Revegetation of Retired Farmland: Response of Fourwing Saltbush To Establishment Irrigation and Weeding

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Abstract

This is an experiment on seeding fourwing saltbush (Atriplex canescens) in 80-inch wide waterharvesting microcatchments on retired farmland west of Tucson. At 32 months after planting, plots that received the establishment irrigation had more cover than unirrigated plots. Keeping plots free of competing weeds also gave some advantage. However, the coefficient of variation was very high, and none of these differences was statistically significant.

Introduction

Fourwing saltbush (Atriplex canescens) is a native perennial shrub that is widely adapted in Arizona. It is a useful forage plant for cattle, and provides cover, seed, and forage for wildlife. However, it usually does not establish itself on retired farmland until 20 - 40 years after farming ceases (4).

Microcatchment waterharvesting is the technique of moving small amounts of soil to direct rainwater from a contributing area to a catchment area. This technique has been used to increase the productivity of saltbush in the Negev Desert of Israel (6), and to establish saltbush in a test near Red Rock, Arizona on the west side of Interstate 10 (9).

The objective of this experiment is to identify reliable and inexpensive methods of establishing saltbush on farmland before the land is retired.

Materials And Methods

The experiment is at the Three Points Test Area, which is a farm that was purchased by the City of Tucson and retired for a water transfer. The Gila silty clay loam was farmed for the last time in 1985.

All of the plots are in 80-inch wide waterharvesting microcatchments. I made the microcatchments with a pair of road grader blades welded together in a "V" form. These 80-inch wide "V" shaped furrows are only 4-inches deep in the center of the "V". The catchments are oriented to the land slope to maintain a dead-level grade in along the length of these broad furrows, and are parallel to the old farm furrows.

I planted the saltbush on November 13, 1987, with John Deere 71 Flexi-Planters mounted behind each "V" blade, with one seed line near the bottom of each "V". With the planters geared to their lowest possible rates and H-1300-B seed plates, the seeding rate was 3.6 pounds per acre of de-winged seed. The planting depth was about 1/4-inch (3,7).

The plots are randomized complete blocks, with the irrigation treatment as the main plot and the weeding treatment as sub-plots. There are four replications.

I applied one establishment irrigation immediately after planting, filling the microcatchments about half full. The unirrigated plots received rainfall only.

I kept the weeded subplots clean by hand-hoeing. For the first two years, tumbleweeds (Salsola kali) dominated the unweeded plots.

On July 11, 1988 (8) and again on July 25, 1990, I evaluated the percent of area covered by saltbush in the plots and the plant heights.

Results And Discussion

The results of the first plant cover evaluation are in the 1988 issue of Forage and Grain (8), and are presented again here for comparisons. There were some significant differences in that first evaluation.

In the 1990 evaluation, the irrigated and weeded treatments still had a numerical advantage over the unirrigated and unweeded treatments. However, the coefficient of variation turned out to be much higher than it was in 1988, and there were no statistically significant differences between any of the treatments. The plant cover in the irrigated/weeded plots varied from 1.3 to 45.0 percent, which contributed to the very high coefficient of variation.

Table 1. Response of fourwing saltbush plant cover to establishment irrigation and weeding.

Irrigated Treatment	Weeding Treatment	1988 Percent Cover	1990 Percent Cover
Irrigated	Weeded	9.17 a*	13.37 a*
Irrigated	Unweeded	1.18 b	3.24 a
Unirrigated	Weeded	0.70 b	0.77 a
Unirrigated	Unweeded	0.00 c	0.00 a
Coefficient of Variation		13.5%	243.31%

*Means followed by the same letter within a column are not significantly different at the 0.05 level.

In the 1988 evaluation, the differences in plant height paralleled the differences in plant cover (Table 2.). By 1990, the irrigated/weeded treatment did not have the significant advantage over the irrigated/unweeded and unirrigated/weeded treatments.

Table 2. Response of fourwing saltbush plant heights to establishment irrigation and weeding.

Irrigation Treatment	Weeding Treatment	1988 Plant height (inches)	1990 Plant height (inches)
Irrigated	Weeded	13 a*	29 a*
Irrigated	Unweeded	7 b	30 a
Unirrigated	Weeded	8 b	17 a
Unirrigated	Unweeded	0 c	0 b
Coefficient of Variation		43.5%	58.27%

*Means followed by the same letter within a column are not significantly different at the 0.05 level.

Conclusions

With the very high coefficient of variation in the 1990 cover evaluation, I cannot say with a 95% confidence level that establishment irrigation or weeding will significantly improve the success of a saltbush planting. However, the large numerical advantage remains, and establishment irrigations are recommended for revegetating surface mined areas in the desert (1,5).

There are other establishment techniques that I did not investigate in this experiment. Surface mulching with straw has proven beneficial in mine revegetation (1,5). A commercial contractor who revegetates construction sites and roadsides in Arizona points out that he achieves better than 90% success rates with seedbed tillage and straw mulching (2). Adding straw mulch is expensive, but perhaps the residue from the last crop on the farmland could be utilized as a mulch.

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Literature Citations

1. Cook, W.C., R.M. Hyde, and P.L. Sims. 1974. Revegetation Guidelines for Surface Mined Areas. Colorado State University Range Science Department, Science Series No. 16.

2. James, Richard D. 1990. Manager, Western Sere Arid Adapted Revegetation, P.O. Box 1062, Casa Grande, AZ 85222. Personal Communication.

3. Johnsen, Tom. 1987. Research Agronomist, USDA-ARS Aridland Watershed Management Research Unit, 2000 E. Allen Road, Tucson, AZ 85719. Personal Communication.

4. Karpiscak, M.M. 1980. Secondary Succession of Abandoned Field Vegetation in Southern Arizona. Doctoral Dissertation, University of Arizona Department of General Biology, Tucson, AZ 85721.

5. Scholl, David C. 1986. The Study of Soil Water in Mine Reclamation. In: Principles and Methods of Reclamation Science, Univ. of New Mexico Press, Albuquerque, N.M.

6. Shanan, L., N.H. Tadmor, M. Evenari, and P. Reiniger. 1970. Runoff Farming in the Desert. III. Microcatchments for Improvement of Desert Range. Agron J. 62:445-9.

7. Springfield, H.W. and D.G. Bell. 1967. Depth to Seed Fourwing Saltbush. J. Range Manage. 20:180-2.

8. Thacker, G. 1988. Revegetation of Retired Farmland: Response of Fourwing Saltbush To Establishment Irrigations and Weeding. In: Forage and Grain, A College of Agriculture Report. Series P-74, September 1988. The University of Arizona, Tucson, AZ 85721.

9. USDA-SCS. 1985. Vegetative Treatment of Abandoned Cropland in the Sonoran Desert to Reduce Soil Erosion. Technical Notes, Plant Materials No. 4. SCS Tucson Area Office, 3241 N. Romero Road, Tucson, AZ 85705.