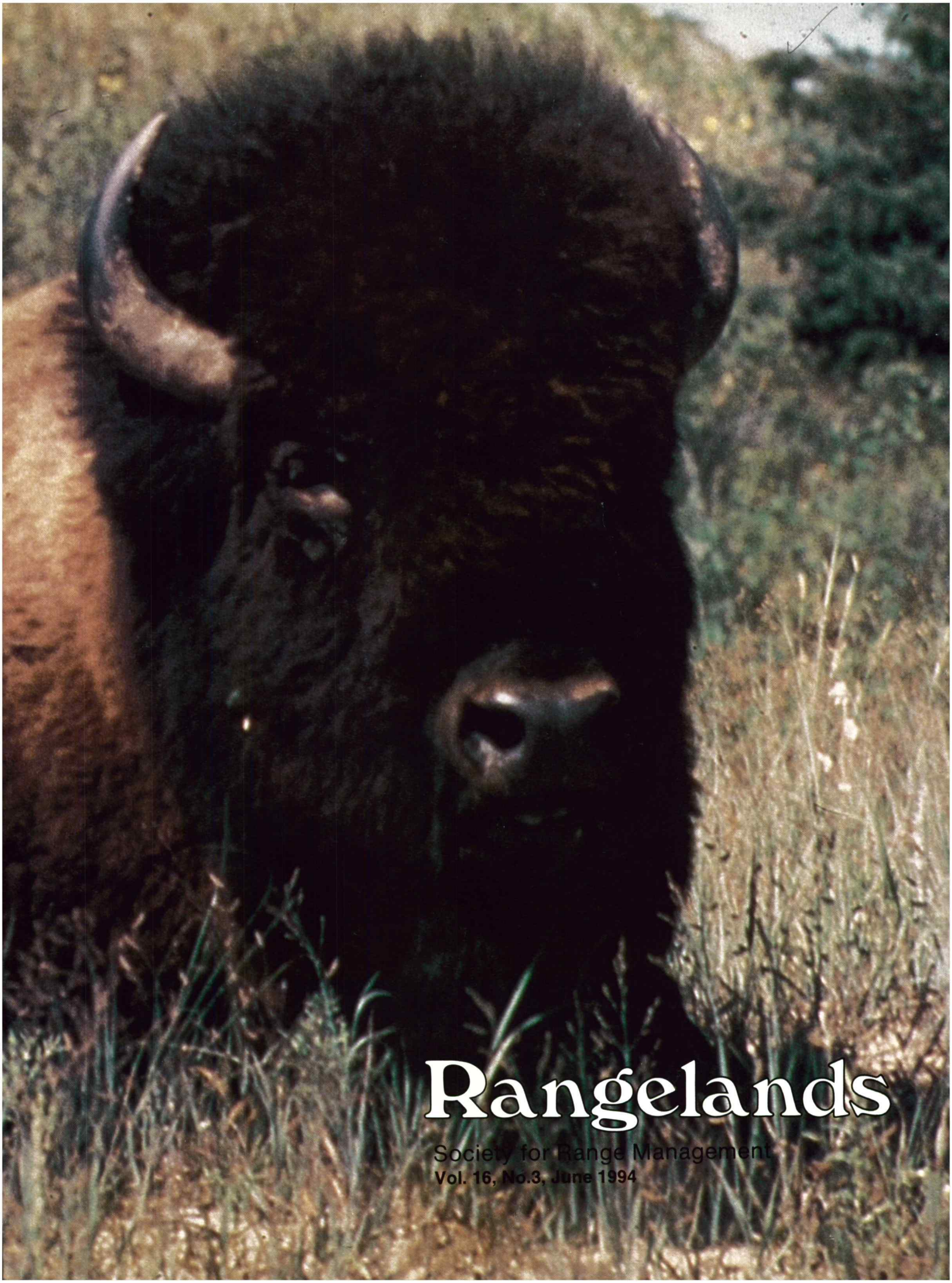

Rangelands

Society for Range Management
Vol. 16, No.3, June 1994

Rangelands

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FEATURE ARTICLES

DEPARTMENTS

Cover Photo: Bison at the Niobrara Valley Preserve, located in North Central Nebraska.See related article on page 107. Photo by Carolyn Greigel.

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The objectives for which the corporation is established are:

—to properly take care of the basic rangeland resources of soil, plants and water;

—to develop an understanding of range ecosystems and of the principles applicable to the management of range resources;

—to assist all who work with range resources to keep abreast of new findings and techniques in the science and art of range management;

—to improve the effectiveness of range management to obtain from range resources the products and values necessary for man's welfare;

—to create a public appreciation of the economic and social benefits to be obtained from the range environment;

—to promote professional development of its members.

Membership in the Society for Range Management is open to anyone engaged in or interested in any aspect of the study, management, or use of rangelands. Please contact the Executive Vice-President for details.

Rangelands serves as a forum for the presentation and discussion of facts, ideas, and philosophies pertaining to the study, management, and use of rangelands and their several resources. Accordingly, all material published herein is signed and reflects the individual views of the authors and is not necessarily an official position of the Society. Manuscripts from any source—nonmembers as well as members—are welcome and will be given every consideration by the editors. ***Rangelands*** is the nontechnical counterpart of the ***Journal of Range Management;*** therefore, manuscripts and news items submitted for publication in ***Rangelands*** should be in nontechnical nature and germane to the broad field of range management. Editorial comment by an individual is also welcome and, subject to acceptance by the editor, will be published as a "Viewpoint."

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Executive Vice-President's Report

The Mission Statement of the Society for Range Management is "to promote and enhance the stewardship of rangelands to meet human needs, based on science and sound policy." A fair number of SRM members spent a lot of time developing the statement, so I have to believe that is as close to the mission of the Society as we can come right now. Personally, I am comfortable with the statement and believe that it projects the concept of what we are all about. What is not so clear is the role of SRM in achieving that mission.

The Society cannot implement its stewardship ethic directly because it does not manage any rangeland. It cannot, by edict, require management of rangelands to be based on science. And while the Society spends considerable time and energy developing position and policy statements, it has no direct means to implement them; perhaps their greatest utility is in serving as a vehicle for testing and evaluating the values of its members.

The only means that I see for the SRM to achieve this mission is through education. Education programs that will convince "others" that SRM's values and technologies are morally and environmentally correct and economically rewarding and to do so in such a way that they will be eager and willingly to adopt these values and technologies. Range management must be capable of producing a kind of truth which, as the saying goes, can never be told in such a way as to be understood without being believed. I have referred to educating 'others' because I presume SRM members are already true believers. If this is correct than what 'others' are we talking about?

A basic requirement in the delivery of any message or program is to identify the audience. The *Journal of Range Management* is written largely by scientists to explain the results of original research to develop new knowledge or technologies. Regardless of the *Journal's* high reputation, few outside the scientific community will find the *JRM* entertaining, leisure reading. *Rangelands* is derived largely from volunteer papers submitted by members and reflects their backgrounds and experiences. The content of *Rangelands* is much easier to read and, because of this, most probably find it more enjoyable to read. How many people other than SRM members read *Rangelands*? The answer is, of course, unknowable; but I can tell you there are less than a dozen nonmembers who have taken advantage of the special program to subscribe to *Rangelands*. I submit that most of the educational programs that SRM delivers is for the consumption of its members. Now, there is nothing wrong with this as long as it is understood, and as long as it is in line with member's expectations.

The evidence suggests that SRM has done a good job of communication among its members. The *Journals* are widely used among segments of the Society and the reputation of both journals continues to improve. Also, membership has been very stable for over a decade. Herein lies the heart of the dilemma: does SRM continue to use *Rangelands* to communicate among its members or do we use *Rangelands* to reach "others" with the SRM message. If the latter is true, do we do so by continuing to advocate the same format (for which there appears to be little demand outside SRM); or do we alter the contents to attempt to create more demand among some specified, targeted audience, and perhaps risk alienating some current members in doing so.

An ad hoc task group chaired by 1st Vice President, Fred Bryant, was appointed last year to look at ways of improving the financial position of *Rangelands* (reducing cost or increasing income). One of the recommendations coming from this task group was to "develop a new, bold marketing strategy. Such a strategy could include a merger with other publications such as *Range* or to create a forum for bringing together the agricultural and environmental community" (there were other important recommendations that I don't want to slight, but they were more traditional and many are in the process of being implemented). This is a rather radical departure in thinking and will require considerable discussion among a much broader spectrum of the membership before it is implemented. It will also require identification of the specific target audience (of "others") and get specific about how to best reach this audience. We all too frequently determine the message before identifying the audience.

This recommendation forces us to look outside ourselves (to contemplate preaching to someone other than the choir). If we are really serious about SRM's mission then we must do this. Samual Lamb wrote (*Rangemans Journal,* Vol. 1 (1): page 5, 1974) "Thus if we are to be successful in any attempt to sell the idea of good range management, we must get our material into the homes of the people living, playing and working on the range. This requires that we put readable material in the hands of people through media readily available to them". The challenge is the same today, only the magnitude has increased.

How to accomplish this is still a matter for debate. It could be done through an entirely new publication, or perhaps we need to think about a new institution whose total efforts are on rangeland education. But I sincerely believe that if a different road is not traveled, The Society for Range Management will have to drive a stake in the ground to measure any progress toward achieving its mission.—**Bud Rumburg,** EVP, SRM

The Diamond Bar
The Real Story

Jed Elrod

As the preservationist movement progresses in the United States, fewer and fewer of this country's population have hands-on contact or experience with production agriculture. Because of this inexperience, many individuals and groups are "adopting" federal lands ranching allotments in an attempt to reacquaint themselves with rural experiences in much the same manner a suburban organization adopts a highway median. These individuals and groups are attempting to involve themselves and their agendas into the decision making process and the day-to-day management of federal land ranching operations. Many city dwellers have little rural experience, minimal natural resource knowledge, and a lack of appreciation for an area's custom and culture to make sound long-range economic and resource-oriented decisions for an agricultural producer. Ironically, those who adopt these allotments can maintain the easy life by returning to town and all its creature comforts while ranchers must remain to care for the land and livestock.

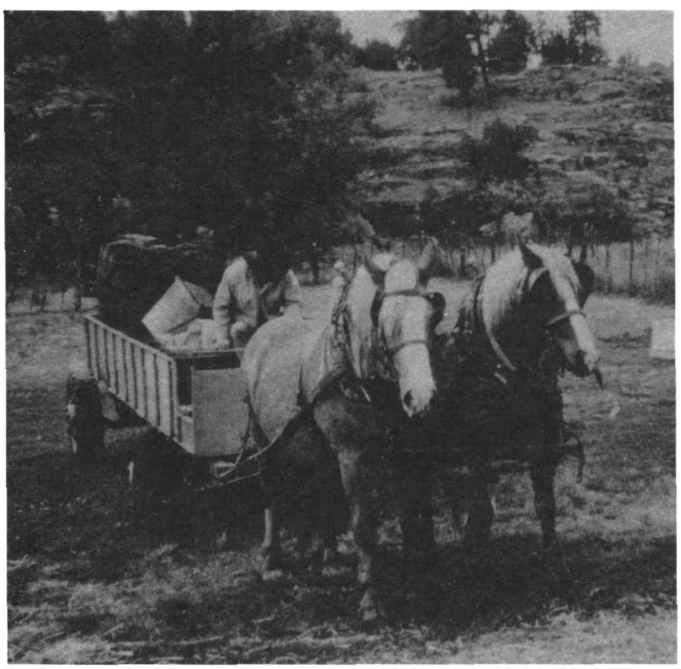
The impacts of not having ranchers' daily stewardship efforts and their presence on the 16 western federal lands states would have far-reaching effects. Because rural and urban economies are connected, the absence of ranchers on federal land will affect major population centers such as Albuquerque, New Mexico, or Denver, Colorado. Now, to paraphrase Paul Harvey, here is, "The Real Story."

The New Mexico Section Society for Range Management selected four quadrant nominees to be recipients of its prestigious Excellence in Grazing Management awards. Kit and Sherry Laney received one of the awards as recognition from this professional range management organization.

The Laneys are fourth-generation ranchers and co-owners of the Diamond Bar Cattle Company, located in the Gila National Forest, along the Continental Divide of southwestern New Mexico. The Diamond Bar Cattle Company is located north of Mimbres, New Mexico, and is the largest U.S. Forest Service grazing allotment (in the state) at 144,578 acres. This allotment is located entirely in the Gila National Forest. Eighty-five percent of the Laneys' ranching operation falls into two separate wilderness areas: the Gila Wilderness, which was the nation's first designated wilderness, and the Aldo Leopold Wilderness, named after the man who is recognized as the "Father of Game Management" and who initiated the concept of a societal land ethic for conservation.

The Laneys are management partners of the Diamond Bar Cattle Company who, because of wilderness designations, compete in today's modern high-tech world of computer programs, modems, and forward contract futures using 1800s methods. Special restrictions, resulting from wilderness designations, limit conventionally accepted management practices. More importantly, however, these restrictions preclude the use of *any* motorized mechanial device in wilderness areas except when specifically authorized by the U.S. Forest Service.

Many people of today's generation have no agricultural background and think of Larry McMurtry's epic film, "Lonesome Dove," when they envision ranching. In much the same way as the film, the Laneys spend long days in the saddle in rough, remote country gathering strays and moving cattle, with only occasional help. Many hours are



Kit Laney prepares to haul fencing and water supplies to a job site in the Gila Wilderness with his big team.

Author is Wildlife & Range Resource Specialist, New Mexico Dept. of Agric., Las Cruces, New Mexico.

Editor's Note: A success story for all.

spent packing fencing supplies into otherwise inaccessible areas with mules and pack horses. Salt is hauled to their cattle in wagons with draft horses. They also have to contend with a myriad of other problems unknown to their predecessors and current day counterparts. These issues include: mitigation measures to protect threatened or endangered species, protection and enhancement of riparian areas, the burgeoning population of elk that compete for forage with cattle and trample fences, watershed conditions including the Clean Water Act, and other resource considerations including dealing with environment organizations' concerns.

The Diamond Bar Allotment was first permitted for grazing by the U.S. Forest Service in 1908 and reached a peak of 2,300 animal units year-long in 1924. Through a series of transfers of permit holders, the Laneys acquired the Diamond Bar Allotment from the Federal Intermediate Credit Bank of Houston (Texas) who held the lien on the permit, real property, and chattels late in 1985. Most resources and improvements were in a state of disrepair. Previous permittees of the Diamond Bar Allotment met with limited ranching success overall. Subsequent to designation of these two wilderness areas, most fence and right-of-way construction on the Diamond Bar Allotment has been accomplished without benefit of motorized tools or equipment. Data supplied by the U.S. Forest Service from 1979 to 1992 indicate preferred grazing plants increased by 29 percent, while bare soil decreased 7 percent, largely due to the Laney's management and their commitment to the land, livestock, and lifestye. U.S. Forest Service data during this same 13 year period indicate 81 percent of the vegetation transects are in an upward or static trend.

The Laneys ride and work in country ranging from 6,000 feet elevation along the East Fork of the Gila River to 10,000 feet at Diamond Peak on the crest of the Black Range of the Gila National Forest. Precipitation varies from an average annual of less than 15 inches in the lower elevations to more than 25 inches at the higher altitudes. They contend seasonally with temperature extremes of -20° to near 100° F. Deep snow, steep trails, and frigid temperatures offer challenges not often met by non-wilderness ranchers when caring for livestock.

Heavy calves in adequate numbers are what make ranchers money. The Laneys have increased weaning weights from 400 pounds to almost 500 pounds per calf after trailing their weanlings 15 miles to a shipping point at Beaverhead, New Mexico. They have increased their calf crop from 50 percent to over 70 percent in six and one-half years, with a future goal of a consistent 80 percent.

A wildland forest fire, known as the Divide Fire, occurred in 1989 along the Upper Diamond Creek drainage of the Diamond Bar Allotment and was followed by heavy rains. The subsequent ash and sediment load deposited in the creek system by these rains caused almost all the federally endangered Gila trout to die. The surviving trout were rescued and placed in a captive breeding program. Dr. Karl Wood, a New Mexico State University professor specializing in watershed management, has indicated the damaged Upper Diamond Creek has sufficiently recovered to reintroduce captive propagated Gila trout into historic habitat. Dr. Wood feels this watershed recovery was accomplished largely due to many days of persistent hard riding by the Laneys to keep cattle off the succulent regrowth and their deep commitment to the resource.

According to the most recent U.S. Forest Service range analysis, 98 percent of the grazeable acreage within this ranching allotment is in fair or better range forage condition. In April 1993, Gila National Forest, Mimbres District Ranger, Gerald Engel observed, "A major improvement has taken place in riparian condition."

The Laneys consistently reduce per capita consumption of nonrenewable fossil fuels and electricity by using horses, mules, and teams as their main source of daily transportation on the ranch. They make as much as of their personal needs—meat, butter, cheese, clothes, leather goods, and equipment—as possible. Motorized vehicular travel is limited to a trip to town about once every six weeks for staple food items and hardware supplies.

> "Due to the nature of managing a wilderness ranch allotment, our annual expenditure for horseshoes and nails has frequently exceeded what we spend on fossil fuels (gasoline, propane, kerosene, and oil)," Kit Laney observed.

Kit and Sherry Laney currently serve as president and secretary, respectively, of the Gila Permittees Association and are active in several other producer organizations in the area.

The Laneys' livestock operation positively affects the overall public perception of the livestock industry by providing a link to the past through wilderness ranching as well as a window to view the future from a historical perspective. They are demonstrating that proper resource stewardship can be a worthwhile and profitable endeavor for individuals, while protecting and promoting natural renewable resources for the public.

The Laneys have steadfastly and tenaciously remained open-minded to suggestions from federal and state agency personnel and other interest groups, while demonstrating a responsible resource stewardship ethic toward a otherwise little-used area of the nation. They have improved an area which has been historically abused and misused, and are contributing to the stabilization of local economies and the states's infrastructure while maintaining the wilderness integrity. By applying a strong work ethic to a sound stewardship and conservation program, the Laneys are exemplary in their efforts of how the American agricultural industry feeds and clothes much of the world.

Pricklypear Management in South Texas

C. Wayne Hanselka and Lawrence L. Falconer

Pricklypear (*Opuntia* sp.) occurs on over 25 million acres of rangeland in Texas. Weather and soil type are two major factors controlling cactus populations but grazing, insects, fire and physical disturbance also influence abundance. South Texas stands have increased from 100%–300% after mechanical brush control such as rootplowing, chaining, and discing, These treatments scatter the cladophylls (pads) on disturbed soils and a high percentage take root and develop into new plants.

Negative attitudes toward pricklypear exist among ranchmen because dense stands interfere with livestock handling and movement and forage utilization. The cactus plants also compete with desirable grasses and shrubs. Livestock may become habitual consumers of pricklypear ('pear-eaters'). The pricklypear spines can cause bacterial infections in mouths and the gastrointestinal tract and seeds may cause rumen impaction in sheep.

Conversely, wildlife and emergency livestock feed value of pricklypear are the reasons why over 60% of South Texas ranchers believe the plant enhances ranch productivity. Pricklypear is important to white-tailed deer, javalina, and other wildlife species and provides bobwhite quail screening cover.

Vegetation management decisions must be based upon livestock and wildlife needs. A rational management plan, based upon goals and objectivies, must consider pricklypear's net value, including costs of pear-related livestock health problems, impacts of pricklypear on herbaceous forage production and utilization, costs/benefits of preparation and feeding of pricklypear to livestock, and costs and effectiveness of available options for control.

Pricklypear Management

The primary reasons for including pricklypear in a forage program have been to diversify the forage base and to provide a drought reserve and supplemental forage system for beef cattle and wildlife enterprises. This serves to level forage supply fluctuations caused by weather events and lowers grazing risks.

Authors are Range Specialist and Economist/Management, respectively, with the Texas Agricultural Extension Service, Route 2, Box 589, Corpus Christi, 78406-9704. The efforts of Sylvia Garza and Mary Ann Ybarra in typing the manuscript and the cooperation of Alvin Streidel, ranch manager, Lundel's Inc.; Tiller Helicopter Service, Alice Texas; and DowElanco is appreciated. Jim Mutz, Jessie Howell, Bill Maltsberger, Charles DeYoung, and Fred Guthery provided valuable input into this discussion and their cooperation is also appreciated.

Beef cattle carrying capacities are usually estimated on the grass forage component (26 lb of dried forage/A.U./day) whereas pricklypear as a supplement or emergency feed is calculated at 112 lb/A.U./day (22 lb dry matter and 90 lb water). White-tailed deer require 1,200 lb of browse annually (Nelle 1984). If 21% of the diet is cactus (Arnold and Drawe 1979) an additional 270 lb of pricklypear/deer/year will be necessary.

Since a cow can consume 10% or more of her body weight in cactus per day, she needs 20–25 lb of dry matter in her daily diet. Consuming 112 lb (fresh weight of pricklypear) daily will provide for these needs. Rangeland supporting 25 tons of pricklypear per acre will provide for the needs of one cow for one year. This includes the factor that only 66% of a pricklypear plant should be browsed during the year and that a three-year recovery period for the plants is necessary. Similar calculations are necessary for wildlife considerations.

Controlling Pricklypear

Range evaluations indicate that pricklypear canopies increase from 25% to 33% per year and densities may double within three years. If dense pricklypear stands are a problem the manager has several effective control methods to limit populations. Treatment selection depends on stand size and density, availability of hand labor, associated vegetation, and financial resources.

Pricklypear on rangeland can be effectively controlled with prescribed fire, hand grubbing, mechanical methods, or herbicides (Hanselka, Paschal, and Landers 1993). Prescribed burning under very hot conditions and/or with heavy fine-fuel loads may provide sufficient control to meet management objectives. It is often difficult to accumulate adequate fuel under dense pricklypear stands. Burning alone usually kills most of the pads but many clumps will resprout and regrow to the original size in three to five years. Mechanical treatments such as chaining, railing, or rootplowing can aggravate a pricklypear problem by spreading pads and increasing stand densities. Under hot, dry conditions, dragging (railing) may cause the pads to dry before rains wet the soil surface. This will reduce pricklypear stands. Aerial and ground broadcast spraying of herbicides, particularly picloram, or prescribed fire followed by picloram treatments is effective. Picloram may also be mixed with clopyralid, triclopyr, and other herbicides for increased control of

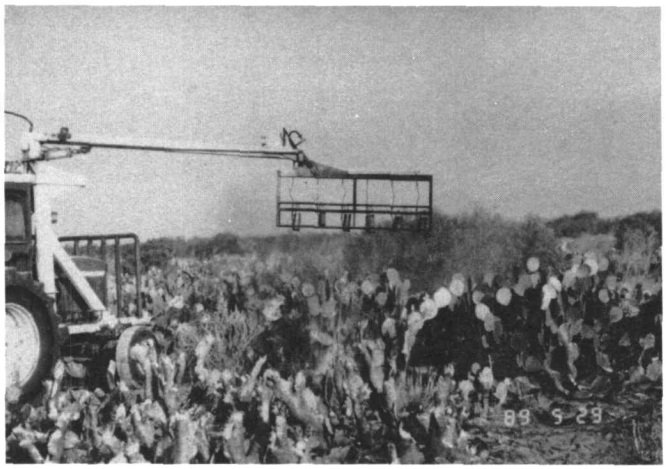


Fig. 1. *Spines are singed off pricklypear with "Pearburners" to allow livestock to consume the "burned" cactus.*

associated brush species. Costs of control will vary with the kind and extent of treatment.

Preparation and Use As An Emergency Feed

The main considerations in using pricklypear as a feed pertain to when to feed, ensuring a balanced diet, and preparation of the cactus for consumption by livestock. As an emergency feed ration pricklypear is an abundant natural resource. However, as an alternative forage, it must be considered in a total forage management context. Beef cattle stocking rates must be adjusted to changing forage supplies and care taken not to overuse grasses. Managers should evaluate their pastures and begin burning pear as a supplement before grasses are depleted. Under extremely dry conditions, pricklypear may become the primary nutrition source instead of a supplement.

Pricklypear's nutrient content is often less than that required for livestock maintenance (Hanselka and Paschal 1991) so a salt and protein supplement, such as cottonseed meal, needs to be fed with pricklypear to meet the nutritional requirements of beef cows. Cottonseed meal's high protein and phosphorous content complements pricklypear's highly digestible carbohydrates (energy), vitamins, and water.

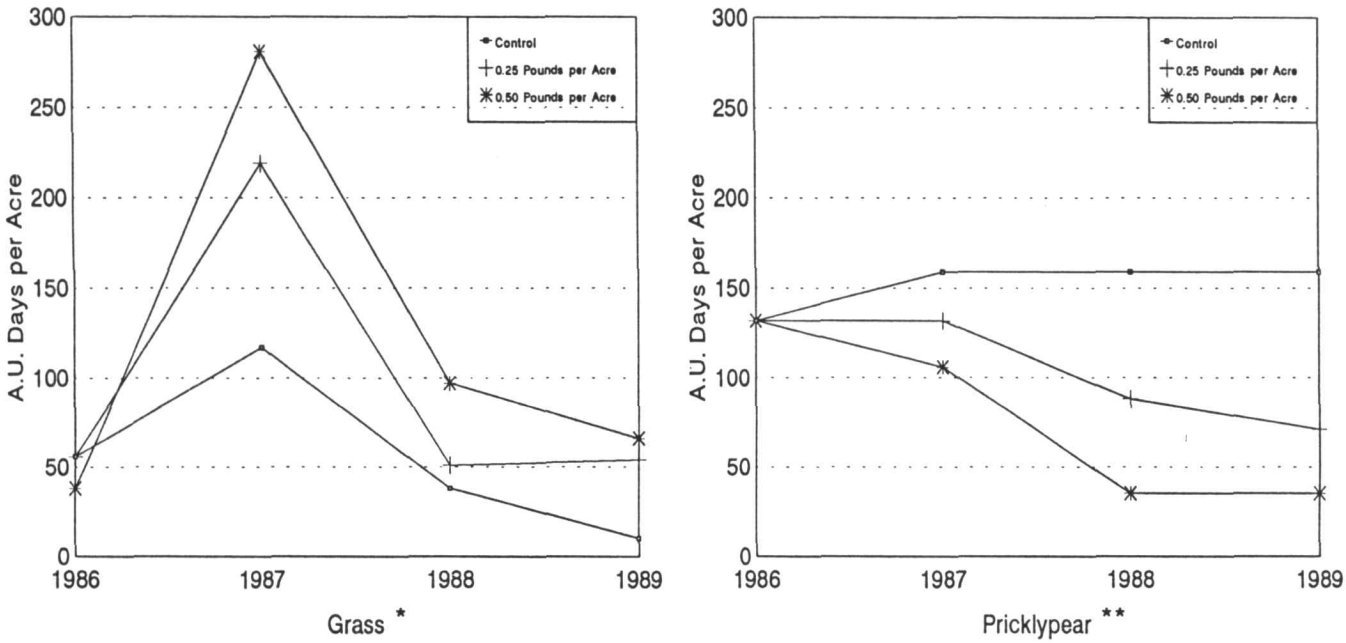
Depending on labor availability, cactus supply and fuel cost, pricklypear may be fed in place by singeing the spines with a "pear burner" and allowing livestock free choices access. "Burning" treatment options include: (1) carrying an individual pear burner and moving from plant to plant; (2) carrying a propane tank in a truck and burning with a long hose and burner (this requires one person to move the hose and one to burn); or (3) pulling a tank with several burners attached to a farm tractor (Fig. 1.)

A 5-gallon pear burner will hold only about 4 gallons of propane and usually provide one day's feed for about fourteen cows on dense pricklypear. In warm, dry weather an experienced individual can burn enough pricklypear for two hundred or more cows in a day

Vegetation Responses to Management

In November, 1986, a pricklypear management system was initiated in South Texas. A *Prosopos-Acacia* mixed brush community was rootplowed in 1980 and seeded to Buffelgrass. Pricklypear populations exploded and dominated the community (approximately 15,000lbs/acre, wet weight). The pricklypear area was aerially sprayed with .25 lb/ac (low rate) and .50 lb/ac (high rate) of picloram in 1986. There were no important differences between the two herbicide rates in total numbers of plants killed, but the high rate affected pricklypear faster than the lower rate. The two treatments had achieved similar results by the third year. Approximately 20% to 40% of the pricklypear canopy remained three years after the herbicide treatments. More canopy cover remained on the low rate area which resulted in more residual biomass than on areas sprayed at the higher rate. It was estimated that the non-sprayed areas supported over 18,000 lb/ac (wet weight) of pricklypear. Almost 8,000 lb/ac and 4,000 lb/ac pricklypear remained three years after spraying with the half and full rates of picloram, respectively.

Grass densities and production increased as pricklypear stands were reduced. An average of 1,000 lb/ac grass forage was produced on non-treated areas and this doubled during periods of above average rainfall. However, grass forage production increased to 4,500 lb/ac and 5,500 lb/ac, respectively, on areas treated with the two rates of picloram. These increases in forage availability improved cattle carrying capacities (Fig. 2). The low-rate treatment of picloram allowed significant increases in carrying capacity based upon grass availability with pricklypear residuals maintaining a buffer during fluctuations in grass production. Grazing capacities increased in the pasture treated with the high rate of herbicides, but were not much higher than that of the low-rate treatment because of less pricklypear residual.



* Calculated on 26 pounds of dry forage daily and 25% grazing efficiency.

** Calculated on 112 pounds of pricklypear per day.

Fig. 2. *Changes in grazing capacities (A.U. days/ac) following treatment of a pricklypear community with picloram at .25 and .5 lb/ac.*

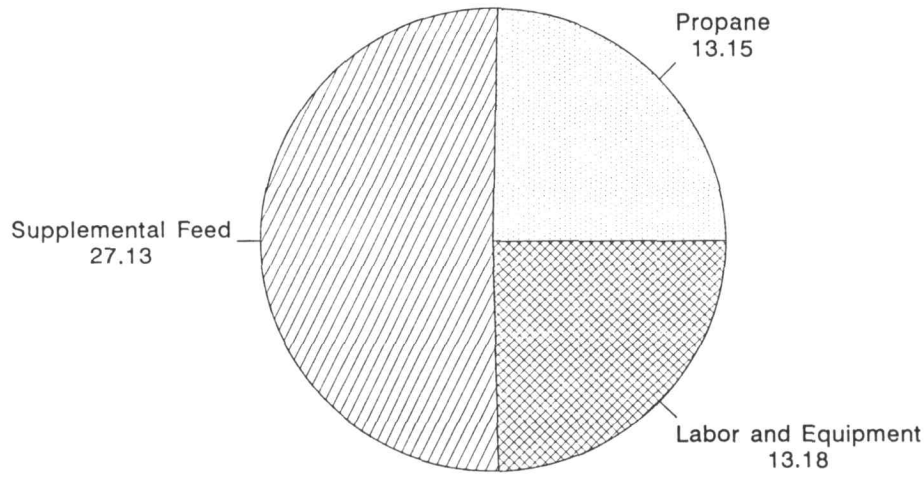
There are several trade-offs in these scenarios. A lack of pricklypear control results in "boom and bust" grass responses between wet and dry years, with relatively stable pricklypear production. However, greater biodiversity exists when pricklypear competition is lessened by herbicide treatments. Grass responses and grazing capacities are more stable. Although fluctuations in total forage production do occur, they are not as drastic. Enough pricklypear residual remains to use as an emergency feed, if necessary, following herbicide applications.

The Economics of Pricklypear Management

To make management decisions with respect to pricklypear the ranch manager needs to estimate: 1) the value of grass production that may be lost to dense stands of pricklypear, 2) the net value (after preparation costs) of pricklypear as an emergency feed, 3) the value of pricklypear to wildlife habitat and 4) the cost of reducing pricklypear densities and amount of reduction desired.

The cost of using pricklypear as a feed depends upon several factors. These include the quality of the pricklypear, the density of the stand, the equipment used to prepare it for feeding, and the cost of fuel required to singe the spines from the pricklypear. Propane is the primary fuel used to "burn" pricklypear and has a sharply defined seasonal price pattern. Prices are lowest in the summer and highest in winter months primarily due to competing demands from heating uses. South Texas producers have reported usage rates ranging from .2 to .33 gallons of propane/cow/day to prepare pricklypear for feeding. Fuel costs range from $ .10-$.26/head/day during periods of seasonally strong propane prices. Labor required to prepare pricklypear varies from one man being able to prepare sufficient feed for 125 cows in .5 day to two men being able to prepare enough for 400 cows/day. Assuming a wage rate of $5.00/hour plus a 25% charge for employment taxes and other benefits, labor costs would range from $.20/head/day to $ .25/head/day. Repairs required to keep burning equipment in service normally range from $75 to $100 per year.

These values would total to cost estimates of preparing pricklypear for feeding that range from $ .30 cents/head/day to $ .41/head/day. However, these cost estimates may not represent all the cost involved in a total feeding program (e.g. as protein supplements). Pricklypear-based rations allow cost-effective weight gains on steers. A stocker cattle enterprise near Laredo, Texas, gained .7 lbs/head/day on pricklypear and supplemental feed in early 1993. Direct cash costs per pound of gain were $0.53/pound (Fig. 3) (Hanselka and Falconer 1993).



Costs shown in cents per pound.
Total cost of gain of 53.46 cents per pound.

Fig. 3. *Stocker steer costs of gain (per pound) on pricklypear-based rations.*

Economic feasibility of pricklypear stand reduction was analyzed using capital budgeting techniques. Three capital budgeting methods, payback period, internal rate of return (IRR), and adjusted benefit-cost ratio were applied to this management system to determine the economic feasibility of picloram application to pricklypear (Workman 1981).

Payback period analysis was used for producers who are primarily concerned with financial liquidity when making investment decisions. By selecting the pricklypear control method with the shortest payback period, the producer will increase the liquidity of his operation relative to choosing other control options. However, payback period analysis may not lead to the selection of the most profitable control alternative over time. By selecting the control method with the largest IRR, the producer will maximize profitability of the firm over time. The adjusted benefit-cost ratio analysis is included to take into account the size of the investments made in pricklypear control. By selecting control alternatives with the highest benefit-cost ratio, the producer will maximize profit to his/her entire credit base.

Tables 1 and 2 show the changes in cash flows for low rate and high rate pricklypear control options. Cash flows for the low and high rate control methods were calculated by multiplying the estimated changes in grass carrying capacity by $98.28/head. This value per head is the aver-

Table 1. 0.25 pounds/acre Picloram Application Economic Analysis per 247 acres.

Increase in Hunting Lease Revenue per Acre	Change in Annual Cash Flow				Payback Period (Years)	Internal Rate of Return	Adjusted Benefit-Cost Ratio (5%)
	1986	1987	1988	1989			
$0.00	($3,829.00)	$1,474.20	$98.28	687.96	5.08	-25.60%	0.76
$1.00	($3,829.00)	$1,721.20	$345.28	$934.96	3.83	-12.69%	0.88
$2.00	($3,829.00)	$1,968.20	$592.28	$1,181.96	3.07	-1.27%	1.00
$3.00	($3,829.00)	$2,215.20	$839.28	$1,428.96	2.56	9.21%	1.13
$4.00	($3,829.00)	$2,462.20	$1,086.28	$1,675.96	2.20	19.03%	1.25
$5.00	($3,829.00)	$2,709.20	$1,333.28	$1,922.96	1.93	28.36%	1.38

Initial investment at $15.50 per acre.

Table 2. 0.50 pounds/acre Picloram Application Economic Analysis per 247 acres.

Increase in Hunting Lease Revenue per Acre	Change in Annual Cash Flow				Payback Period (Years)	Internal Rate of Return	Adjusted Benefit-Cost Ratio (5%)
	1986	1987	1988	1989			
$0.00	($5,681.00)	$2,260.44	$786.24	$884.52	4.34	-19.22%	0.66
$1.00	($5,681.00)	$2,507.44	$1,033.24	$1,131.52	3.65	-10.60%	0.78
$2.00	($5,681.00)	$2,754.44	$1,280.24	$1,378.52	3.15	-2.71%	0.91
$3.00	($5,681.00)	$3,001.44	$1,527.24	$1,625.52	2.77	4.65%	1.03
$4.00	($5,681.00)	$3,248.44	$1,774.24	$1,872.52	2.47	11.62%	1.16
$5.00	($5,681.00)	$3,495.44	$2,021.24	$2,119.52	2.23	18.28%	1.28

Initial investment at $23.00 per acre.

age annual grazing cost per cow derived from the National Cattlemen's Association SPA database (McGrann et al.). Cash flows are also developed for 6 alternative levels of increase in hunting lease values. With no increase in cash flows from hunting lease values none of the control methods are economically feasible over the 3 year planning horizon. However, the payback period, IRR and adjusted benefit-cost ratio indicates that if hunting lease rates are increased $3.00/acre by pricklypear control, then the low rate treatment is economically feasible and preferred to the high rate treatment option.

Management Implications

There are several reasons that support inclusion of pricklypear in South Texas range management strategies. Total removal of pricklypear would undoubtedly damage the potential revenue that could be generated from hunting leases since properly managed pricklypear stands can add value to wildlife leasing enterprises. These are an increasingly important source of revenue to ranch operators. As shown in the economic analysis, some value must be added from sources beside livestock grazing from the control of pricklypear with picloram to be economically feasible.

Pricklypear can also serve as a cost effective feedstuff in drought situations. However, livestock carrying capacities can be doubled during good rainfall years by reducing pricklypear densities and lessening competition for forage grasses. Forage grass response is immediate but is highly dependent on rainfall. This forage base declines during drought years with concomitant reduction in livestock carrying capacity but a forage base remains in the form of pricklypear. The residual pricklypear can add many additional Animal Unit days/ac to ranch carrying capacities. Preparation and supplemental feeding of pricklypear will add to the costs/cow but may avoid herd liquidation during extended drought.

It is clear that use-values of land with extremely dense stands of pricklypear can be feasibly increased by picloram applications. If, by opening up the pricklypear canopy, hunting lease values can be increased by $3.00 to $4.00/acre and livestock carrying capacities also increase, then the control of pricklypear with picloram becomes economically feasible. It is generally advisable to treat dense pricklypear stands with a low rate of picloram in order to decrease pricklypear stand canopies and grow more grasses. Also, it is our opinion that portions of pastures or small traps should be left untreated as nutrient banks for emergency use.

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Foraging Ecology of Bison and Cattle

Glenn E. Plumb and Jerrold L. Dodd

Widespread access to bison of breeding age in the recent decade has created an alternative to cattle in grassland natural area management. Cattle and bison are considered generalist foragers, yet, differences in food habits indicate that cattle are more selective foragers than bison (Peden et al. 1974). During rut, investment in social interactions should be greater for bison than cattle and might be expected to influence foraging behavior. Foraging by either herbivore may directly influence ecosystem structure and interactions in the biotic community (Ellis et al. 1976).

The challenges facing natural area managers often include recognizing ecological disturbances which are essential (i.e., fire, herbivory) and learning how to implement such processes within fragmented natural landscapes (Steuter et al. 1990). In a natural area context, are bison and cattle analogous herbivores? The paper is a condensation of an earlier report by Plumb and Dodd (1993) and discusses data collected during 1985 to 1987 on a mixed-grass prairie owned and managed by The Nature Conservancy in north-central South Dakota.

Results and Discussion

Diet Composition

In our study warm-season (C_4) grasses accounted for approximately one-third of bison diets early in the season and increased to 40% during late July and all of August. Bison reduced feeding on the warm-season grasses after September 1 to about 15% by September 30. A large increase in cool-season (C_3) graminoid use by bison occurred after September 1, to levels greater than 80%. Total graminoid use consistently increased during early summer, reaching 90% of diets by July. After July, forbs contributed little to bison diets. Browse contribution to diets of bison was minimal (0–3%).

Trends in use of warm-season grasses by cattle were less dynamic. Cattle use of warm-season grasses did not vary from late June through early August. Use of warm-season grasses declined in cattle diets after September 2. Shifts in the amounts of cool season graminoids and total graminoids eaten by cattle occurred biweekly throughout the summer. Forbs contributed 15% and browse contributed near 10% of cattle diets during June and early July. Forb and browse use by cattle decreased in late-July and was maintained at this level for the remainder of the summer. As observed for cattle, seasonal variation in the contribution of graminoids to bison diets also appears to be correlated to seasonal peaks in forage quality (Peden et al. 1974).

There were herbivore by date interactions in amounts of each major forage class contributed to bison and cattle diets. Bison generally consumed more warm-season grasses or cool-season graminoids than cattle from early June through August. Bison always consumed more total graminoids than cattle. Cattle use of forbs was greater than bison from early July through mid-September. Forbs were never less than 5% of cattle diets and peaked in early July at 16%. Conversely, only during June and early July were forbs of any importance to bison diets. Use of browse species by cattle was greater than by bison at five sampling dates from June through mid-September.

Forage Selection

Each herbivore exhibited selectivity by using forage resources out of proportion to availability. Bison and cattle selected for warm-season grasses and against cool-season graminoids during June and August. During August, bison selected against forbs. In June, cattle selected for forbs and browse. However, during August,

Bison at Niobrara Valley Preserve located in North Central Nebraska. Photo by Dr. Carolyn Greigel.

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cattle consumed forbs in proportion to availability while selecting for browse forage.

Time Budgets

There were significant herbivore and month effects for percent time spent grazing per day, duration of grazing periods, and number of grazing periods per day. Cattle allocated more time to grazing than bison during the entire summer. The time cattle spent grazing per day increased rapidly during early to mid-summer, reaching 70% by August. Bison always allocated less time to grazing than cattle, but also increased grazing activities throughout the summer season. Cattle grazing period duration was longer than that observed for bison, yet it is unclear whether observations represent the upper limit for either herbivore. In accordance with seasonally increasing grazing activity of both herbivores, the number of grazing periods decreased.

As total feeding time increases, cattle may allocate greater time to finding a broader array of the non-randomly distributed forage resource. While allocating greater time than bison to search and feeding activities during early and mid-summer, cattle diets are more broadly based on forbs, browse, and graminoids. As the season progresses towards late summer with increases in senescent standing crop, the bison rut is ending and feeding time allocation becomes less relevant. This is the time that cattle and bison diets should contain most similar levels of graminoids. Our study suggests that the relationship between social time investment (as it influences feeding and non-feeding time partitioning during the rut) and forage patchiness is important in explaining differences in diet choice between bison and cattle.

Implications for Natural Area Management

The appropriateness of bison or cattle for natural area management may depend on the potential of either herbivore to interact within the context of the evolutionary history of the site. In a review of bison-fire-small mammal herbivore relationships on mixed prairie, Steuter et al. (1990) conclude that natural area stewardship independent of the landscape's disturbance history, will strongly limit native community structure and function. An examination of early historical references (1690–1880) suggests that bison grazed heavily on a local scale, which combined with secondary effects such as wallowing, trampling, and rubbing, created a vegetation mosaic (England and DeVos 1969). This literature suggests that prehistoric habitat use patterns of bison regulated different forage classes, altered vegetation structure, and produced variable conditions amenable to other plains ungulates.

Relevant Agents of Stewardship?

It may be incorrect to broadly suggest that because of their prehistoric role in grassland ecology, bison are the large herbivore of choice for grassland natural area management. We presume that bison reflect to a greater degree the evolutionary context of a grassland natural area. We also presume that differences between free-roaming bison on pristine grasslands and semi-free roaming bison on a fenced natural area must be much greater than those of the latter and domestic cattle.

Bison at Niobrara Valley Preserve owned by the Nature Conservancy. Photo by Dr. Carolyn Greigel.

Inasmuch as changes in grassland structure and function may occur as a result of grazing-related activities, bison and cattle are similarly capable. An assessment of whether bison and cattle are analogous herbivores in an ecosystem context can be evaluated by considering the foraging behavior of these herbivores at various ecological scales. Within a fenced natural area, feeding station/patch and landscape scales are generally most important. Bison tend to avoid patches dominated by forbs and browse while cattle select more strongly for these forages. This suggests that at the patch scale, bison respond to reduced feeding time per day by maximizing intake of high quality, randomly distributed grasses and graminoids.

Within a landscape large ungulates should select for feeding areas which maximize foraging efficiency. Indeed, both bison and cattle respond positively to relatively coarse patterns of higher forage quantity and/or quality induced by grazing, fire, and seasonal growth dynamics. Whether bison and cattle are analogous in a natural area context is scale dependent. Incorporation of bison and/or cattle into management planning must match these scale dependent goals.

It must also be asked under what programmatic circumstances do semi-free roaming bison or cattle represent appropriate grassland natural area management tools?

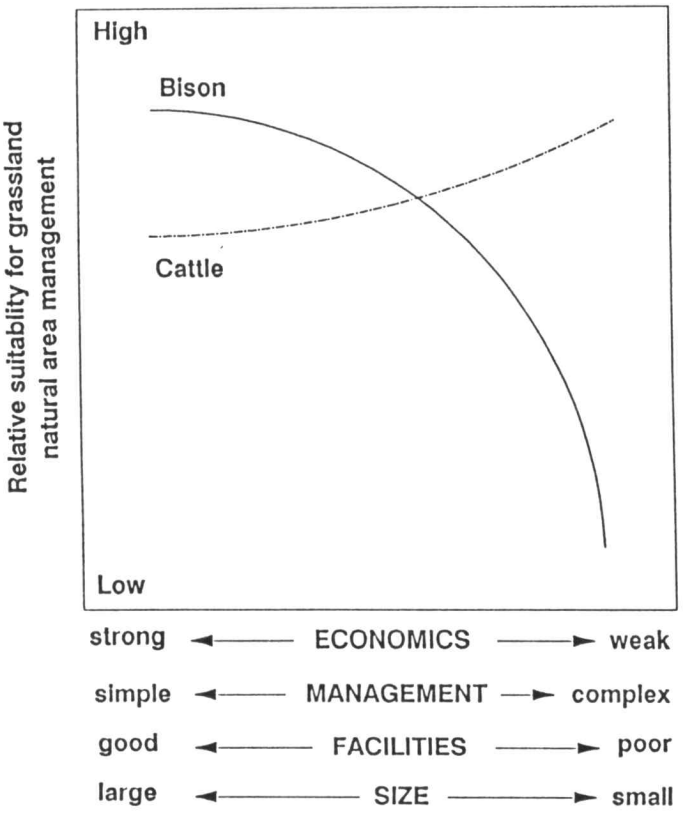

Fig. 1.

When considering large ungulates as a stewardship alternative, concerns about herbivore tractability, size of natural area, complexity of management plans, and capital return on investment may become very important. Since bison breeding stock are relatively expensive, an initial investment could be very large. Additionally, disposal of surplus bison requires involvement in a small but highly charged market where outlets and prices vary greatly from year to year. Bison should be a preferred alternative when the natural area is medium to large, economics are acceptable, facilities exist to permit proper handling, and management plans are sufficiently simple so as to preclude very difficult herd manipulations. The actual assessment of the suitability of either herbivore is necessarily case dependent, but major concerns can be estimated as in Figure 1.

In a hypothetical case where natural area size is small, economics are poor, a fire return interval is estimated at five years, and grazing is periodically desired, it seems more reasonable to devote available resources to achieving a proper prescription burn and graze the site with cattle to a desired utilization level on a periodic basis. Where natural areas encompass medium and large tracts, the intimate relationship between bison and grasslands suggests that stewardship with bison may continue relatively uninterrupted throughout the year at a lower stewardship cost per acre. Indeed, stewardship plans encompassing bison and cattle may prove to optimize economic stability and ecological integrity of management.

Summary

The relationship between feeding time investment and forage patchiness appears to be important in determining diet choice of bison and cattle. Both display generalist food habits, exhibiting forage selection while consuming a variety of forages. In contrast to cattle, it appears that bison balance nutrient and time demands by consuming almost exclusively graminoids.

The similarities and differences in the foraging ecology of bison and cattle suggest interesting opportunities for natural area management. When managed to encourage strong social time investment, bison should forage at a feeding station/patch scale primarily on graminoids and impact herbaceous non-graminoids relatively less than cattle. Yet, at the landscape scale, a mixed management model incorporating both herbivores may prove more flexible and appropriate to implement herbivorous disturbance. We suggest that only under certain programmatic conditions does the combination of strong social organization and environmental tolerances (as they influence foraging and fitness) suggest that bison are the most appropriate large herbivore for northern mixed prairie natural area management.

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Improved Foothill Rangelands—An Economic Analysis

Nelson Cronyn and John P. Workman

The Role of Seasonal Ranges.

Livestock producers in the Intermountain area rely on seasonal ranges to meet livestock nutritional requirements. Timing of use depends on factors such as precipitation and vegetation quality and quantity. Low elevation desert ranges are used in the winter, middle elevation foothill ranges in the spring and fall, and mountain ranges during the summer and early fall (Call and Malechek 1989).

Foothill ranges, while offering the most potential for seasonal range improvement, have been the most abused. Overgrazing and farming during the late 1800's and early 1900's, combined with fire suppression, resulted in a loss of perennial grasses and forbs and an increase in big sagebrush and other undesirable woody species (Call and Malechek 1989). Natural recovery of disturbed range ecosystems is uncertain (West et al. 1984, Westoby et al. 1989). Even if natural recovery is possible, ranchers cannot afford to protect an area from grazing for several decades in the hope that the area will regain its productivity. Once a range site deteriorates beyond a particular threshold, significant management interventions (e.g., burning, plowing, revegetation) may be required to restore the site (Friedel 1991). Under these conditions, it may be economically feasible to use artificial revegetation to restore productivity.

Overcoming The Spring Forage Bottleneck

Limited availability of spring forage (the "spring forage bottleneck") is a production constraint on the typical Utah ranch (Call and Malechek 1989). In response to ranchers' needs for an inexpensive spring forage, the Agricultural Research Service (ARS) has recently developed several improved forages including Hycrest, a cultivar of crested wheatgrass (*Agropyron cristatum* (L.) Gaertn., *A desertorum* (Fisch. ex Link) Schult.), Vinall, a cultivar of Russian wildrye (*Psathyrostachys juncea* (Fisch.) Nevski), and Syn A, a synthetic hybrid of Russian wildrye.

The Crucial Question

From the rancher's perspective, a paramount concern is whether revegetation will "pay for itself." Only then will a rancher worry about which species or cultivar to use. In this economic analysis, we compared Hycrest crested wheatgrass, Vinall Russian wildrye, and Syn A Russian wildrye with Nordan crested wheatgrass and with each other. Each improved forage species was also compared with unimproved native range and "old" (20 years or more) crested wheatgrass stands left as is. The forage yields were measured on upland loam range sites. We used net present value (NPV) anaylsis which makes it possible to compare projects of different size and duration (Workman 1986).

The following are among the factors that have biologic and economic impacts on the establishment and use of improved forage species on Intermountain rangelands: (1) sagebrush overstory kill; (2) size of treatment; (3) stocking rate; (4) retreatment schedule (Workman and Tanaka 1991). Variability in abiotic factors, input costs, and management strategies mean no two ranchers will deal with the same combination of costs and returns.

We analyzed three combinations of costs and returns to represent the range of possible revegetation outcomes: 1) the USU Tintic research area represented high costs and low returns; 2) ARS research plots represented average costs and high returns; and 3) the "realistic" combination complied from Bureau of Land Management (BLM) and Soil Conservation (SCS) data represented average costs and average returns.

Preparing The Economic Analysis

Economic analysis of range revegetation projects requires the following information: (1) project costs, (2) project benefits, (3) value of benefits, (4) interest rate, (5) project risk, (6) expected project life, and (7) the range site selected for revegetation (Workman and Tanaka 1991). Project costs include seed, seedbed preparation, seeding, alternate forage, and labor. Project benefits are valued by multiplying the forage portion of the private lease rate ($8.51 * 0.70 forage value = $5.96/AUM) by the increase in annual forage production (AUM/ac). This stream of annual future benefits is then converted to present dollars by discounting, using a 4% real (inflation free) interest rate as recommended by Row et al. (1981). This present value is then further discounted by one year, to recognize the need to defer grazing. Project risk (expected failure rate) is expressed as a percentage of initial project costs. An expected failure rate of 15%, for example, increases project costs by 15%. The expected project life was set at a conservative 20 years.

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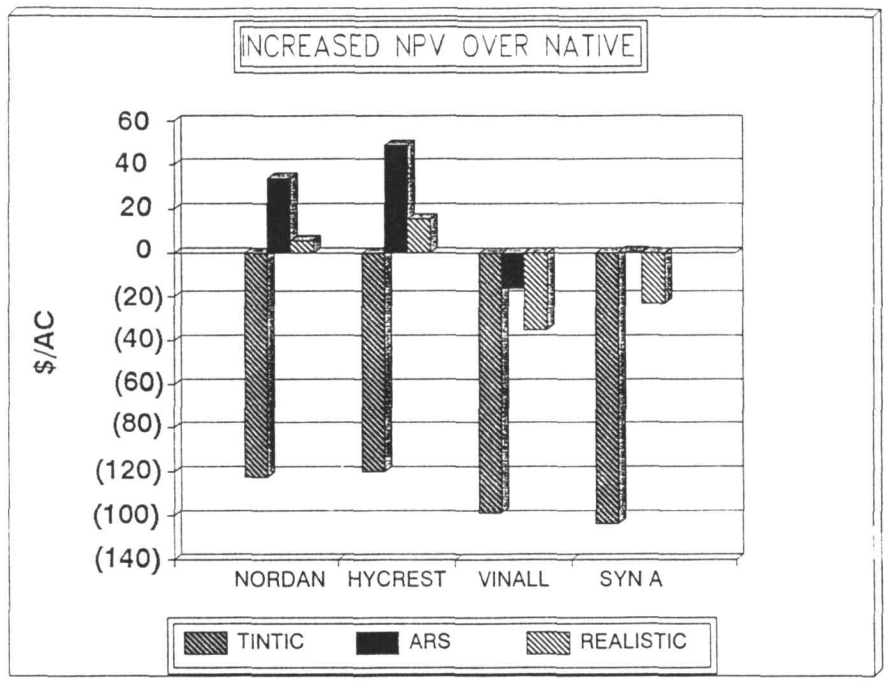

Fig. 1 *Increased net present value (NPV) of revegetating with Nordan, Hycrest, Vinall, or Syn A compared to native range left as is. Data were collected on upland loam range sites in central Utah.*

An Example

The following is an example of the economic analysis described above. The cost of seed, seedbed preparation, and seeding of $33.53/ac was added to $1.71/ac deferment cost (alternate forage), and a 15% risk cost for a total cost of $40.53/ac. Hycrest crested wheatgrass produces 1,151 lb/ac/yr under favorable conditions on an upland loam range site (Mason 1971). An estimated 90% of the herbage is forage, of which 65% can be utilized. This yielded 673 lb/ac/yr of usable forage (1,151 lb/ac/yr herbage * 90% forage * 65% utilization), or 1.02 AUM/ac (673 lb/ac/yr divided by 660 lb/AUM). Native range, under the same conditions, produced .30 AUM/ac. The annual value of the increased production (1.02- 0.30 = 0.72 AUM/ac) was $4.29/ac (0.72 AUM/ac * $5.96/AUM). Present value of the increased production, taking into account one year deferment, was $56.08/ac ($4.29 * $13.590_{20\ yrs.,\ 4\%}$ * $0.961_{1\ yr.,\ 4\%}$). Net present value (NPV) was the present value less total costs, or $15.55/ac.

Which Alternative Will Provide The Greatest Net Return?

Analysis of the data from Tintic indicated that revegetation with any of the improved forage species was not economically feasible at the high seed costs and drought that existed at the time of seeding and establishment (Figs. 1 and 2). In a situation where revegetation is necessary to meet unquantifiable but important noneconomic goals (e.g. erosion control), Hycrest was the least cost improved forage species.

Analysis of the data from ARS, collected under ideal conditions (small plot sizes, clean and firm seedbeds, and favorable years) indicated that it was economically feasible to revegetate native range with Nordan, Hycrest, or Syn A but not with Vinall (Figs. 1 and 2). It was economically feasible to revegetate "old" crested wheatgrass with Nordan or Hycrest, but not with Vinall or Syn A. Hycrest was the economically efficient choice for revegetation with a net present value of $49.27 per acre on native range sites and $40.38 per acre on "old" crested wheatgrass sites.

Analysis of "realistic" forage yield data indicated that revegetation with Nordan was economically feasible on native sites but not on "old" crested wheatgrass (Figs. 1 and 2). Revegetation with Vinall or Syn A was not economically feasible on either native range or "old" crested wheatgrass sites. Hycrest was the economically efficient choice for revegetation on both native range sites and "old" crested wheatgrass sites, with net present values of $15.55 and $6.66 per acre, respectively.

Summary

Intermountain ranchers continue to deal with the "spring forage bottleneck". Foothill range forage species recently released by the USDA/ARS may provide an economically

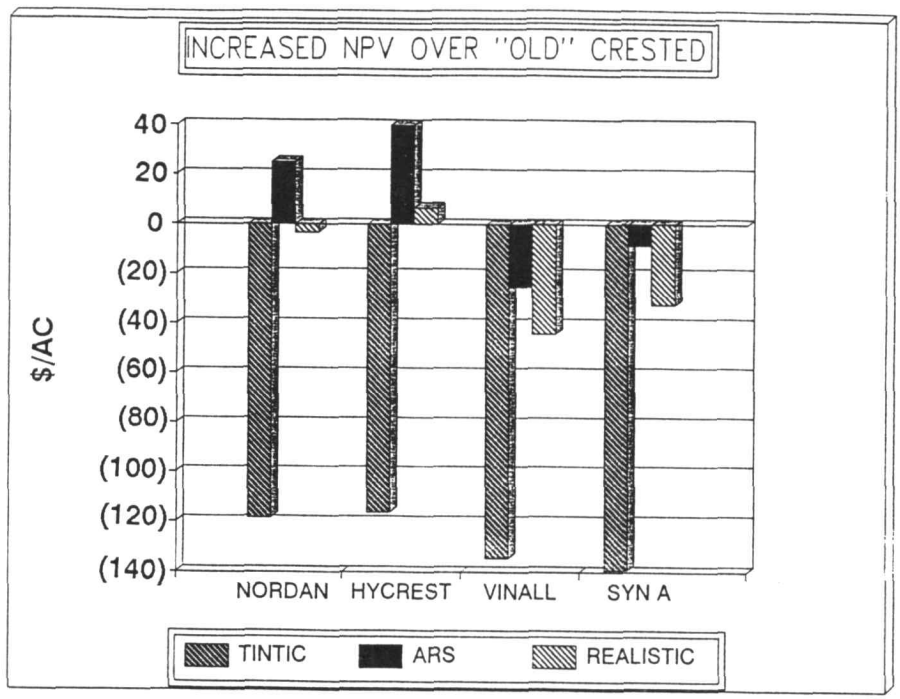

Fig. 2. *Increased net present value (NPV) of revegetating with Nordan, Hycrest, Vinall, or Syn A compared to "old" (greater than 20 years) crested wheatgrass left as is. Data were collected on upland loam range sites in central Utah.*

feasible solution to this problem. We compared the economic returns of seeding Nordan, Hycrest, Vinall, and Syn A to "old" crested wheatgrass seedings and native range. Economic performance was evaluated under three combinations of costs and returns producers might expect.

Hycrest was the economically efficient choice for revegetating upland loam range sites currently supporting native range or "old" crested wheatgrass. Revegetation may not be economically feasible if seedbed preparation costs are unusually high. Due to high risks of establishment, it is not economically feasible to revegetate with Vinall and Syn A.

Most range managers know that factors beyond their control can profoundly affect the biological and economic outcomes of revegetation projects. For example, the cost of seed following an unfavorable seed production year is substantially higher than after a favorable year. If possible, range managers should postpone purchasing seed for a revegetation project until the fall following a good seed crop. Programs such as the Conservation Reserve Program (CRP) may increase demand for seed and drive up price. Economic feasibility of a project depends more on near future events than on those that occur in the distant future. Thus required grazing deferment is more important in economic success than is project life (Workman and Tanaka 1991). Drought during the establishment period that postpones establishment and flow of project benefits (i.e., increased production) is very costly to the economic feasibility of a project. Uncontrolled herbivory by insects can also decrease the NPV of revegetation projects (Asay et al. 1985).

This study raises some important questions regarding research on improved forage species. While ARS needs a clean seedbed and precision seeding to evaluate forage species from biological and ecological perspectives, this type of research does not simulate conditions of practical revegetation projects on large areas of rangeland. On-ranch studies would permit researchers to evaluate improved forage species under "real life" conditions.

Finally, whether improved forage species are evaluated on research plots or on large rangeland areas, costs associated with revegetation projects must be carefully recorded to facilitate an accurate economic analysis. An accurate record of the costs and the seedbed preparation techniques on a particular revegetation project are essential if range managers are to gauge the expected economic outcome of revegetation.

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Keeping Small Horse Pastures Productive

Everett M. Stiger

I purchased 40 acres near Wolf Creek, Montana for horse pasture in 1983. This was part of a large ranch that had been subdivided to pay off debts when the owner got caught in the cattle price squeeze in the seventies. The original ranch had not been seriously overgrazed, but was the victim of hard use during those tough times. My first measurement of forage production indicated about 1,000 lbs./ac. on that portion of the pasture invaded heavily by sagebrush. My first priority was to fence the pasture into two 20-acre units and then make plans to prescribe burn the sagebrush. Since I had six horses to pasture, I obviously couldn't prescribe burn the entire 40 acres at one time. Plans were made to burn the north half first.

Since I was a member of the local Volunteer Fire Department, I enlisted the Department's help as a training exercise, drafted a training and burn plan, and set out to prescribe burn the north half during the fall of 1987 (having no indication at that time of the terrible drought looming on the horizon during the winter and summer of 1988!). The ignition sequence was pretty simple, using roads and blackline[1] to hold the fire. Extreme caution had to be exercised and a well-thought-out burn plan followed closely, since year-round residences surrounded the pasture. Our neighbor to the north allowed us to use their access road as one boundary. Another neighbor let us use his stock pond as a water source.

Main ignition

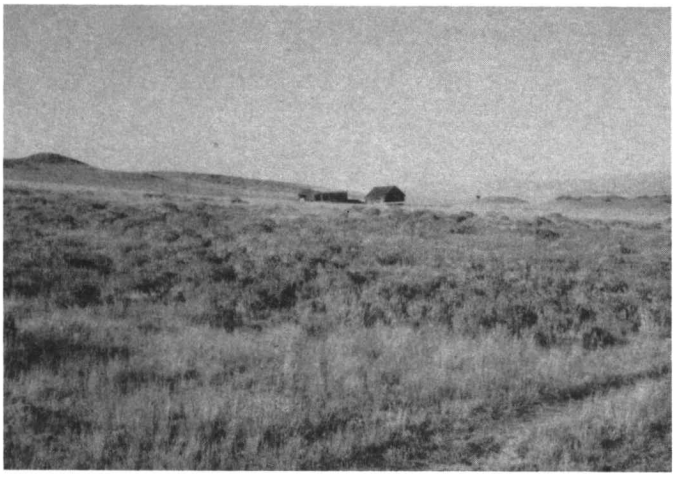
Everett M. "Sonny" Stiger is a retired U.S. Forest Service fuel management specialist, and retired vice-president of Montana Prescribed Fire Services, Inc.

Editor's Note: A good example of what can be done on small acreages with a little effort.

Blackline: Prescribed fire containment that uses a strip of land where all fuel has been removed by burning. The width of the strip depends upon the expected flame lengths.

Igniting the first buffer strip

Securing the buffer strip and blackline



Near Plot #1, primarily bluebunch wheatgrass and Junegrass pre-burn. Fall 1987—960 lbs./ac.

Immediately post-burn, Fall 1987.

An Incident Command System was set up with a Safety Officer assigned to assure that safety was always the first consideration during the burn. The prescribed burn went off like clockwork and the Fire Department members received superb training under a real fire situation.

To determine just how much improvement I would get from burning the sagebrush, I established several plots across the unit: Plot #1 in the heavy sagebrush, Plot #2 in a portion of the native pasture without sagebrush, and Plot #3 in a portion of the unit that had been planted to smooth brome and crested wheat by a previous owner.

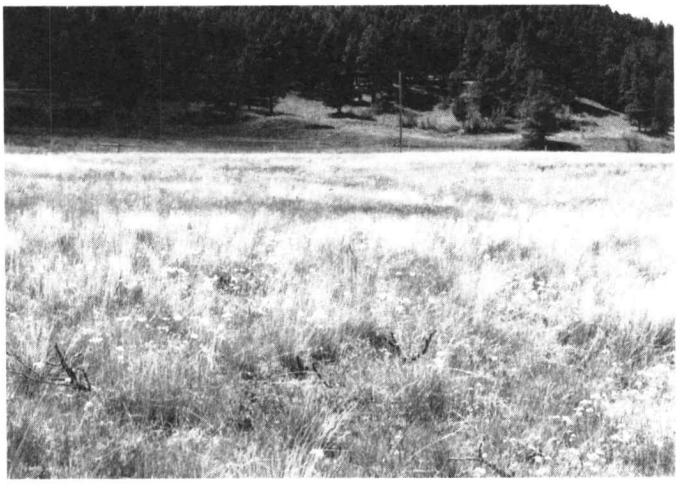
Plot #1 Production

Pre-burn 1987	960 lbs./Ac.
Fall 1989	2,178 lbs./Ac.
Fall 1991	2,613 lbs./Ac.

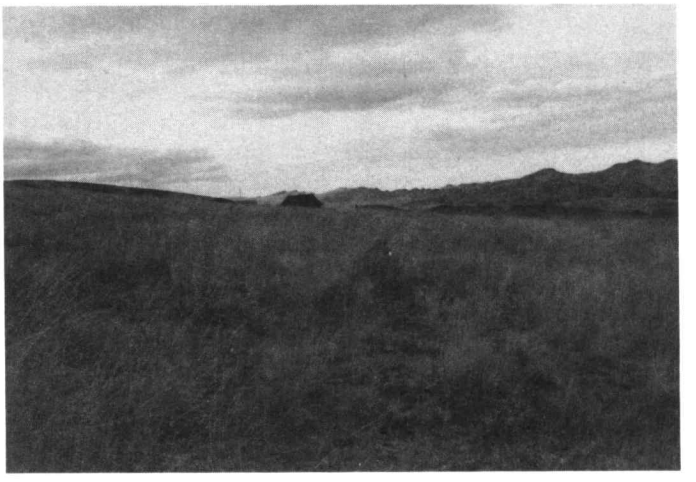
Two years after the prescribed burn, Plot #2 had essentially no change in production, however, Plot #3 in the smooth brome went from 1,920 lbs./ac. pre-burn in 1987 to 2,450 lbs./ac. in 1989. Production was measured by clipping all forage within a one-foot square on plots protected by a simple sheep-wire cage. The clipped forage

Near Plot #1
June 1988, first spring after burn.

Plot #1—fall of 1989
2,178 lbs./ac.



May 1990
With sagebrush removed, increased production is over entire area.



Near Plot #1, Fall 1991
2,613 lbs./ac.

was air dried in paper sacks until no further weight loss could be detected by weighing on a gram scale. Pretty simple, and basic, but effective.

The south half of the pasture was prescribe burned in the spring of 1990 with essentially the same results. The increase in production was so spectacular that neighbors on two sides of my pasture also prescribe burned their pastures as well. Each unit was rested one growing season after being burned.

To assure that the range improvement will be maintained, I developed a three-unit deferred rotation, using my two units (north and south halves), plus a third unit of 20 acres I rent from my neighbor to the west who is not using it at the present time. I use the three units with six horses from April 1st through the opening of hunting season in late October.

Grazing Schedule

North Half	South Half	Rented
April–May	June–July	August–October
June–July	August–October	April–May
August–October	April–May	June–July

From opening day of hunting season through March 31 of each year, I feed the horses hay while the pasture rests, usually under a blanket of snow.

Macro Economics and Cattle Ranching

Jerry L. Holechek, Jerry Hawkes, and Tim D. Darden

In the past, estimates of the financial outcomes of different range management practices in the USA have been primarily based on micro-economics. This approach evaluates cost-return benefits by focusing on current interest rates, livestock prices, livestock production costs, etc., with the assumption that major changes will not occur. In contrast macro-economics concerns the economy as a whole, and how government policy and global business conditions will affect management outcomes. A profitable ranching operation depends on a good understanding of both micro- and macro-economics. A close look at the last 20 years shows that the financial outcomes of decisions regarding grazing systems, brush control, stocking rate, fertilization, range seeding, and ranch expansion were as much affected by changes in the economy at large as the biological efficiency of the practice. This can be illustrated by considering the relationship between cattle prices and the macro-economy. This relationship is important because historical cattle prices have been closely associated with financial returns to western ranches (Fowler and Torell 1987).

History of Cattle and Ranch Prices

Since the formation of the western range livestock industry in the 1860's, there have been four basic periods of high cattle prices. Each of these periods was followed by a crash in cattle and ranch values. Each period is linked with a general economic inflation caused by a major sociopolitical event (war) that reduced supply followed by a depression or recession that occurred 7 to 10 years later due to restoration and over-expansion of supply.

The first major economic boom occurred during and after the Civil War (1861–1865) and lasted until the depression of 1873. The high cattle prices during and after the Civil War encouraged the formation of the cattle industry in Texas, and brought about the cattle drives to the railroads in Kansas in the late 1860's through the 1870's. The depression of 1873 was triggered by excessive speculation in railroads followed by disappointing profits once they were completed. Another major factor was the winding down of the boom caused by post Civil War reconstruction which caused a sharp drop in cattle prices for a few years (Stoddart and Smith 1943).

The next major economic expansion was brought about by the explosion of technology at the turn of the century. World War I caused an inflationary spiral that lasted until 1920. The period from 1914–1920 was one of the most favorable for farmers and ranchers in the history of the country. It was also a period of great exploitation in which many fragile western rangelands were either severely overgrazed or plowed. Farm product prices (cattle included) declined in the early 1920's but recovered a bit between 1927–1929. This ended precipitously with the onset of depression in 1930. At the bottom of the depression in 1933 cattle prices had declined 35% from the 1929 levels and over 50% from 1920 levels. World War II (1941–1945) brought economic recovery and a sustained period of high cattle prices that peaked in 1951 at the peak of the Korean War and then crashed by nearly 50% over the next 2 years (Fig. 1). Cattle prices stayed relatively low until the Vietnam conflict began in 1964 and steadily climbed upward peaking in 1973 with the oil shock at nearly triple the 1964 level. After a 3 year pullback they resumed their ascent reaching another peak in 1979 when another oil shock occurred. The last bottom occurred in 1986 when cattle prices adjusted for inflation were the lowest since WWII (Fig. 1).

There are 6 basic stages to most business cycles each of which favors different classes of assets (commodities, stocks, bonds, cash, real estate) (Stoken 1984, Pring 1992). During stage 1 at the bottom of a slump, business becomes leaner and more productive by eliminating unprofitable operations, and reducing labors costs (Fig 2). In this period consumer demand is low due to concerns over debt, high unemployment, and high interest rates. Stocks, real estate (ranches), and commodities (cattle) are depressed but high quality bond prices are up.

Austerity leads to stage 2 when capital accumulation and lack of credit demand pushes interest rates lower. This causes a mild increase in economic activity. For ranchers this is the most favorable period to buy land, control brush, implement grazing systems, and expand the herd. The problem here is that because bankers are cautious from going through a period of bankruptcies and foreclosures only the ranchers with the highest credit ratings have access to capital. Financial assets, primarily stocks and bonds, do well in stage 2 but prices of real estate and commodities remain depressed.

Stage 3 marks beginning of the recovery in commodity and real asset prices. This is due to reduction in inventories and depletion of consumer goods. Bond prices tend to be flat but stock prices increases due to improvements

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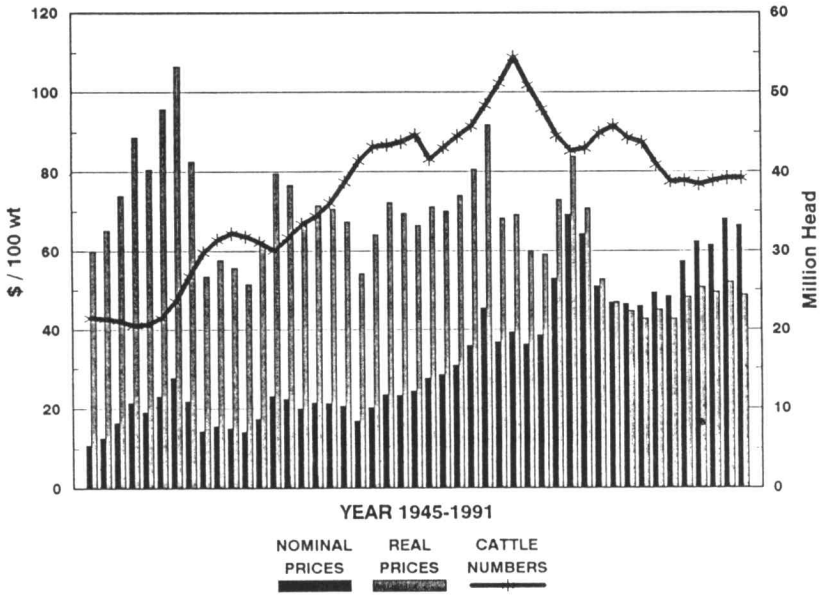

Fig. 1. *The relationship between cattle numbers, nominal cattle prices and real cattle prices between 1945 and 1991.*

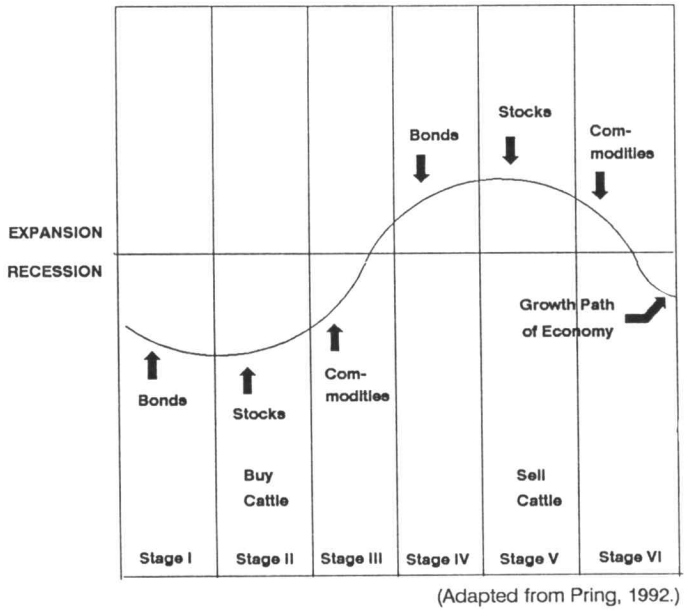

Fig. 2. *The relationship between the stages of the idealized business cycle and the various asset classes.*

in corporate earnings. Real estate (ranches) and commonity (cattle) prices start to increase in this stage.

Stage 4 brings a high level of confidence about the future of the economy. Consumer and business spending causes interest rates to rapidly rise which depresses bond prices. Growing inflation and easy credit cause real estate and commodity prices to shoot upwards. This is the favorable period for both cattle prices and ranch values.

Stage 5 brings the peak in the business cycle. Here optimism about the future has lead to recklessness. Credit is too easy to obtain, which causes high inflation and encourages poor business decision making. Commodity prices and real estate peak in this period due to both real and speculative demand. Real demand results from workers experiencing increased wages and access to easy credit. They are in a position to upgrade their standard of living. Speculative demand results from inflation pressures that causes investors to shift into real assets as a hedge against devaluation of the currency. Money flows out of the stock market into short term money market funds that provide high yields. Long term bonds are in disfavor due to fears of increasing inflation. This is the period when cattle and ranch prices peak. The thinking rancher will want to sell as many livestock as possible retaining only a core herd. This is the time to take capital gains on any extra land purchased during stages 1 or 2. Debt should be liquidated and avoided to the extent possible in this period. Historically this has been the period when credit was easiest to obtain and ranchers generally expanded their operations.

Stage 6 is characterized by a crash in commodity and real estate prices and a general economic downturn due to an oversupply of goods financed by excessive debt. The prosperity of stages 4 and 5 causes recklessness and over-optimism by bankers, producers, and consumers. The only way the boom can be sustained is with excessively loose credit. If the Federal Reserve maintains the discount rate

Table 1. Cattle prices in relation to American economy for the period between 1970 and 1992[1].

Year	% Change in real GDP[2]	% Unenployment	% Change in consumer price index	Discount interest rate, %	Prime interest rate, %	Real interest rate, %	% Gain S&P 500 stock index	Nominal cattle prices, $[4]	Real[3,4] cattle prices, $	U.S. Beef cattle numbers (1000's)
1970	(0.3)	4.9	5.6	5.95	7.91	2.31	0.1	28.40	70.12	43,120
1971	2.8	5.9	3.3	4.88	5.72	2.42	11	30.90	73.92	44,541
1972	5.0	5.6	3.4	4.50	5.25	1.85	16	35.80	80.63	45,794
1973	5.2	4.9	8.7	6.44	8.03	(0.67)	(17)	45.30	91.89	48,354
1974	(0.5)	5.6	12.3	7.83	10.81	(1.49)	(30)	36.70	68.22	51,234
1975	(1.3)	8.5	6.9	6.25	7.86	0.96	32	39.30	69.07	54,351
1976	4.9	7.7	4.9	5.50	6.84	1.94	19	36.30	59.90	50,943
1977	4.7	7.1	6.7	5.46	6.83	0.13	(12)	38.50	59.05	47,919
1978	5.3	6.1	9.0	7.46	9.06	0.06	1	52.90	72.87	44,596
1979	2.5	5.8	13.3	10.28	12.67	0.63	12	69.20	83.98	42,589
$\bar{X}$	3.38	6.2	7.41	6.46	8.10	0.69	3.21	41.33	72.96	47,344
1980	(0.2)	7.1	12.5	11.77	15.27	2.77	26	64.30	70.74	43,049
1981	1.9	7.6	8.9	13.42	18.87	9.97	(10)	51.00	52.85	44,910
1982	(2.5)	9.7	3.8	11.02	14.86	11.06	15	46.99	46.99	45,837
1983	3.6	9.6	3.8	8.50	10.79	6.99	17	46.50	44.75	44,276
1984	6.8	7.5	3.9	8.80	12.04	8.14	1	46.00	42.75	43,677
1985	3.4	7.2	3.8	7.69	9.93	6.13	26	49.40	45.07	40,912
1986	2.7	7.0	1.1	6.33	8.33	7.23	15	48.50	42.69	38,781
1987	3.7	6.2	4.4	5.66	8.21	3.81	2	57.20	48.35	38,943
1988	4.4	5.5	4.6	6.20	9.32	4.72	12	62.30	50.77	38,432
1989	2.9	5.3	4.6	6.93	10.87	6.07	27	61.40	49.52	38.922
$\bar{X}$	2.67	7.3	5.14	8.63	11.85	6.71	13.1	53.34	49.45	41,774
1990	1.0	5.4	5.4	6.75	10.01	4.61	(4.5)	68.00	52.02	39,179
1991	(0.6)	6.6	4.2	5.00	8.00	3.80	28	63.92	48.75	39,205
1992	2.1	7.5	2.9	3.25	6.00	3.1	4.5	69.73	51.49	42,378

[1]Sources: National Agriculture Statistical Services 1945–1991; United States Department of Labor, Bureau of Labor Statistics; United States Department of Commerce, Consumer Price Index.
[2]Gross Domestic Product.
[3]Averaged across classes of cattle and adjusted for inflation using 1982 as the base year.
[4]$/100 wt. (lbs).

(cost of money to banks) below the inflation rate, the money supply increases at a more rapid rate than the expansion of the economy. This occurred during the 1970's (Table 1). Historically this has always caused devaluation of a nation's currency and collapse of its bond market (Davidson and Rees-Mogg 1993). Debtors are always favored over creditors when the goverment takes the inflationary approach, by making the real cost of money negative (prime interest rate minus consumer price index). Investment goes into speculation in real estate, commodities, gold, precious metals, chinese ceramics, etc., as a hedge against currency devaluation rather than into creation of real wealth through product development and improved production efficiency. Western ranch values increased at around 10% per year when this happened in the 1970's.

To contain inflation the Federal Reserve raises the discount rate well above the inflation rate (typically measured by the consumer price index). This forces bankers to contract credit which in turn slows product demand. Commodity and real estate prices fall in response to tighter credit and oversupply of goods. Falling prices are accentuated by bankruptcies of heavily indebted businesses and consumers that now meet their financial obligations with lower collateral (falling real estate) and less income (lower wages, lower employment levels). Cash and U.S. treasury bonds are favored assets in this period. High yield, low grade corporate bonds are to be shunned because of high default rates. Stock prices are depressed in this period due to sagging corporate profits and the fact investors will have shifted to money market funds to capture their high real interest rates at low risk.

The conditions just described prevailed in the early 1980's. The Federal Reserve raised interest rates to the point that the real cost of money was over 8% (Table 1). This collapsed cattle and ranch prices with nearly a third of western USA ranchers going out of business. In New Mexico ranch values dropped 16%–38% (Torell and Fowler 1986) and in the southern part of the state 40% of the ranchers were for sale (Torell and Fowler 1985).

It is interesting to note that just prior to this policy shift the prevailing view among bankers and economists was that the trend towards higher ranch and cattle prices would last indefinitely. Ranchers were encouraged to borrow and heavily capitalize their ranches. Most of those who followed this strategy bought high, sold low, and are

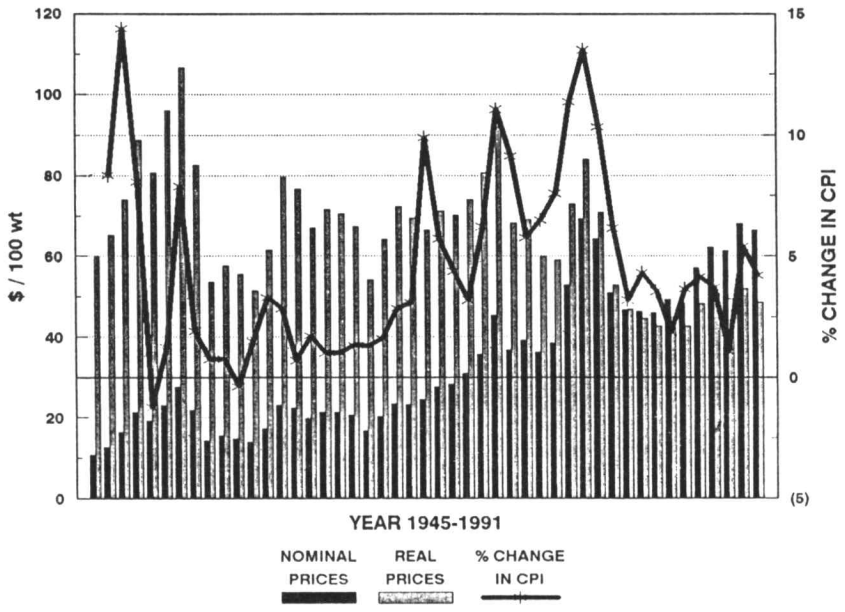

Fig. 3. *The relationship between nominal cattle prices, real cattle prices and percent change in consumer price index (CPI) between 1945 and 1991.*

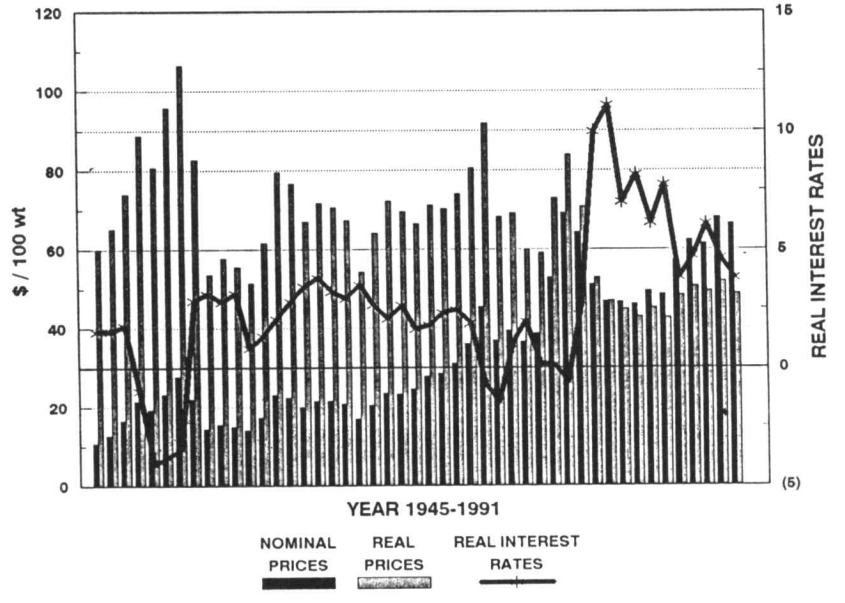

Fig. 4. *The relationship between real interest rates, nominal cattle prices and real cattle prices between 1945 and 1991.*

no longer in business. In the deflationary phase of the business cycle the informed rancher will be sitting on sidelines with high cash levels and only core holdings in land and livestock.

Since the 1860's cattle prices have closely followed the previously described model. Highs in 1872, 1918, 1951, 1973, 1979, and 1990 all corresponded to a rising consumer price index, negative or low real interest rates and in most cases followed a period of high economic growth (Figs. 3, 4). In contrast falling cattle prices were characterized by the opposite conditions generally bottoming when real interest rates (prime rate - consumer price index) were at maximum.

Beef Demand and the Future.

Although recent nominal cattle prices have come off the 1984 bottom, real cattle prices are close to their lowest levels since WWII (Fig. 1). The real question confronting ranchers is why the present low real prices and what the future will hold for cattle and ranch prices. To examine this issue it is necessary to consider indirect factors such as the world economy and grain production as well as future beef demand in the USA.

The present low real prices for beef are partially explained by the low corn and wheat prices. Low corn and wheat prices result in low chicken and pork prices because these are the main feeds used to produce these meats. Chickens and pigs convert grains into meat more efficiently than cattle, and therefore beef becomes relatively much more costly than poultry or pork when grain prices are depressed (Godfrey and Pope 1993). Annual per capita consumption of beef has dropped from 86 lbs in 1978 to 70 lbs presently based on U.S. Dept. of Agriculture data. Although the cholesterol scare has been blamed for this drop and has caused some of it, the reduction in per capita beef consumption is primarily because of the relatively low cost of chicken and pork relative to beef (Godfrey and Pope 1990).

The other big factor is the expansion of world grain production due to improved technology. China has gone from a net importer to a net exporter of wheat over the past 15 years. Russia is expected to become a grain exporter within the next 6 years assuming its free market reforms work out. This all means cheaper feed for chickens and pigs.

In the USA grain yields and total production are continuing to be boosted even though around 35 million acres of farmland have been retired since 1985 under the Conservation Reserve Program (CRP). If this land goes back into production it will probably adversely impact beef prices either indirectly by expanding grain supplies or directly by being used as a forage source. Our estimates indicate that if CRP contracts are allowed to expire it would increase beef production by 1.5 to 3%.

Another factor is the expanding world supplies of low grade beef from production increases in the developing countries, particularly Argentina and Australia. These countries are gaining world market share because their production costs are well below those in the USA. Research by Dr. Bill Gorman, Agricultural Economist at New Mexico State University, indicates that production costs are about 62% lower in Argentina and about 34% lower in Australia compared to the USA. For this reason the USA now imports more beef than it exports.

The positives for western cattle producers are increased human population and the possibility of improved affluency in some developing countries that would allow them to afford more meat in the diet.

The greatest improvement in living standards is occurring in the Pacific Basin (Asiatic) countries. These countries are a bright spot for USA cattle producers since they prefer high quality beef and per capita consumption is increasing. Australia is interested in capturing this market. So far the USA has had the quality advantage in producing the higher grades of beef but Australia has the cost advantage with the lower grades.

The other bright spot is Mexico where the North American Free Trade Agreement (NAFTA), if passed, will lower tariff levels on USA goods and should improve Mexican income levels. NAFTA is expected to expand Mexican demand for US beef. In the Mexican market we have the competitive edge in supplying the high quality cuts but we face serious competition from Argentina on lower grade beef.

Here in the USA our population is growing at a low rate (1% per year). About half of this growth comes from immigrants who consume high amounts of chicken and pork because of their low incomes and cultural traditions.

Based on this scenario we see nothing that would trigger a big increase in cattle prices over the next 5–10 years. There is a wild card. The USA has been experiencing disinflation since the early 1980's (Table 1). Productivity was increased and the government switched from printing money to fund its debt in the 1970's to borrowing the money to fund its debt in the 1980's (Davidson and Rees-Mogg 1993). Borrowing favors financial assets (bonds, stocks) over real estate and commodities. Debt in all sectors (consumer, business, local goverment, federal government) of the USA economy during the 1980's has lead to low level economic growth in the 1990's (Davidson and Rees-Mogg 1993). If the economy slips into recession or depression the goverment could decide to monetize the debt (print instead of borrow the money) and stimulate the economy with massive spending. Such a program could cause money to flow into commodities (beef) and real estate (ranches) as hedges against inflation. A severe devaluation of the dollar against foreign currencies would be the outcome of this approach. A lower dollar should increase our beef exports, but it could destabilize both the economy and the goverment (Calleo 1992, Davidson and Rees-Mogg 1993). Another problem for producers is that costs for fuel and supplemental feed could rise more than beef prices. Ranchers running extensive, low cost operations with high levels of long term debt at low interest rates would be most likely to benefit from this type of inflationary spiral.

Strategy for the Future.

We believe there is great uncertainty regarding the future of the USA and world economy in the next 5 years. Therefore we recommend ranchers use a conservative, gradualist approach that involves diversifying their assets and enterprises along with avoiding debt. We suggest that prudent ranchers try to maintain 10% of their liquid assets in cash at all times and invest no more than 25% of their annual net income back into the ranch. The other 65% would be allocated to cash, stocks, bonds, and commodities depending on stage of the business cycle. The rancher with a high cash level is in better position to buy low and sell high during the swings in cattle, land, commodity, stock and bond prices.

Historically stocks and bonds nave given greatly superior returns compared to cattle ranching. Since 1900 western cattle ranches have returned about 1–3% on capital investment compared to 10% for stocks and 4–6% for bonds. We recognize that most western ranchers are not in the business strictly for monetary gains but unsound financial management is one of the quickest ways to become an ex-rancher. We strongly recommend diversification of assets, maintaining a high degree of liquidity, and keeping a major part of financial resources where they will receive the highest return. One important advantage of stocks and bonds is liquidity. In contrast, lack of liquidity is a disadvantage of real estate or investments in range improvements such as brush control, seeding or fence for grazing systems.

Need and risk/reward ratios should be determined for the remaining 25% of assets invested in the ranch. Some

of the options would include brush control, range seeding, specialized grazing systems, water development, herd improvement, and infra-structure repair, and construction. Brush control and seeding to increase grazing capacity would make little sense if a large portion of the ranch is poorly used due to lack of water. However, it might be the best selection if forage supplies were lacking in certain seasons due to government grazing permit restrictions. It might also be appropriate if a strategic calving pasture was wanted where animals could be concentrated for better care and nutrition. Specialized grazing systems would be advantageous where distribution problems occur due to terrain and/or heterogeneity in plant communities. The rancher with limited capital resources in a desert area might choose to improve efficiency of range use and livestock productivity through better selection of livestock.

Conclusions

The business cycle has received little consideration in management decisions by western ranchers and range economists. Our analysis of available information shows cattle and ranch prices are closely tied to the general economic conditions in the country.

We find it regrettable that ranchers have not been trained to conscientiously orient stocking rate, brush control, ranch expansion, and other decisions around the business cycle. They have often been advised to buy when nominal interest rates and cattle prices were at a peak and then were later forced to sell low because of excessive debt that could not be serviced when prices fell. The approach of buying low and selling high has long been used by successful Wall Street investors. History shows it has just as much utility with livestock as common stock.

Barring war, an oil shock or some other disaster that causes inflation, the rancher who takes a conservative approach avoiding high risk management strategies and debt is most likely to survive. Investing more than 25% of liquid financial resources back into the ranch appears unwise. We believe improved financial skills would be of great benifit to most ranchers. Diversification into guest ranching, nature tours, fee hunting, pack trips, and marketing of plants for landscaping could offer income opportunities for the enterpreneurial rancher.

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CHANGING OF THE TIMES

With this issue of *Rangelands* we are embarking upon a new era. These changes are a result of several factors, personnel changes, state of the economy, and improved technology.

Personnel Changes: Most Society for Range Management members are aware that Dr. Patrica Smith, Production Editior for *Rangelands* since its beginning, retired on 1 April 1994 and left the SRM production staff to pursue other interests. The duties of Production Editor for both *Rangelands* and the *Journal for Range Management* are now being fulfilled by Patty Perez who has been involved with the Society's publications for over 15 years as typesetter and Assistant Production Editor.

The Economy: One of the main goals of *Rangelands* is to present articles of interest to the SRM members in a non-technical format. These articles cover a wide range of subjects such as historical accounts, new research findings, opinions, and many other topics. *Rangelands* is a forum for the members to communicate with others within and outside the Society for Range Management. From its inception *Rangelands* has depended upon its members, and others, for voluntary submission of articles. The articles are reviewed with comments submitted to the author(s) for consideration during the revision process. The ability to pay page change has not been a factor in the acceptance of an article for publication. Under this concept *Rangelands* has developed into one of the major success stories for the Society.

The changing times are upon us which require us to modify our philosophy. We must try to derive some additional funds to support the costs of producing *Rangelands.* The Society for Range Management Board of Directors has requested that authors pay page charges unless there is written verification of no institutional, agency, or industry support to defray those costs. It is not our purpose to "turn down" any article because of the absence of page charge funds. We do ask that any author make an honest attempt to find funds to support the page charges. It is our belief that most agencies and institutions have means to support page charges especially if they can be identified in the yearly planning and budgeting processes.

Improved Technology: The typesetting equipment used for this issue of *Rangelands* was "State-of-the-Art" when purchased new 10 years ago. It can still furnish a superb product. Unfortunately, technology has made it outdated, parts and service are almost a thing of the past. Starting with the next issue of the *Journal of Range Management* the articles and manuscripts for *Rangelands* and the *Journal of Range Management* will be prepared using "desk-top-publishing" on PCs. This allows the submission of articles on computer floppy disks. This will reduce the work in preparing the papers for printing and hopefully reduce the number of errors that need to be corrected in the proofing process.

While the past is good to remember, we must be open minded toward the future. We hope the changes which are being implemented will alllow us to continue to produce the quality product the members of the Society for Range Management have come to expect each month.

The Production Staff of *Rangelands* and the *Journal for Range Management,*
Gary Frasier, Techincal Editor
Bud Rumburg, Managing Editor
Patty Perez, Production Editor
Tawnya Castello, Production Assistant

The Good Ol' CPER

by Jeff Thomas and Mary Ashby
(Meter repairs by Dick Hart

When you're headin' up ol' 85 from Greeley to Cheyenne,
You'll notice things a-changin' on the Colorado land.

You'll pass the farms of "taters, corn and beans and sugarbeets,
And miles and miles of green and brown in fallow strips and wheat.

Where the farms all turn to grassland, anyone can see the change,
Theres a sign that says "The Central Plains Experimental Range."

For short it's called the "CPER" by local folks 'round here;
Home to research, cows and antelope, rattlesnakes and deer.

It started up in years gone by, 55 to be exact,
When the gov'ment gave out homesteads and the 'steaders gave 'em back!

All of sixteen thousand acres of native prairie land;
The land that's felt the might touch of God's creating hand.

On summer days, we must confess, it gets most awful hot,
And winter drops to 40 below and the wind, it blows a lot.

But springtime at the CPER rejuvinates your soul,
WIth green grass growin' ev'rywhere and hawks on ev'ry pole.

And summer nights, so dark and still, you look up at the stars,
And feel your soul go soarin' out past Jupiter and Mars.

But I reckon fall at CPER is my fav'rite time of year;
The colors up on Owl Creek almost make me shed a tear.

And even winter blizzards have a beauty of their own,
Unless your feedin' cattle when they 'fridgerate your bones.

Sure, the weather's sometimes drastic, like the snow of '49;
Or the flood of '65 that washed the heifers down the line.

The snow interred the outhouse, and the heifers swam to Nunn,
But the moisture made the grass grow when we finally got some sun.

And when you crave some action, weekends are now slow;
You can always mosey off to town and sit and "Watch Nunn grow!"

And so there may be lots of folks that think us kinda strange,
But we think we'll keep our saddles at the Experimental Range!

Capital Corral . . . . . Ray Housley

Washington Representative

The historical lesson is there is no permanent equilibrium.
Bruce Babbitt
(Commenting on the struggle over grazing reform, Jan. 1994)

Forest Service rangeland reform regulations appeared in the Federal Register April 28. The end of the comment period will roughly coincide with that for BLM regs released earlier. The Environmental Impact Statement on Reform for both agencies was being distributed as *Rangelands* went to press. Simultaneous hearings in the western states were scheduled June 8 to take comments on both BLM and FS proposed regulations. FS proposals were less sweeping than BLM's, with no Advisory Councils and no additional ideas about "standards and guidelines", which FS deals with as part of the Forest planning process. Otherwise, most are procedural matters and non-controversial ones at that.

The House Appropriations Committee (Subcommittee on Interior and Related Agencies) heard testimony on BLM and FS budgets that would increase range management funding by $8.3 million for BLM and $5.2 million for FS. The subcommittee was not expected to increase those amounts without some indication a fee increase was likely to be implemented. The Soil Conservation Service budget request did not include funds for the Grazing Lands Conservation Initiative, but the presentation stressed the need for increased range management support. The Agriculture Appropriations subcommittee is not expected to do much about that need when it marks up the USDA 1995 appropriation. Fiscal Year 1996 may be a different story. GLCI is strongly supported within the SCS and USDA, and money for it is likely to be included when the budget goes to OMB from the Department this winter.

The California Desert Protection Act moved closer to almost certain enactment when the Senate broke its deadlock, 69-29, and sent the hotly contended measure to the House, which passed a similar bill three years ago. The Senate version would create 7.75 million acres of wilderness, and expand two National Monuments, Joshua Tree and Death Valley, giving them National Park Status; a new East Mojave National Park of 1.2 million acres would be created. Despite strong opposition from California Governor Pete Wilson (R), Senator Dianne Feinstein (D-CA) was able to get enough support to pass the bill through concessions allowing continued livestock grazing on existing allotments in Death Valley and East Mojave, removing the 276,000 acre Lanfair Valley from East Mojave and preserving military access in a number of areas. Environmentalists have vowed to try to defeat those concessions when the bill is taken up by the House.

The Interior Department and its Capitol Hill allies were moving cautiously on all things having to do with the National Biological Survey, at least until the appropriations process gets a little farther along. For example, all the rumor mills in the capital city were reporting that Ron Pulliam, Director of the Institute for Ecology at the University of Georgia would be named DIrector of NBS by Earth Day (April 22). But no announcement was made even after USDI appropriations hearings were held in the House. Hearings on legislation to formally establish NBS as an agency were still pending at press time.

A proposal to refurbish and extend the Conservation Reserve Programs was introduced by Rep. Doug Bereuter (R-NE) as HR 3894). Rep. Bereuter is not a member of the Agriculture Committee, but CRP supporters consider his bill a good basis for beginning the debate on the future of CRP. The bill would extend CRP for ten years, and give more flexibility on which lands to enroll; no acreage limitations would be set. Bereuter would encourage trading up to Highly Erodible Land by allowing early exit of non-HEL. Rental payments would be limited to 80% of the current annual rate. Crop bases could be transferred, sold or leased upon expiration of contracts provided the former CRP lands remained in permanent cover. Finally, the bill grants new authority to State Technical Committees authorized in the 1900 Farm Bill for defining "environmentally sensitive land" and approving demonstration projects.

Those of us who try to keep track of Who's Who and Doing What in the federal agencies have either given up or prepared their own directories using real-time update mode. For example:

Dr. Peter Smith has been promoted to Director of Ecological Sciences for the SCS, vice Jim Newman who retired. Smith has been serving as Director of Strategic Planning for SCS, and earlier served as Environmental Coordinator for USDA, and as a staff assistant to the Assistant Secretary. Almost the entire "headshed" at SCS has been shuffled; nearly every member of the top staff has different responsibilities and titles than they did only a few months ago.

Bob Joslin is the Regional Forester for the FS Southeastern Region, having served as Deputy Regional Forester in the Intermountain Region most recently. He's a long-time active member of SRM who's worked all over the country since leaving the ranch in Montana. Dale Bosworth, Deputy Regional Forester in California (and second-generation FS employee) became RF in the Intermountain Region. Chip Cartwright replaced Larry Henson (who retired) as Regional Forester in the Southwestern Region; Cartwright had been acting deputy RF in Ogden, UT. When Mike Barton retired as RF in Alaska, Phil Janik, a fisheries biologist and FS Assistant DIrector of the Wildlife and Fisheries Staff in headquarters, was named RF. Kathy Maloney is the new Director of the Resource Planning staff,

rounding out the list of recent Senior Executive promotions. Several vacancies at that level remain, some may not be filled until after "renovation" is completed.

Recent retirements at top levels in BLM include Nevada State DIrector Bill Templeton and Wyoming SD Dale Brubaker, Jim Parker, Utah State Director has announced his retirement effective in July. Assistant Director Mike Penfold moved from Headquarters to Billings, where he oversees the agency's implementation of Rangeland Reform. Meanwhile, Dean Bibles, Oregon State Director moves to Washington to become a special assistant to the secretary; his successor is Elaine Zielinski, formerly Assistant SD in Oregon. Tom Allen is the new Alaska State Director, replacing Ed Spang, who was reassigned to headquarters. Bill Calkins is State Director of New Mexico.

Part of what sparked these wholesale changes was the Buyout, an arrangement authorized by Congress whereby agencies required to reduce budgets and employee numbers were able to offer incentives, (up to $25,000) to certain employees to retire or resign. By doing this, costly RIF's (Reductions in Force) were avoided, and literally thousands of younger employees were spared the stark prospect of job-hunting in a tough market. Many can contemplate early promotions! Statistics from three of the agencies who are the major employers of SRM members look like this:

Forest Service had just under 2,200 who accepted the buyout offer, and 101 of those were in Grade 14 and above (at least four were Senior Executives). Four hundred seventy five left the Pacific Northwest, where drastic decline in the timber program had made hundreds of employees surplus. Nationally, 445 forestry technicians, 328 foresters, 189 engineering technicians and 17 range conservationists availed themselves of the opportunity. (Probably some of those reported as foresters were actually doing range work because of the way FS classifies supervisory positions). In research, there were 144 takers, reportedly in support and administrative jobs, many at grade 14. Of those who left the FS, almost half were eligible for regular retirement, some waited for the buyout, some accelerated their retirement plans on account of it.

SCS which offered the buyout to all employees on a first-come, first served basis rather than the targeted approach others attempted, had 1,034 takers, which approximates the number of positions the agency was required to reduce. Forty five of those were headquarters employees and 5 were Senior Executives. Most of those who left were in professional and technical jobs rather than administrative and clerical. Only 13 range conservationists were reported, but it seems clear that a great many more range people were affected. At least 4 state range conservationists and many area and district conservationists and their range staffs were also involved. Some prominent SRM names were mentioned. Besides Jim Newman, Harlan DeGarmo retired, as did recent board member Dennis Phillippi and past president Dan Merkel.

BLM had more takers (521) than it could accommodate (295). Ten were in headquarters, and 4 or 5 were senior executives. In addition, BLM targeted public affairs, personnel management and administrative jobs as well as forestry positions, according to our source in the Bureau's personnel shop.

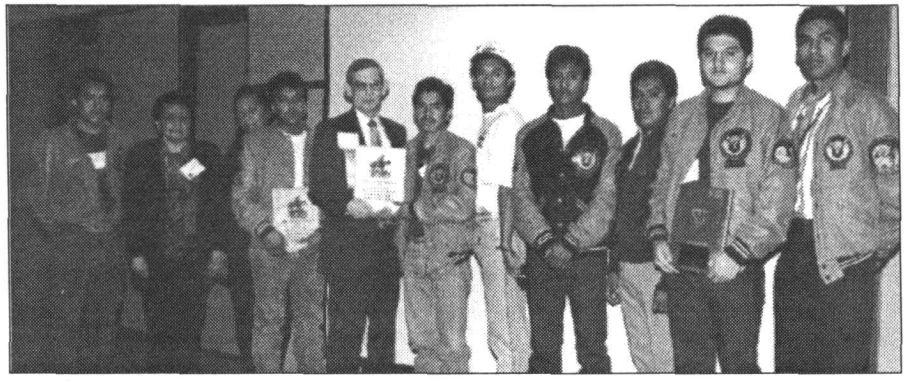
The Wildlife Society is scheduled to hold its first Annual Conference September 21-25 in Albuquerque. For information, call TWS at (301) 897-9770.

The American Sheep Industry has published a special edition of the *Sheep Research Journal* devoted to techniques and benefits of using sheep grazing as a tool in natural resources management. Case histories are presented along with the findings gleaned from some 15,000 published papers from around the world. The document is available from ASI, Dept. SIRJ, 691 S. Yosemite St., Englewood, CO 80112-1414. Price: $10.00.

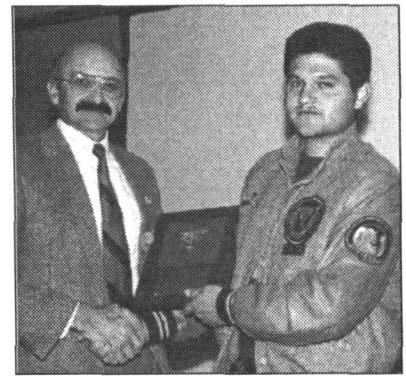
Resources For the Future, the premier "think-tank" and policy research organization in the natural resources arena, has withdrawn its membership in the Renewable Natural Resources Foundation. RFF had been a key member of RNRF since 1982, and filled an important role in intellectual leadership during that time. RFF was reportedly dismayed by protracted delay and acrimony over correction of long-standing defects in the original building at the RNR Center in Bethesda, MD, and by concerns over RNRF confusion about fiduciary responsibilities of board members. It perhaps was not lost on RFF that recent RNRF Board action on membership eligibility would effectively screen out RFF were it to apply today. The American Anthropological Association has determined to continue its membership "for one more year" pending resolution of real estate and other problems.

Winning Teams, 1994 Annual Meeting

Range Plant Identification Winners

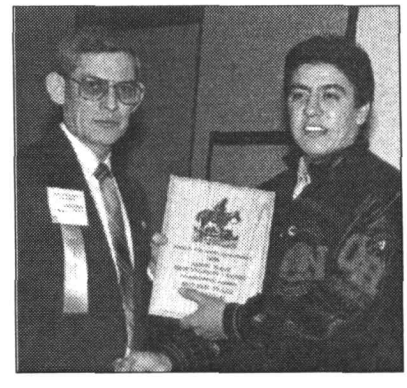


1st Place: *Universidad Autonoma Chapingo. Mauro Bravo E., Juan C. Garcia A., Lino de La Cruz C., Jose A. Montero S., Benito Morales M., Jose L. Flores P., Silvestre Charraga A., Mario J. Lopez C., Angel S. Guevara R., Profesores: Antonia Gonzalez E., Berta Rodriguez C., and Jorge L. Castrellon M.*



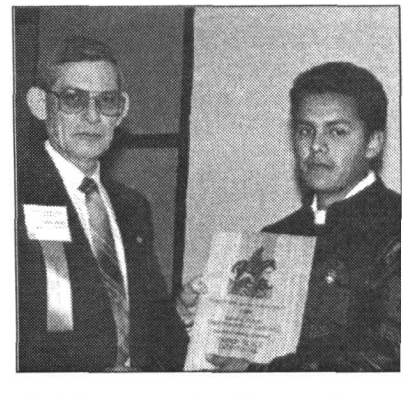
1st Place: *Angel Guevara (Universidad Autonoma Chapingo) presented by Buddy Arvizo.*

2nd Place: *Universidad Antonio Narro. Carlos Daza Ochoa, Juan Antonio Encina Dominguez, Teresa Resendiz Montoya, Carlos Fuantos Cano, Dr. Gary B. Donart, Vladimir Briseno Ahumada, David Hernandez Sanchez, Humberto Alvarado Raya, Florentino Montoya Manzano, Juan Jose Eduardo Del Angel, Ricardo Vasquez Aldape (Coach).*



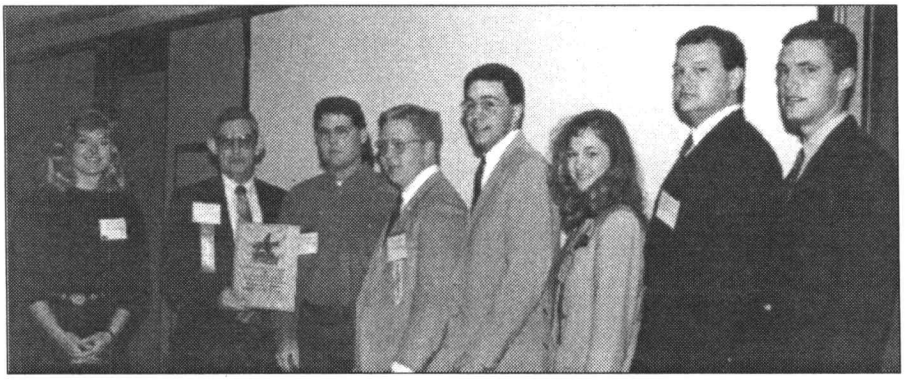
2nd Place: *Juan Antonio Encina D. Dominguez (Antonio Narro) presented by Gary Donart.*

3rd Place: *Texas Tech University. Brandon Wheeler, Keith Klement, Travis Walker, Cale Wenmohs, Mathew Evans, Philip Vardygriff, Johnny Brock, Coached by Drs. Karen Launchbaugh and Russ Pettitt.j*



3rd Place: *Florentino Montoya (Antonio Narro presented by Gary Donart.*

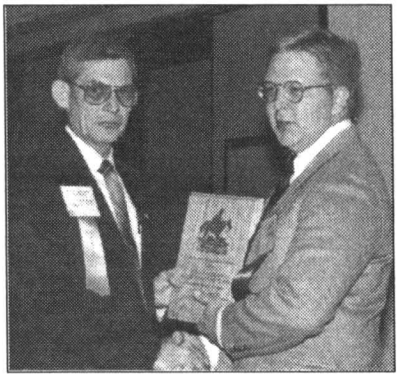
Undergraduate Range Management Exam Winners



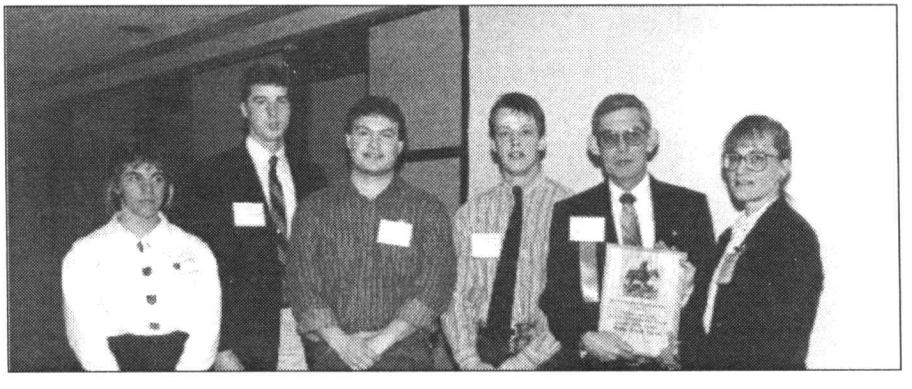
1st Place: *Texas A&M University. Kelley Hays, (Gary Donart), John Grymes, Ned Weathers, Lee Knox, Shaunna Haisler, Travis Haby, and Rudolph Reinecke.*

1st Place: *Lee Knox (Texas A&M) presented by Dean Boe, Forest Service.*

2nd Place: *University of Alberta. Chris Bayduza, (Gary Donart), Craig Carr, Sonya Clausen, Paula Schnick, Ronda Olson, and Jane Thornton.*



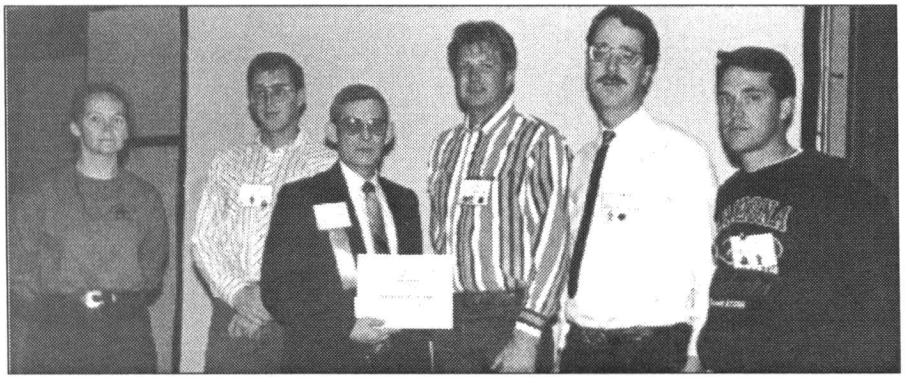
2nd Place: *Ned Weathers (Texas A&M) presented by Gary Donart.*



3rd Place: *Montana State University. Melissa Peterson, Koy C. Holland, Matt Phillippi, Rob Cosgriff, (Gary Donart), and Billi Jo Doll.*

Student Display Contest Winners

1st Place: *Arizona State University. Gary Donart, Ruth Olsen, Kendra Kent.*



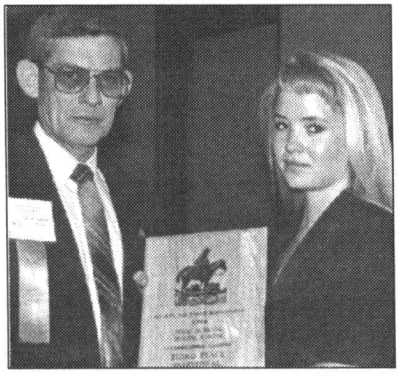
2nd Place: *University of Arizona. Wilma Renken, Bill Edwards, Gary Donart, Dan Bell, Kevin Williams, Ben Nelson.*

3rd Place: *University of Idaho. Karin Oosterling, Jim Strickland, Lori Anne Webster, Gary Donart, Kara Anne Wickward, Stacey Kelly, Marni Dickard, Barbara Ann Sonnen, Joy Handley, Susannah Hole, and Richard Sonnen.*

High School Youth Forum Winners

1st Place: *LaDane Olson (N. Great Plains Section) presented by Gary Donart.*

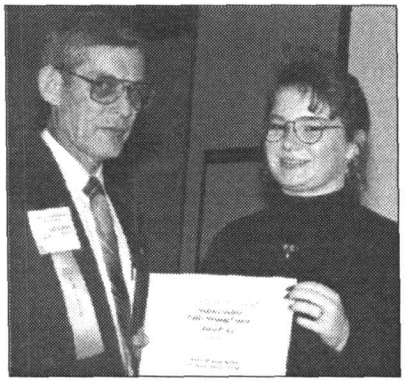
2nd Place: *Lindi Clayton, (Texas Section) presented by Gary Donart.*



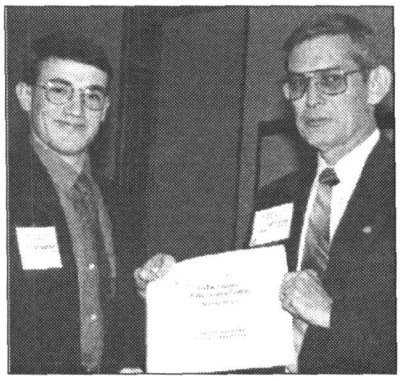
3rd Place: *Noelle Humphrey (Nevada Section) presented by Gary Donart.*

Student Conclave Winners

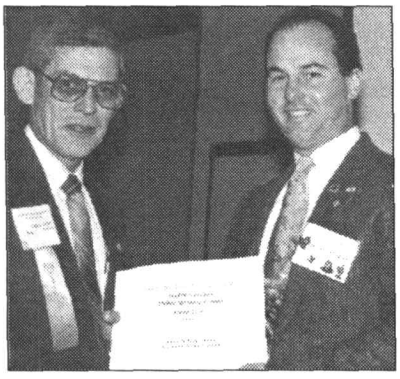
Congratulations to the Winners at the 1994 Annual Meeting in Colorado Springs, Colorado.



1st Place: *Brenda Yankim (University of Nebraska) presented by Gary Donart.*



2nd Place: *Eric Zimmerman (Texas A&M) presented by Gary Donart.*



3rd Place: *Kyle Hitchcock (Ft. Hays State) presented by Gary Donart.*

SRM congratulates all it's winners. The Plant Identification winners are: Team winners, 1st Place: Universidad Antonoma Chapinga; 2nd Place: Universidad Antonio Narro; 3rd Place: Texas Tech; 4th Place: South Dakota; 5th Place: Texas A&M. Individual winners are: 1st Place: Angel Guevana (Chapingo); 2nd Place: Juan Antonio Encina Dominguez, (Antonio Narro); 3rd Place: Florentino Montoya, (Antonio Narro); 4th Place: Jose FLores (Chapino); 5th Place: Keith Klement, (Texas Tech); Undergraduate Range Management Exam winners are: Team, 1st Place: Texas A&M University; 2nd Place: University of Alberta; 3rd Place (Montana State University; 4th Place: South Dakota State University; 5th Place: University of Nebraska-Lincoln. Individual Placings: 1st Place: Lee Knox, (Texas A&M); 2nd Place: Ned Weathers (Texas A&M); 3rd Place: Joshua Voorhis, (Colorado State University); 4th Place: Bill Edwards, (University of Arizona); 5th Place: Tom Jones, (South Dakota State University). High School Youth Forum winners are: 1st Place: LaDane Olsen (Northern Great Plains Section); 2nd Place: Lindi Clayton (Texas Section); 3rd Place: Noelle Humphrey (Arizona Section); 4th Place: Gwen Rentner (Nevada Section); 5th Place: Will Ward (Colorado Section).Student Display WInners are: 1st Place: Arizona State University; 2nd Place: University of Arizona; 3rd Place: University of Idaho. Student Conclave winners are: 1st Place: Brenda Yankim (University of Nebraska); 2nd Place: Eric Zimmerman (Texas A&M); 3rd Place: Kyle Hitchcock (Ft. Hays State); and 4th Place: Kara Wickward (University of Idaho).

Results of the 1994 Graduate Student Paper Contest will appear in the August issue of *Rangelands.*

Board of Directors Meeting Highlights

The Annual Meeting of the SRM Board of Directors was held in the Crystal Room of The BroAdmoor Hotel in Colorado Springs, Colorado on February 13-18, 1994. President Gary B. Donart presided.

The Board of Directors (BOD) accepted the bid from the Mexico Section to host the 1998 Annual Meeting in Guadalajara.

A Task Group has been formed to prepare SRM's official response to the **Rangeland Reform** document due out in mid-March. Sections wishing to respond on their own have been asked to send copies of their response to SRM prior to submitting to ensure consistency.

Two proposals for a **JRM Bibliographic Data Base** suitable for electronic searches were presented which would allow individuals to purchase a data base listing of the *Journal of Range Management* and *Rangelands*. The BOD empowered the Executive Vice President to make a decision on which proposal to pursue.

A Task Group was formed last year to look into ways of making ***Rangelands*** more profitable and the group developed a number of possibilities including: increase advertising fees immediately; develop a strategy to increase advertising; develop a new, bold marketing strategy to appeal to a broader audience; to name a few. Gary Frasier reported that due to a shortage in papers submitted for publication in *Rangelands*, page numbers will be cut for the remainder of the year. It was felt that *Rangelands* should be provided to the membership as a service, it should not be expected to pay for itself, funds should come from other sources than the membership.

The opinion poll conducted on this year's ballot regarding the name change for the ***Journal of Range Management*** indicated that the membership did not wish to change the name. The BOD approved a motion that the name of JRM would not be changed nor considered for change within three years.

The **Memorandum of Understanding** with **AFGC** was approved in concept by the BOD, however, there was concern that the membership has not been adequately informed about the whole concept of a cooperative agreement with AFGC. It was decided that pros and cons of the MOU would be published in the *Trail Boss News* with a tear-out response form to complete and return so that the BOD would have a better indication of how the membership felt about this cooperative agreement.

The BOD approved the establishment of an ad hoc committee to study means of making a **membership directory** readily available to members at a low cost. Distribution on a disk, on request, appears desirable. The Technology Transfer Committee will work with the Denver staff, the Membership and Professional Affairs Committees to work out the details.

As a result of a recommendation from the **Unity in Terminology and Concepts Task Group**, the BOD approved the establishment of an interagency working group charged with the development of a statistically valid inventory and condition assessment of the rangelands of the United States. This inventory must be accomplished through a partnership effort with the Soil Conservation Service, Forest Service, Bureau of Land Management, National Park Service, Bureau of Indian Affairs, Environmental Protection Agency, National Biological Service, Fish and Wildlife Service, Department of Defense, and other appropriate agencies. The BOD also approved the Ecological Site Description as developed by the Task Group and recommend its adoption by agencies.

The **Utah State University** Department of Range Science was reaccredited for another ten years.

The BOD extended its full support to the **Grazing Lands Conservation Initiative Task Group** in its effort to establish grazing land committees in each state. The Task Group is trying to bring this initiative from a grassroots level.

The BOD approved two new publications, ***Plant Physiology*** and ***Range Wildlife***, to be publish as soon as funds are available.

The BOD adopted the following **Positions Statements and Resolutions** (see statements on page 134): Responsibilities and Rights of Private Rangeland Owners Position Statement; Wetlands Position Statement; and Resolution on Salmonid Fisheries and Rangeland Watershed Management; and the USLE Position Statement was sunset.

The **Summer Meeting Handbook Committee** was sunset. The **International Affairs**, **Remote Sensing & GIS**, **Watershed/Riparian** and **Wildlife Habitat** Committees were reauthorized for another five years. The **Small Tract Range Task Group** was sunset, however their function and expertise were attached to the Information & Education Committee.

The BOD approved recommendations from the Finance Committee to 1) make an **SRM credit card** available to members; 2) purchase **desktop publishing equipment** with funds from the working capital account with the provision that the funds will be replaced with revenue to be raised through a capital fund drive; and 3) that the Society establish the goal of accruing a **capital cash reserve** equal to the amount of a 3-year average of its annual operating expenses and that if funds are borrowed from this reserve to meet current needs, these funds must be replaced.

The **Student Affairs Committee** recommended and received BOD approval for a Student Public Speaking Contest to be recognized on the same level as the URME Exam and the Plant ID Contest.

The BOD approved a recommendation from the **Coordinated Resource Management Committee** to develop a fact on the benefits of CRP to be used when contacting policy makers and the media.

The **Range Consultants Certification Panel** recommendation: that certified range management consultants be allowed to use the "Trail Boss" logo and "SRM" acronym, as long as stationery, business cards, etc., are tied to the SRM certification number of the individual consultant, was approved by the BOD.

Joint Meeting of the Board of Directors and Advisory Council

The following recommendations were made to the SRM Board of Directors at a Joint Meeting with the Advisory Council on February 17, 1994 at 1:00 p.m. Chair of the Advisory Council Darrel N. Ueckert and President David A. Fischbach presided. Ueckert presented the recommendations of the Advisory Council as listed below and the subsequent actions were taken by the Board to the recommendations

Recommendation 1. That the 1996 Summer Meeting be held in San Antonio, Texas. *BOD accepted.*

Recommendation 2. That the 1999 Annual Meeting be held in North Platte, NE., with Omaha as alternate. *BOD accepted.*

Recommendation 3. That the BOD provide financial support to the International Affairs Committee to produce and mail leaflets in English and foreign languages. *BOD accepted.*

Recommendation 4. That the Wetlands Position Statement drafted by Public Affairs Committee be adopted. *BOD accepted.*

Recommendation 5. That the resolution on Salmonid Fisheries and Rangeland Watershed Management drafted by Public Affairs Committee be adopted. *BOD accepted with minor changes.*

Recommendation 6. That the position statement on Responsibilities and Rights of Private Rangeland Owners drafted by the Public Affairs Committee be adopted. *BOD accepted with editorial changes.*

Recommendation 7. That the AC be provided an updated SRM budget at the 1994 Summer Meeting. *BOD accepted.*

Recommendation 8. That SRM publications be published solely by the Society for Range Management. *No action - tabled by BOD.*

Recommendation 9. That the Excellence in Range Management Committee be given the responsibility of reviewing videos in the SRM Video Library to ensure conformity to SRM policy and positions. *BOD will act after their meeting with Excellence in Range Management Committee.*

Recommendation 10. That the American Sheep Industry be commended for their efforts in developing educational materials in support of the mission of the Society for Range Management. *BOD accepted .*

Recommendation 11. That the BOD develop a mechanism to recognize recipients of Section Excellence Grazing Management Awards at the parent society level. *Excellence in Grazing Management to discuss with Board Representative of Excellence in Range Mgmt. & Awards Committees about this*

Advisory Council Meeting Highlights

***Rangelands* & *JRM* Report.** Gary Frasier reported on the need to find additional revenue sources to support *Rangelands* and *Journal of Range Management.* Gary also informed the AC that Pat Smith is retiring and Patty Perez will take over as Production Editor.

The SRM office is acquiring desktop publishing equipment and will be using Waverly Press for it's printing.

Advisory Council Procedures Handbook. The Advisory Council adopted a newly revised procedures handbook. The new handbook was drafted by Darrell Ueckert, Marty Beutler, Ron Mitchell, and Ron Ries. The Samuel Roberts Noble Foundation paid for the printing. Copies are available in the Denver office.

Administrative Handbook. The benefits of each section having an administrative handbook was discussed. The Texas' Sections Handbook was offered as a model. Each section should consider developing a handbook to facilitate section operations and committees.

Endowment Fund Board of Governors Report. John Hunter provided an updated handout of the Endowment Fund. Lapel pins are still on sale. Pete Jackson will be the '94 Chair of the Endowment Fund.

Leadership Training Workshop at '95 Meeting. The Leadership Development Committee would like to begin Leadership Training Workshop for the Board of Directors and Advisory Council at the 95 Winter Meeting in Phoenix, AZ.

Awards Committee. Tommy Welch suggested that the sections consider giving an Outstanding Young Range Professional Award. Nominations for the Chapline Research Award may also be considered for the Outstanding Achievement Award.

Executive Vice President's Report. Bud reviewed personnel changes at the Denver office. They include: Ann Harris as Director of Administration and Marlowe Williams as Office Services Manager. SRM may need a fund raising drive to purchase desktop publishing system. Status of joint involvement with American Forage and Grasslands Council (AFGC) is not settled yet.

Future Meetings. 1996 Summer Meeting will be held in San Antonio, TX. North Platte, NE was selected as the 1999 Annual Meeting location with Omaha, NE as backup.

"A section in search of purpose" was how the National Capital Section was described by Greg Hendricks. He proposed that the N.C. Section would establish a committee to assist other sections in the capital. Any activity for this committee would go through the SRM Office and Ray Housley.

SRM '94 Budget. To increase revenue for *Rangelands:* page charge collections will be more vigorous; an investigation will be persuaded into marketing subscriptions through *Range* Magazine; and other marketing strategies will be solicited.

Public Affairs needs volunteers to help review resolutions and statements.

SRM Logo Use. The Range Consultants Certification Panel and Public Affairs Committee recommended that certified range consultants who desire to use the SRM Logo on their letterhead be able to do so. They recommended that the logo have a circle around the Trail Boss with the consultants number beside the Trail Boss. An article will appear in *Rangelands* explaining the duties of a consultant.

Chair-Elect Election. Nominations were received for the position of Chair-Elect, after the votes were tallied, Bob Childress of Hot Springs, SD was elected.

SRM Position Statements and Resolution

Position Statement

RESPONSIBILITIES AND RIGHTS OF PRIVATE RANGELAND OWNERS

The Society for Range Management recognizes the role of the private land owner as a primary steward of rangelands. The Society supports the right to own and use private property and recognizes that within those rights are imbedded certain responsibilities. These rights should be respected and protected. The Society also recognizes that owners of private rangelands — whether they be individuals, institutions, or commercial businesses — have a vested interest in the condition of their rangelands, an incentive which often leads to maintenance or improvement of the resource.

Privately owned rangelands, and those lands that are ancillary to the sound management of rangeland ecosystems (pasture, haylands, woodlands and croplands) greatly influence the economic and environmental health of nations throughout the world. These privately owned lands, when thoughtfully managed with stewardship of all resources, serve many beneficial purposes. Included among these are: Healthy watershed function, the retention of the essential habitat for many species, including threatened or endangered plants and animals, and the supply of food and fiber to world economies Private rangeland ownership carries responsibilities. The Society supports rangeland owners in managing their resources, within the context of the whole ecosystem, in such a way as to protect resource health and long-term sustainable production.

Accepted by the SRM Board of Directors on February 16, 1994.

Position Statement

Wetlands

The Society for Range Management believes that many rangeland uses are compatible with proper wetland function and values. SRM actively encourages the implementation of management strategies for wetlands that optimize their values while maintaining or restoring the wetland function. This may include restoration techniques when these values have diminished or in creating wetlands where their values are desired.

Wetlands are areas characterized by soils that are usually saturated or ponded (i.e., hydric soils) that support mostly water-loving plants. Wetlands are unique ecosystems that vary in their complexity due to hydrology, soils, climate, animal and plant interactions. The function of wetlands may include water quality enhancement, flood control, nutrient cycling, sediment capture, groundwater recharge and the provision of habitat for a diversity of living organisms.

Wetland values provide for human health and safety, biological diversity, aesthetic, economic and recreational opportunities which require properly functioning wetland areas.

Accepted by the SRM Board of Directors on February 16, 1994.

Resolution

Salmonid Fisheries and Rangeland Watershed Management

WHEREAS The Society for Range Management supports the conservation of species and their
habitats and recognizes the importance and function of biological diversity, and

WHEREAS salmon, steelhead and trout, because of their specific requirements of quality water and stream conditions, are indicators of watershed conditions in many parts of the world, and

WHEREAS several species or populations of salmonids have been federally listed as sensitive, threatened, or endangered, and many other salmonid populations are at historically low levels because of many human impacts, and

WHEREAS among these impacts, improper watershed management and certain competing water uses where identified can affect salmonid populations by altering timing and duration of flow and stream channel morphology and by degrading water quality and fish habitat,

THEREFORE BE IT RESOLVED that the Society for Range Management encourages all federal, state and provincial land management agencies and private land owners to plan and apply land and water management that maintain or restore watershed functions, and stream and riparian conditions.

Accepted by the SRM Board of Directors on February 16, 1994

Accepted by the SRM Board of Directors on February 16, 1994.Accepted by the SRM Board of Directors on February 16, 1994

Life Members

(bold face indicates Sustaining)

Robert C. Accola
Kenneth G. Adams
Ramondo Aguirre
Eduardo Airzpuru-Garcia
Jack D. Albright
Ricardo V. Aldape
Bob Alexander
Christopher Allison
Dean M. Anderson
E William Anderson
Mrs.Darwin Anderson
Jonathon Anderson
Paul Anderson
Val Anderson
Art J. Armburst, Jr.
Neal E. Artz
Abdulaziz M. Assaeed
Josiah T. Austin
Calvin Baker
Nancy C. Ballard
Robert F. Barnes
Eduardo J. Barragan
Reginald H. Barrett
Mack Barrington
Keith Bartholomay
John Baumberger
Rodney D. Baumbergre
Jerry R. Bean
David J. Beard
Thomas E. Bedell
Alan A. Beetle
Robert E. Bement
R. Gordy Bentley, Jr.
William A. Berg
Lloyd L. Bernhard
Lester J. Berry
C Robert Binger
Kenneth P. Blan
D Morris Blaylock
Albert E. Blomdahl
Vosila L. Bohrer
Eric G. Bolen
D Terrence Booth
Michael Borman
George E. Bradley
Lorenz F. Bredemeier
Vernon C. Brink
H Leo Brown
Patrick J. Broyles
H Harold Bryant
Steve Bunting
A Lynn Burton
Evert K. Byington
Dwight R. Cable
Margie M.Campbell
Bartley P. Cardon
Roy M. Carlson, Jr.
Jose F. Casco
Martha Chaney
George D. Chattaway
W. James Clawson
C. Rex Cleary
Charles Clement
Alvin M. Clements
James S. Cochrane
Elizabeth H. Colbert
Thomas A. Colbert
Sam H. Coleman
Richard L. Coose
Roy Copithorne
Max A. Corning
James A. Cornwell
Debra Sue Couche
Donald A. Cox
Patrick I. Coyne
Nick J. Cozakos
Kent A. Crofts
John L. Cross
L. Dean Culwell
Jack R. Cutshall
Sterle E. Dale
Lawrence A. Daley
Robert A. Darrow
Gary G. Davis
Maurice R. Davis
Howard De Lano
Joe Deschamps
Wright Dickinson
Claude C. Dillon
Olan W. Dillon Jr.
Everett R. Doman
Gary B. Donart
Donald C. Douglas
John Drake
Richard E. Dresser
Robert S. Drinkwater
W. James Duffield
R. A. Dyer, Jr.
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Gerhard Ehlert
Virginia M. Emly
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Lani Estill
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Marion E. Everhart
Sherman Ewing
Dahir Abby Farah
Richard W. Farrar
Nancy R. Feakes
Fredrick Finke
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Herbert G. Fisser
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Carlton S. Fonte
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Richard T. Forsman
William A. Fortune
Bruce T. Foster
Philip H. Fox
Joeseph G. Fraser
Ed L. Fredrickson
Jim C. Free
Daniel G. Freed
John D. Freeman
Howard R.Freemyer
Leroy Friebel, Jr.
Dennis K. Froeming
Kenneth O. Fulgham
Trinida B. Garcia
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Allen N. Garr
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Melvin R. George
Will R. Getz
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R. "Richie' Gonzalez
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Win Green
Geoffrey E. Greene
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Margaret Gunderson
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Marshall HaferkampL
L. I. Hagener
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Robert Hamner
Eugene J. Hand
Edward B. "Brent' 'Handley
Richard M. Hansen
Jackie L. Hanson
Julie A. Hansmire
Earl E. Hardie
Glenn W. Harris
Robert W. Harris
Richard H. Hart
Craig Haynes
Harold F. Heady
Darwin C. Hedges
Dennis Heffner
Rodney Heitschmidt
Humberto Hernandez
O. N. Hicks
Joseph Hiller
C. E. "Chuck" Hitch
Lynnel A. Hoffman
Charles A. Holcomb
Lee J. Holden
Royal G. Holl
Richard J. Holler
John R. Hook
August L. Hormay
R. M. "Ray" Housley
A. C. Hull Jr.
Robert R. Humphrey
Victor H. Humphreys
John R. Hunter
Richard M. Hurd
William D. Hurst
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W. O. Hussa
Margaret F. Hyatt
Milton Hyatt
S. Wesley Hyatt
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Richard Johnson
Thane J. Johnson
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Colleen G. Larkoski
Robert D. Larsen
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