What's in an Exclosure?

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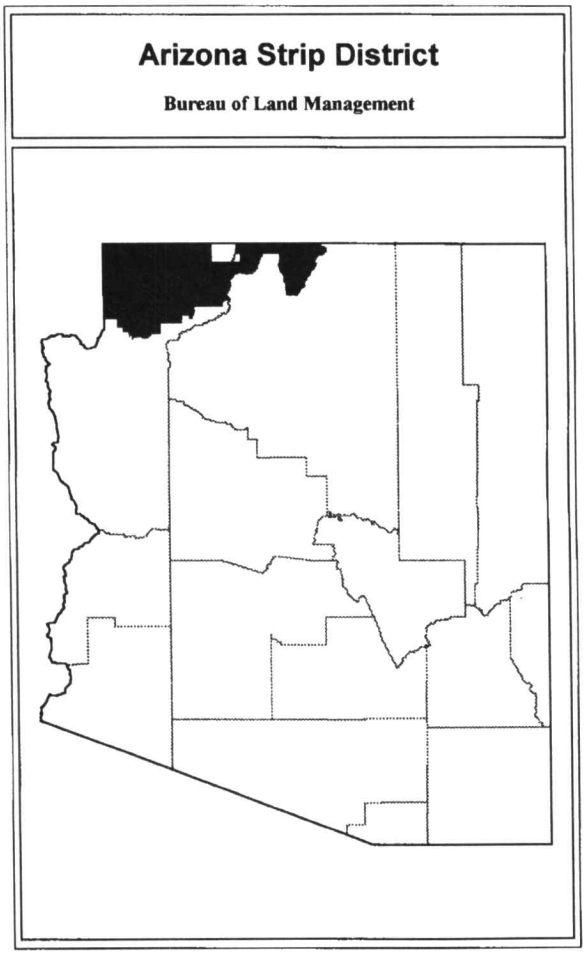
Exclosures, which exclude livestock grazing on small parcels of rangeland, are to range managers what controls or placebos are to scientists. So what does a manager ask when he ponders the data and views the exclosure? "Do I change grazing practices or leave them the same? Is there enough data and observations to justify that change?"

There is a school of thought that the size of most exclosures are too small to maintain a control environment. The small size (usually an acre) allows some species to disappear even though the supposed cause of mortality-livestock grazing is excluded. Newmark 1995, states that even national parks of several thousand acres have not prevented some species from going extinct as habitat is fragmented outside the park. This prevents migrations of rare species into the parks. A version of this phenomena was observed in Ide Valley on the Arizona Strip in northern Arizona (map). Non-native grasses (crested wheatgrass, etc) were seeded in the chained pinyon forests and an exclosure built to exclude an area of grass from livestock grazing. For some reason, possibly continuous spring grazing, the seeded grasses died out over a 5 to 10 year period. The exclosure grass, ungrazed, also died out (Unpublished Data Files 1965). A neighboring seeding, in an adjacent allotment, completed at about the same time is still producing crested wheatgrass under rest-rotation grazing (Hughes 1989). The small size of exclosures no doubt have their drawbacks for providing a complete picture of what grazing exclusion may mean for plant species frequencies or compositions. However, differences have been found in exclosures with species common both in and out of the exclosure (Hughes 1980, Hughes 1983, Chew 1982).



The author revisited and collected data at the above exclosures in the 1990s in the desert shrub/grassland and sagebrush plant communities. Differences, again, were found between the species frequencies inside and outside the exclosures.

Sites

The exclosures studied occur in the sagebrush and desert shrub/grassland plant communities of the Arizona Strip. Five of the exclosures are in the desert shrub/grassland community and 5 occur in the sagebrush community. The precipitation ranges, on an average, from 9 to 13 inches per year across the 2 plant communities. The elevation varied from 5,100 to 5,600 feet above sea level. Seven of the exclosures are 1 acre in size, 2 are a 1/2 acre and 1 is 100 acres in size. Six of the exclosures were built in the 1950s, 3 were built in the 1960s and 1 was built in 1985 (Table 1).

Plants were sampled using the pace frequency method (Ruyle 1991). Two hundred plots (quadrat) were transected inside and outside on the same soil type. The quadrat was 12- × 12-inches. The herbaceous and shrubby plants that were rooted in each quadrat were counted as an occurrence for the species. In the case of shrubs, the canopy was counted as an occurrence if it overhung the quadrat. The outside transects were 50 to 100 feet away from the exclosure fence, away from livestock concentration areas at the corner posts.

Results

The 5 desert shrub/grassland exclosures showed a few notable differences in species frequency between the inside of the exclosures and outside of the exclosure. The south Clayhole exclosure had a big difference in the

Table 1. Characteristics of the exclosures.

Name	Vegetation	Elevation	Precipitation	Size	Date Built
		(feet)	(inches)	(Ac)	
Larsen Bringhurst	Sagebrush	5400	11 to 13	1/2	1954
Cedar Knoll	Sagebrush	5400	11 to 13	1/2	1954
Wolfhole	Sagebrush	5300	11 to 13	1	1950
Big Sage	Sagebrush	5600	11 to 13	100	1985
Chamberlain-Pugh	Sagebrush	5400	11	1	1968
Sunset	Desert grassland	5000	10	1	1967
Antelope	Desert grassland	5100	11	1	1969
North Clayhole	Desert grassland	5300	11	1	1951
Middle Clayhole	Desert grassland	5100	9	1	1951

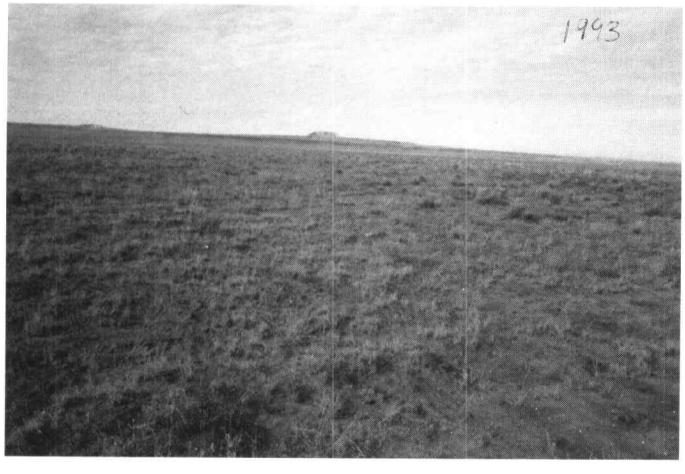
browse, (edible woody plants) winterfat and four wing saltbush. The saltbush showed a little difference, however, the winterfat occurred at much greater frequency inside the exclosure than outside the exclosure (Table 2). Shrubs (non-edible woody shrubs) occurred at a greater difference outside the middle Clayhole exclosure than inside. Warm season grasses (galleta and blue grama) occurred at a notably greater frequency inside the south and middle Clayhole exclosures than outside; however, the north Clayhole and Antelope exclosures had a greater occurrence of warm season grasses outside the exclosure than inside.

The sagebrush exclosures also had few species with frequency differences between the inside and outside of the exclosure. Shrubs occurred at a greater frequency outside the exclosure at the Chamberlain exclosure, but the Wolfhole and Big Sage exclosures had more inside. Cool season grasses (squirreltail and Indian rice grass) showed greater frequencies inside the Larsen and Cedar Knoll exclosures (Table 3).

Discussion

The exclosure data shows few differences in species frequencies between the inside and outside, with some exceptions. The large amount of sameness between the grazed and ungrazed areas indicate most grazing management plans are allowing forage plants the same opportunity to exist as the non-forage species. However, some of the exclosures show differences attributable to poorly managed grazing management.

The south Clayhole exclosure has a big difference in the winterfat and the warm season grasses between inside and outside the exclosure. The difference for both categories of species in and out of the exclosure. has persisted through the 1980s and 1990s (Unpublished Data 1995). The middle Clayhole exclosure has a difference in shrubs, in this case shadscale, with more shadscale occurring outside (40% outside to 21% inside) the exclosure. The Larsen and Cedar Knoll exclosures had notable differences between the cool season grasses, with greater amounts occurring inside the exclosures than out. The data shows the cool season grasses in Larsen were equal in frequency in and out of the exclosure in 1983, but a big difference through



South Clayhole exclosure outside the exclosure under grazing. Note the less frequent occurrence of winterfat outside under grazing.

Inside the exclosure. Note the greater frequency of winterfat.

Table 2. Species frequency of the desert shrub/grassland exclosures.

	South		Middle		North		Sunset		Antelope	
	In	Out	In	Out	In	Out	In	Out	In	Out
	93	93	91	91	91	91	93	93	93	93
Species	(%)									
Browse	23	13	1	0	20	17	9	3	7	2
Shrubs	4	10	24	41	8	16	29	35	11	5
Cool Season Grasses	8	2	0	1	0	0	2	11	0	0
Warm Season Grasses	56	41	96	79	102	132	86	74	50	77

In 91 is the species frequency inside an exclosure in year 1991. Out 91 is the species frequency outside an exclosure in 1991. South, North, and Middle are the Clayhole exclosures. Browse is woody vegetation eaten by livestock. Shrubs are woody vegetation not eaten by livestock. The grasses are perennial grasses in their categories.

Table 3. Species frequency of the sagebrush exclosures.

	Larsen		Cedar Knoll		Chamberlain		Big Sage		Wolfhole	
	In	Out	In	Out	In	Out	In	Out	In	Out
	95	95	95	95	95	95	95	95	95	95
Species	(%)									
Shrubs	68	70	61	67	44	67	64	49	59	29
Cool Season Grasses	66	49	28	12	34	32	1	0	16	15
Warm Season Grasses	29	20	0	0	0	0	2	4	67	65

In 91 is the species frequency inside an exclosure in year 1991. Out 91 is the species frequency outside an exclosure in 1991. South, North, and Middle are the Clayhole exclosures. Browse is woody vegetation eaten by livestock. Shrubs are woody vegetation not eaten by livestock. The grasses are perennial grasses in their categories.

the 1980s and 1990s of more cool seasons inside than outside the exclosure (Unpublished Data 1995).

The warm season grasses in most the desert shrub/grass exclosures are of high frequency and have ebbed up and down in frequency with corresponding moisture amounts through the 1980s and 1990s. Most exclosures had equal or close to equal amounts inside and outside of the exclosures except for those discussed above (Unpublished Data 1995).

Conclusion

The conclusion drawn from this overview of the 10 exclosures is that exclosures can be useful for a reference point in determining future grazing strategies. The exclosure data can be used to demonstrate when a grazing system is not adapted for a certain class of forage. Winterfat had a greater occurrence inside the south Clayhole exclosure in the 1980s and 1990s. The Shadscale occurred more frequently outside the middle Clayhole exclosure. Shadscale is a non-forage plant for cattle for most of the year and winterfat is a much desired forage plant. This indicates a need to change grazing management in those pastures. That was done in 1993 when the rancher and the BLM decided to move their cattle more frequently on lower utilization levels instead of by the calendar. The Cedar Knoll exclosure's persistent difference in cool season grasses still needs to be addressed.

Exclosures can be a useful tool in grazing management monitoring; and data can be obtained from them to make needed changes in grazing management. The exclosures can provide answers for long term trend of vegetation that would not be available from trend plots that are under the influence of grazing.

Literature Cited

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