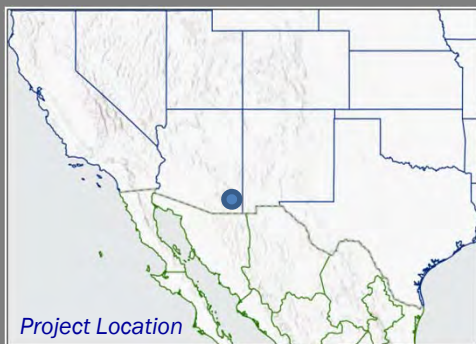


## RESTORATION

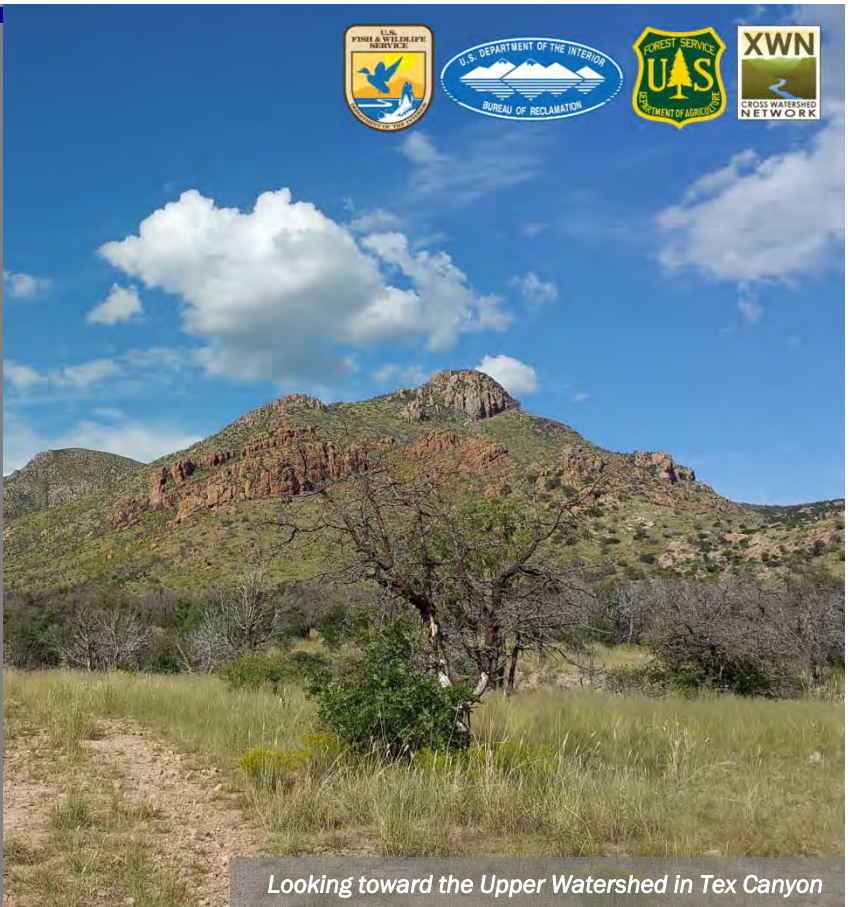
# Post-Fire Watershed Restoration and Monitoring in the Chiricahua Mountains of Arizona



The Chiricahua Mountains are a Sky Island range in the Coronado National Forest (CNF) of southeast Arizona. They rise out of desert grasslands up to mixed-conifer forests at elevations over 9,000 ft. Their extraordinary biodiversity and scenery attracts birders and hikers from around the world. In 2011, the Horseshoe 2 fire severely burned large portions of the range, causing widespread loss of vegetation and destabilized slopes. To address resulting soil erosion, partners are engaged in a watershed restoration project in burned (Tex Canyon) and unburned (Bar Boot Allotment) watersheds in the southern Chiricahua Mountains using in-channel loose rock erosion control structures.



Project Location



Looking toward the Upper Watershed in Tex Canyon



## KEY ISSUES ADDRESSED

In many fire-adapted ecosystems in the western United States, historic fire suppression has caused increased fuel-loads and forest densities. When fires occur under these conditions, they often have catastrophic results; loss of vegetation cover following high-severity fires can lead to accelerated erosion, especially on steep slopes and in drainages during monsoon rains that typically follow fire season. In 2011, the Horseshoe 2 Fire burned over 239,000 acres in the Chiricahua Mountains, with over 25,000 acres categorized as high burn-severity. As a result, many burned areas experienced intense flooding and erosion which led to stream sedimentation, infrastructure damage, and degraded watershed conditions. Erosion control structures in drainages can help rehabilitate burned areas by slowing flood flows, reducing soil loss, and promoting vegetation establishment.

## PROJECT GOALS

- Install erosion control structures in burned and unburned watersheds
- Assess the impacts of structures on vegetation and hydrologic response
- Demonstrate replicable, volunteer-driven pre-and post-fire adaptation actions in uplands of watershed

## GROWING RESILIENCE

Roots and canopy of perennial vegetation establishing near erosion control structures can help stabilize the streambed and eventually remove the need for continued management.



*Increase in Native Perennial Grasses behind a Structure at Bar Boot after One Rainy Season/SIA*

## PROJECT HIGHLIGHTS

**Structure Installation:** Over 700 in-channel rock erosion control structures were installed in 2015 in burned Tex Canyon (585 structures in 7 drainages) and the unburned Bar Boot allotment (123 structures in 4 drainages).

**Inmate Crew:** Project partners secured funding to hire a 10-person Department of Corrections crew for 30 days of work, including funds to train and supervise the crew. The crew installed 585 rock structures in Tex Canyon, and an additional 77 structures at Bar Boot.

**Youth Engagement:** 46 of the structures at Bar Boot were built by a 7-person paid crew of youth interns from Douglas, AZ hired through The Borderlands Earth Care Youth (BECY) Institute, a program that engages youth in conservation and natural resource management.

**Monitoring Restoration Impacts:** Monitoring includes USGS long and short-term vegetation study plots, as well as eight separate hydrology data stations (4 in each project area) where sensors are employed to monitor soil moisture and flood events.

## Collaborators and Funding Partners

- Coronado National Forest
- US Geological Survey
- Geosystems Analysis, Inc.
- Borderlands Restoration
- Cuenca los Ojos

Case study support provided by the US Fish and Wildlife Service, US Bureau of Reclamation, US Forest Service, and Cross Watershed Network. Updated August 2018. Photos courtesy of Matthew Grabau/GeoSystems Analysis, Inc.

## LESSONS LEARNED

After two monsoon seasons, up to 30 cm of sediment accumulation occurred at Tex Canyon, but there was no significant change in sediment levels at Bar Boot structures, likely due to greater soil stability in this unburned landscape.

There are higher frequencies of perennial plants, including native and non-native species, at sites with rock structures, potentially in response to increased sediment and soil moisture. The roots and canopy of perennial vegetation can help stabilize the streambed and eventually remove the need for continued management of erosion control structures.

Continued maintenance and observation of the structures is required, especially following intense monsoon rain events. Many structures blew out during a 500-year flood in 2015 and had to be rebuilt the following year. However it is difficult to maintain funding to monitor structures for a meaningful length of time after installation (beyond 1-2 years).

## NEXT STEPS

- Use results of this project to increase the scope and scale of this type of watershed restoration on the Forest Service Douglas Ranger District
- Continue annual vegetation monitoring near erosion control structures

## PROJECT RESOURCES

For more information on this project, contact Carianne Campbell: [carianne@skyislandalliance.org](mailto:carianne@skyislandalliance.org)

For additional project resources and case studies, visit the Collaborative Conservation and Adaptation Strategy Toolbox: [WWW.DESERTLCC.ORG/RESOURCE/CCAST](http://WWW.DESERTLCC.ORG/RESOURCE/CCAST)



*Installing Hydrology Monitoring Instruments at Bar Boot*