RESTORATION OF SEVERELY DEGRADED RANGELAND IN THE CHIHUAHUAN DESERT USING COTTON BUR/BURLAP WATTLES

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Abstract

Water is a critical component to range health, especially in arid regions such as the Chihuahuan Desert. A study to determine the feasibility of biodegradable wattles as a restoration technique was implemented in the Terlingua Creek watershed. Accepted mechanical techniques that are known to reverse site degradation were not applicable on the study site due to the high erosion risk of the Straddlebug soil which is a sodic haplocambid. The objectives of the study were to: 1) increase infiltration rates by slowing down runoff without using an intrusive technique, and 2) begin revegetation of desirable species in order to maintain improvements. This was done by laying wattles along contour lines every 33m within the study site. The wattles were constructed of 100% biodegradable burlap bags filled with cotton burs (gin trash). Bands above each wattle were harrowed and reseeded with native species. Erosion bridges were used to measure soil erosion/deposition. Soil samples were taken to compare moisture content. Two treatment sites were compared to a control site. The two treatments compared the effects of different installation methods. The first treatment was designed with no soil disturbance and used wooden stakes to support the wattles. The second treatment used a dozed trench to support the wattles, so required some soil disturbance. Results indicated that both treatment areas were significantly different in vegetation and soil moisture content than the control, with the dozed area having the highest vegetative cover and soil moisture, followed by the staked area. The control showed little revegetation. Wattles were successful at creating a microclimate conducive for seedling germination on a site where germination would not otherwise occur.

Study Site

The study site was located in Brewster county, Texas on the 02 Ranch.
The site was selected as an area that had shown marked degradation since the 1940's. Historic aerial photos show no grass cover and an over 1200% increase in mesquite (*Prosopis gladulosa* var. *torreyana*) cover, with evidence of major soil loss. Adjacent sites have begun to recover but this site has shown no potential for natural recovery. The site lies within the variable source area of Hackberry Creek, Paradise Draw, and Terlingua Creek.

Figure 1. Location of the Paradise study site, 02 Ranch, Brewster county, Texas.

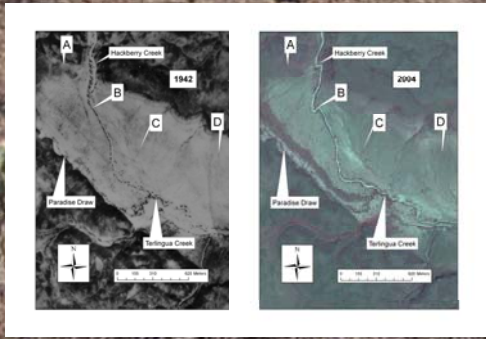

Figure 2. Comparison of aerial photos of the Paradise study site from 1942 and 2004. Note the differences at the features of interest labeled A-D.

Figure 5. Before and after photographs of the two wattle treatments. The first set of pictures was taken just after wattle installation in August 06 and the second set in August 07.

Methods

- Wattle Construction
  - Special ordered burlap tubular sacks 20 ft in length and 18 inches in diameter (Woolsacks Inc.)
  - Fabricated a grain auger with a hopper to accommodate a bobcat bucket
  - Loaded cotton burs into the hopper and the auger forced the burs into the burlap sack
- Wattle Placement
  - Two 20 acre sites were selected for the two treatments
  - Each line was marked to begin in 33m intervals down the slope and a laser level used to mark level lines across each site
  - The first treatment: wattles were laid along the contour lines and staked with 4 pine guard stakes on the down slope side of each wattle
  - Second treatment: a D-2 dozer was used to excavate a 20 cm trench along the contour lines and the wattles were laid in the trench
  - Two meter bands above each wattle line were harrowed and seeded with native grasses using an ATV and Truax seeder in June, 2006
- Sampling
  - Seven randomly selected points were used in each treatment area for soil moisture and erosion bridge measurements
  - Erosion bridges were installed for long term soil erosion monitoring
  - Every 2 weeks a soil sample was taken and soil moisture recorded
  - Vegetation was sampled using the point intercept method with the wattles as the transect lines
  - Vegetation width above the wattles was measured on random transects above the wattles on transects perpendicular to the wattle lines

Figure 3. A modified grain auger used for stuffing burlap sacks with cotton burs to create wattles.

Figure 4. Location of treatment areas, wattles, and sampling points.

Results

- The wattles have stayed in place over the course of one year, with biodegradation started
- Under flow and end flow has been limited to existing gullies, which should be treated differently than the uplands, as the wattles were not sufficient to slow water flow
- Soil moisture was significantly different in all three areas, with the highest being in the dozed treatment and decreasing in the staked treatment and the control
- Vegetation was significantly different in all three area as well, with the highest cover and band width in the staked treatment
- Perennial grasses were present in the two treatment areas but absent from the control, which was dominated by annuals mainly Russian thistle (*Salsola iberica*)

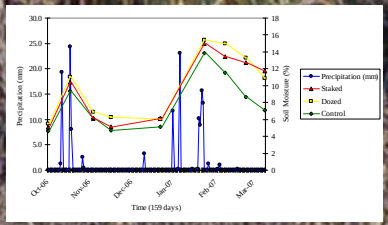

Figure 6. Soil moisture of the two treatments and the control area in response to precipitation.

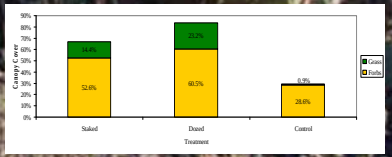

Figure 7. Percent canopy cover and percent grass and forbs of the two treatments and the control area.

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