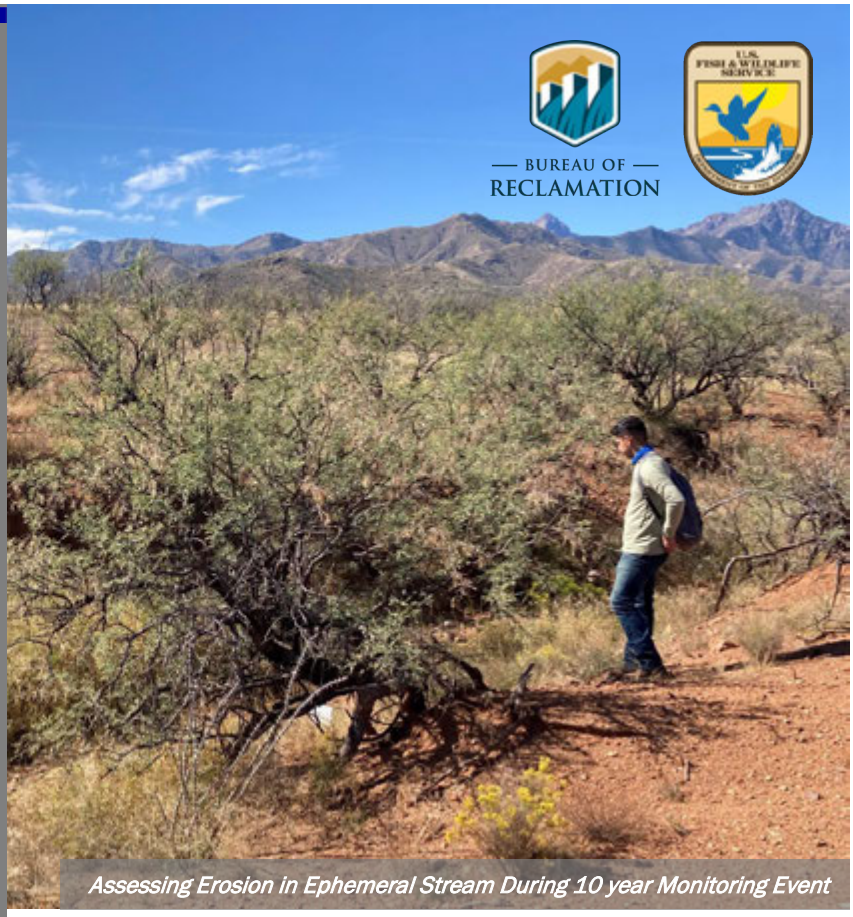
ACTIONABLE SCIENCE

Reversing Erosion on Semi-Arid Grassland Ranches: A 10-Year Analysis

A fenceline road in the Altar Valley of southern Arizona increased erosion in the ephemeral streams it crosses by concentrating water during monsoon storms. This erosion damaged infrastructure, lowered water availability, and reduced cover of vegetation and forage. In 2011, The Altar Valley Conservation Alliance (AVCA) formed an interdisciplinary team to rehabilitate the road, slow soil erosion, and restore vegetation using "Natural Channel Design" techniques. This project, the Elkhorn/Las Delicias Watershed Restoration Demonstration Project (Elk/LD Demo Project), serves as a public demonstration site where participants collaboratively monitored results of restoration implemented in 2012 for 10 years and learned about the long-term results of erosion control strategies by comparing treated channels to similar untreated ones.



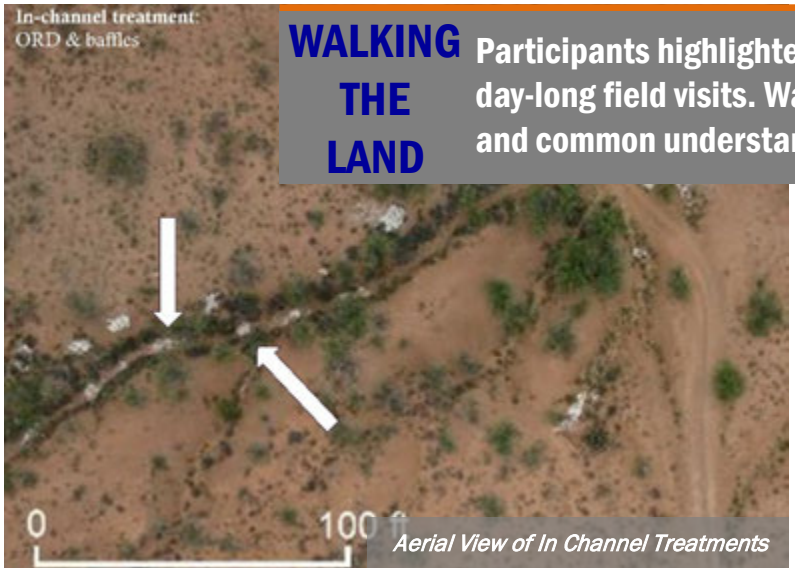
Assessing Erosion in Ephemeral Stream During 10 year Monitoring Event

KEY ISSUES ADDRESSED

High volumes of water running off the fenceline road was exacerbating erosion in the 25 ephemeral streams it crossed. Increased downcutting of the ephemeral streams caused erosion to progress uphill and damage roads and other ranch infrastructure. The eroding and deepening of channels disconnected water flows surrounding floodplains, dewatered uplands, and lowered the water table. The lack of available water in uplands starved soils and vegetation of water, causing a further loss of in-stream and upland vegetation. Natural Channel Design techniques were new to the Altar Valley, and little information was available about appropriate treatments for long-term results in the local ecosystems.

PROJECT GOALS

- Rehabilitate road to reduce erosion
- Use rock media lunas to reduce erosion and increase vegetation cover in the uplands
- Use Natural Channel Design and rock detention structures to reduce erosion, restore floodplains, and increase vegetation in ephemeral streams
- Collaboratively monitor treatments to identify which methods were most effective



Aerial View of In Channel Treatments

WALKING THE LAND

Participants highlighted the value of collaborative monitoring during the day-long field visits. Walking the land together helped build relationships and common understanding of erosion control techniques.

PROJECT HIGHLIGHTS

Demonstration Site: There have been annual volunteer monitoring days, several workshops, and many other events that have reached >500 people since 2011.

Road Rehabilitation: Road dips and rock detention structures raised the level of the channel bed and increased deposition of sediment up to 200 feet downstream from road rehabilitation sites.

Restoring Uplands: Media lunas increased vegetation, captured litter, seeds, and sediment, and increased total soil nitrogen and organic matter content in the uplands.

Restoring ephemeral streams: Rock structures helped halt the advancement of headcuts, raise the level of the stream bed, and facilitate formation of small floodplains.

Supporting Vegetation Takes Time: Effects of in-channel structures on vegetation were unclear after two years, but after 10, in-channel rock structures increased vegetation cover (sometimes doubled compared to controls) and promoted vegetation resilience during drought years.

Cost Effective Monitoring: Photo monitoring reduced labor costs compared to quantitative monitoring of vegetation and soil. A GIS system with monitoring points, photos, and real-time data entry streamlined data management.

LESSONS LEARNED

The most cost-effective and impactful treatments were the road rehabilitation and rock media lunas in the uplands. These treatments anchored the riparian system and will be prioritized in future erosion control projects. One-rock dams and baffles were effective at supporting channels to return to natural function, and structures built too tall tended to fail first. Structures should be built to allow peak water flows to run over them without causing damage. Maintaining structures after the first large rain event is important to prevent further erosion and must be included in initial budgeting. The diverse experience of partners helped this project succeed. Rangeland scientists and ranch operators could identify areas with increased erosion, and experienced restoration practitioners could link erosion to improper structure construction. Leveraging partnerships enabled project participants to recruit volunteers for monitoring and data collection to use cost-effective photo-point monitoring techniques that compensated for limited monitoring funds. Photo points were marked with T-posts and distance from the nearest fence to locate them easily. Remote sensing techniques cannot measure changes in erosion smaller than the detection limit of ~60cm and landscape features can sometimes reduce accuracy. Therefore, combining remote sensing with in-field monitoring is important to accurately monitor results of these erosion reduction projects.

NEXT STEPS

- Expand the project area,applying the most effective methods identified in this project
- Scale up these methods elsewhere in the Altar Valley

Collaborators & Funding Partners

- Freeport MacMoran Copper and Gold Foundation
- Full list of Collaborators & Funding Partners Online

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Photos courtesy of AVCA.
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A Group of Participants at 10 year Monitoring Event