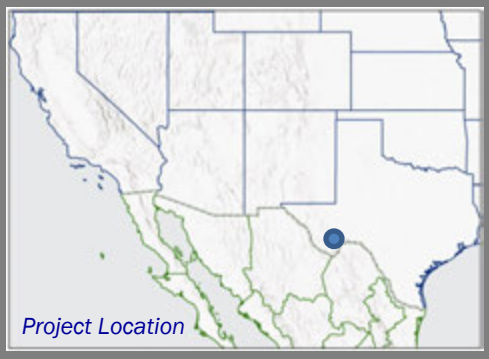
RESTORATION

Using Soil Science to Restore Desert Grasslands in Big Bend National Park

Due to a combination of historic grazing and drought, Big Bend National Park (BIBE) has lost much of its natural banded vegetation. Alternating patterns of banded vegetation and bare ground are important for regulating infiltration and runoff, and reducing erosion from rain by intercepting raindrop througfall. This is especially pertinent in erosion-prone low-elevation tobosa (*Pleuraphis mutica*) dominated grasslands with fine-textured soils. Without vegetation cover, soils in these arid desert grasslands have eroded. To address erosion, scientists with the National Park Service (NPS) collaborated with partners to develop and implement low-tech process-based restoration to interrupt cycles of soil erosion and restore soil and hydrological integrity to encourage the reestablishment of native banded vegetation.



A Healthy Tobosa-Dominated Grassland at Big Bend National Park

KEY ISSUES ADDRESSED

Without the protective cover of native banded vegetation, soils experience increased erosion, higher temperatures, lower soil moisture, and reduced plant establishment. Banded vegetation reduces erosion by intercepting raindrops and reduces soil temperatures by increasing soil cover. It also increases infiltration and slows surface water flow by interrupting flow of water across the landscape. Previous restoration methods have not simultaneously increased soil cover and interrupt the flow of water on the landscape. Soil degradation needs to be addressed at an appropriate scale and broad collaborations are needed to implement restoration actions at a landscape scale.

PROJECT GOALS

- Improve soil characteristics and restore hydrological processes necessary for banded vegetation to establish and persist on the landscape
- Introduce seed with a hydromulcher, in combination with other restoration techniques, to restore patterns of banded vegetation
- Increase coordination and collaboration among different departments within BIBE as well as with partners outside the National Park Service

THINK LIKE A RAINDROP

When using whole branch mulch from many different species, managers "thought like a raindrop" and applied branches thick enough to intercept 9 out of 10 raindrops instead of following strict depth guidelines.

Restored Area With New Growth After Summer Rains

PROJECT HIGHLIGHTS

Process-Based Restoration: Restoration techniques improved hydrological processes by reducing erosion and formation of physical soil crusts. Light tillage broke the existing physical soil crust, increasing infiltration. A mulch of full branches from various woody plants protected soil from raindrops by intercepting rain, reducing throughfall, and shading the soil.

Learning from Scale: Initial treatments on 1x1m plots did not reduce soil temperatures or recruit vegetation. through consultations with NRCS plant materials center and other partners and repeated trials, managers scaled treatments by using a hydroseeder with tackifier and placing treatments to on the landscape to mimic the natural arrangement of banded vegetation.

Improved Soil Conditions: Branch mulch increased soil moisture and lowered soil temperatures, which aids plant germination and establishment. Branch mulch also increased soil organic matter and amount of soil microbes. Within the first year, branch mulch reduced toxic levels of NO3.

Vegetation Response: Vegetation responses after monsoon rains in 2004 were observed to be significant compared to untreated areas. Between 2008 and 2017 grass cover decreased but cover of forbs increased. Cover of plant litter and dead or dormant plant bases also increased.

Collaborators

- See full list of collaborators online

Authors: Maddison Elliott/University of Ohio & Jeff Bennett/American Bird Conservancy (ABC) November 2022. Photos: Jeff Bennett/ABC. For more information on CCAST, contact Genevieve Johnson (gjohnson@usbr.gov) or Matt Grabau (matthew_grabau@fws.gov).

Visit CCAST:

LESSONS LEARNED

Restoring hydrological processes can mitigate the impacts of drought on the landscape. After the extreme drought and freeze of 2011 there was very little plant growth, but the application of branch mulch still improved underlying soil hydrological processes (infiltration, soil moisture) to levels similar to those in the existing native banded vegetation. This increased the potential for successful plant establishment when drought conditions subsided.

Scaling these restoration techniques required several thousand yards of brush. Managers sourced woody materials from: The National Park Service Fire Management Office's fuels reduction work, National Park Service maintenance crews, and invasive species removal projects along the Rio Grande. Delivering removed biomass to restoration sites was a win-win because it reduced transportation and processing costs for these programs. This shifted perspectives to start seeing "waste" brush as a valuable resource for restoration.

Using whole branch mulch requires labor and coordination to move and spread biomass. Partnerships with volunteer organizations like the Sierra Club reduced labor costs and coordination among NPS departments and outside partners enabled transportation of brush to restoration sites.

NEXT STEPS

- Conduct additional photo-point monitoring to assess continued impacts of restoration.
- Collaborate with partners to continue the program and use restored area as a field classroom.

For more information on this project, contact Jeff Bennett: jbennett@abcbirds.org or David Larson: david_larson@nps.gov

Whole-Branch Mulch Over Seed and Burlap Before Summer Rain