R_XGrazing to Benefit Watershed-Wildlife-Livestock

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Livestock grazing is perceived by the general public as being detrimental to riparian areas, watersheds, and wildlife habitat. Contributing to this concept are various research and popular reports comparing no livestock grazing with excessive utilization. Since intermediate intensities of utilization were not mentioned, the public equates all livestock grazing with excessive utilization.

There are too many instances on both public and private lands where resources are being damaged under current livestock grazing. Others are not being improved at a satisfactory rate. The reasons are many. Resource management decisions often are made on the basis of maximizing short-term profits. Long-term and multiple-use benefits are not given due consideration.

Nevertheless, there are innumerable instances where resource management on both private and public lands is based on practical application of scientific principles and long-term multiple-use considerations. These examples show that livestock grazing need not be detrimental. Management can be designed to produce benefits to watersheds, wildlife, and livestock.

Two wildlife-oriented examples in Oregon are especially noteworthy. Longevity and quality of their programs have provided excellent bases for evaluating procedures and results. They are the Bridge Creek Wildlife Management Area in northeast Oregon, which has been monitored since 1965, and the Hart Mountain National Antelope Refuge in southeast Oregon, which has been monitored since 1979. Management emphasis of these projects is on wildlife habitat. Management techniques used on these projects also apply to livestock ranching enterprises. These projects, which represent both relatively moist and arid rangelands, demonstrate the types of bunchgrass rangelands that have responded favorably to the principles involved.

Key Ingredients

Management programs for these projects involve three key components:

—Diligent effort on the part of the resource manager to ensure project success starting with a carefully formulated plan of action, preferably a coordinated resource management plan, followed by efforts to refine and improve (Anderson and Baum 1987, 1988).

—Adherence to moderate utilization of key forage species and evaluation of utilization zones within grazing units (Anderson 1969, Anderson and Currier 1973).

—Application of basic grazing system principles, adjusted to fit the land and livestock operation, that benefit (1) the vegetation as top priority, (2) the long-term livestock operation so that incurred costs can be amortized, and (3) watershed, wildlife, fishery, and recreational values so these benefits may be evaluated along with livestock benefits.

Bridge Creek

This project is located at 45° north latitude at an elevation between 2,800 feet and 4,000 feet and receives about 16 to 18 inches precipitation, six inches during the growing season April through July. The vegetation is primarily a natural grassland interspersed with some timbered drainages, typical of lower elevations in the Blue Mountain ecological province of northeast Oregon.

In 1961 the Oregon Game Commission acquired approximately 8,000 acres of land that had been under submarginal ranching for about 80 years for big game winter range, primarily elk, which historically wintered on this area. In 1964 an ecological site and condition inventory was made and a plan of development and management formulated. In 1973 the area was increased to 13,187 acres to complete the project as originally planned. The management plan was upgraded to a coordinated resource management plan because of inter-related wildlife values on the adjacent Umatilla National Forest.

The grazing system for this project was designed to improve ecological status of plant communities and, more specifically, improve quality and quantity of forage for wintering elk. One permittee provides the livestock consisting of a herd of yearling steers and a herd of yearling heifers which are grazed separately. The Bridge Creek drainage, which bisects the project, was fenced out as a 900-acre riparian unit and reserved for wildlife. Existing interior fences were relocated to form six grazing units, three for the steer herd and three for the heifer herd. All interior fences are lay-down type which are laid down prior to winter so as not to impede elk movements, and erected each spring. Fences are erected each spring before the project is grazed by cattle and this job is completed in a few days.

Livestock are moved out of the grazed-first unit about mid-growing season, early enough to permit regrowth. This is the pre-conditioning treatment that increases nutritional quality of autumn/winter forage (Anderson and Scherzinger 1975, Evans 1986, Pitt 1986, Rhodes and Sharrow 1983). Annual observations of wintering elk have proved they prefer the regrowth on early-grazed units. The two grazed-second units are grazed from about mid-growing season until August when the yearlings are marketed. The two grazed-third units are not grazed by livestock but are deferred and reserved for wintering elk. The

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Fig. 1. *1988 vegetational cover on a portion of the Bridge Creek Wildlife Management Area in Oregon that was rated in POOR condition in 1964. Total vegetational cover was rated as being one-tenth that of potential for the site and Idaho fescue constituted only 2% of the total cover. In 1988 total vegetational cover was 50% which is about three-fourths that of potential and Idaho fescue was the dominant species. The area has been grazed by cattle under a planned grazing system two out of every three years since 1964 and by elk every winter.*

seasonal sequence of livestock grazing is rotated so that no unit is grazed during the same season two consecutive years. Each unit is deferred once every three years (Anderson 1967).

Monitoring consists of caged plots comparing ungrazed growth with grazed stubble. The amount of forage livestock removed by the end of the grazing period and the amount remaining for wintering elk is measured. Forage removed by elk by the time they migrate to higher ranges in the spring is measured as a basis for judging elk carrying capacity. Plots are relocated annually before livestock grazing begins. Zones of utilization are observed after livestock removal to determine grazing distribution patterns. Livestock utilization consistently has rated MODERATE and LIGHT, which leaves adequate quantity of standing stubble for plant and soil protection and forage for wintering elk.

Results on Vegetation

The 1964 range inventory, following three years of total rest from livestock grazing, showed about 17% of the project to be in POOR range condition class (early seral ecological condition), 40% FAIR, 40% GOOD, and 3% EXCELLENT. In 1988 the only areas still in POOR and FAIR were a few small areas where erosion had left only a shallow layer of subsoil. Recovery has been good even on badly depleted areas if a reasonable soil mantle remained. For example, in 1964 the most deteriorated and eroded plant communities were in the northwest portion of the project. At that time, Idaho fescue, which is the dominant species in the potential natural plant community (PNC) for the site, was rated at 2% of the total vegetational cover, and the total vegetational cover was rated as being one tenth that of PNC. In 1988 this same area had recovered to the point where it had 50% total vegetational cover, which is about three fourths that of PNC. Idaho fescue had increased to 40% of the total cover with young plants being abundant (Fig. 1). Estimated usable forage on this particular area had increased from about 75 pounds to 300 pounds per acre.

The permittee stated that they did not buy this property because it was so badly deteriorated. They thought it would take about 20 years of rest before it could be grazed. Except for the initial three years rest from livestock grazing, the area has been grazed by cattle during the growing season two out of every three years since 1965. Moderate utilization of key forage species, rotation of grazing seasons, periodic deferments, and shorter periods of grazing—instead of season-long grazing year after year—have produced these results. Meanwhile, elk have grazed the area every winter.

Results on Grazing Animals:

Table 1 summarizes results of the Bridge Creek management program on wild and domestic herbivores. The livestock grazing system began in 1965. Low wildlife counts in 1979, 1984, 1985, and 1986 are due to deep snow and severe cold weather which moved wintering wildlife to lower elevations off the project. Mule deer did not respond as did elk to this resource management because they primarily use steep canyon sites inaccessible to vehicles and virtually ungrazed by cattle. Deer counts followed regional trends in which population lows follow prolonged severe winters. Low elk counts in 1970 were largely due to harassment by snowmobilers for a few years before the project was closed to all vehicular traffic during winter months beginning in 1970. Elk numbers dropped in 1981 due to a heavy anterless harvest designed

Table 1. Grazing use by major herbivores 1960-1987 on the Bridge Creek Wildlife Management Area in north central Oregon. (conversion ratio is 1 cow or 1.7 yearlings or 2.5 elk or 5 deer equals 1 animal unit).

	Animal Unit Months			
Year	Mule Deer	Elk	Cattle	Total
1960	153	185	1,250	1,588
	Grazing System Initiated			
1965	297	771	340	1,408
1967	237	896	684	1,817
1970	48	399	943	1,390
1976	357	2,379	1,051	3,787
1977	313	2,262	1,000	3,575
1978	274	2,944	1,000	4,218
1979	113	367	1,050	1,530
1980	163	2,708	793	3,664
1981	166	1,162	880	2,208
1982	211	1,217	1,215	2,643
1983	230	1,280	1,380	2,890
1984	121	868	1,454	2,443
1985	71	800	1,463	2,334
1986	158	778	1,412	2,348
1987	188	1,743	1,225	3,156

to reduce the herd. While elk numbers were down it was necessary to increase cattle grazing to maintain succulent forage and prevent formation of over-mature, "wolfy" plants which elk reject in favor of succulent grazed plants. Otherwise, elk would have left Bridge Creek to winter on grazed private rangelands.

Cattle are a genuine tool for management of wildlife habitat on this project. During the 27 years of this project, production, in terms of animal unit months, essentially has been doubled and ecological status of the vegetation has been improved beyond expectation.

Hart Mountain

Hart Mountain is a 270,000 acre National Antelope Refuge which lies at 42° 30′ north latitude and varies from about 4,500 feet to over 8,000 feet in elevation. Crop year (September through June) precipitation varies from about 8 inches at lower elevations to about 16 to 18 inches on top of the mountain. Forty percent of precipitation occurs during the growing season April through June at lower elevations and May through July on the mountain. The vegetation consists of a variety of natural shrub-grassland plant communities on sites that typify the High Desert ecological province of southeast Oregon and northwest Nevada.

In 1968-69 an ecological site and condition inventory was made and a resource management and development plan formulated for the project. Grazing systems were adjusted in 1979 to incorporate improvements and to improve management of livestock grazing.

Extensive grazing is required on Hart Mountain because of the expanse and aridity of the area. The grazing systems are similar to that designed for the Bridge Creek project with vegetation the top priority, emphasis on improving wildlife habitat, and the seasonal sequence of grazing rotated among management units. Several permittees are involved and, although they basically operate cow-calf herds, their ranching enterprises differ markedly. Five separate grazing systems function on the project, each designed to conform to the land and resources of a particular portion of the refuge and to accommodate the ranching enterprise involved. Adjustments are made from time to time, as needed, but, in general, turn-in is about April 15 to May 1 into lower elevation units that were deferred the previous year. Higher elevation units are used for mid- and late-season grazing. No cattle are wintered on this refuge.

Monitoring consists of permanent plots representing all major ecological sites and management units. Photopoints and quantitative data are documented at intervals of about 5 years (Anderson 1988). Utilization patterns are observed annually within management units that were grazed during the growing season to provide a basis for management adjustments.

Results on Vegetation

The 1968 inventory of Hart Mountain refuge rated the unfenced, unmanaged northeast portion in POOR condition class. It was very deteriorated due to many years of season-long grazing. This is the most arid portion of the refuge. Its aridity is depicted by the perceived PNC for the Arid Loamy Terrace, a major site, which is dominated by Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, Indian and webber ricegrasses, and squirreltail.

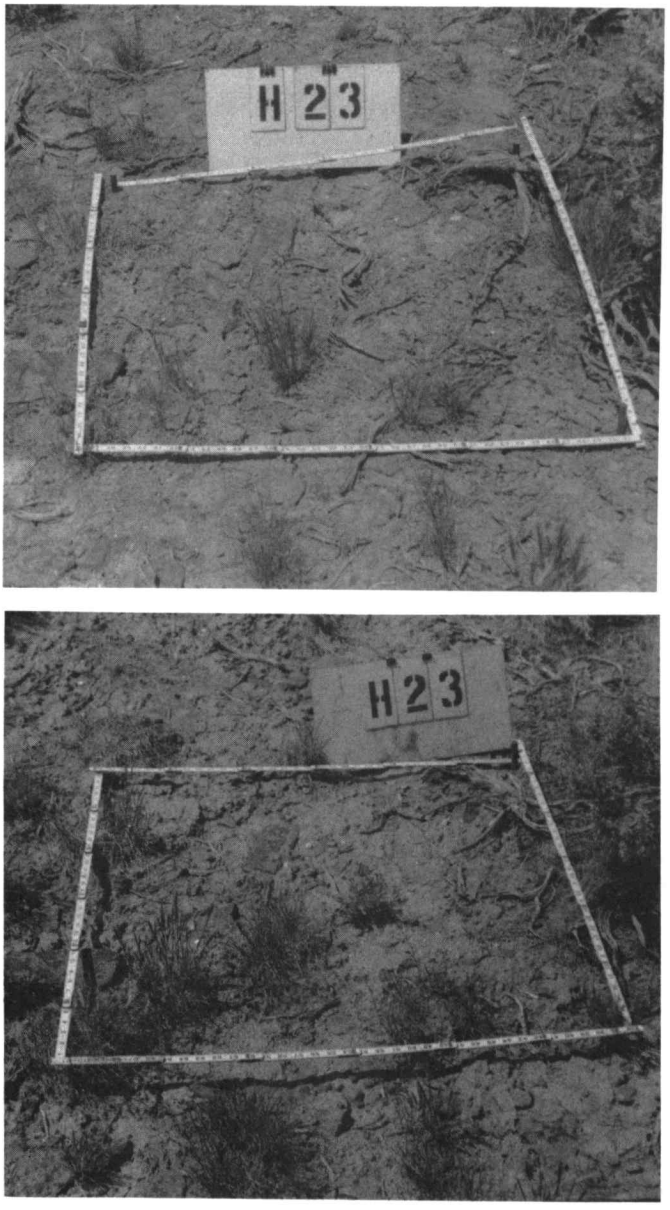

Fig. 2. *Photopoint plot for the Arid Loamy Terrace site in the northeast portion of Hart Mountain National Antelope Refuge in Oregon which receives about 8 inches precipitation. In 1979 this area was in very deteriorated ecological status (2A) when grazing was season-long. Subtle but significant vegetational responses (2B) occurred during eight years of monitored grazing.*

In 1979 this northeast portion was fenced and the area became the 19,000-acre East Rock Creek unit, one of four units that make up a grazing system. During eight years of monitored management there were five consecutive years of below-normal growing season precipitation and three years of above-normal growing season temperatures.

Table 2. Grazing use by major herbivores 1963-1987 on the Hart Mountain National Antelope Refuge in southeastern Oregon. (conversion ratio is 1 cow or 5 antelope or 0.8 horse equals 1 animal unit)

Year	Animal Unit Months			
	Antelope	Feral Horses	Cattle	Total
1963	761	435	11,544	12,740
		Management Plan Initiated		
1970	565	750	12,156	13,471
1971	337	1,050	14,010	15,397
1972	569	1,125	13,394	15,088
1973	860	1,800	12,500	15,210
1974	509	2,520	14,289	17,318
1975	545	2,550	13,617	16,712
1976	1,462	2,010	13,639	17,111
1977	1,058	2,190	10,577	13,825
1978	769	3,390	11,048	15,207
1979	871	4,245	10,958	16,074
		Grazing Systems Adjusted		
1980	1,280	4,815	11,452	17,547
1981	1,388	870	12,350	14,608
1982	1,103	1,095	12,615	14,813
1983	1,438	1,365	11,321	14,124
1984	1,258	1,710	10,574	13,542
1985	769	2,160	10,986	13,915
1986	783	2,700	9,928	13,411
1987	1,674	2,640	11,623	15,937

Such climatic deviations from numerical averages are typical for the High Desert province. Nevertheless, monitoring data for the Arid Loamy Terrace site in the East Rock Creek unit show that total canopy cover of perennial species increased from 35% in 1979 to 58% in 1987; perennial grasses increased from 7% to 12%; mosses/lichens increased from 7% to 25%; cover of perennial forbs, annuals and shrubs remained static. Litter cover increased from 10% to 15% primarily due to residues resulting from periods of rest and deferment and moderate utilization each year the unit was grazed. The number of perennial grass and forb species increased from 3 to 7 while shrub species remained static in the monitored plant community on this site (Fig. 2).

The East Rock Creek unit was grazed during the growing season in one of the 8 years; grazed after seed maturity (deferred) in 4 of the 8 years; and was not grazed (rested) in 3 of the 8 years of monitored management. This prescription was based on the priority need to increase plant vigor in the very deteriorated plant communities within the unit.

On the entire refuge the most significant vegetational changes during the years 1979-87 were the number of new perennial species in the floristic composition of major ecological sites. For example, the three low sagebrush sites, which are major antelope kidding and sage grouse habitats, added 36 new perennial species to the stand whereas, 18 species disappeared from the stand. The four big sagebrush sites added 36 perennial species and lost 31. The bitterbrush site, which is a major mule deer habitat, added 18 and lost 4 perennial species. The dry meadow site gained 6 and lost 3 species. Two minor-

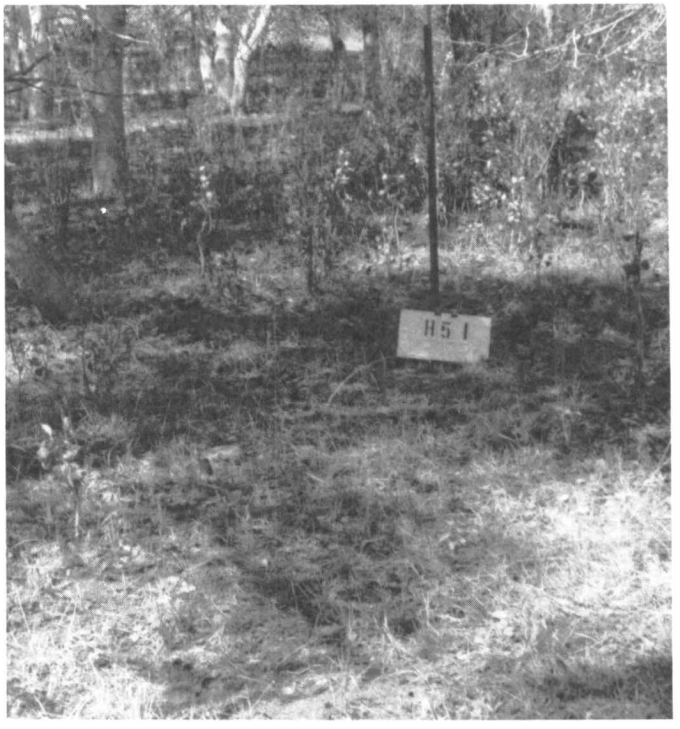

Fig. 3. *General aspect plot for the Aspen Grove site on Hart Mountain National Antelope Refuge in Oregon which receives run-on moisture from snowbanks. In 1979 this site was moderately deteriorated (3A) due to summer-long grazing. Dramatic changes in vegetational growth (3B) occurred on this moist site during eight years of monitored management in which the site was grazed in early summer one year and late summer the following year.*

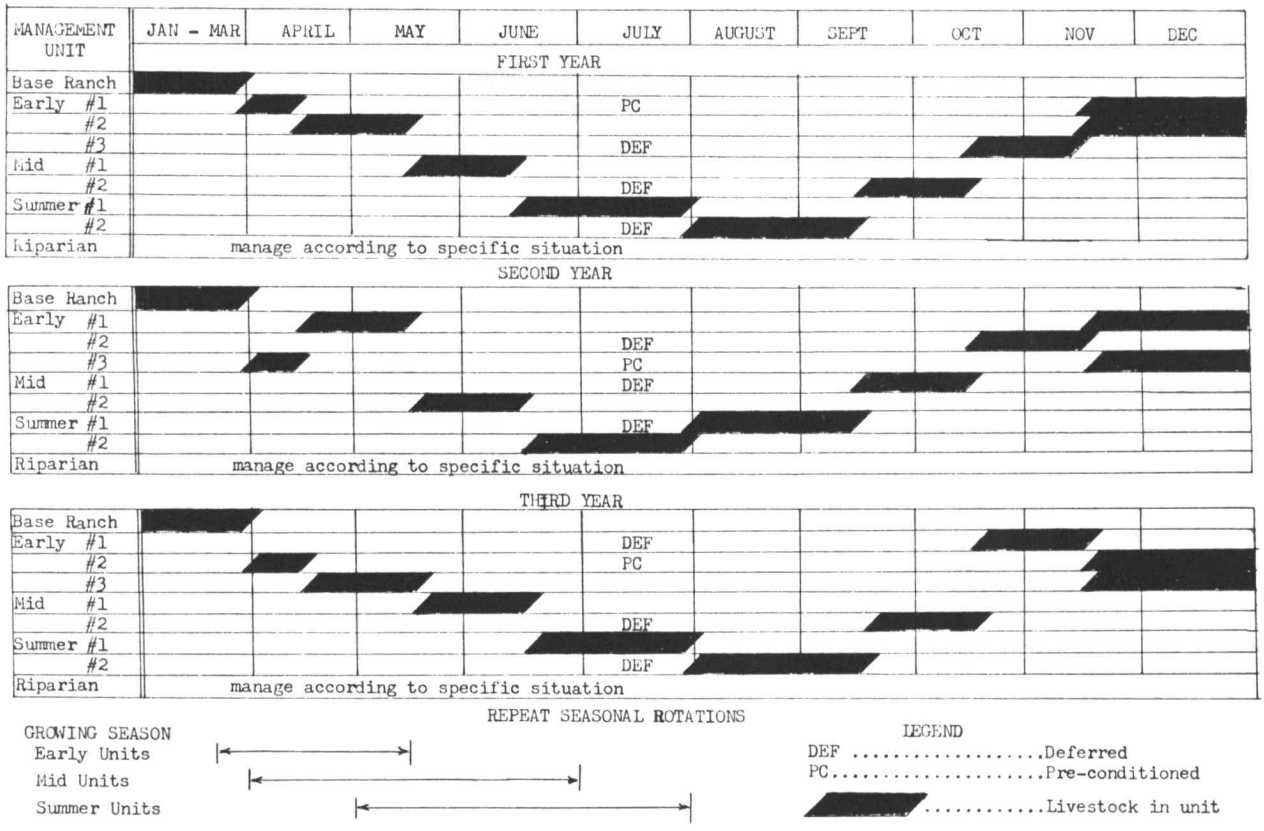

Fig. 4. *Basic grazing system used as a conceptual guide for helping design a resource management program for Pacific Northwest bunchgrass rangelands that equitably benefits the vegetation, soil and water; livestock operations; and wildlife habitat, recreation, fisheries, and similar downstream values.*

area sites that are dependent on snowbank melt or run-on moisture—Aspen Grove and Moist Bottomland Fan—lost more perennial species than gained, probably due to the prolonged below-normal precipitation and above-normal temperatures during the 8 years. Nevertheless, dramatic changes in vegetational growth occurred on these moist upland sites (Fig. 3).

Some of these floristic changes could reflect the fact that many herbaceous species are naturally cyclic in respect to their abundance from year to year and some disappear for a period of years. However, in this case where number of perennial species increased in spite of prolonged adverse weather, management can be credited for the change. A significant increase in the number of perennial species in the plant communities of major ecological sites creates a beneficial kind of vegetational diversity—within the site—that is often overlooked. Diversity is usually perceived as being mixed patches of trees, shrubs, and grasslands, which normally are different sites. Diversity of species within the plant community of a site is equally important.

Results on Grazing Animals

Table 2 summarizes results of the Hart Mountain refuge management program on wild, feral, and domestic herbivores. Mule deer population data could not be cited due to a change made in census procedures beginning in 1980 which prevents depicting long-term population trends. Annual antelope use, which averages 9 months on the refuge, responded with a 60% average increase during the 8 years of monitored management. Feral horse use, which is year-long on the refuge, was curtailed by periodically removing excess numbers above planned objectives. This was done in the winter of 1980 and again in 1988 when it was reduced to 315 AUMs. Cattle use was reduced by 100 head for one permittee in 1986 in order to protect an area burned by wildfire in 1985. Otherwise, adjustments in cattle use during the 8 years of monitored management have been voluntary by the permittees. Overall, total AUMs of grazing use on the refuge has remained relatively stable. This suggests that improved quality of forage for antelope may be related to the increase in antelope use after grazing systems were adjusted. Changes in quality of habitat, according to known criteria, is essentially the objective of resource management.

Antelope AUMs and horse/cattle AUMs are not comparable figures because of differences in their diets. However, as used here, they do show trends for each herbivore independently.

Basic Grazing System

Generally, a grazing system for bunchgrass rangelands should be designed to give top priority to growth and reproduction of the desirable vegetation. This includes

observing moderate utilization, range readiness, proper season of use, and rotation of deferments and/or rests among the management units over a period of years. Other priorities must be met:

—The system must be practical—fit the land and livestock operation.

—It must provide benefits to the livestock enterprise so that livetock-related costs incurred due to the system can be amortized.

—Watershed, soil, wildlife, fishery, and recreational values must be consciously taken into account and the degree of their benefits evaluated along with livestock benefits in justifying the system's costs.

—The system must involve a sufficient number of management units and short enough grazing periods so that controlled livestock concentration actually provides the tool for manipulating the vegetation. Merely having livestock out on the land is not enough. The degree to which grazing under a planned system can be intensified is limited by the capability of the resources and the managerial abilities, family objectives, preferred lifestyle, and mode of ranch operations of the rancher/operator. Each rancher is more or less different in these respects.

The basic grazing system used as a conceptual guide when developing actual systems for Bridge Creek and Hart Mountain is illustrated in Figure 4. Although this system represents an idealistic minimum, it serves as a pattern for incorporating several important principles into systems designed to fit actual field conditions.

A riparian management unit is depicted in the model grazing system as a reminder that special consideration should be given to managing riparian resources (Elmore and Beschta 1987; Swanson et al. 1987, 1988). Segregating riparian areas in special grazing units often provides the easiest and most effective management alternatives.

The model grazing system depicts three management units suitable for early-season grazing, two for mid-season, and two for summer-season grazing. Three or more early-season units provides flexibility in livestock management options in case early-forage production is delayed by cold weather. Only two mid- and two summer-season units are depicted because stability of growing conditions normally improves as the season advances.

Benefits derived from application of principles represented by this basic grazing system include:

Benefits to Vegetation-Water-Soil

—Seasonal grazing is based on stage of plant growth.

—Removing livestock about mid-growing season allows forage plants to produce regrowth which strengthens plant vigor.

—Early grazing utilizes annuals while they are nutritious and may reduce their competitiveness with later-maturing perennials.

—Grazing during the critical grass-flowering season occurs once in the rotation and not in successive years.

—Periodic deferment of each unit allows forage plants to complete their physiological cycle before being grazed by livestock, which strengthens plant vigor.

—Unfenced riparian areas respond favorably to variation in seasons of grazing and periodic deferments.

—Improvement of ecological status of the vegetation improves watershed quality and helps stabilize soil movement.

—Deferred grazing and moderate utilization results in accumulation of stubble and litter, which retains snow, reduces frost heaving, increases infiltration and reduces evaporation of water, reduces soil crusting, and provides the shaded micro-environment needed for establishment and survival of grass and forb seedlings.

Benefits to Livestock

—Grazing a turn-in unit that was deferred the previous year often can be earlier than normal because old-growth stubble supplements new spring growth.

—As vigor of forage species increases, spring growth is accelerated. This contributes to earlier range readiness, which helps reduce winter feeding.

—Livestock graze on green forage during the time they are moved from early to mid-season and then summer units. This allows optimum use of high nutritional forage values in a series of units which improves animal performance.

—All units in the operation are grazed by livestock at some season each year. This provides flexibility to adjust livestock movements throughout the entire operation according to variable weather and forage production.

—Regrowth formed after livestock are removed about mid-growing season has higher-then-normal nutritional value when it matures. Reserving this pre-conditioned forage for early winter grazing helps reduce winter feeding costs.

Benefits to Wildlife-Recreation-Fisheries

—Livestock graze only a portion of the grazing units at any given time. Units not being grazed provide areas of sanctuary for wildlife and ample opportunity for recreational activities that are thought to conflict with the presence of livestock.

—Moderate utilization by livestock leaves an abundance of forage remaining for wild herbivores.

—Succulent regrowth on individual plants grazed by livestock are preferred as forage by wild herbivores.

—Pre-conditioned and deferred forage in early-season units provides quality winter forage for wild herbivores.

—Rotating seasons of livestock grazing benefits forage shrubs. During the green-forage season, livestock concentrate mainly on herbaceous forage, leaving shrubs unbrowsed. Periodic late-season grazing of shrubs by livestock helps keep shrub growth within reach of wild and domestic herbivores and perpetuates subsequent growth of new twigs.

—Improved vegetational cover on watersheds benefits water quality, reduces peak/slack flow differentials, and prolongs flow in streams and springs. This benefits fisheries, wildlife, livestock, recreation, and similar downstream values.

CRMP

Achieving benefits cited herein can be enhanced through use of the coordinated resource management planning (CRMP) process. Various ownerships and types of resources are normally included within the seasonal management units. The inter-related benefits to vegetation, livestock, wildlife, watershed, fishery, and recreation warrant involvement of these various disciplines, including agencies, landowners, and resource users. The combined interests of the CRMP planning group in their periodic reviews of progress helps motivate resource managers to continuously strive to refine and improve. Experience has proved that it is beneficial to develop several contiguous coordinated plans. This enhances the overall benefits to wildlife and watersheds due to the large area involved.

Conclusion

Grazing management on both private and public lands in the Pacific Northwest involves wildlife habitat, watershed, and riparian qualities to some degree. In eastern Oregon, for example, about 50% of big game critical winter range and a large proportion of important riparian areas occur on private lands. This intricate resource management situation confronts range managers, users and owners with political, environmental, and ethical concerns. Valid questions that should be asked about existing grazing systems include:

—Are these systems on public lands sufficiently dovetailed with those on interdependent private lands so that both, in fact, are contributing to the improvement or maintenance of resource values and efficient ranching operations?

—Are concerns for wildlife habitat, fisheries, and recreational values consciously a part of the system's design or just incidental, if at all?

—Do opportunities exist for adjusting the system so as to benefit potential recreational activities that, on private lands, might help diversify and strengthen cash-flow income?

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International Grassland Congress Report

The 16th International Grassland Congress met in Nice, France, October 4-11, 1989, at the Acropolis. It was a marvelous place to hold a meeting with excellent facilities and many oral and poster presentations. Although the Society did not have a formal place on the program and we were not even an official sponsor, we did participate in an informal evening session facilitated by Bob Barnes, American Society of Agronomy Executive Vice-President and SRM member.

There were over 1,300 people registered at this congress. Some 121 or more full members were from the United States with an additional 42 associate members or a total of at least 163 persons. At the evening meeting I had an opportunity to discuss the Society for Range Management with the group and I introduced Pete Jackson, Rex Cleary, Stan Tixier, and their spouses. We were probably the only Society there with a full executive committee and I was extremely proud of SRM. I related the efforts of the International Affairs Committee in making direct and personal contact with people in at least 47 countries. I believe we have a model for other societies to use if they truly want to work worldwide.

I hesitate to use quantification to indicate participation in the Congress, but my reckoning shows at least 22 SRM members presenting oral papers, another 10 presenting posters, and at least 7 directly participating in the "Landscape Ecology in Mediterranean Ecosystems" all-day workshop, October 7. In addition, there were several more of us there who did not give papers. I believe this shows that SRM and the profession is making a real and successful effort to communicate within the broader context of international resource management.—**Tom Bedell,** SRM President, 1989.