



Zuni bowl in northeastern Johnson County. Photo courtesy of Clear Creek Conservation District.

# Use Zedyk structures to restore meadows and floodplains

**W**hile riparian areas and wet meadows occupy less than two percent of rangeland ecosystems, these habitats provide critical resources for many species. Known as mesic areas, they significantly influence rangeland vegetation, wildlife, and water resources, especially during drought periods.

## What is a mesic habitat?

Mesic habitats are functioning meadows and floodplains that capture and hold water in the soil. After runoff events, such as a big rainstorm or quick snow

melt, they slowly release the water they have stored like a sponge. This sustains base flows and maintains water tables throughout the growing season. As a result, the plant communities in mesic areas are more productive than surrounding landscapes, making them attractive for wildlife and livestock.

## Degradation

Both current and past land use can lead to erosion, lowered water tables, and reduced drought resilience in mesic habitats. In the western U.S., many mesic areas



Headcut in a degraded mesic area. Photo courtesy of Zach Byram.

have been degraded by improper grazing management, soil compaction, roads and trails, historic flooding events, and invasive plants.

Degradation of mesic areas disconnects floodplains, reduces groundwater discharge, and decreases water storage capacity. Degradation can also alter the composition and structure of plant communities.

While many landowners and managers are interested in restoring degraded mesic areas, traditional restoration practices are often intensive and costly. For those seeking simpler, more cost-effective, and scalable options, Zeedyk structures offer a potential solution.

## Zeedyk structures

Zeedyk structures are one way of controlling erosion in mesic areas. These low-profile structures are designed to slow and disperse water, capture sediment, and increase moisture. These structures can also help improve wildlife habitat, water quality and quantity, soil health, carbon sequestration, livestock forage, and drought resiliency.

Compared to traditional techniques, Zeedyk structures are relatively low risk, both structurally and in terms of time and expense. However, be aware that the amount of labor and time required to install and maintain these structures may vary depending on the situation.

## Effective, low-tech solutions

Headcuts are erosional features that migrate upstream and can lead to channel incision, gully

formation, and potential loss of mesic habitat. Land managers often prioritize shallow headcuts and smaller incised channels because their restoration can be achieved in a reasonable timeframe without heavy equipment and earthwork.

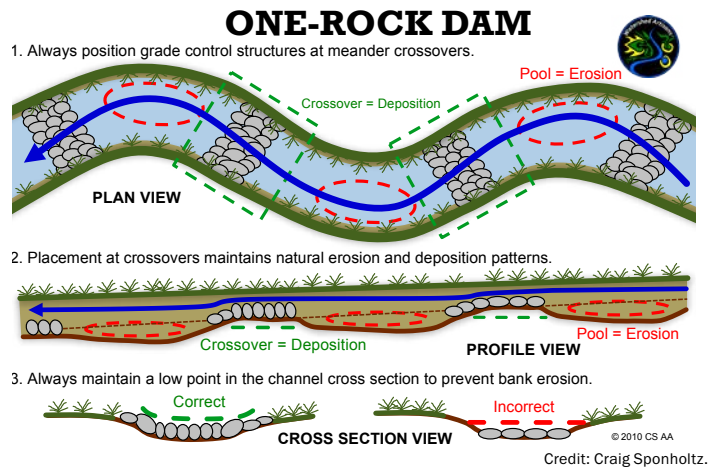
In low-tech restoration practices, Zeedyk structures are used to treat ephemeral streams impacted by gully erosion. These hand-built structures, typically made of rock or wood, address relatively shallow headcuts, gullies, or incised channels that are less than four feet deep.

To build an effective Zeedyk structure, individual pieces of rock or wood must be carefully placed to ensure that water passes over the structure in a manner that promotes stability and vegetation growth.

## Types of Zeedyk structures

### One-rock erosion control structure

This is the most commonly used Zeedyk structure. One-rock structures are used in areas where they can help slow-moving water infiltrate into the bank or where

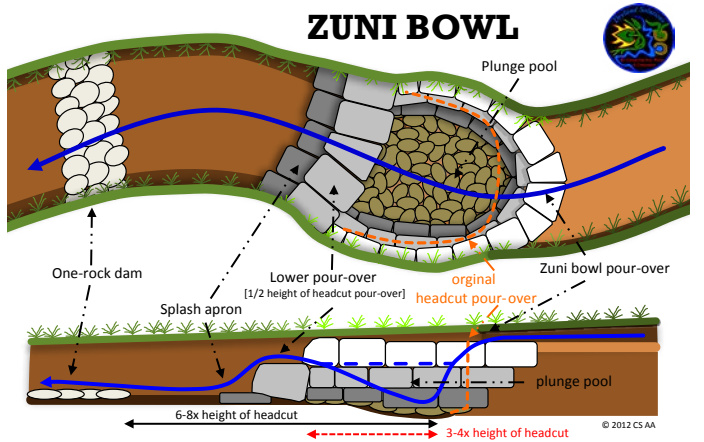


raising the channel bed elevation can help reconnect the channel with the floodplain or subsurface hydrology.

The one-rock structure gets its name from being only one rock high. It is constructed by tightly fitting many rocks together and is generally no more than one-third the height of the channel.

## Zuni bowl

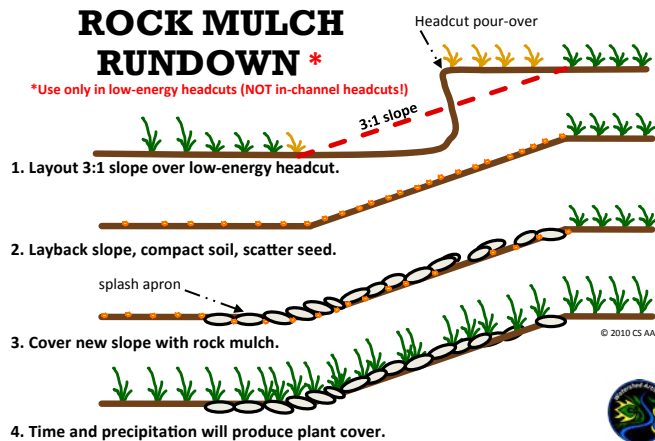
A Zuni bowl comprises rock-lined step falls with a plunge pool, which dissipates falling energy and stabilizes the headcut. Zuni bowls are typically used to treat in-channel headcuts.



Zuni bowl plan and cross-sectional view. Credit: Craig Sponholtz.

## Rock mulch rundown

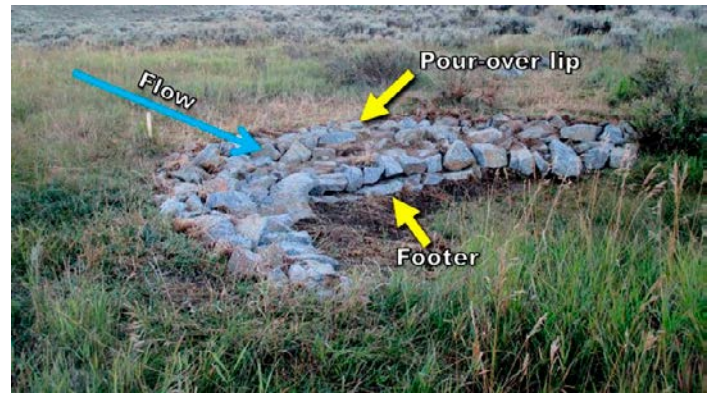
A rock rundown is used in low-energy headcuts that are generally 1.5 feet tall or less. When building this type of structure, the headcut is usually shaped into a stable angle (3:1 slope) and then armored with rock.



Credit: Craig Sponholtz.

## Rock layback

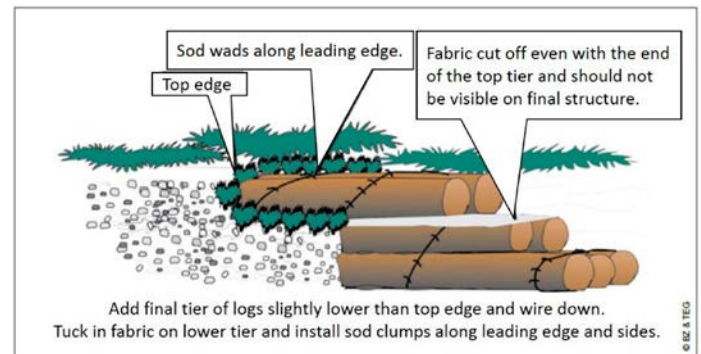
Rock laybacks are used to treat long headcuts that experience shallow, low-velocity flow events (sheet flow). These structures are built by shaping the headcut into a slope that will hold stacked rock.



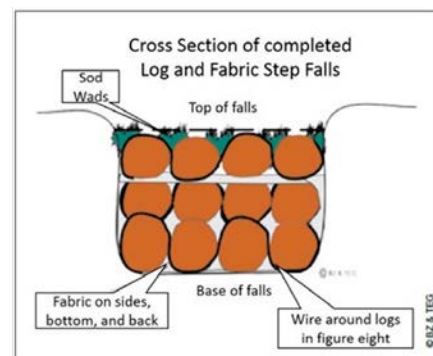
Rock layback. Photo by Shawn Conner.

## Log and fabric

In locations where logs are more readily available than rock, log and geotextile fabric structures can be used to mitigate headcuts. These structures are typically used to alleviate in-channel headcuts up to four feet high.



Credit: Craig Sponholtz.



Credit: Craig Sponholtz.

## Good planning

Many land managers find that the time and effort required to install and maintain Zeedyk structures are well worth the benefits of erosion control and habitat improvement. To ensure that your structures are well placed and functional, consider the following before



Log and fabric structure in northeastern Johnson County. Photo courtesy of Clear Creek Conservation District.

beginning the build.

- **Goals and objectives:** Go beyond just “stop erosion” or “install structures.” Think in terms of the desired hydrologic or ecological outcomes.
- **Prioritization:** Resources, funding, and capacity are often limited, so it is important to be strategic in terms of where to do the work. Select your site based on the greatest potential for achieving desired objectives.
- **Site evaluation and inventory:** Once an area has been prioritized, consider the following when selecting a site(s) to work on.
  - Restoration potential
  - Ease of access for construction material delivery
  - Opportunities to scale up the project
  - Habitat condition and value
  - Feasibility and estimated cost
- **Treatment design:** The size and type of headcut usually determine which type of structure to use, but also pay attention to the surrounding landscape (grades, vegetation types, and areas where water moves more quickly or slowly).
- **Consultation and permitting:** Working in wet areas

and waterways typically requires consultation with numerous regulatory agencies. Specific laws and policies vary, so check with local regulatory agencies early in the process to see if you need permits.

## Monitoring and maintenance

Zeedyk structures are designed to make incremental changes over time, so a long-term commitment is necessary for the project to succeed. Typically, structure maintenance and repair are most important following the first runoff event (before the structure has had a chance to fill in with sediment and be colonized by vegetation). Any rocks or logs that have been dislodged should be replaced at that time.

Zeedyk structures should, at a minimum, be checked annually after runoff events until stability is achieved. Monitoring the project can be as simple as annual photo monitoring or as intensive as annual line-intercept transects.

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