BORDERLANDS RESTORATION NETWORK

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Groundwater Recharge on Working Lands by Local Youth to Enhance Ecosystem Services

4th Semi-Annual Monitoring Report

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Project Summary

Borderlands Restoration Network (BRN) and the Arizona Department of Water Resources (ADWR) established an agreement to conduct restoration activities at T4 Ranch – a privately owned working cattle ranch located approximately fifteen miles north of Nogales, AZ. Project goals are to 1) stabilize the headwaters of T4 Ranch; 2) stabilize the main drainages within this watershed; and 3) return vegetative cover to the watershed for the benefit of the landscape's hydrologic cycle. This will be accomplished through the construction of rock and wood erosion control structures (ECS) that slow water flow, trap sediment, mitigate erosion, and increase infiltration; mulching and seeding bare ground; and engaging local youth with the restoration of their home watershed through paid internships. Additionally, effectiveness monitoring will be completed through aerial photography of baseline and end-of-project conditions and through modeling infiltration changes due to ECS construction.

Project Deliverables

Task 1 – Erosion Control: Install 400 ECS across 12 drainages on T4 Ranch with native materials. Photos and GPS points of each structure will be reported back to ADWR staff.
Task 2 – Mulch and Seed: Apply native grass seed pellets across 40 acres of working grasslands.
Photos and descriptions will be reported back to ADWR staff.
Task 3 – Local Youth Engagement: Hire and train 10 local high school students in grassland and riparian restoration techniques. Supervise high school students to build 100 ECS and apply further seed and mulch to grassland uplands.

Task 4 – Effectiveness Evaluation: Measure ECS once completed. Calculate potential sediment capture. Take fixed point photo points of various structures over time. Report results back to ADWR staff.
Task 5 – Watershed Modeling: Following completion of restoration work, BRN will use a geospatial watershed assessment tool developed by USDA, EPA, and University of Arizona scientists to model infiltration increases due to erosion control structure installation.

Work Summary
Task 1: All ECS has been installed in previous reporting periods, with a total record of 699 structures and 11 photo monitoring points.
Task 2: Mulching activities were halted as described in a previous reporting period. Funding for mulching went towards building additional erosion control structures (Task 1). The remainder of the seed pellets were spread throughout the treated drainages during this reporting period.
Task 3: The high school youth work was completed in summer 2022. A second week of high school youth work took place with leftover funding. This allowed new and returning students the opportunity to build erosion control structures, learn field safety, plant identification, and how watershed restoration benefits the landscape.
Task 4: All ECS have been constructed, measured, and potential sediment capture has been calculated. This task was amended to no longer require drone flyover footage. Fixed photo points of 11 structures were created following installation. These points include the initial photos after ECS were built, and the first round of 'after' photos, which were taken during monsoon season, 2023, along with a photo from each following season for one year. Since then, photos have been taken after each biannual rainy season (summer and winter). An additional round of repeat photography was conducted after the most recent winter rainy season. Each point now has 7 photos attached to document changes over time.
Task 5: Former BRN intern, Eden Santiago, submitted a watershed model used as her capstone project for her Master's thesis in GIS Administration. A group of graduate students from the University of Arizona were able to collect soil samples from the restoration and control sites over the course of two days in May 2024.

Upcoming Work
Fixed photo point monitoring will continue, taking photos at each point following the upcoming 2025 summer monsoon season. They will be taken in September or October after coordination with T4 Ranch managers. These photos will be included in the Final Report, which will be developed and submitted on or before November 30th, 2025.

Accompanying Data
In previous reporting periods, data submitted included a layer file of the 11 fixed photo points. This file has been updated and is accompanying this report, and now each point contains 7 photos. Also submitted with past reports is a spreadsheet showing ECS measurements and calculations for potential sediment capture. Some ECS do not have measurements because the program switched from manual to digital data collection, and some information was not carried over. In total, 196 tons of sediment can be collected behind ECS at T4 Ranch, which is equivalent to 10 dump truck loads. A copy of Eden Santiago's final presentation on Watershed Impact Analysis at T4 Ranch was included as well.