTIVE RECOVERY	нен	TECH (HT) nel work-e.g. resizing, shaping, overflow channels (
PAS		ACTIVE RECOVERY	HIGH	
PA	SSIVE RECOVERY (P)	ACTIVE RECOVERY LOW-TECH (LT) Leaky beaver dam features (LT)		nel work-e.g. resizing, shaping, overflow channels (lood structures-e.g. large wood structures anchored
Elin	ninate grazing (P)	ACTIVE RECOVERY LOW-TECH (LT) Leaky beaver dam features (LT) Wood structures-e.g., BDAs, PALs Wood placement with		nel work-e.g. resizing, shaping, overflow channels (food structures-e.g. large wood structures anchored allast or piles (HT)
Elin	ninate grazing (P) Fence out grazing (P)	ACTIVE RECOVERY LOW-TECH (LT) Leaky beaver dam features (LT) Wood structures-e.g., BDAs, PALs Wood placement with	LT)	nel work-e.g. resizing, shaping, overflow channels (lood structures-e.g. large wood structures anchored allast or piles (HT) Stage Zero Full Valley Reset (HT)





September 12, 2023 Riparian Book Club: **Process-Based Restoration (PBR) Umbrella**

The Process-Based Restoration Umbrella—It isn't just about beavers

There's a lot of talk about the benefits of beavers in stream restoration, but Colorado's riparian systems are complex-when it comes to restoring stream systems, there isn't one tool that works in all situations. Rather, there are many tools in the restoration toolbox.

Process-based restoration (PBR) is an important category of restoration work that targets the root causes of ecosystem change and aims to restore a river's natural processes so the area can begin to self heal. But under the PBR umbrella, there is a spectrum of restoration approaches, which

PBR works with the natural processes that drive ecosystem function and dynamics PBR addresses causes of degradation, rather than symptoms of it PBR matches the watershed context and human setting of the natural system

PASSIVE RECOVERY: Typically requires no restoration design in order to remove sources of disturbance or causes of degradation. This removal allows the river to self heal.

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includes active and passive recovery (beaver mimicry is considered active). Even with this diversity of approaches, certain characteristics define what fits within the PBR "umbrella."

LOW-TECH PBR (LTPBR): Uses simple, temporary, low-unit-cost, typically natural structures, often mimicking beavers, to slow a stream's flow and allow it to connect with its natural floodplain.

HIGH-TECH PBR (HTPBR): Typically uses more costly treatments, and requires planning and detailed engineering analysis to design for disturbance, with adjustments made over time.





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Hally Strevey, Coalition for the Poudre River Watershed (CPRW) Colin Barry, Ayres Associates

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September 12, 2023 Riparian Book Club: Process-Based Restoration (PBR) Umbrella



LTPBR & HTPBR case studies shared by project proponents & lead designers:

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HIGH-TECH PBR (HTPBR): Typically uses more costly treatments, and requires planning and detailed engineering analysis to design for disturbance, with

LTPBR:

&

HTPBR:

Eric Richer, Colorado Parks & Wildlife (CPW) Johannes Beeby, Stillwater Sciences



PASSIVE RECOVERY: Typic This slide is linked to another presentation and is only viewable from the app

HIGH-TECH PBR (HTPBR): Typically uses more costly treath NAPRROACH):

	Common level of design an
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The Process-Based Restoration Umbrella—It isn't just

Riparian Book Club Discussion

20 responses

Outside Colorado

category of restoration work that targets the roo causes of ecosystem change and aims to restore a river's natural processes so the area can begin to self heal. But under the PBR umbrella, there is a spectrum of restoration approaches, which

> If water rights weren't a concern, would you have included BDAs in your project design?

Have you made any predictive calculations on sediment capture? Or any plans to do so with monitoring?

restoration design in order to remove sources

Where do you decide to place large Woody material? Can it be placed incorrectly causing more degradation

When selecting a restoration approach and treatment, water manage and low-tech active recovery projects fall toward the left and middle R you seeing same increases in run-off across burn areas for snowmelt & rain? Comes from experience in recent years of run-off from snow melt being much lower in relation to snowpack. Correlation?

I know you said you didn't expect any change in fish/macro numbers at Kemp -Breeze until 5 or so years, but have you seen any changes this year?

Risk tactors include stream cropmer potential, intrastructure adiacoocy, public salesy, system scale, atc

HIGHER

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LOWER

cojectualitations of "appeting" for undertainty, often but not always inverse

TIME TO DESIRED GOALS ACCEPTABLE FOR PROJECT Passive and tow-tech approaches sometimes, but not always, require more

LEVEL OF DESIGN ANALYSIS REQUIRED FOR PROJECT Larger investment in design analysis warranted to address risk, uncertainty and/or time to reach goals

COST INVESTMENT FOR PROJECT

st about beavers

	Common level of design an
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How are you measuring aggregation at the sites?

unction and dynamics

Has anyone studied the long term impacts of beaver structures in a watershed vs. watersheds without beaver structures? Does CWCB consider beaver structures to be consumptive or non-consumptive uses?

engineering analysis to design for distarbance, with ritime,

proportional to clair

time to see result

How much did the first phase of construction cost?

Channel work-e.g. resizing, shaping, overflo

Wood structures-e.g. large wood structu ballast or piles (HT)

Stage Zero Full Valley Reset [HT]

Floodplain reconnection (LT, HT)



Riparian Book Club Discussion

20 responses

How long did it take to get the permits from ACOE and state to do the inchannel and connected physical system work?

Are you measuring changes in ground water levels?

For the low-tech project, who installed the structures? Volunteers, Forest Service crews, etc?

Which factors primarily determine which structure is ideal?

Current beaver work being done https://www.e3ecologic.org/restoring-beaver-habitat

			Common level of design an		
			No design required for system Design for safe removal of the be required		

Have you considered making permeable BDA structures?

Is Adaptive Management integrated into the project plans and if so does it have appropriate authorities and administrative support to implement?

What is the difference between the wood structures you use and those that imitate beaver dams?

I recommend talking with Peter May in Crestone he is doing research on beavers and can offer some great insights



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Riparian E	Book Club Discussion	sed restoration (PBR) is an important				 No design required for system Design for safe removal of the be required
20 respon	Ses category	of restoration work that targets the root ecosystem change and aims to restore atural processes so the area can begin at But under the PBR umbrella, there rum of restoration approaches, which				
ls there any myc	ology being incorporated?	Have any indigenous com	munities been involved ?			



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A recording of this webinar will be available at <u>https://colorestoration-network/</u> and <u>https://co-co.org/cra-csrn-ripe</u>

recording with links to any resources shared.

adjustments made ov

Please stay tuned for future Riparian Book Clubs!

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