November 8, 2024

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RE: Sacramento Valley Conservancy-Sloughhouse RCD Restoration Partnership

The Sacramento Valley Conservancy (SVC) is a non-profit, accredited land trust which aims to preserve the beauty, character, and biodiversity of the Sacramento Valley landscape by protecting and stewarding natural and working lands, and scenic open spaces for the benefit of current and future generations.

SVC is planning on implementing an initial restoration project on its Deer Creek Hills Preserve property (DCH) within the Sloughhouse RCD action area. Deer Creek Hills is located along Latrobe Road within proximity to the unincorporated community of Rancho Murrieta. The property's primary land use is as functional rangeland, however, since the property also serves as a nature preserve, there is an established public access component of use and management. Deer Creek Hills Preserve is characterized by annual grasslands and large stands of mature blue oak woodland; other intermixed oak species include valley and interior live oak. There are portions throughout the Preserve which contain mature riparian woodland corridors, these corridors are associated with currently ephemeral drainages as well as ephemeral and perennial ponds within the Preserve boundaries. The two most prominent ephemeral watercourses are Deer Creek and Crevis Creek. Deer Creek Hills Preserve is seasonally grazed and managed by SVC stewardship staff for rangeland and oak woodland health, focusing on preserving and promoting biodiversity within this working landscape.

The planned restoration will involve the use of "low-tech process based restoration" techniques (PBR) in the form of beaver dam analogs (BDA) and post assisted log structures (PALS). Process based restoration is partnering with nature to recover degraded river and stream catchments by removing impediments to physical and biological processes and harnessing the system's fluvial and biological energy to do most of the restoration "work". Practitioners use low-risk approaches that minimize the use of fossil-fuels to achieve restoration goals. Heavy machinery is primarily reserved to address source problems such as levees, roads, and legacy mine tailings that confine the fluvial landscape. Additional treatments are designed to replace missing or altered functional ecosystem components that maintain floodplain connectivity and complexity. Treatments may include adding woody features such as post-assisted log structures and beaver dam analogs, and large woody augmentation. Partnered restoration actions may include recruiting ecosystem engineers such as beaver, managing livestock grazing operations, applying controlled burns, forests thinning, and supplemental riparian and

meadow vegetation planting. Interventions are guided by a stewardship mentality whereby they are adaptive over time in response to environmental feedback with a goal of encouraging a self-sustaining, dynamic ecosystem (CALPBR 2024).

Implementation of BDA and PALS structures within ephemeral watercourses has become a growing practice on both public and private lands to increase the capacity of degraded river and stream ecosystems to retain water, support biodiversity, create fire resiliency, promote landscape level adaptation to climate change, reduce the effects of erosion, improve groundwater recharge, promote small scale/localized flooding within proximity to the installation site, remedy incised banks, and generally improve watershed health. In short, implementation of these restoration measures slows flow within historically fast flowing watercourses and keeps water on the landscape for longer periods of time.

SVC is requesting $7,000 in funding from Sloughhouse RCD to support the Crevis Creek restoration and habitat creation project. The funding will be used either as a match to NRCS funding or as the primary funding source to cover project design, permitting, materials, on-site installation, and for post-install monitoring and public education and marketing of beaver dam analogs and post-assisted log structures. Project duration is highly dependent on the acquisition of funding and completion of the permitting process. SVC is optimistically looking at project implementation between January and February of 2025, however, project implementation mid-December 2024 would be preferred. In the case this timeline is not feasible due to winter storm events or other unforeseen environmental factors, SVC would push back project implementation to the spring of 2025.

For this initial restoration project, SVC plans to implement three structures within a single reach of Crevis Creek where it runs through annual grassland towards mature blue oak dominant woodland. SVC plans to associate these restoration efforts with riparian restoration plantings; SVC has been actively propagating locally sourced willows in-house to utilize for this restoration project. SVC plans to utilize stewardship staff, an existing volunteer network, and docents to complete this work in an efficient and timely manner; as such, this initial BDA/PALS project is expected to take approximately 1-2 full days of physical work onsite and post implementation monitoring will be conducted regularly in tandem with weekly and bi-weekly management visits by SVC staff. Following initial implementation, the installed structures would continue to function for multiple years with little to no needed maintenance. Longterm maintenance of the BDA/PAL structures would be conducted by SVC stewardship staff as part of routine preserve management. For this initial project, SVC will consult with the American River Conservancy, the California Process Based Restoration Network, and the Wet Meadows Institute to design and plan this BDA project. Following implementation, SVC will consult and seek technical assistance and funding from NRCS and USFWS Partners Program to continue implementation of similar structures within the Preserve. Below, we have provided a series of representative photos and website links which better describe the process and benefits of BDA and PALS restoration measures.

Additionally, SVC is seeking a partnership with the Sloughhouse Resource Conservation District on this initial restoration project with the hope that success in this endeavor may lead to continued collaboration on watershed health initiatives and restoration projects. SVC sees this BDA/PALS implementation as a fantastic opportunity for both organizations to engage the public, both in person and through social media. We believe this project presents an especially crucial opportunity for the Sloughhouse RCD to

broaden their reach and further engage with the public through the avenue of watershed restoration and wildlife habitat creation. SVC plans to generate content in the form of professional-quality photography taken on the restoration service day (social media blast content) and would also include pre and post implementation aerial photography and video taken in 4k resolution to show the impacts of BDA/PALS implementation (use for social media, website, and newsletter content). Through this partnership, all content produced by SVC will be accessible to Sloughhouse RCD for use on its website and social media. SVC will highlight this collaboration in announcements and social media promotions, which will further enhance the public visibility of Sloughhouse RCD.

Links/Resources/References

https://www.calpbr.org/pbr (CalPBR 2024)
https://www.calpbr.org/
https://www.youtube.com/watch?v=IAM94B73bzE&t=1s (Beaver Dams and Fire Resiliency)
https://www.youtube.com/watch?v=-Tg58wKmZRA&pp=ygUSYmVhdmVyIGRhbSBhbmFsb2dz (Nature Conservancy – Beaver Dam Analogs)
https://www.instagram.com/arconservancy/reel/DA1WIOkBnSt/ (American River Conservancy – Leek Meadows Restoration Project)
https://www.wetmeadows.org/ (Wet Meadows Institute)

Leek Springs Meadow Restoration Project

AMERICAN RIVER CONSERVANCY
Preserving Rivers and Lands for Life

Eroded channel draining meadow floodplain.

Volunteers installing groundwater monitoring wells.

The Leek Springs Meadow Restoration Project, scheduled for the summer of 2024 will use process-based restoration tools of beaver dam analogs (BDAs) and post assisted log structures (PALS) to trap sediment in runoff, reconnecting stream channels to adjacent meadow floodplains. Encroaching lodgepole pines will be removed from meadow areas to decrease evapotranspiration and to be used as materials for building instream structures. This work will be completed using hand tools and foot traffic, thereby having minimal effects on current meadow soils and vegetation.

This work, will be managed by the American River Conservancy on land owned by the California Department of Fish and Wildlife with support from many partners and funding agencies including the Wildlife Conservation Board, United States Forest Service and Point Blue Conservation Science.

Point Blue Conservation Science

Publication made possible by a grant from the U.S. Department of Agriculture [USDA], Forest Service, Resource Advisory Committee, under the authority of Secure Rural Schools and Community Self Determination Act of 2000, Pub.L. 106-393, 16 U.S.C. 500, as reauthorized and amended. USDA is an equal opportunity provider, employer, and lender.

Human built BDA to mimic beaver effects in meadow.

For more information contact ARC Stewardship Manager, Cathy Mueller at Cathy@ARConservancy.org

Postless BDA Details

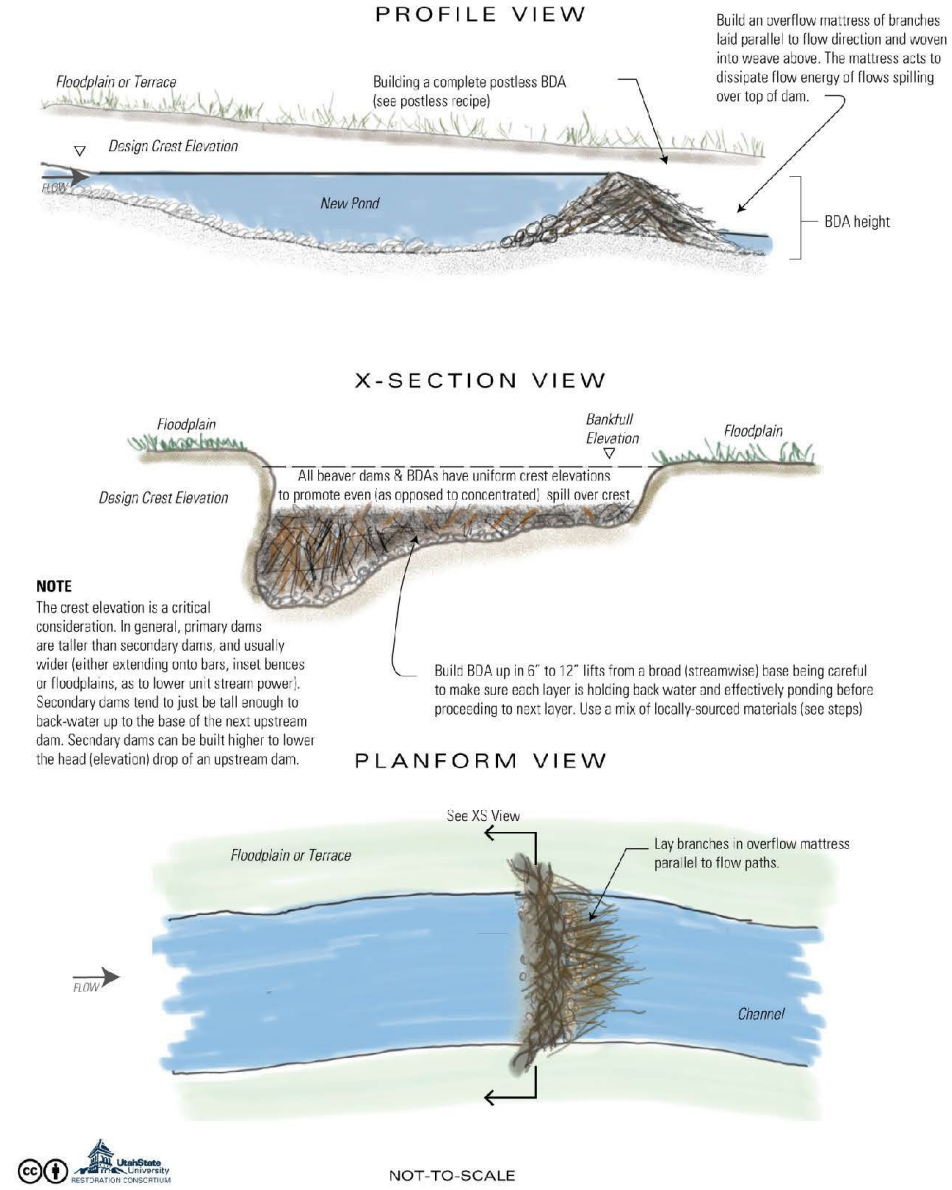

Figure 30 – Typical schematic sketches of a postless BDA.

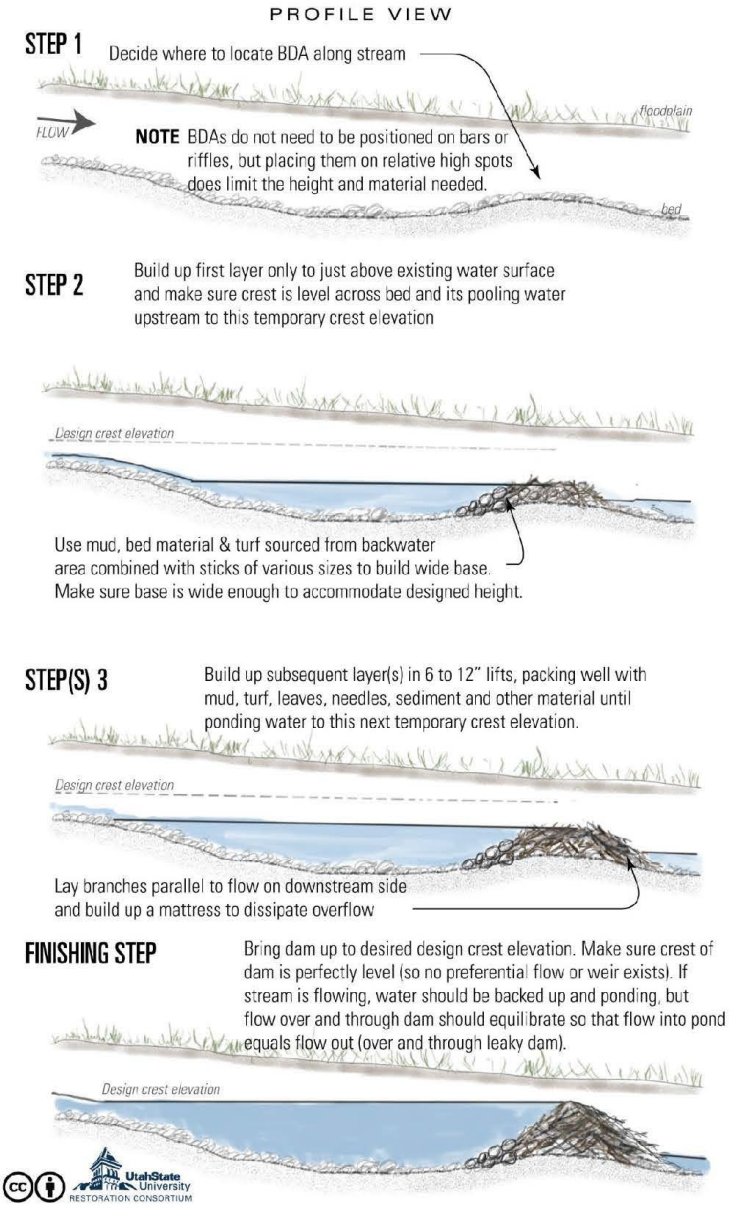

Figure 31 – Sequence for building postless BDAs, build up in 6" to 12" lifts, slowly, like beaver do. Make sure that your lifts are level, and water is backed up sufficiently that is flowing over the crest evenly (as opposed to through or under the dam), and the base is broad, before building up to your next layer.

Postless BDA with Key Pieces Details

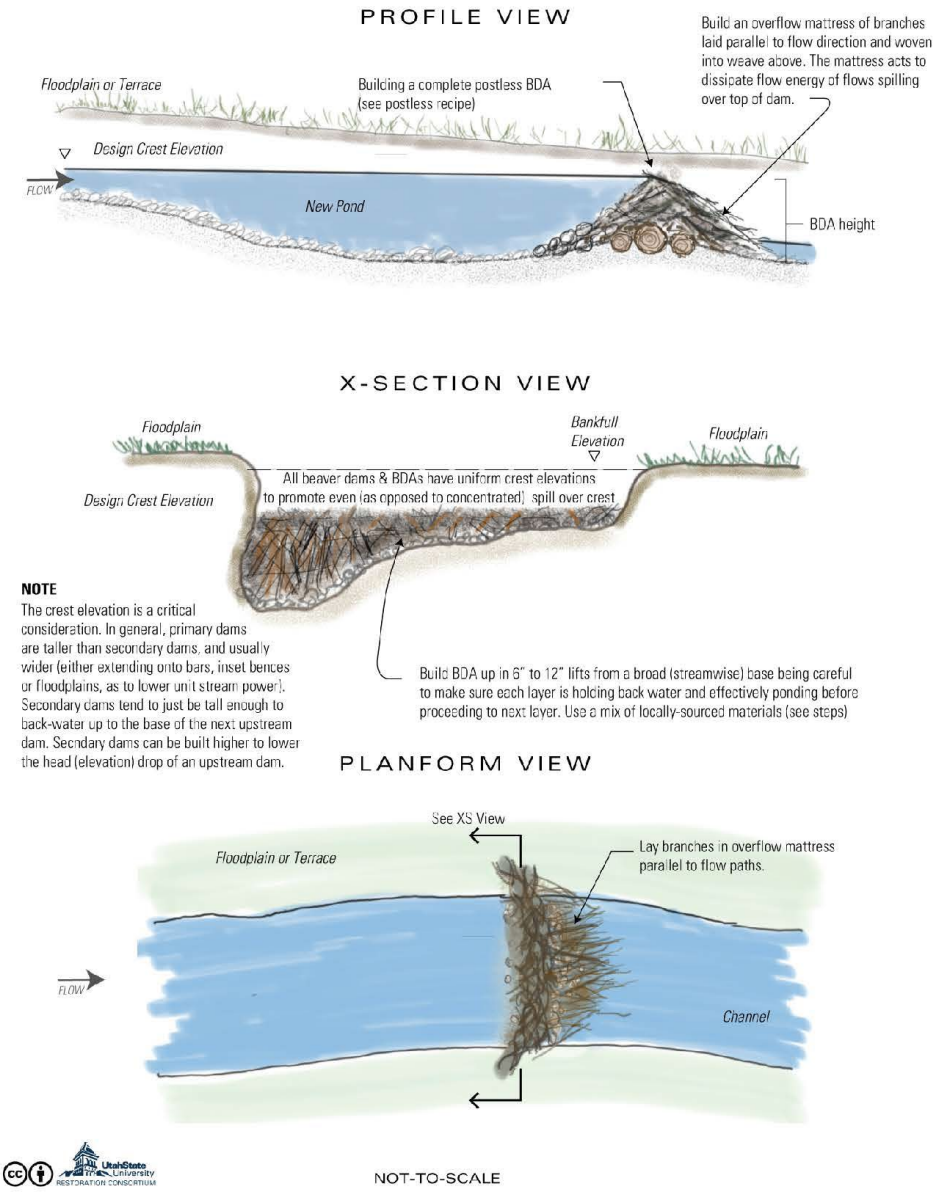

Figure 32 – Typical schematic sketches of a postless BDA with key pieces used in base.

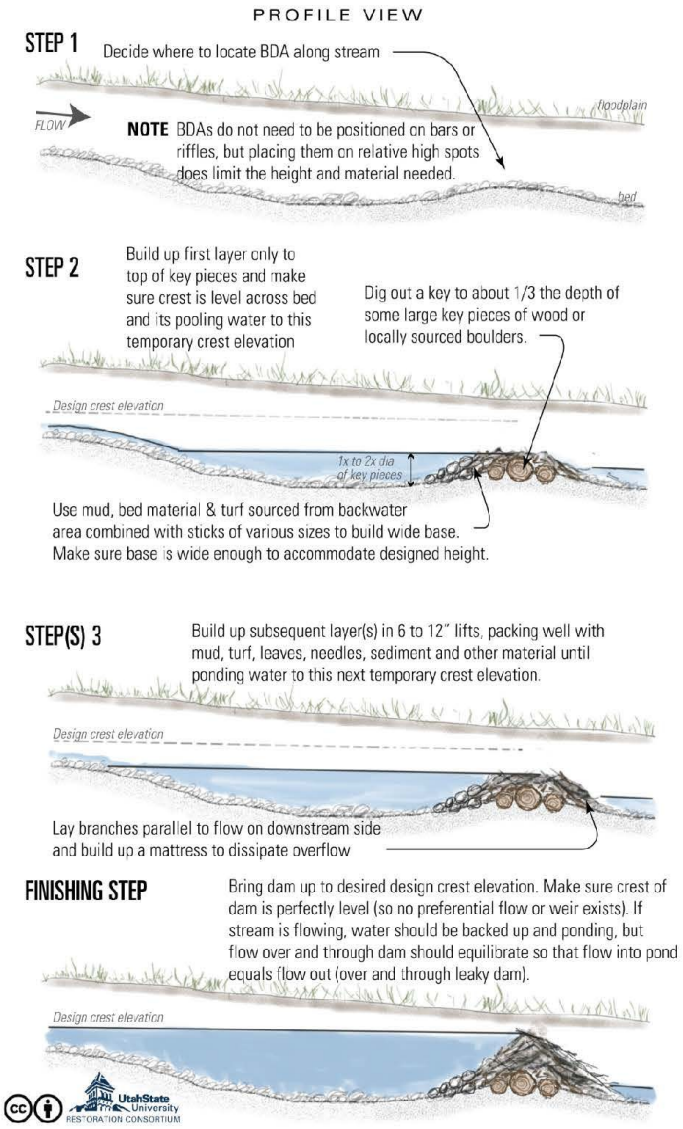

Figure 33 – Sequence for building postless BDAs with key pieces, build up in 6" to 12" lifts, slowly, like beaver do. Make sure that your lifts are level, and water is backed up sufficiently that is flowing over the crest evenly (as opposed to through or under the dam), and the base is broad, before building up to your next layer.

Post-Assisted BDA

Some practitioners who build BDAs have become very accustomed to using posts, because that's how the first details they saw of BDAs were built and they stuck to the post-line wicker-weave recipe (Figure 36 Appendix C and Figure 19). Posts can provide some temporary anchoring and stability to help with high flows in systems with flashier flow regimes or that produce larger magnitude floods. However, in many situations beaver can produce plenty strong dams without posts. For situations where additional support during high flows is deemed necessary, our suggested practice is to start out following the instructions to build a postless BDA, and then simply add posts (Figure 34 & Figure 35).

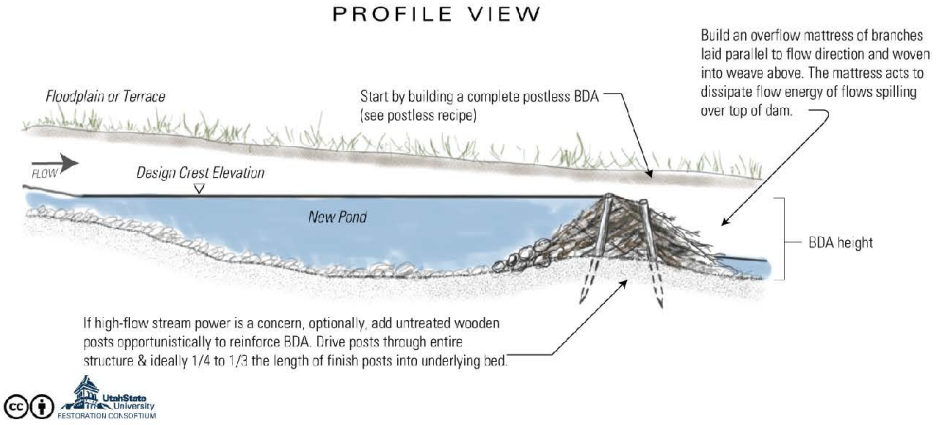

Figure 34 - Profile schematic of post-assisted BDA. If you think you need posts, our preferred approach is to build a postless BDA as per Figure 31, and then reinforce after the fact with some posts driven through the structure.

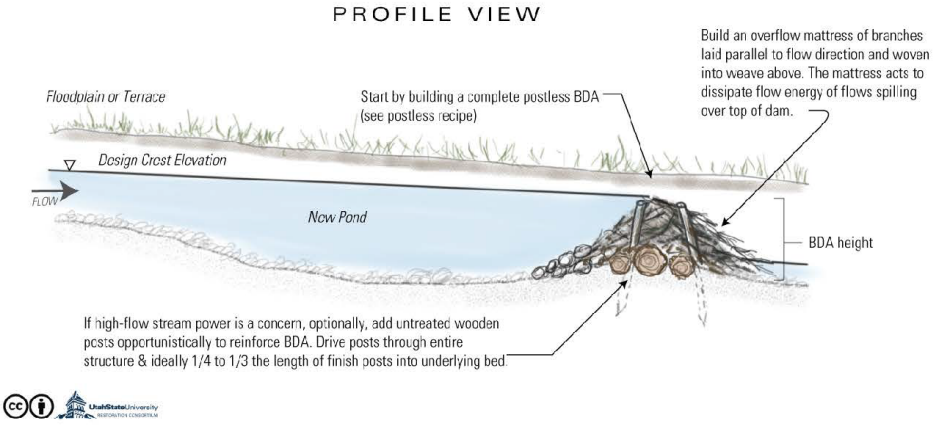

Figure 35 – Profile schematic of post-assisted BDA with key pieces. If you think you need posts, our preferred approach is to build a postless BDA as per Figure 33, and then reinforce after the fact with some posts driven through the structure.

Post-Line Wicker Weave as a BDA

As described in Appendix C, a simple post-line wicker weave was the first version of BDAs. Post-line wicker weaves have been used since at least the 1930s (Kraebel and Pillsbury, 1934) and in the 1800's in France (Chapter 1: Shahverdian et al., 2019a). Post-line wicker weaves as BDAs have the important characteristic that the crest elevation is built to be perfectly uniform in height. Post-line wicker weave BDAs can and have worked in many situations. Draw backs to this method are the emphasis often goes into building the weave and gaining elevation, and a postless BDA design emphasizes what a beaver dam is meant to: holding back water. We have also seen these wicker-weaves open in floods like a barn gate, which often produces good habitat, but those are situations a bank-attached PALS would have made more sense (e.g. Figure 24) and have been more economical to build.

General Post-Line Wicker Weave as BDA Recipe

Ingredients

- Untreated wooden fence posts (as many as needed to space 30 – 50 cm apart and staggered)
- Willow weave material (long (i.e., > 1 m), limbed branches of ¼" to 2" diameter willow branches
- Cobble, gravel, sand and mud

Tools needed

- Personal Protective Equipment (see Chapter 6)
- Cutting tools: loppers and chainsaw minimally; optionally hand saw(s), pruning shears
- Digging tools: Shovels & optionally pick-axe or digging bars
- 5 Gallon Buckets - for filling and moving finer fill material from source areas to BDA
- Optionally -cam straps are sometimes helpful to bundle together branches for easier hauling from source or staging areas to BDA.

Instructions

1. Decide location of BDA dam crest, configuration (e.g., straight or convex downstream), and crest elevation (use landscape flags if necessary). Position yourself with your eye-level at proposed crest elevation of dam (make sure it is < 1.5 meters in height) and look upstream to find where the pond will backwater to. Adjust crest elevation as necessary to achieve desired size of pond, inundation extent, and overflow patterns. If concerned about head drop over BDA, build a secondary BDA downstream with a crest elevation set to backwater into the base of this BDA (and lessen head drop or elevation difference between water surface in pond and water surface downstream of BDA).
2. Install posts with hydraulic post pounder into stream bed and banks in configuration as shown.
3. Trim (with chainsaw) posts to level, desired crest elevation (this can be done at end instead).
4. Weave willow branches in between posts across the channel. Pack stream substrate from area to be ponded against upstream face of dam to 'plug' up.
5. Work a willow mattress (laying branches parallel to flow) into dam on downstream side to provide energy dissipation for overtopping flows.
6. If desired, and time permits, attempt to plug up BDA with mud and organic material (small sticks and turf) in order to flood pond to crest elevation. Optionally, you can leave this for maintenance by beaver or for infilling with leaves, woody debris and sediment.

Notes

- Resist the temptation to overbuild the BDA.
- A BDA that 'breaches' or 'blows out', just like natural beaver dams do, is not a 'failure' if designed to accommodate such a response. Often, BDAs that blow out or breach provide improved and more complex habitat.
- Design life: < 1 year (note actual life may last many years or even decades).

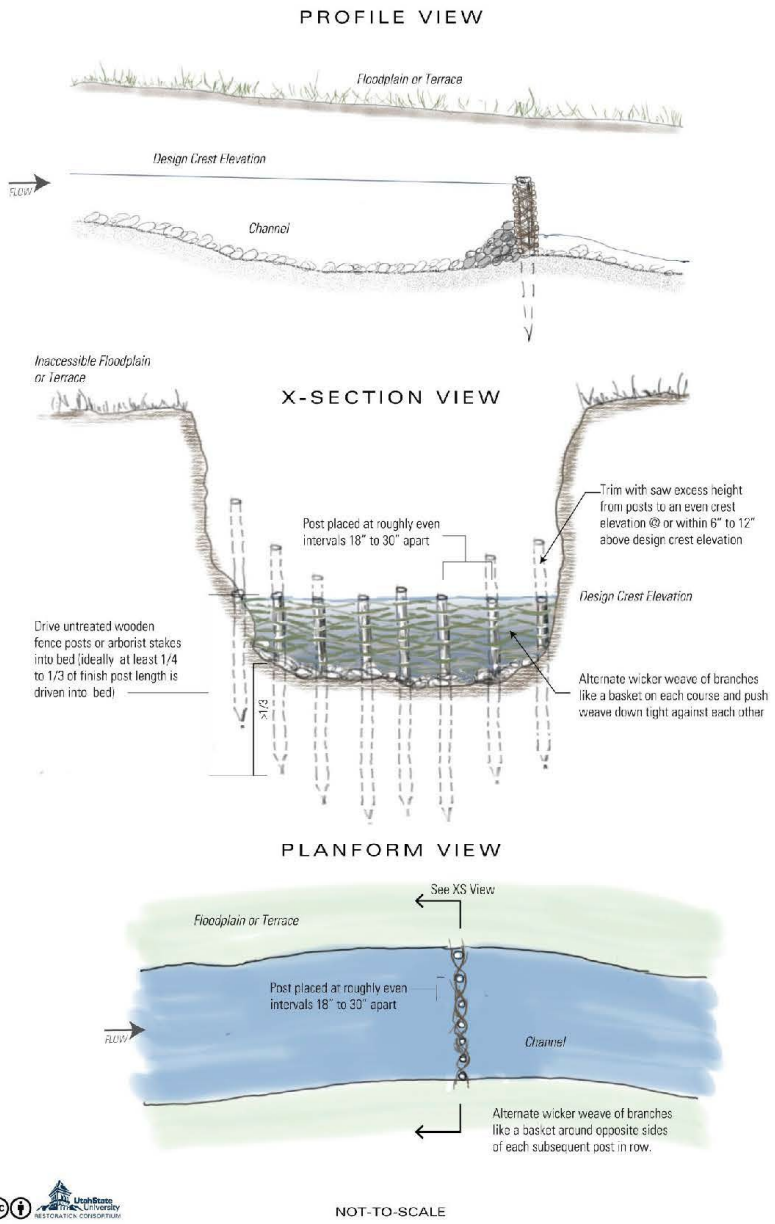

Figure 36 – Typical schematics of the first generation of wicker-weave post-assisted BDAs (similar to Figure 20) using a single row of posts and essentially building a vertical wall. We do not recommend this method, as the wall results in an overflow scour pool that can undermine the base, but in situations where the bed can aggrade quickly in the pond, the deposit can act to stabilize the dam.

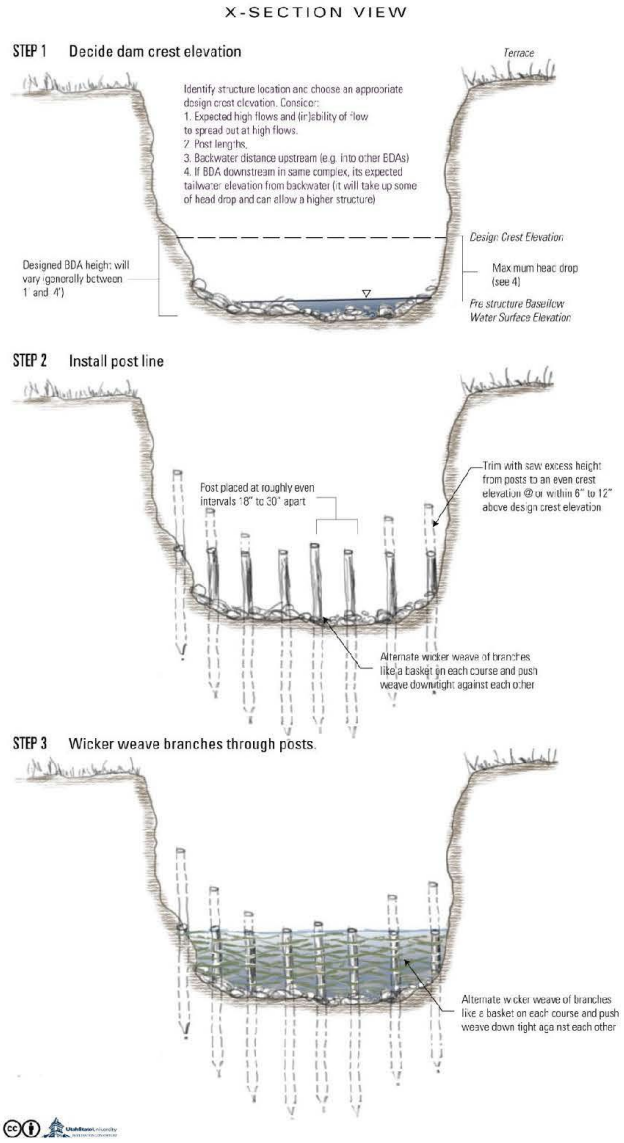

Figure 37 – Typical construction sequence for a post-line wicker weave BDA. First, a single row of posts is installed, and then the wicker weave is placed, and then an attempt is made to patch up the leaks.

Improvements to the Post-Line Wicker Weave BDA – Double Rows of Posts & Mattress

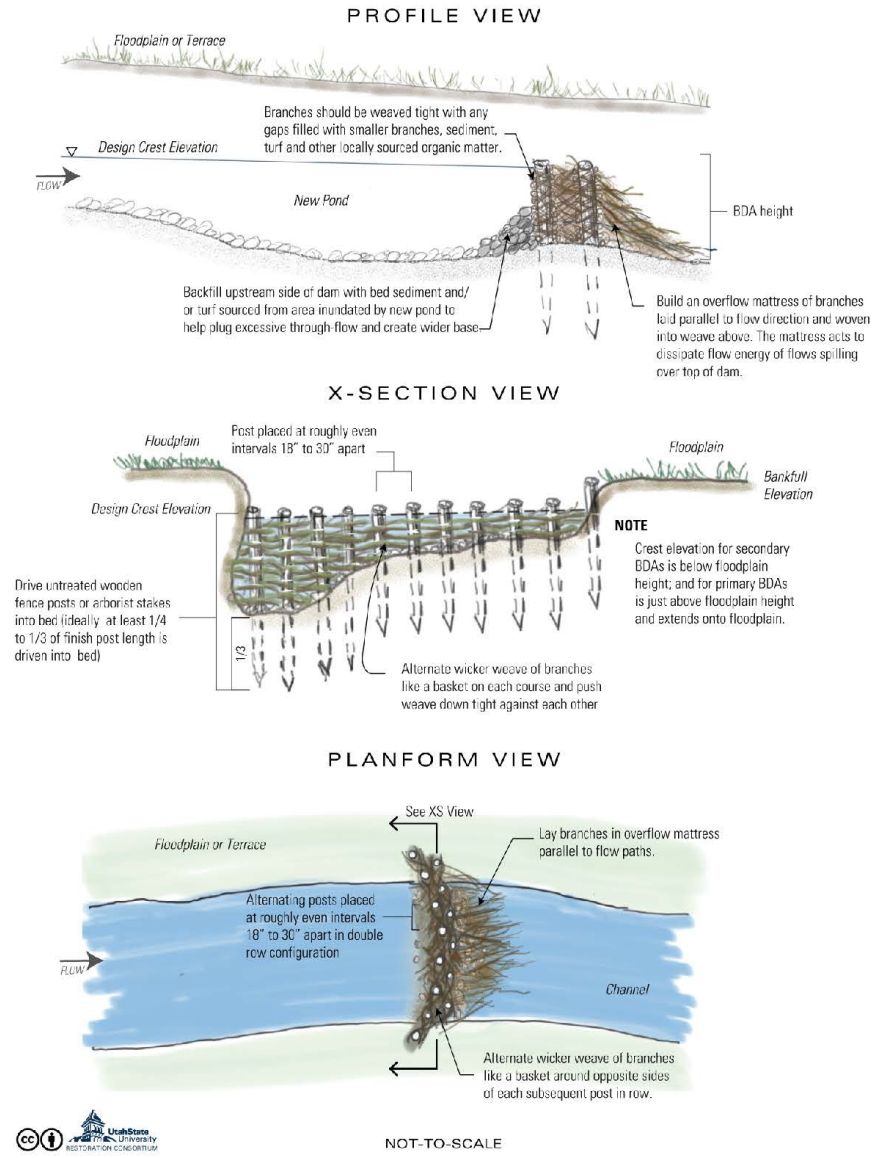

Figure 38 – Typical schematic sketches of a post-line wicker weave BDA, with simple improvements to include a double row of alternating posts, a convex downstream crest orientation, and most importantly an overflow mattress to dissipate flow over the top of the dam.