Report for 2002AZ1B: THE IMPACTS OF UNGULATES ON VEGETATION ASSOCIATED WITH WATER CATCHMENTS

There are no reported publications resulting from this project.

Report Follows:

A. Problem and research objectives:

Land and wildlife managers in Arizona and California spend >$800,000/year designing, developing, and maintaining water catchments for wildlife. However, there has been very little research that has addressed how the catchments influence wildlife and their habitat. Recently, some individuals and organizations have challenged the value of water catchments and claimed that adding water into an area may have a negative influence on biotic and abiotic elements of the habitat for some species (Broyles 1995). Because water catchments are an important part of management and mitigation of wildlife throughout the Southwest (Rosenstock et al. 1999), state game agencies, federal agencies (i.e., U. S. Fish and Wildlife Service, U. S. Bureau of Land Management, Department of Defense), and nonprofit organizations (i.e., Defenders of Wildlife) want more information on the influences of water developments on wildlife and their habitats. Our objective was to determine how desert ungulates, primarily desert mule deer (*Odocoileus hemionus eremicus*), influenced vegetation in proximity to water catchments.

B. Methodology:

The study was conducted in the bajadas and flats around the eastern Chocolate Mountains, southeast California (33E N, 115E W). The climate was arid with summer temperatures > 45E C and low annual rainfall (70mm). Vegetation in the area was typical of the Lower Colorado River Valley Desert subdivision of the Sonoran Desert. Paloverde (*Cerciduim floridum*), ironwood (*Olneya tesota*), catclaw (*Acacia greggii*), mesquite (*Prosopis glandulosa*), and cheese bush (*Hymenoclea salsola*) were common in washes.

Seasons were spring (April, May, June), summer (July, August, September), autumn (October, November, December), and winter (January, February, March).

Other ungulates in the area were bighorn sheep (*Ovis canadensis*) and burros (*Equus asinus*). There were $29 water sources in the entire area, in addition to the Colorado River. The area is described in detail by Andrew et al. (1999).

To determine if desert ungulates were influencing the vegetation in proximity to water catchments, we compared forage abundance in washes immediately adjacent to 8 catchments and forage abundance in 8 washes $3 km to the nearest catchment (i.e., 16 wash sites in total). We selected washes so that each water catchment in a wash could be paired with a wash of similar size and in similar topography that did not contain a catchment. Catchments were from 1 to >40 years old. We selected catchment washes to reflect this range.

We established 1 transect at each of the 16 wash sites. Each transect was 3 km long and followed the edge vegetation of the wash leading down-wash. For the washes with catchments, the transects originated at the point on the wash nearest the catchment. At 500-m intervals, we established 20 plots (1 m x 1 m x 2 m). We placed 10 on each side of the wash, the first after a random starting point, and the rest every 20 m thereafter. For each transect there were 2 plots: 20 plots at 500 m, 20 at 1,000 m, 20 at 1,500 m, 20 at

2,000 m, 20 at 2,500 m, and 20 at 3,000 m. Each cluster of 20 plots allowed us to determine estimates of vegetation characteristics and variation in those characteristics at each 500-m interval from a catchment or its paired noncatchment wash interval.

For each plot, we determined percent plant species composition by the dry-weight-rank method (Mannetje and Haydock 1963), and plant biomass (green leaves and twigs) by a modification of the comparative yield method (Haydock and Shaw 1975). The amount of forage in each plot was visually assessed and assigned a rank from zero to 4. Zero represented a plot with no forage (either completely empty or with only inedible larger stems), 1 a plot 25% full of forage, 2 a plot 50% full of forage, 3 a plot 75% full of forage, and 4 a plot 100% full of forage. To determine biomass, we clipped several plots representing each rank. We used regression to determine a relationship between rank of the plot and biomass of forage it contains. We clipped 1 plot for every 20 plots we sampled (Haydock and Shaw 1975). Mazaika and Krausman (1991) determined that the dry-weight-rank technique was valid for desert systems. We conducted the biomass estimates every 3 months to determine seasonal changes in forage availability. We measured use along transects by deer and sheep by counting pellet groups in 2 x 20-m plots between each vegetation plot, along the edges of the sampled washes.

C. Principal Findings and Significance:

In general there were no consistent patterns in the amount of dry plant biomass in washes with or without catchments or with catchments built before or after 2000 (Figure 1). We could not determine that desert ungulates influenced the vegetation abundance. However, the catchments built before 2000 received more use by deer and sheep than all other classes in all years. These ungulates likely were familiar with catchments built before 2000 and either were not aware of recent developments (2001) or did not need to use them (Figure 2). There were more pellets found in washes with catchments that had established waters in all seasons at all intervals. Because biomass of vegetation was not significantly different along transects, it is likely desert ungulates used washes with water primarily for water, and any foraging was not influential enough to alter biomass (Figures 1, 2).

These data suggest at least 3 important findings. First, vegetation was not altered significantly from 500 to 3,000 m from water sources (Figure 1) by deer and sheep in our study area. Second, desert ungulates used washes with water more than washes without water. Third, established waters were used more than newly created water sources.

Literature Cited

Andrew, N. G., V. C. Bleich, and P. V. August. 1999. Habitat selection by mountain sheep in the Sonoran Desert: implications for conservation in the United States and Mexico. California Wildlife Conservation Bulletin 12.

Broyles, B. 1995. Desert wildlife water developments: questioning use in the Southwest. Wildlife Society Bulletin 23:663-675.

Haydock, K. P., and N. H. Shaw. 1975. The comparative yield method for estimating dry matter yield of pasture. Australian Journal of Experimental Agriculture and Animal Husbandry 15:663-670.

Mannetje, L. T, and K. P. Haydock. 1963. The dry-weight-rank method for botanical analysis of pasture. Journal of the British Grassland Society 18:268-275.

Mazaika, R., and P. R. Krausman. 1991. Use of dry-weight-rank multipliers for desert vegetation. Journal of Range Management 44:409-411.

Rosenstock, S. S., W. B. Ballard, and J. C. DeVos, Jr. 1999. Viewpoint: benefits and impacts of wildlife water developments. Journal of Range Management 52:302-311.