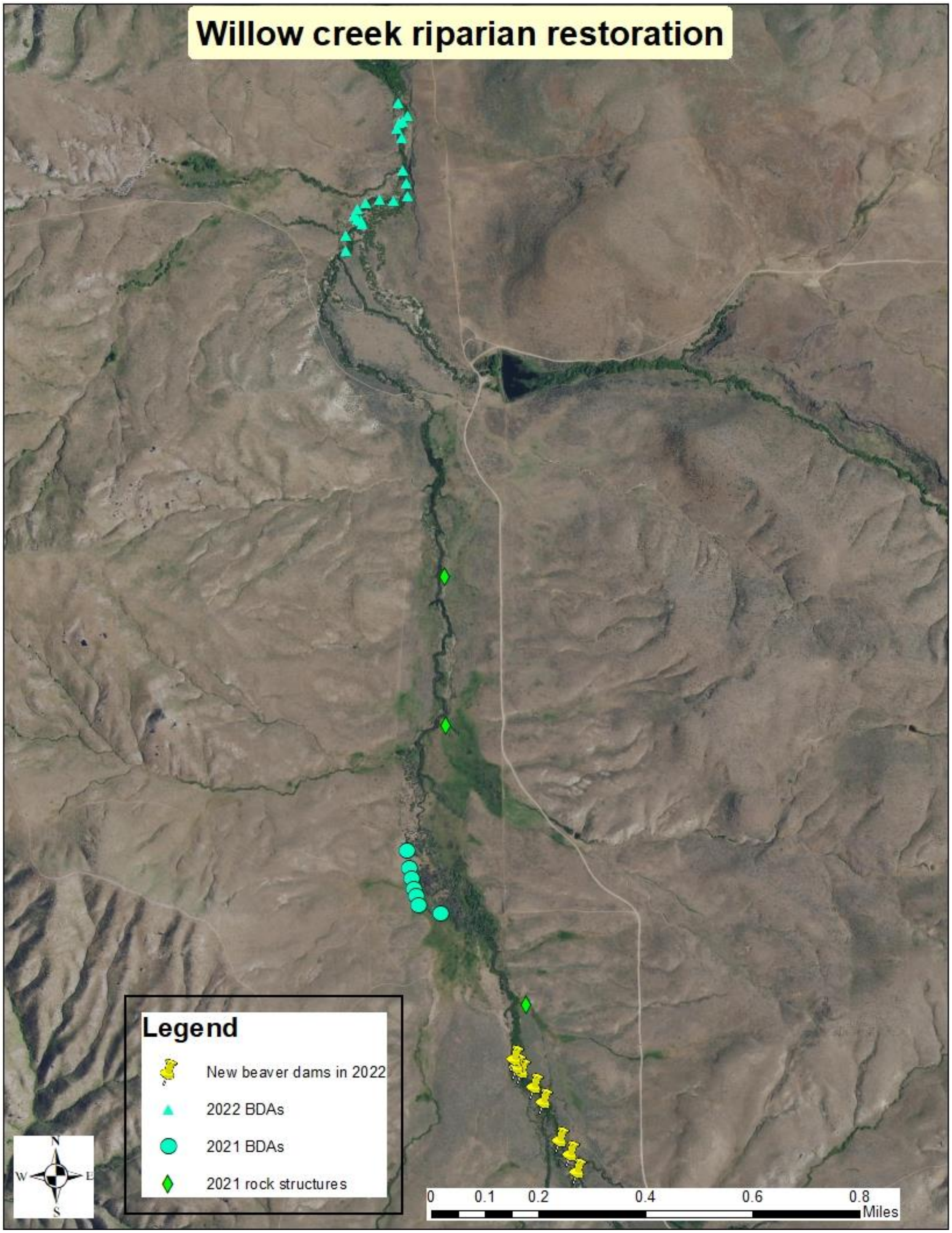
LTPBR monitoring report – Willow creek, Danskin mountains 2023



Since 2021, IDFG has worked with IDL to implement several low-tech riparian restoration techniques on Willow Creek, in the Danskin mountains. The perennial stream flow, evidence of historic beaver occupancy, and the broad width of the historic floodplain made this an ideal candidate for restoration work. In 2021, IDFG contracted Anabranch Solutions to implement phase 1 of the project, as well as provide the Willow Creek Restoration Summary Report which outlines future restoration work potential and direction. Anabranch 7 BDAs and 11 rock erosion control structures (Structures 1-18 in Appendix B). The rock erosion control structures were constructed in ephemeral drainages adjacent to the stream channel and were primarily mean to halt headcutting and further degradation to valuable meadow habitat. Around this time, IDFG had begun translocating nuisance beavers to both Willow and nearby Case creek in hopes of reestablishing a self-sustaining population of beaver. Several beavers were released in the upper reaches of Willow creek in an area where abandoned beaver dams were still ponding water (Figure 1).

Figure 1. Several abandoned beaver ponds made an ideal release site for beaver translocation efforts.

In 2022 IDFG staff discovered a brand new beaver complex had been constructed ~ .5 miles downstream from the Willow creek beaver release site. That same year, IDFG worked with IDL to fund the Idaho Conservation Corps (ICC) to implement phase 2 of the project, which included installing 13 additional BDAs (Structures 19-32 in Appendix B), as well as reinforcing several of the new beaver dams with posts (Figure 2).

Figure 2. ICC crew members reinforcing one of the many new beaver dams that appeared in 2022

Monitoring in 2023 occurred on May 15 and May 17. The methods and protocols used to evaluate the performance of each structure were developed by Anabranch Solutions (Shahverdian et al. 2020). This monitoring technique was developed to capture overall ecological trends for a treated stream. Because many LTPBR projects rely on building a large number of structures, it is often difficult for project managers to annually gather detailed vegetation, hydrologic response, and stream aggregation data for every structure, in addition to their other job duties. For this reason, Anabranch Solutions developed a monitoring strategy that sufficiently captures overall ecological changes that are occurring as the result of a project by looking at several key attributes at each structure to determine if the desired outcomes are being met. The following is a list of the attributes that were used to evaluate each restoration structure.

Structure type (if known) – Where possible, we noted the type of structure that had been originally designed. Documenting the structure type enables us to learn if certain structure types were more effective at achieving restoration objectives. The structure types can include: beaver dam analogue (BDA), postless BDA, channel-spanning post-assisted log structure (PALS), mid-channel PALS, bank-attached PALS, Zuni bowl, rock rundown, rock layback, and reinforced natural beaver dam.

Condition – The condition of each structure was assessed in order to evaluate whether or not they are likely to continue to influence the hydrological and geomorphic processes that create and maintain riverscape health. We used the following categories to describe each structure: *natural* – the structure was naturally occurring, including both natural beaver dams and accumulations of large wood. Natural structures can be composed of material that previously was part of a man-made restoration structure (i.e., formed from wood previously on a structure that was mobilized and reformed into a new structure); *accumulation* – structure increased in size by trapping additional woody material; *intact* – structure was neither smaller nor larger than when originally built and still capable of influencing flow; *buried* – structure experienced sediment deposition to at least 75% of the height of the structure; *breached* – structure experienced a partial loss of material; *blown-out* – structure experienced a complete loss of material, rendering it ineffective at all flows.

Overbank flow – At all structures we documented whether or not the structure was currently forcing flows overbank. Because restoring channel-floodplain connectivity is an objective of restoration in many reaches, monitoring structures' direct influence on overbank flows is critical.

Net Geomorphic Response – We qualitatively assessed the net geomorphic response at all structures. Net geomorphic response was characterized as either: *no change* – there was no evidence of geomorphic change; equal – erosion and deposition were approximately equal; *erosional* – erosion exceeded deposition, or: *depositional* – deposition exceeded erosion. Where changes were uncertain, or limited, we characterized the net geomorphic response as either no change or equal, to ensure that the responses do not overestimate the geomorphic change attributable to restoration. We prefer to err on the side of a conservative assessment, with the understanding that future monitoring and remote sensing will be able to supplement our current observations.

Geomorphic Units – In addition to the net response, we recorded the geomorphic units present at each structure. We recorded the in-channel geomorphic units present in order to assess how structures were affecting specific patterns of erosion and deposition and to inform future restoration actions. We recorded geomorphic units that can provide clues to help predict the trajectory of restoration as well as current conditions. We employed a simplified/adapted classification that separated geomorphic units into depositional or erosional categories (Table 1).

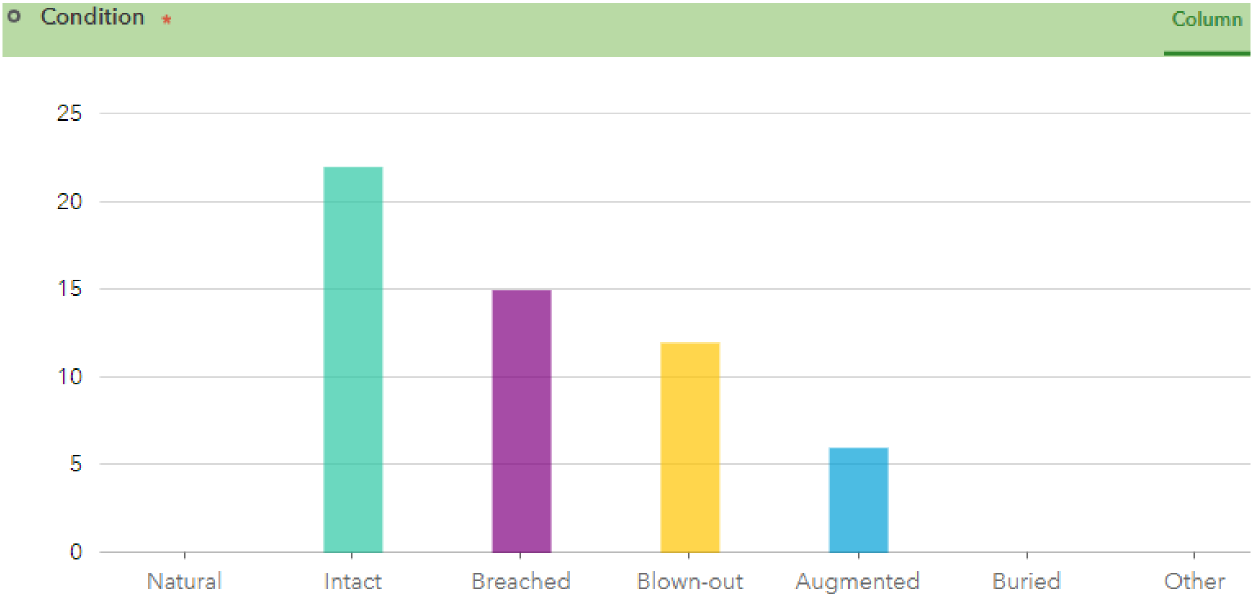
Depositional	**Description**
Bars	convex features that may be bank-attached, mid-channel, or channel-spanning
Uniform	deposition that covers the entire channel and is planar in shape, rather than convex
Erosional	
Bank erosion	removal of bank material as channel widens or migrates laterally
Scour pool	concave feature that results when flow converges and removes bed material
Plunge pool	convcave feature that results from flow falling over a structure and removing bed material
Uniform	general lowering of the entire channel bed, the result of channel incision, and producing a planar rather than concave shape

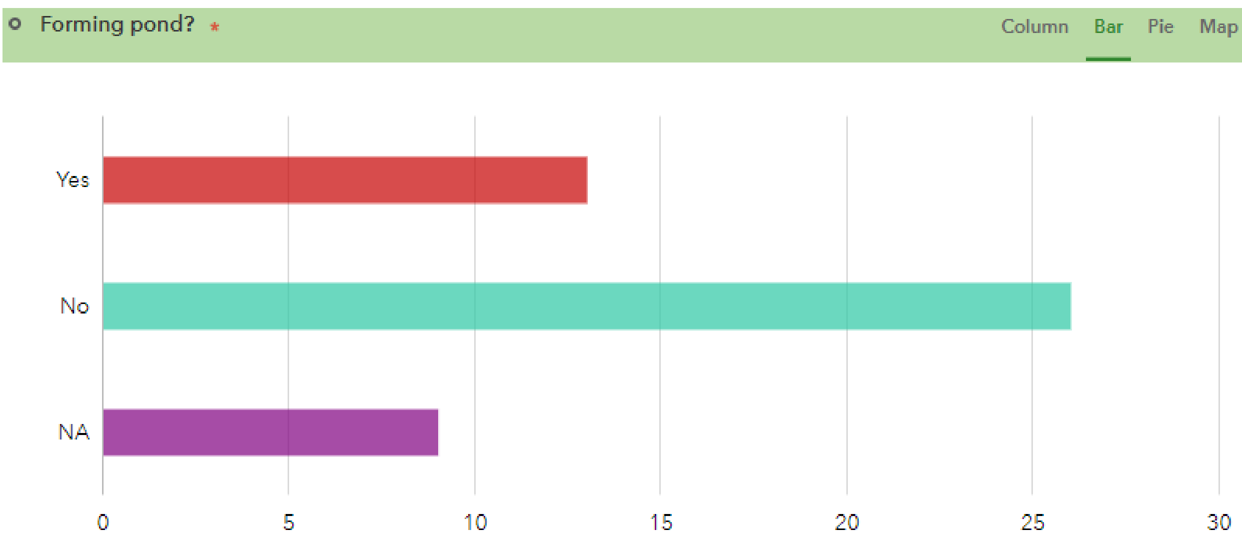
Table 1. Geomorphic units surveyed at all restoration structures.

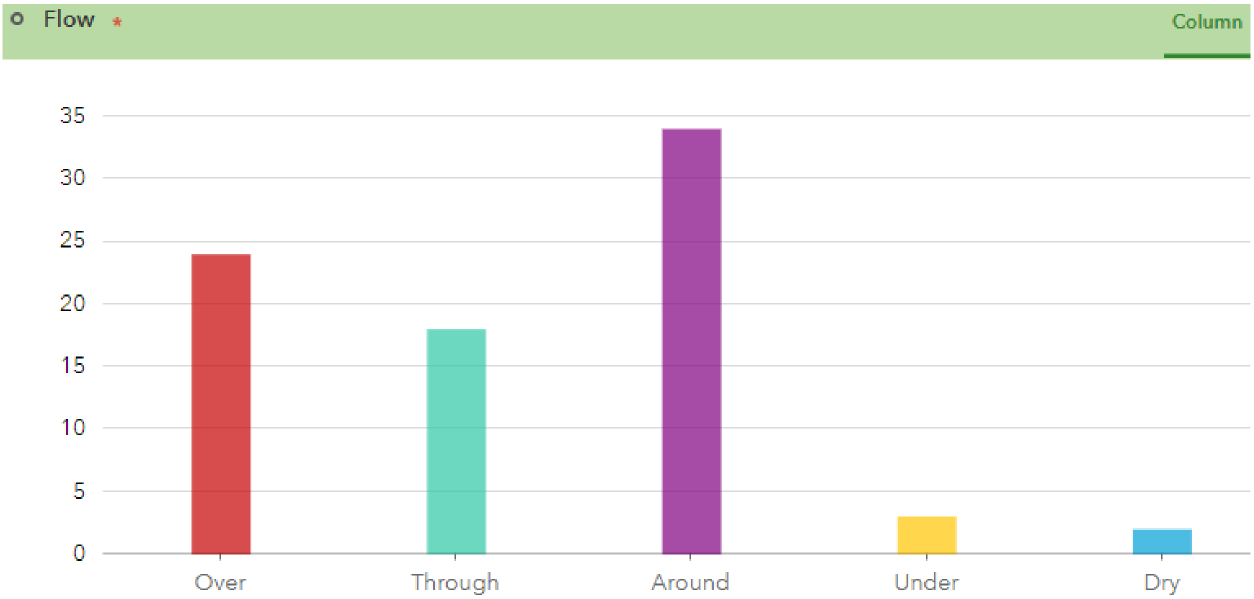
References

Shahverdian, SM., Wheaton, JM., and Bennett, S. Baugh Creek Post-Fire Emergency Restoration – Year 1 Monitoring Report. Prepared for the Idaho Sage-Grouse Actions Team by Anabranch Solutions, LLC. Newton, UT. 96 Pages

Appendix A – Overall structure condition and performance






Flow *
Column
35
30
25
20
15
10
5
0
Over
Through
Around
Under
Dry

Appendix B - Structure monitoring data

Submitted By: christopher.yarbrough@idfg.idaho.gov

Survey Date: May 15, 2023

Stream name
Willow creek

Surveyor
Chris Yarbrough

Stream flow conditions
Spring runoff

Structure Table

Structure number
1

Location


Type (if known)
Zuni bowl

Condition
Breached

Flow
Under

Net Geomorphic Response
No change

Maintenance?

Yes

Notes

Added rock to upstream side of Zuni bowl and built one rock dam

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Structure number
2

Type (if known)
Rock rundown

Condition
Breached

Flow
Around

Net Geomorphic Response
Erosional

Geomorphic Units
Bank erosion (Erosional)

Maintenance?

Yes

Notes

Added rock on sides that had eroded

Structure number

3

Type (if known)

Rock layback

Condition

Intact

Forming pond?

NA

Flow

Dry

Overbank flow?

NA

Net Geomorphic Response

No change

Geomorphic Units

NA

Maintenance?
No

Notes
It Worked perfectly

Structure number
4

Type (if known)
Postless BDA

Condition
Intact, Breached

Forming pond?
No

Flow
Over, Through

Overbank flow?
Yes

Net Geomorphic Response
Equal

Maintenance?

No

Notes

Still forcing flow into side channel

Structure number

5

Type (if known)

BDA

Condition

Breached

Forming pond?

Yes

Flow

Around

Overbank flow?

Yes

Net Geomorphic Response

Depositional

Geomorphic Units

Scour Pool (Erosional), Uniform (Erosional)

Maintenance?

No

Notes

Flowing around river right

Structure number

6

Type (if known)

BDA

Condition

Intact

Forming pond?

No

Flow

Around

Overbank flow?

Yes

Net Geomorphic Response
Equal

Geomorphic Units
Uniform (Depositional), Bank erosion (Erosional)

Maintenance?
No

Notes
Water running around both ends

Structure number
7

Type (if known)
BDA

Condition
Intact

Forming pond?
Yes

Flow
Over, Around

Overbank flow?
No

Net Geomorphic Response
Depositional

Geomorphic Units
Uniform (Depositional)

Maintenance?
No

Structure number

8

Type (if known)

BDA

Condition

Intact

Forming pond?

No

Flow

Around

Overbank flow?

No

Net Geomorphic Response

Erosional

Maintenance?

No

Structure number

9

Type (if known)

BDA

Condition

Intact

Forming pond?

Yes

Flow

Over, Around

Overbank flow?

No

Net Geomorphic Response

Equal

Geomorphic Units

Bank erosion (Erosional), Plunge pool (Erosional)

Maintenance?

No

Structure number

10

Type (if known)

BDA

Condition

Breached

Forming pond?

No

Flow

Over, Around

Overbank flow?

No

Net Geomorphic Response

Erosional

Geomorphic Units

Bank erosion (Erosional)

Maintenance?

No

Structure number

11

Type (if known)

BDA

Condition

Breached

Forming pond?

No

Flow

Around

Overbank flow?

No

Net Geomorphic Response

Erosional

Geomorphic Units

Bank erosion (Erosional)

Maintenance?

No

Structure number

12

Type (if known)

BDA

Condition

Breached

Forming pond?

No

Flow

Around

Overbank flow?

No

Net Geomorphic Response

Erosional

Geomorphic Units

Bars (Depositional), Bank erosion (Erosional)

Maintenance?

No

Structure number

13

Type (if known)

BDA

Condition

Breached

Forming pond?

No

Flow

Around

Overbank flow?

No

Net Geomorphic Response

Erosional

Geomorphic Units

Bars (Depositional), Bank erosion (Erosional)

Maintenance?

No

Structure number

14

Type (if known)

Rock rundown

Condition

Intact

Forming pond?

NA

Flow

Over

Overbank flow?

NA

Net Geomorphic Response

No change

Geomorphic Units

NA

Maintenance?
No

Notes
Holding up

Structure number
15

Type (if known)
Zuni bowl

Condition
Intact

Forming pond?
NA

Flow
Over

Overbank flow?
N/A

Net Geomorphic Response

No change

Geomorphic Units

NA

Maintenance?

No

Structure number

16

Type (if known)
Zuni bowl

Condition
Intact

Forming pond?
NA

Flow
Over

Overbank flow?
NA

Net Geomorphic Response
No change

Geomorphic Units
NA

Maintenance?

No

Structure number

17

Type (if known)

Zuni bowl

Condition

Intact

Forming pond?

NA

Flow
Over

Overbank flow?
NA

Net Geomorphic Response
No change

Geomorphic Units
NA

Maintenance?

Yes

Notes

Added rock at lip and at the tail end

Structure number

18

Type (if known)

Zuni bowl

Condition

Intact

Forming pond?

NA

Flow

Dry

Overbank flow?

NA

Net Geomorphic Response

No change

Geomorphic Units

NA

Maintenance?

No

Survey date: May 17, 2023 2:50 PM

Structure number

19

Type (if known)

BDA

Condition

Intact, Augmented

Forming pond?

Yes

Flow

Over, Around

Overbank flow?
Yes

Net Geomorphic Response
Equal

Geomorphic Units
Uniform (Depositional), Plunge pool (Erosional)

Maintenance?

No

Notes

Structure is activating 3 side channels

Structure number

20

Type (if known)

BDA

Condition

Intact

Forming pond?

Yes

Flow

Over, Around

Overbank flow?

Yes

Net Geomorphic Response

Erosional

Geomorphic Units

Plunge pool (Erosional)

Maintenance?

No

Notes

Should be doubled in width and add some height. Plunge pool formed on downstream side

----

Structure number

21

Type (if known)

Other

Other

Postless bda

Condition

Intact, Augmented

Forming pond?

Yes

Flow

Over, Around

Overbank flow?

Yes

Net Geomorphic Response
Depositional

Geomorphic Units
Uniform (Depositional)

Maintenance?
No

Notes
Some beaver-chewed sticks around structure

Structure number
22

Type (if known)
BDA

Condition
Breached

Forming pond?
No

low
Around

Overbank flow?
Yes

Net Geomorphic Response

Equal

Geomorphic Units

Bank erosion (Erosional), Scour Pool (Erosional)

Maintenance?

No

Notes

Needs 5 more posts and to be extended on both sides. Some overbank flow on river right

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Structure number
23

Type (if known)
BDA

Condition
Intact, Augmented

Forming pond?
Yes

Flow
Through, Around

Overbank flow?
Yes

Net Geomorphic Response
Equal

Geomorphic Units
Bars (Depositional)

Maintenance?

No

Notes

Needs extended on river left. Some beaver activity just upstream from structure

----

Structure number

24

Type (if known)

Other

Other

Postless bda

Condition

Blown-out

Forming pond?

No

Flow

Through

Overbank flow?

NA

Net Geomorphic Response

No change

Geomorphic Units
NA

Maintenance?
No

Notes
Totally gone

Structure number
25

Type (if known)
Postless bda

Condition
Blown-out

Forming pond?
No

Flow
Through

Overbank flow?
NA

Net Geomorphic Response
No change

Geomorphic Units
NA

Maintenance?
No

Notes
Totally gone

Structure number

26

Type (if known)

BDA

Condition

Intact, Augmented

Forming pond?

No

Flow

Over, Through, Around

Overbank flow?

Yes

Net Geomorphic Response

Equal

Geomorphic Units

Uniform (Depositional), Plunge pool (Erosional)

Maintenance?

No

Notes

Forcing overbank flow that activates River right side channel. Structure could use 5 more posts and be built higher

----

Structure number

27

Type (if known)

BDA

Condition

Intact, Augmented

Forming pond?

Yes

Flow

Over, Around

Overbank flow?

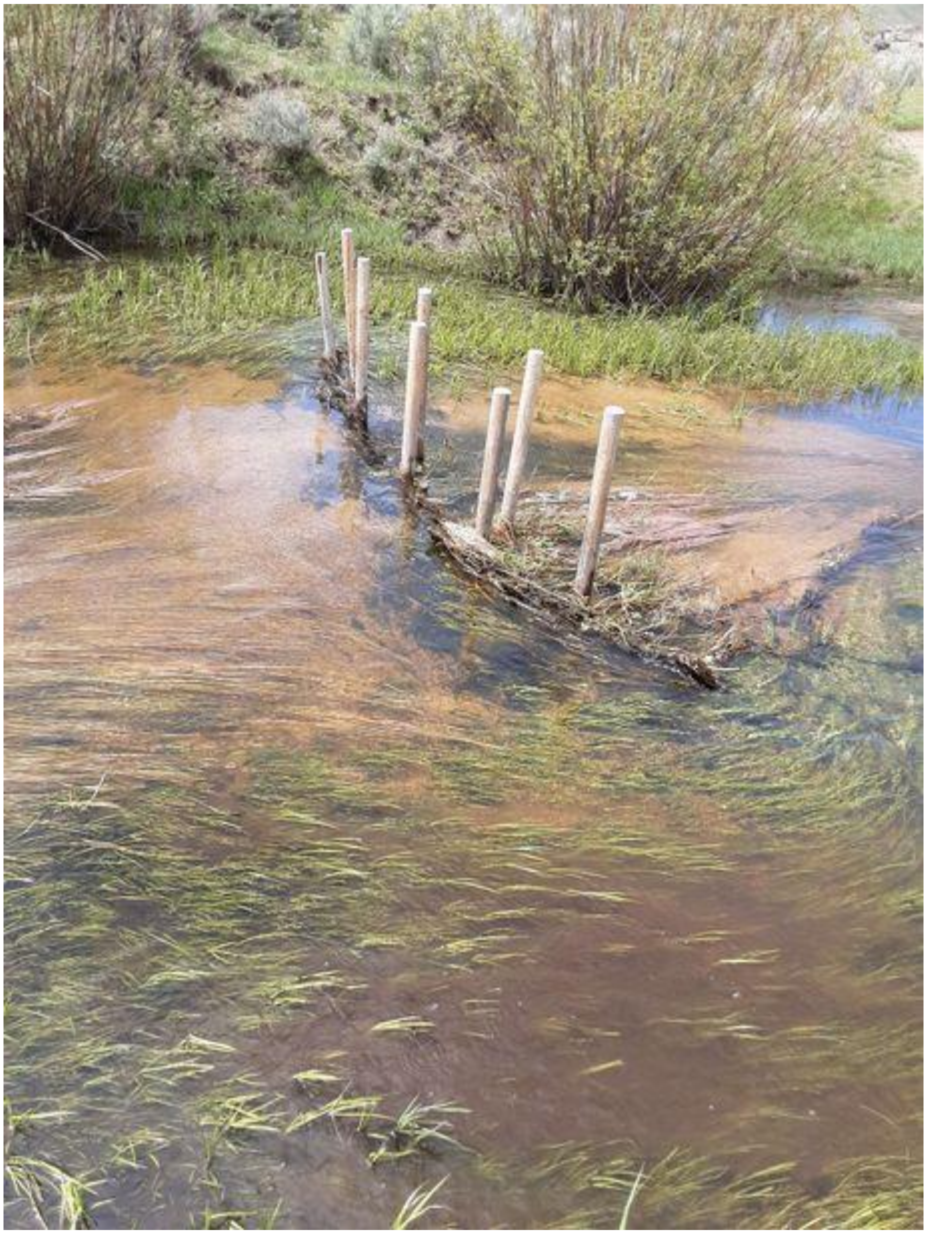
Yes

Net Geomorphic Response

Equal

Geomorphic Units

Bars (Depositional), Uniform (Depositional), Plunge pool (Erosional)



Maintenance?

No

Notes

Lots of aggradation behind bda. Fllosplain river right is gettimg tons of water. Could be extended on both sides and raised

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Structure number

28

Type (if known)

BDA

Condition

Intact

Forming pond?

No

Flow

Over, Around

Overbank flow?

Yes

Net Geomorphic Response
Erosional

Geomorphic Units
Plunge pool (Erosional)

Maintenance?
No

Notes
Forcing ovrrbank flow on both sides. Extending it 6 posts to River Left will increase floodplain connectivity

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Structure number
29

Type (if known)
BDA

Condition
Intact

Forming pond?
No

Flow
Over, Around

Overbank flow?
Yes

Net Geomorphic Response
Equal

Geomorphic Units
NA

Maintenance?
No

Notes
Forcing overbank flow on River right

Structure number
30

Type (if known)
BDA

Condition
Intact, Augmented

Forming pond?
No

Flow
Over, Around

Overbank flow?
Yes

Net Geomorphic Response
Equal

Geomorphic Units
Plunge pool (Erosional)

Maintenance?
No

Notes
Over bank flow on both sides

Structure number
31

Type (if known)
BDA

Condition
Intact

Forming pond?
No

Flow
Around

Overbank flow?
Yes

Net Geomorphic Response
Equal

Geomorphic Units
Plunge pool (Erosional)

Maintenance?

No

Notes

Overbank flow to River Right

Structure number

32

Type (if known)

BDA

Condition

Breached

Forming pond?

No

Flow

Over, Through, Around, Under

Overbank flow?

Yes

Net Geomorphic Response

Erosional

Geomorphic Units

Plunge pool (Erosional)

Maintenance? No
