MANAGEMENT NOTES

Changes on a Sagebrush-Grass Range in Nevada Ungrazed for 30 Years[1]

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Highlight

Thirty years rest enabled a 20-acre tract of eroded sagebrush-grass range in northern Nevada to increase its vegetal cover in all life forms. The cover of perennial forbs increased the most, 85%. Thurber needlegrass increased 7 fold. Only annual forbs and locoweed declined. Bluebunch wheatgrass was reestablishing naturally in favored spots. Newly cleared and seeded range outside the exclosure produced three times as much grass forage as produced after long rest without clearing.

Personnel of the Grazing Service and Forest Service selected a site for range improvement studies in a big sagebrush-Sandberg bluegrass (*Artemisia tridentata-Poa secunda*) type in Paradise Valley, Humboldt County, Nevada, in 1939. A 20-acre tract was fenced on federal land at 4,700 feet elevation below the boundary of the Humboldt National Forest. It lies in Section 34, T 42 N,R 39 E near the Singas Creek Road two miles west of its junction with Highway 8B. The enclosure was assigned to the Intermountain Forest and Range Experiment Station as a responsibility of the Santa Rosa substation.

Seeding trials in 1940–44 showed the possibility of establishing desert wheatgrass (*Agropyron desertorum*) and beardless bluebunch wheatgrass (*A. inerme*). These species yielded 133 lb./acre and 625 lb./acre, respectively, in their sixth year. Eleven others failed to establish and survive, thereby reflecting the harshness of the environment. Only one-fourth acre in a corner was disturbed by these plots.

The woven-wire fence remains sound but was not designed to exclude rabbits.

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Lying near Singas Creek, a permanent stream, this range has been grazed by cattle, sheep, and horses since ranching began in the 1860's. The Santa Rosa Mountains, towering immediately on the west, have provided the summer forage, while the ranches below have grown hay for about three months of winter feeding. Consequently, the foothill and valley ranges have supported the stock for 5–6 months in spring and autumn.

Two local range managers looked at the allotment that includes this exclosure in 1951 and wrote of it as follows:

> "There are many acres of sick land throughout the western states—lands in critical condition. The history of use of these ranges is similar to many other comparable regions throughout the West: early settlement, rapid development of livestock industry and influx of many nomad grazing herds. These nomad herds, lacking a base of operations stayed on the ranges as long as weather permitted. This use coupled with the grazing herds of the bona fide rancher and settler, together with game herds increasing under protection by law, rapidly damaged or denuded much of the grasslands area of Paradise Valley. The Paradise C & H allotment on the forest and the adjacent Paradise Unit on the Bureau of Land Management lands is one of those areas which had not responded to ordinary good management practices. Flash floods, soil and vegetation losses, decrease in perennial grasses and the spread of halogeton, sagebrush and other undesirable plants were still progressing. The range trend was still downward. These lands had been early denuded of palatable forage over the years and the grazing capacity was estimated to be 20 acres or more per AUM. Sagebrush and halogeton had invaded this area in considerable quantities." (Cloward and Fulwider, 1955).

An area lower on the slope than the Singas Creek exclosure but clothed by similar vegetation was classified as loam and placed in the Brown Great Soil Group. The hardpan was at 1½ to 2 feet. Rocks were fewer than within the exclosure. Other characteristics at 1–3″ depth were: as to texture—gravel 6%, sand 38.3%, silt 47.2%, clay 14.5%; as to reaction—pH 7.2; as to electrical conductivity 0.46×10^3. Organic matter was 0.96% and total nitrogen 0.11% in the surface 6 inches (Eckert et al., 1961). The soil of the exclosures is obviously well within the chemical and physical parameters known to be suitable for halogeton (*Halogeton glomeratus*) (Robocker, 1958) which was not observed in the Valley in 1939.

Measurements Made

Forty circular temporary plots were located along 5 transects. Plot area was 100 sq. ft. They were spaced at 100-ft intervals. One transect was exactly on the long axis, the other four paralleled the sides and ends at a distance of 100 ft.

Cover characteristics of these plots were recorded by the writer, using the square-foot density method of Stewart and Hutchings, 1936. The work was done on July 20–23, 1940.

Plots were relocated by measurement from original markers on the fence and cover was re-estimated by the same technician and method on July 23–24, 1970.

Range bordering the exclosure had been seeded to crested wheatgrass in 1968 by the Bureau of Land Management. It was nearly mature but as yet ungrazed. As a sidelight, a transect of fifteen 9.6 sq. ft. plots was clipped in the crested wheatgrass for comparison with a parallel set within the exclosure.

Table 1. Change between cover (%) estimates at Singas Creek Exclosure, Paradise Valley, Nevada 1940 and 1970.

Species	1940	1970	Change
Grasses			
Crested wheatgrass	0	0.002	—
Sandberg bluegrass	0.843	0.903	+ 7.7
Squirreltail	0.194	0.548	+ 182.3
Thurber needlegrass	0.050	0.413	+ 726.0
All perennial grasses	1.087	1.866	+ 71.7
Cheatgrass brome	0.215	0.297	+ 38.1
Forbs			
Locoweed	0.155	0.038	- 75.5
Woolly phlox	0.372	0.778	+ 109.1
Other perennial forbs	0.189	0.507	+ 168.2
Other annual forbs	0.336	0.006	- 98.2
Shrubs			
Big sagebrush	4.425	7.781	+ 75.8
Smooth horsebrush	0.078	0.128	+ 64.1
All shrubs	4.503	7.909	+ 75.6
Total vegetal cover	6.857	11.401	+ 66.3
Height sagebrush	25.0″	21.9″	- 12.4
No. sagebrush/100 ft²	—	9.4	
Surface			
% rock	1.55	1.08	- 30.3

Changes Observed

There had been a general increase of over 60% in vegetal cover. Only locoweed (*Astragalus arrectus*) and miscellaneous annual forbs decreased (Table 1).

Only three perennial grasses were present both years and they increased in basal cover by 72%. The annual cheatgrass brome (*Bromus tectorum*) increased 38%.

Thurber needlegrass (*Stipa thurberiana*) multi-

Table 2. Comparison of production by forage grasses on protected, brush-grass range and cleared, seeded range in lb./acre of air dry matter.

	Native range, 30 years protection	Reseeded
Perennial grasses	179	858
Annual grass	20	68
Total	199	926
% of seeded	22	100
% of protected	100	465

plied its basal area over seven times during the 30 years while squirreltail (*Sitanion hystrix*) nearly trebled. Sandberg bluegrass made little change.

Increase in perennial forbs as a group was also spectacular, 85%. Woolly phlox (*Phlox hoodii*) more than doubled its ground cover.

The two shrubs increased in canopy cover in about the same degree as the perennial grasses, 76%. At the same time the average height of sagebrush declined three inches.

Several species were present only as traces in the plots and are omitted from specific comparison in Table 1. They are wild onion (*Allium* sp.), sego lily (*Calochortus nuttallii*), thistle (*Cirsium* sp.), wild lettuce (*Lactuca* sp.) and foothill death camas (*Zygadenus paniculatus*). "Other perennial forbs" in Table 1 also include several natives so scarce in 1940 that they were not estimated by species. Though more abundant in 1970 they were again consolidated. This group includes false yarrow (*Chaenactis douglasii*), tapertip hawksbeard (*Crepis acuminata*), fleabane (*Erigeron concinnus*), desert parsley (*Lomatium* sp.), stony-ground lupine (*Lupinus saxosus*), and aster (*Macheranthera leucanthemifolia*). Density of sagebrush in 1970 was 9.4 plants per 100 sq. ft. Counts were not made in 1940.

Crested wheatgrass in one plot represented the volunteers from plots seeded in 1940. Halogeton, now abundant in the Valley, appeared in three plots much suppressed. Organic litter, including moss, not estimated in 1940, was estimated as 10.2% in 1970.

Exposed rock surface was diminished nearly one-third by the increase in organic cover. The exposed surface soil, inside but not outside of the exclosure, consisted of a vesicular crust which readily compressed underfoot.

Production by the new crested wheatgrass was conspicuously more than across the fence in the long-protected vegetation. Differences in dry matter yield as the average of 15 plots are presented in Table 2. The newly seeded range is producing over three times as much forage as that protected for a long period. The forage is also more accessible.

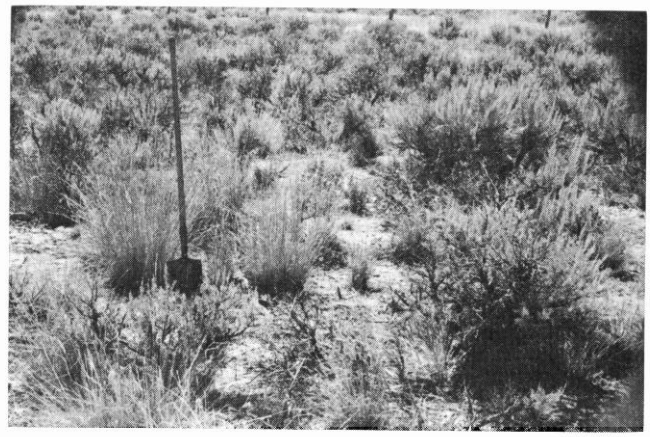

FIG. 1. These *Agropyron spicatum* plants appear to be in the vanguard of a returning population.

Discussion

Data obtained by the square-foot density method are supposedly more consistent when repeated by the same technician. However, in this instance, safeguards are lacking against changes in judgment that could occur over the 30-year interval. Care was used to follow the same technique.

It is probable that forbs and ephemerals were under-estimated in 1940 and 1970 because of their advanced phenology. July of both years was abnormally dry. However, May–June precipitation in 1970 was 4.24″ compared with 0.82″ in 1940. Probably the difference in vegetal cover was influenced thereby.

Concomitant increase in cheatgrass brome and decrease in exposed rocks may have resulted from much higher spring precipitation in 1970. Perennial species as well doubtless responded by increasing cover during the wet May and June of 1970.

The appearance of vigorous bunches of bearded bluebunch wheatgrass (*Agropyron spicatum*) in swales in 1970, though not shown in the plot data of Table 1, is believed to be a significant indicator of upward trend (Fig. 1). It suggests also that this excellent forage species was originally prominent on the site.

The increase in perennial forbs and decrease in annual forbs may reflect a continuing process of secondary succession in which the former balance among life forms is being restored since cessation of sheep grazing. Doubling in area of the mat-forming phlox is ecological salve for a sore soil.

Partial disappearance of rocks indicates a trend toward better surface protection.

Thurber needlegrass, and to a lesser degree, squirreltail, behaved as decreasers by increasing under protection. The concept of Sandberg bluegrass as an increaser was not shaken by its behaviour here.

Height reduction of 3 inches in sagebrush may result from demise of taller plants without replacement, or an increase in density with younger age classes present and suppressed by competition. The latter appeared to be the better explanation.

While the plot data indicate that forage cover on a depleted sagebrush range can be improved by long rest, obviously superior results can be obtained more quickly by the now familiar one-two punch, brush control and seeding. For best returns this should be followed by a well-planned yet flexible grazing system.

Literature Cited

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