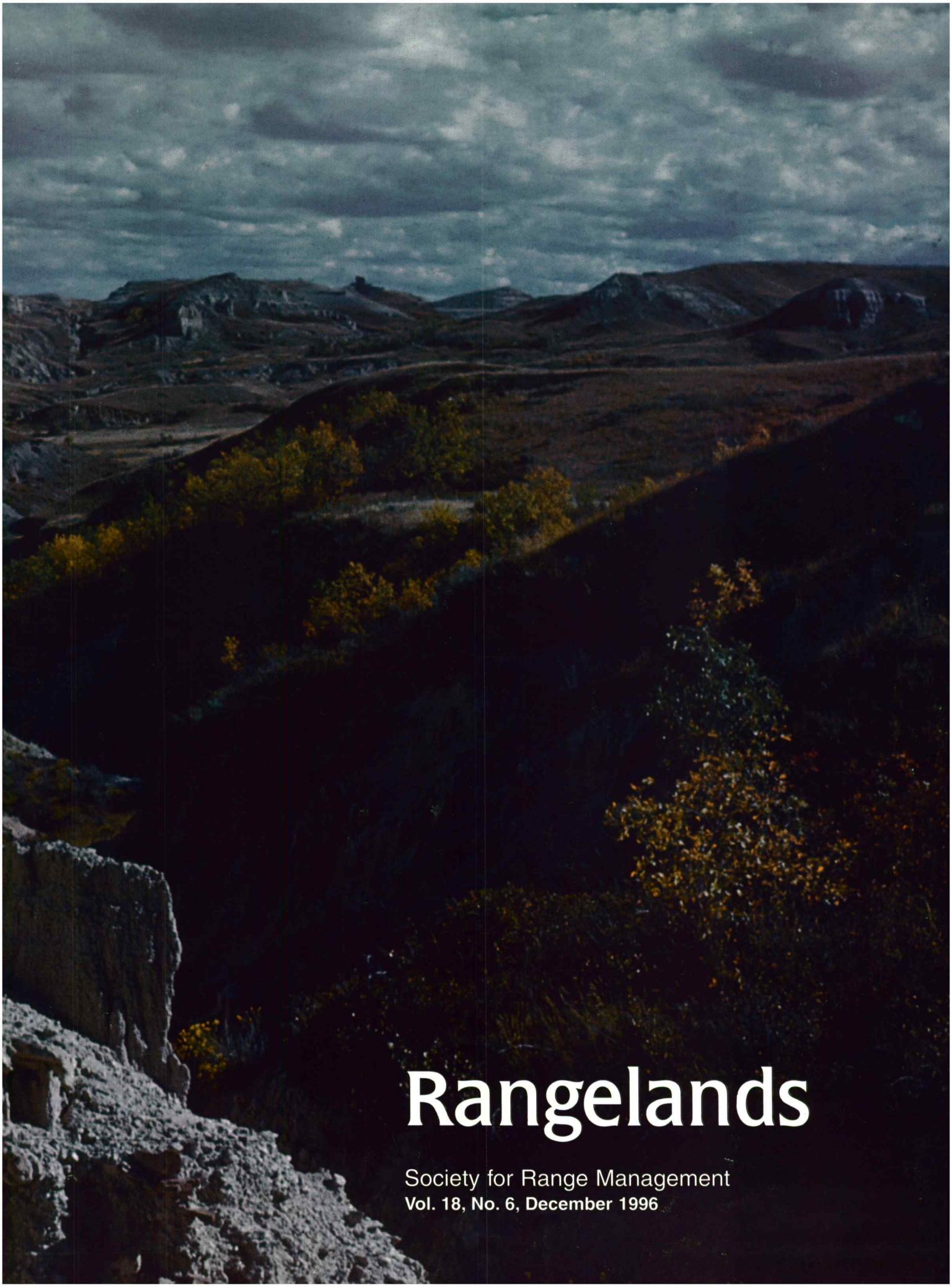

Rangelands

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Badlands formation in Slim Buttes in South Dakota. Photo by Bob Gartner. Read Bob's article on South Dakota rangelands on page 212.

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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 of 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 or 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 1996 Farm Bill. The Farm Services Agency released proposed rules for implementing the Federal Agricultural Improvement and Reform Act (FAIR), the 1996 Farm Bill. There are two provisions in this Bill that have significant implications to private rangeland: the Conservation Reserve Program (CRP) and the Environmental Quality Incentives Program (EQIP). The proposed rules for CRP were released in the Federal Register September 23, 1996 and are perceived by SRM as drastically changing the program and leading to large shifts in land use in the Great Plains. Incentives favor a conversion of CRP acreage to annual crops as the CRP contracts expire. The Society's CRP committee has been active in reviewing the proposed CRP rules and regulations and responded to the USDA, Farm Services Agency, with their concerns. Responses were due November 7, thirty days after publication. More detail on SRM's response to the CRP proposed rules can be found in the lead article of the *Trail Boss News*.

EQIP proposed rules were released in the Federal Register October 11, 1996. EQIP was established in the 1996 Farm Bill to provide a single, voluntary conservation program for farmers and ranchers who face serious threats to soil, water and related natural resources. EQIP is comprised of four previously existing programs: the Agricultural Conservation Program, Water Quality Incentives Program, Great Plains Conservation Program, and the Colorado River Basin Salinity Control Program. Nationally it provides technical, financial and educational assistance, half targeted to livestock-related natural resource problems and the other half to more general conservation priorities. EQIP is authorized at $200 million per year through 2002 from Commodity Credit Corporation funds. EQIP could have an impact on private rangelands equally as great as CRP. The two programs should be closely related but that does not appear to be the case. EQIP rules for livestock appear to largely overlook management opportunities, and do not allow funding consideration on CRP lands to keep them in permanent cover for agricultural, conservation or wildlife use.

Response to EQIP rules are due November 14, just over 30 days after publication. SRM was surprised by this program and had no organized committee with responsibility to review EQIP rules. Several SRM members are attempting to organize an ad hoc group to respond to proposed EQIP rules but time will likely expire before the response can be prepared.

SRM Response to Public Policy Issues. The Society has in place a formal process for the comprehensive review and adoption of Policy and Position statements and Resolutions. These are outlined in detail in SRM's Bylaws, Article IX Sections 2 through 7. All statements have gone through that process and when completed they are published. That procedure is very thorough, comprehensive and time consuming. However, I submit that there is a difference between developing policy and responding to policy issues. As Vivan has nicely pointed out in his article in this Journal, policy issues have a dimension of time. Responding to the CRP rules is a good example—after November 7, comments become irrelevant. There was not time to have the comments reviewed by any committees or elected officers other than the CRP. That response, in effect, becomes a policy position and it did not conform to established procedures. It is a safe bet that the Society cannot take a position on hardly any issue that will not offend some members.

The current policy for a quick response procedure was established by SRM Officers in 1990. This policy states: that the four SRM officers (President, 1st Vice President, 2nd Vice President and Executive Vice President) collectively serve as the focal point to determine and implement a quick response. Any SRM member in good standing can signal an alert or request action, any officer can request the Executive Vice President to arrange an immediate conference call and the conference call will be utilized to determine nature and timeliness of response and action appropriate to the situation.

Some members were offended with the Society for its support of the Public Rangeland Management Act (PRMA), some for failure to follow procedures in the bylaws for policy development and some for both. Following the policy development procedures outlined in the Bylaws effectively prohibits any policy responses because the issue will have died before completion of the process. Maybe that is what was intended; if so, then the Society should be more explicit about the policy.

Two vastly different choices occur to me, with opportunity for variations of each: the Society can establish a process that members are comfortable with, irrespective of whether or not they agree with the position, or they can explicity and overtly determine that the Society will not take positions on any policy issues. In place of policy positions, the Society could outline parameters on both sides of an issue and encourage individual members to take action based upon their own values. There are good, rational arguments for both positions. I hope the Society will review and agree on a process that the members are comfortable with.

Montana's Agreement on Prescribed Grazing Standards. For the past 4 years a group of individuals representing the Montana Stockgrowers Association, Bureau *(Continued on page 224).*

South Dakota Rangelands: More than a Sea of Grass

F. Robert Gartner and Carolyn Hull Sieg

Pre-settlement explorers described the region's landscape as a "sea of grass." Yet, this "sea" was quite varied, and included a wealth of less obvious forested communities. Both physiographic and climatic gradients across the state of South Dakota contributed to the development of variable vegetation types of South Dakota. The diverse flora truly identifies the state as a "Land of Infinite Variety." Variations in climate, soils, and topography help to accentuate this label. Large herbivores such as bison and periodic fires ignited by lightning and American Indians also contributed to the formation of the pre-settlement landscape.

Topography, Physiography, Climate

South Dakota is located in the geographical center of North America. It lies near the center of the large region of grassland vegetation that once occupied the central part of the continent. Elevation increases from about 900 to 1,500 feet above sea level along the eastern border to 3,000 to 3,500 feet along the western border. The highest point in the United States east of the Rocky Mountains is Harney Peak in the Black Hills at 7,241 feet elevation.

The major portion of the state lies within the Great Plains physiographic province (Fig. 1), and a smaller portion in the Central Lowlands Province (Denson 1964). The Great Plains Province is a broad highland that slopes gradually eastward from the Rocky Mountains on the west to the Central Lowlands on the east. That portion of the Great Plains Province in the western two-thirds of South Dakota has been termed the Missouri Plateau by some authors. The Central Lowlands Province extends from the drainage basin of the James River (approximately the 99th Meridian) eastward.

South Dakota's climate is highly variable, with long-term precipitation perhaps best exemplifying that variability. The capital city, Pierre, is near the center of the state on the

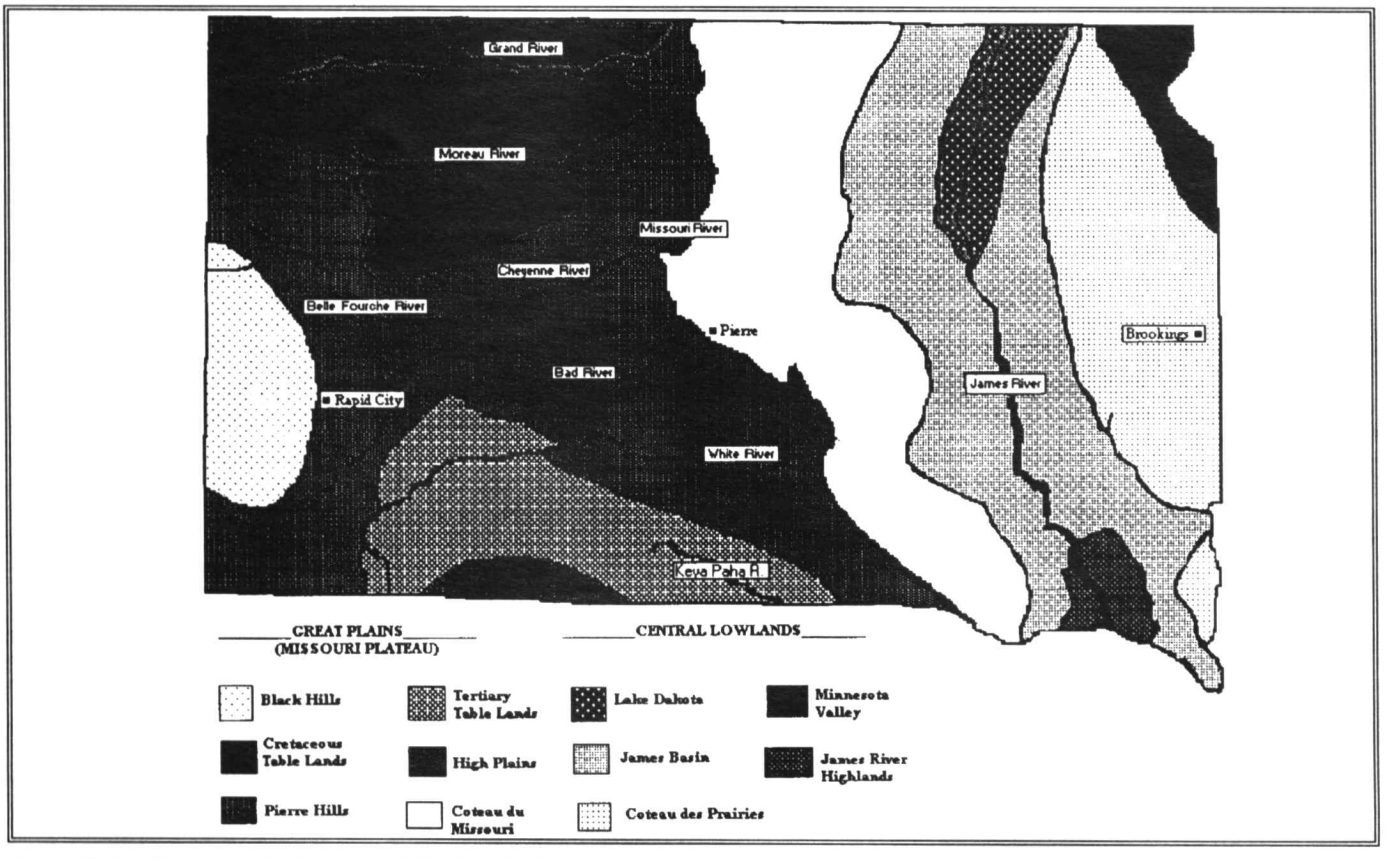

Fig. 1. Major physiographic divisions of South Dakota.

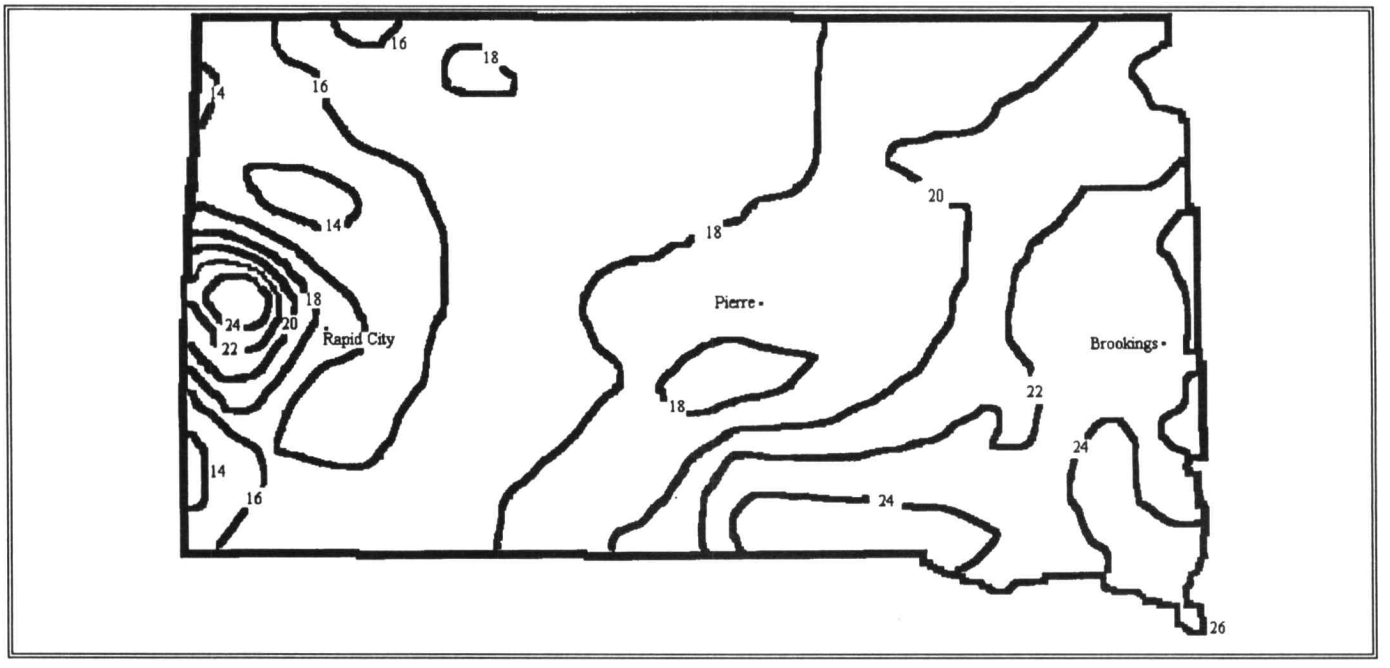

Fig. 2. South Dakota average annual precipitation (inches) 1961–90 (Bunkers, 1993).

east bank of the Missouri River. Pierre is also immediately west of the 100th Meridian, the arbitrary border between the subhumid and semiarid climatic zones. Schumacher (1974) carefully analyzed the 81-year (1892–1972) Pierre precipitation record. He noted that according to Thornthwaite's (1936) climatic classification scheme, five of the years were arid, 33 semiarid, 31 dry subhumid, 12 moist subhumid, and none were humid. Wet and dry years tended to be grouped. Dry years can be quite severe, especially when spring and early summer precipitation is deficient. Plant moisture stress occurs somewhere in the state nearly every year.

Annual precipitation generally decreases from about 26 inches along the southeastern borders to about 13 inches at the extreme northwest and southwest corners of the state (Fig. 2). About 75 percent occurs during the growing season, April through September. The 18-inch precipitation isohyet partly conforms to the 100th Meridian and the eastern boundary of the Great Plains Province (Figs. 1 & 2).

South Dakota Natural Vegetation

A map of the pre-settlement or potential natural vegetation of South Dakota (Fig. 3) reveals that nearly all the land area of the state was once grassland (Baumberger 1977). Most grassland, i.e. rangeland, in the state is a mixed-grass community comprised of a mosaic of varied plant associations. Only a few scattered remnants of tallgrass prairie occur in the eastern third of the state. The mixed grass prairie grades into shortgrass and sagebrush-grassland in the extreme western portion of the state. Sandhills grasslands are found along the southern border and in a small isolated pocket of sandhill topography known as the Hecla Sandhills in the northeast. Riparian woodlands line the rivers and streams of the state; other pockets of deciduous species are restricted to draws and other topographic locations where additional moisture permits their survival. Ponderosa pine occurs on outcrops at several locations in the western portion of the state, and is the dominant tree in the Black Hills. Despite substantial conversions of rangeland to cultivated land, rangeland still dominates most of the central and western South Dakota landscape.

Tallgrass Prairie

The Tallgrass Prairie (or true prairie) once occupied the eastern one-third of South Dakota, mostly on what is known as the Coteau des Prairies (Figs. 1 & 3). The general aspect, in a pre-settlement state, consisted of a dense cover of tallgrasses and an abundance of showy forbs. Soils are deep and formed mainly in glacial drift or loess. Elevations range from a low of about 900 feet above sea level in the extreme northeast corner of the state to about 1,500 feet in the southeast corner.

Dominant species of this portion of the Tallgrass Prairie are big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), porcupine grass (*Stipa spartea*), and tall dropseed (*Sporobolus asper*). Disturbance increases such species as western wheatgrass (Agropyron smithii), sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), hairy grama (*B. hirsuta*), and buffalograss (*Buchloe dactyloides*). Exotic plants, such as Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*), and noxious weeds, such as leafy spurge (*Euphorbia esula*), have invaded many remaining Tallgrass Prairie areas.

Today, the majority of this area is in cropland. What remains of the Tallgrass Prairie is mostly in low range condition with a high percentage of exotics and other invader species. In recent years, some Tallgrass Prairie areas have been restored and are being maintained with periodic fire to stimulate native species and control invaders.

Tallgrass Transition

The characteristic vegetation of this community is a dense cover of tall and midgrasses. It occupies the transition between the Mixed and Tallgrass Prairies in three major physiographic divisions (Figs. 1 & 3). Soils are mostly deep, having formed in glacial till or loamy glacial drift on uplands. At the western edge of the area and along the Missouri River, soils are formed in loess, silty glacial drift, or loess mantled glacial till on uplands.

Dominant species in pristine condition were western wheatgrass, big bluestem, little bluestem, porcupine grass, green needlegrass (*Stipa viridula*), and prairie junegrass (*Koeleria macrantha*). Forbs were abundant. The altered community develops a shorter aspect with increases in sideoats grama, blue grama, and needleandthread (*Stipa comata*), as well as a number of perennial and annual forbs. Kentucky bluegrass is a common invader species. A high percentage of this area has also been converted to cropland. Only steep and rocky soils remain as rangeland.

Mixed-grass Prairie

This community occurs in the Great Plains Province across two large physical divisions: the Pierre Hills west of the Missouri River and the Cretaceous Table Lands in the northwest portion of the state (Figs. 1 and 3). The former is underlain by the Pierre shale formation with soils formed mainly in residuum from clayey or silty shales on uplands at elevations of 1,800 to about 2,000 feet. The Cretaceous Table Lands to the south contain soils that are a mixture of sandy and loamy materials formed from sandstone, siltstone, and shales on uplands to about 3,600 feet.

The natural vegetation of the northwestern section of this vast upland area consisted of a moderately dense cover of midgrasses dominated by western wheatgrass, needleandthread, little bluestem, prairie sandreed (*Calamovilfa longifolia*), green needlegrass, and stonyhills muhly (*Muhlenbergia cuspidata*). Dryland sedges (*Carex* spp.), blue grama, prairie threeawn (*Aristida purpurea*), and fringed sagewort (*Artemisia frigida*) increase with disturbance.

The remaining portion of this community is characterized by a moderately dense stand of mid- and shortgrasses. Dominants are western wheatgrass and green needlegrass with an understory of blue grama and threadleaf sedge (Carex filifolia). Perennial forbs are abundant. With disturbance, the midgrasses decrease in abundance and blue grama, buffalograss, and cacti (*Opuntia* spp.) increase. Common invaders in this community are Japanese brome (*Bromus japonicus*) and curlycup gumweed (*Grindelia squarrosa*).

Today, about 75 to 80 percent of the land area remains in rangeland. Favorable small grain prices have resulted in extensive land conversions over the past 20 years, even though somewhat severe soil and precipitation limitations exist.

Short/Mixed-grass Prairie

The Tertiary Table Lands in the southwestern portion of the state (Fig. 1) consist of a series of benches and buttes

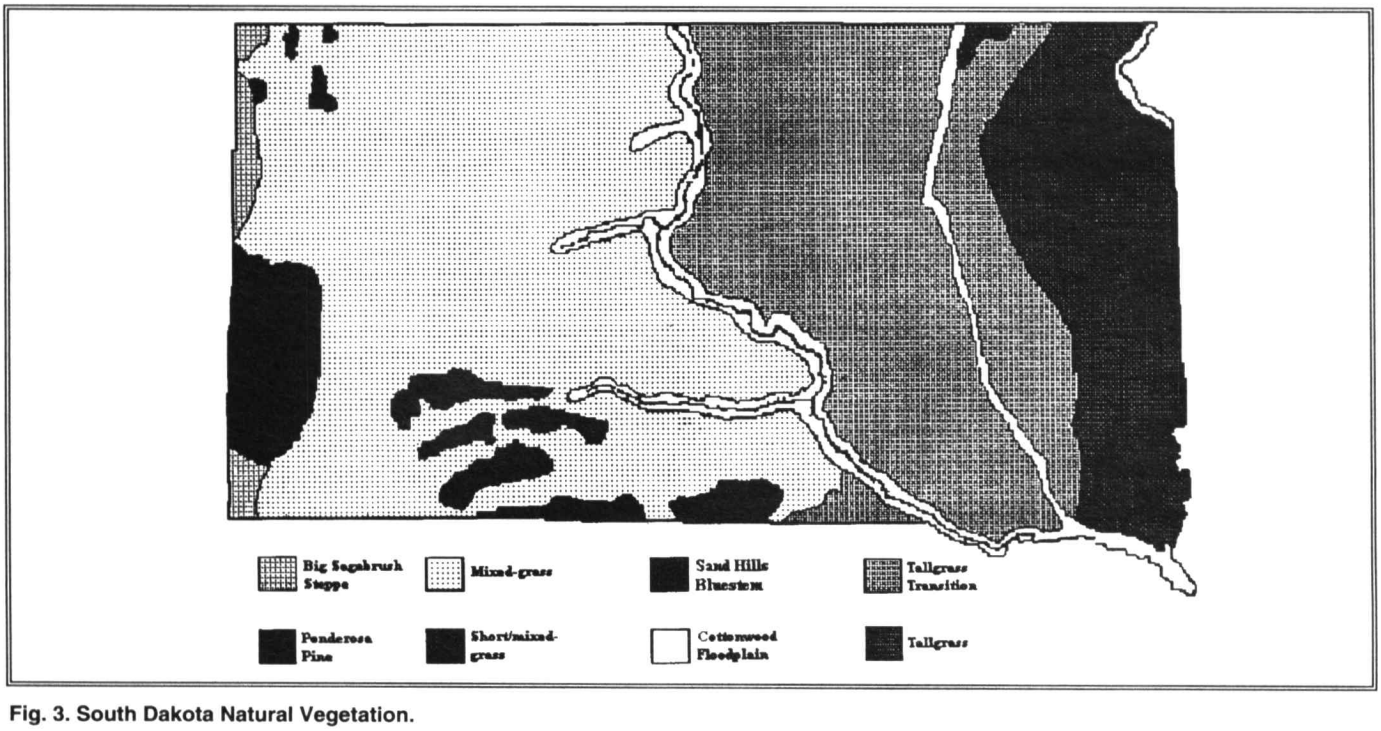

Fig. 3. South Dakota Natural Vegetation.

underlain by sandstones, siltstones, and shales. Elevations range from 3,000 to 3,600 feet. Soils are of loamy and clayey texture and located on nearly level to undulating lands and on steep slopes. Only a small portion of this predominantly rangeland area has been converted to cropland.

Natural vegetation (Fig. 3) includes all the midgrasses and shortgrasses previously mentioned. The vegetation has a wide variety of forms because of extreme variability in topography and soils leading to a "badlands" aspect. Sideoats grama and little bluestem are abundant on shallow soils of slopes. Shortgrasses, needleandthread, and dryland sedges increase when the natural plant cover is repeatedly overused. Rocky Mountain juniper (*Juniperus scopulorum)* occurs on shallow soils above stream channels and minor drainages, but has moved onto deeper soils due to the absence of natural fires. Ponderosa pine (*Pinus ponderosa*) is found on some buttes, but is uncommon east of the Badlands area.

Big Sagebrush Steppe

This community occurs almost exclusively along the extreme western border of South Dakota (Fig. 3). Soils are similar to those of adjacent communities and are clayey and silty in texture. Precipitation is the lowest of any area in the state.

Natural vegetation in the community consists of wheatgrasses, blue grama, prairie junegrass, and forbs with an overstory of big sagebrush (*Artemisia tridentata*) and/or silver sagebrush (*A. cana*). Protection from fire allows big sagebrush to increase; midgrasses decrease with heavy grazing. The majority of the area is in rangeland.

Ponderosa Pine

The largest expanse of ponderosa pine occurs in the Black Hills (Fig. 3). Soils are shallow, well-drained, and clayey to silty in texture. The natural vegetation consists of open to dense pine forest with a diverse understory of herbaceous and shrub species. Common understory species include white coralberry (*Symphoricarpos albus*), common juniper (*Juniperus communis*), and Oregon grape (*Berberis repens*) (Thilenius 1972). Stands of aspen (*Populus tremuloides*) and bur oak (*Quercus macrocarpa*) are common, and Black Hills spruce (*Picea glauca*) occurs on moist, north slopes and generally at higher elevations. Within the Black Hills forest are many large prairie areas.

A variation of the Ponderosa Pine community is confined to sandstone buttes in northwestern South Dakota, the Pine Ridge escarpment in the southwest, and the outer slope and hogback ridge surrounding the Black Hills (Fig. 3). The characteristic natural vegetation is an open stand of ponderosa pine with an understory of big and little bluestem, prairie dropseed (*Sporobolus heterolepis*), stonyhills muhly, blue grama, hairy grama, and sideoats grama. Forbs are numerous and leadplant (*Amorpha canescens*), a low shrub, is abundant. Severe disturbances cause tallgrasses to decrease with corresponding increases of warm-season shortgrasses, Kentucky bluegrass, fringed sagewort, and broom snakeweed (*Gutierrezia sarothrae*). Western wheatgrass also increases on some sites.

Ponderosa pine density and extent have increased dramatically in this century when compared with that documented by the Custer Expedition photographs of 1874 (Progulske 1974). Pine increases, especially in the foothills, are largely due to fire suppression over the past 75 to 100 years. Meadows and deciduous woodland habitats have retreated in response to expanding pine forests; spring and stream flows have also declined. Housing construction, recreational developments, road rebuilding, and mining are forces that threaten the pine forests in the Black Hills and other parts of South Dakota.

Sand Hills Bluestem

This community occupies the northern edge of the Nebraska Sand Hills at elevations from 3,000 to 3,600 feet with a minor outlier in the northeast (Fig. 3). Soils are mostly deep, undulating to rolling, and sandy textured.

The natural plant cover included little bluestem, big bluestem, sand bluestem (*Andropogon hallii*), prairie sandreed, needleandthread, sideoats grama, western wheatgrass, and a wide variety of forbs. Leadplant, wild rose (*Rosa* spp.), sand cherry (*Prunus pumila*), and yucca (*Yucca glauca*) are locally abundant. With retrogression, tallgrasses yield to shorter species and sand sage (*Artemisia filifolia*) and sageworts (*Artemisia* spp.) increase. Some rangelands have been converted to irrigated cropland where sufficient water is available from wells or other sources.

Deciduous Woodlands

Low precipitation limits the growth of deciduous woodlands to areas of increased moisture such as along rivers and in draws. Kuchler (1964) classified the potential natural vegetation along the Missouri and James Rivers in the eastern part of the state as a complex of cottonwood (*Populus deltoides*), peachleaf willow (*Salix amygdaloides*) and American elm (*Ulmus americana*). Cottonwood also lines smaller rivers and creeks throughout the State. Other common woodland types include bur oak stands and "woody draws" dominated by green ash (*Fraxinus pennsylvanica*) and chokecherry (*Prunus virginiana*). Poor tree reproduction is a common problem in wooded draws in the state (Severson and Boldt 1978). In addition, loss of tall shrubs and replacement of native sedges with Kentucky bluegrass threaten these woodlands.

The Black Hills: An Oasis In the Northern Plains

Along the western South Dakota border, the Black Hills comprise about 5,150 square miles, including the Bear Lodge Mountains in northeastern Wyoming (Orr, 1959). Several authors have singled-out the Hills area as the "gemstone of the Northern Plains." McIntosh (1949) stated that from a botanical standpoint the most important climatological difference between the Hills and surrounding country is that the Black Hills receive much more precipitation.

After leading a scientific party through the Black Hills in

the summer of 1875, Colonel R.I. Dodge (1876) concluded:

> The Black Hills country is a true oasis in a wide and dreary desert. The approaches from every direction are through long stretches of inhospitable plains, treeless and broken . . .I pronounce the Black Hills, in many respects, the finest country I have ever seen. As a grazing country it cannot be surpassed; and small stock-farms of fine cattle and sheep cannot, I think, fail of success . . . Splendid grass, pure water, excellent shelter from storms—nothing is wanting to fill all the requirements of a first-class stock-farm . . . In a few years, when this wilderness shall have been made to "blossom as the rose" with cozy farms and comfortable residences, when rocky crags shall have been crowned with palatial hotels, the tourist will find an ample reward in climbing the rugged heights, or exploring the dark defiles of this wonderful land.

Most of Dodge's predictions have become realities in little more than a century. Today many fine ranches exist in the Black Hills, and logging and the summer tourist industry are vitally important to most Hills communities.

Settlement and, in particular, mining in the Black Hills led to unique present-day land management problems. Throughout the Hills, countless mining claims on which deeds were obtained created today's patchwork pattern of land ownership. This intermingling of private and public lands has complicated the tasks of natural resource managers.

Fire suppression following settlement of the Black Hills has prevented the natural, dynamic changes required by most plant communities. Interrupting these changes has led to stagnating ponderosa pine stands which are both hazardous and aesthetically unappealing. Along forest margins, fire suppression has permitted pines to extend their range into grassland at the expense of herbaceous vegetation.

In view of present and future land uses, there is an urgent need to examine fire as a possible management tool for reducing wildfire fuels and improving livestock and wild game ranges, timber productivity, and scenic vistas. The history of wildfire in the Black Hills should be reviewed in order to obtain a proper perspective of fire in various plant communities in the Hills area. In this manner the changes which have occurred with fire suppression may be delineated and, perhaps, underlying causes of change determined.

Today's Challenges

Settlement has drastically changed the character of South Dakota's rangelands. Today, more than 75 percent of the land is cultivated in many eastern South Dakota counties (Johnson and Nichols 1982). West of the Missouri River, less than 25 percent of the area is cultivated. Free-roaming bison have been replaced by confined herds of cattle, fires have been actively suppressed, and the spread of exotic species such as Kentucky bluegrass and noxious weeds such as leafy spurge threaten many native communities. The biggest challenge for range managers in South Dakota may lie in developing methods to restore that diverse "sea of grass" that early settlers saw.

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Presettlement Rangeland Management on the Northern Plains

Theodore Binnema

For many years most people assumed that rangeland management practices arrived on the northern plains with Euroamerican settlers. According to this picture, the previous inhabitants of the land, the Native Americans, lived passively on the land, accepting gratefully what nature provided, but taking few steps to alter their environment. (Pyne, 1982: 81) It is now clear that this view was misinformed (Pyne 1982, Lewis 1977, Willaims and Hunn, 1982). It is no exaggeration to say the Great Plains in 1492 had already been subject to active and sophisticated human rangeland management strategies for centuries (Turner and Butzer, 1992). Indeed, it would be impossible to reconstruct accurately or to understand the environment of the northern plains in the presettlement era without assuming that humans formed an integral part of its ecosystems.

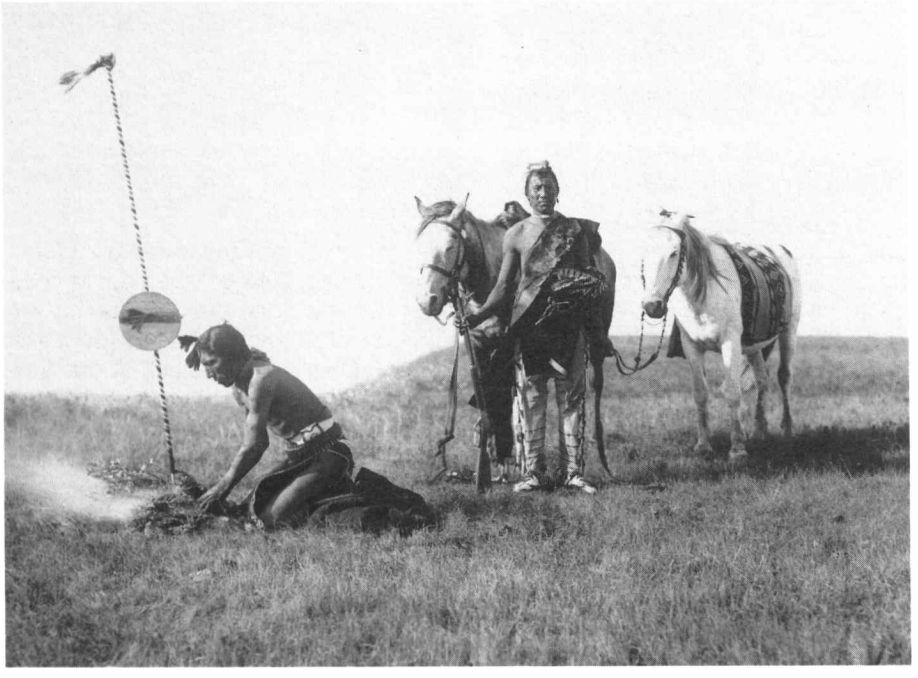
For the Native inhabitants of the northern plains, rangeland management formed part of a comprehensive strategy to promote the security of individual bands and groups of bands. The primary tool for management purposes was fire and the primary goal, but not the only goal, was the maintenance of bison habitat.

Natives appear to have used fire deliberately to keep areas free of tree cover.

The documentary evidence regarding Native use of fire on the Plains and in the neighbouring region of North America allows us to understand some of their management strategies. Natives appear to have used fire deliberately to keep areas free of tree cover. This practice would have been most important in preventing the afforestation of the very productive grasslands along the margins of the Great Plains. Rangeland scientists have shown that forest cover in many uncultivated areas of North America has increased since fire was suppressed. They have also noticed that when trees invade the margins of the Great Plains the first areas they invade are the moist regions that support the most luxuriant grass growth (Bailey and Wroe 1974). By burning these grasslands in the past Natives would have been increasing significantly the carrying capacity of grasslands for buffalo. Presettlement Euroamerican expeditions to the northern plains frequently noted that fire, both natural and anthropogenic kept large areas more open than they might otherwise have been, and settlers and scientists often noted the invasion of forests in previously open regions following the suppression of fires in the settlement era (Arthur 1975).

Natives could also use fire for more short term goals. With the arrival of the cold weather of winter both humans and buffalo would typically be concentrated in the sheltered valleys and wooded margins of the plains. In anticipation of cooler weather, and to avoid being trapped on the open plains should an autumn blizzard arrive, Native bands normally reached their wintering grounds before the bison did. If warm weather lingered in the fall, however, the herds would remain widely dispersed on the plains. For Native hunters this meant only trouble, for winter was usually the time for communal bison drives into pounds. These bison drives, however, required a large group of people. If the herds remained dispersed on the plains, it was difficult to find enough herds to maintain the population. Furthermore, remaining on the prairie in late autumn carried with it the risk of being caught on the open plains without dependable shelter and fuel upon the sudden onset of winter. Fortunately, these warm, dry autumns that kept the bison on their summer ranges would also render the grasses of the plains tinder dry. The grasses of the summer range could be burned to force buffalo to move away toward their winter ranges.

Setting fire to the prairie in fall or spring also had the effect of allowing more bison to survive that critical time of early spring when they could face starvation. By late winter forage quality and quantity would have reached its nadir and bison would be lean (Spry 1968: 21). In unusually severe winters or late springs hunters would face herds of bison so lean that most of the meat would have so little fat that it could not support humans (Speth 1983). Mortality among bison would reach its peak at this time. While there remains some doubt as to whether the burning of grasses improves yield in the long term, Native hunters could easily perceive, as Captain John Palliser did in 1857, that "places where fire had consumed the grass in the previous autumn, after that season's growth had ceased, now became green in the course of a few days, as the snow always disappears from these spots first" (Spry 1968: 391). Lewis and Clark noted that the Hidatsa (of present-day North Dakota) burned the prairie near their villages in early March "for an early crop of grass, as an inducement for the buffalow [sic] to feed on" (Arthur 1975: 25). By inducing the grass to green even a few days earlier, the Natives were providing nutritious forage for bison herds that were losing members daily to starvation and predators.



Two Blackfoot Indians demonstrate for the photographer the ritual of starting prairie fire in this early 20th-century photograph (Provicial Archives of Alberta, P138).

Fire could also be used in all seasons to influence the movements of bison to serve the advantage of a particular groups of Natives. For example, in late 1844 Alexander Christie of the Hudson's Bay Company mentioned that after a number of skirmishes between groups of Métis and Dakota, the Dakota had apparently retaliated by setting some prairie fires that crippled the Métis fall hunt (HBCA 1844). Undoubtedly, it was common for Natives to burn the grasslands in certain areas to prevent the bison herds from moving into enemy lands. During the fur trade era it was routine for the Cree to set fire to the prairie surrounding Hudson's Bay Company fur trade posts in the fall to keep the bison away during the winter. This was not meant to force the traders out of the region but to force them to depend on Cree hunters for their provisions during the winter.

. . . it was routine for the Cree to set fire to the prairie surrounding Hudson's Bay Company. . .

Prairie fires are legend for their intensity and unpredictability, thus use of fire for any purpose required skill and precision. The condition of the grasses, winds and humidity would have to be considered carefully to reduce the risk that any fire set would have unfavourable results. Not surprisingly then, the deliberate setting of prairie fires appears to have been accompanied by some ritual. In the accompanying photograph, taken at the beginning of this century, two Blackfoot demonstrated for the photographer the ritual of starting a prairie fire. Evidently, deliberate and careful efforts to manage the grasslands of the northern plains have a long history on the northern plains. Ironically, the use of fire to manage grasslands fell out of favour for several decades after Euroamerican settlement on the northern plains began, only to be rediscovered as a valuable ecological tool in this century (Pyne 1982). Indeed, proponents of the use of controlled burning of grasslands still face some resistance.

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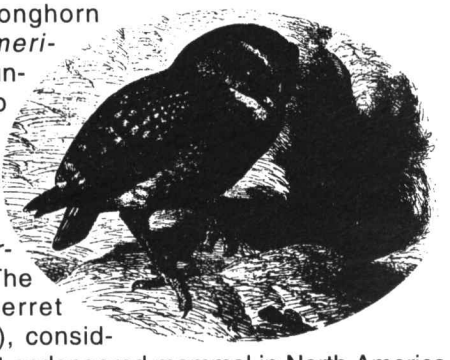
Theodore Binnema is a Ph.D. student in history at the University of Alberta in Edmonton, Alberta. Environmental and ecological matters will form a substantial part of his dissertation on the history of the northwestern plains in the early fur trade era.

Exploring the Eccentric

Marianne Mills

The White River Badlands of South Dakota are situated in southwestern South Dakota and have been carved by the White, Bad and Cheyenne rivers. The stark, intricately eroded pinnacles are so extraordinary that they confuse visitors to this nearly 250,000 acre National Park. Are they the result of an uplift with the lower areas already eroded away? In truth, visitors to the Badlands are perched along the edge of a geologic formation called the Wall. The vast grasslands that fill the flat portions of the Park comprise the largest protected mixed grass prairie in the country.

Badlands National Park is a refuge for many examples of Great Plains wildlife, most notably the American Bison (*Bison bison*), pronghorn (*Antilocapra americana*), Rocky Mountain bighorn sheep (*Ovis canadensis*), prairie rattlesnakes (*Crotalus viridis*), burrowing owls (*Athene cunicularia*), and others. The black-footed ferret (*Mustela nigripes*), considered to be the most endangered mammal in North America, is currently being reintroduced to wilderness areas within the Park. This small, nocturnal creature relies on the prairie dog (*Cynomys* spp) as its main food source. Specifically, in the Badlands, the black-tailed prairie dog (*Cynomys ludovicianus*),is a rotund rodent that can easily be found at Roberts Prairie Dog Town, which is located in the Park's northwestern corner.



Perhaps most notable at Badlands National Park are the fossil resources. Paleontologist-scientists, who study ancient life, have discovered abundant evidence of mammal life that lived in this region between 25 and 50 million years ago. The predominant time period studied at Badlands is the Oligocene Epoch, which falls within the Age of Mammals. While some visitors are disappointed to learn that there are no dinosaurs in the White River Badlands, they are then intrigued to learn that the richest Oligocene mammal fossil beds in the world are found here. Three toed horses, giant pigs, early rhinos, tiny deer, and prehistoric loons once called this formerly warm, moist terrain home. More than 250 species of mammalian fossils have been described in scientific reports. The year 1996 marks the 150th anniversary of fossil research in Badlands, which is considered to be the birthplace of the science of vertebrate paleontology.

Lastly, over 11,000 years of human history is documented in the Park's landscape through scattered worked stone fragments, remnants of ancient campsites, weathered fencing and abandoned homesteads. The Lakota people have traveled through the Badlands since their arrival on the South Dakota plains around 1775 and still call the southern half of the Park, called the Stronghold District, home. The descendants of those early homesteaders also remain as today's rancher's.

At first glance, the White River Badlands of Badlands National Park are strange, eccentric. After spending some time, they become familiar. The natural process at work on them create a slightly new landscape almost daily. One visit isn't enough.

Author is Chief of Resource Education, Badlands National Park

"The Sea of Grass:" the Story of the National Grasslands and National Grasslands Visitor Center

Misty Hays

The National Grasslands Visitor Center, in Wall, South Dakota, is the only center in the United States that is dedicated to telling the story of the 20 National Grasslands in the United States. The Visitor Center features exhibits on Great Plains history, prairie plants and animals, recreational activities, and management activities on the National Grasslands. A visit to the Center is on the agenda for one of the post-convention tours of the 1997 Society for Range Management meeting.

At the Visitors Center, you will hear the tale of the sea of grass, the Great Plains. These windswept plains have seen the pageant of the frontier, the tragedy of the dust bowl, and the wonders of modern agriculture—and all that has passed proclaims our dependence on grass. These lands were once home to many Indian tribes who followed the abundant buffalo herds as they roamed through this never-ending sea of grass. By the 1870's, buffalo were replaced by huge herds of cattle brought in by the barons of the west.

Late in the 19th century, these lands were opened up under the Homestead Act of 1862. This act limited homesteads to 160 acres. Although later this was increased to 640, these lands were not suited to the eastern and European farm practices that settlers used. And, it soon became clear that farming in this land of drought was not sustainable.

The financial crises created by the Great Depression coupled with nature's intense drought made the situation on the grasslands even worse. By the early 1930's, as many as 70 percent of the homesteaders were delinquent in their taxes. Hundreds of thousands were forced to leave. As the dust storms darkened the skies, it became evident that help was needed.

The National Industrial Recovery Act of 1933 and the Emergency Appropriations Act of 1935 allowed the Federal Government to purchase and restore damaged submarginal lands and to resettle destitute families. These lands were called Land Utilization (LU) projects. These LU lands were assigned to the Secretary of Agriculture and administered by the Natural Resources Conservation Service, then called Soil Conservation Service in 1938. In 1954, these lands were transferred to the Forest Service, becoming National Grasslands in 1960. The Buffalo Gap National Grassland was officially named in 1961.

The purpose of the National Grasslands was to serve as demonstration areas for the proper management for forage, wildlife, woodlands, minerals, water and outdoor recreation. Today, twenty National Grasslands are managed to sustain these diverse remnants of the great sea of grass. Much of the region has been cultivated to provide fertile farm land, so the grasslands provide some of the last remaining glimpses of native prairie.

The grasslands appear open and empty, often boring to the casual observer. In reality, these vast open grasslands, "prairies", are home to a deceptive variety of plants and animals. The primary vegetation is, naturally, grass. On the Buffalo Gap National Grassland, dominant species include western wheatgrass (*Agropyron smithii*), green needlegrass (*Stipa viridula*), buffalograss (*Buchloe dactyloides*), and blue grama (*Bouteloua gracilis*). These are plants that have adapted to the harsh environment and historic grazing patterns.

Common animal species of the Buffalo Gap include coyote (*Canis latrans*), pronghorn (*Antilocapra americana*), black-tailed prairie dog (*Cynomys ludovicianus*), white-tailed deer (*Odocoileus virginianus*), mule

A prairie vista on the Buffalo Gap National Grassland. Photo by Bill Perry, District Ranger, Buffalo Gap National Grassland, Wall, S.D.

deer (*O. hemionus*), sharp-tailed grouse (*Tympanuchus phasianellus*), cottontail (*Sylvilagus floridanus*), and black-tailed jackrabbit (*Lepus californicus*). These animals have also adapted to the harsh extremes of the prairie. Pronghorn, the fastest animal in North America, uses speed to survive in these open areas. Many animals have adapted by burrowing, such as the prairie dog. Prairie dog towns provide habitat for a number of other species including the endangered black-footed ferret.

Because of the history of the National Grasslands, the Buffalo Gap National Grassland is not a solid block of public land. It is made up of intermingled pieces of grasslands, other federal lands, state and privately owned parcels. This lends to the uniqueness of the National Grasslands and increases the challenges in managing these lands. The key to good management is balancing uses within the limits of the resources.

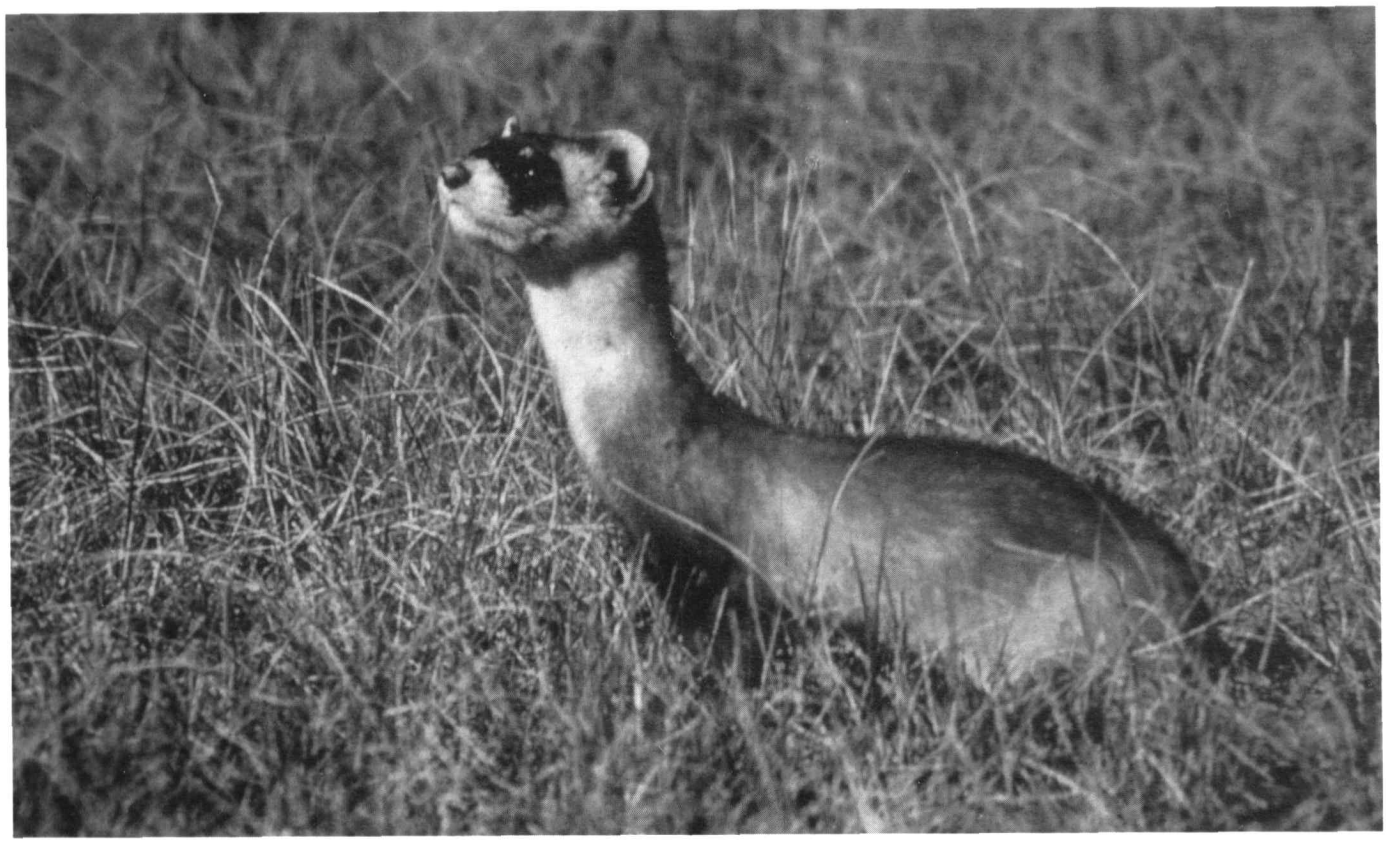
Historically, livestock grazing was the primary emphasis on the grasslands. Domestic cattle have replaced bison as the dominant grazers on the prairie and provide the primary source of income for the local economies. Livestock grazing is an important component of the economic stability in many small rural communities.

Today, the grasslands are being recognized as prime public lands for a variety of recreation. Visitors come to hunt, hike, camp, bike, ride all-terrain vehicles or horses, collect rocks, or just to enjoy the vistas of the prairie.

The East Half of the Buffalo Gap National Grassland is administered out of the town of Wall. This rural community depends on tourism for its survival. This is a stopover for visitors on their way to the Black Hills and Yellowstone. The area also features the Badlands National Park, one of the premier prairie parks.

Oh, and while you are in town, don't miss the world famous Wall Drug Store, the largest drug store in the world. No, this is much more than a pharmacy. You'll also find an art gallery, western store, rock shop, book store, cafe and one of only four Tyrannosaurus Rex exhibits in the country. And, you can still get a cup of coffee for only 5 cents.

Range Management Specialist, Buffalo Gap National Grassland, Wall, South Dakota.



Black-footed Ferret Reintroduction in the Conata Basin/Badlands of Southwestern South Dakota

Peter M. McDonald and Glenn E. Plumb

The long, slender creature cautiously emerged from its hole, glancing right, left, right again, then directly at the beam of the spotlight fixed on him. The emerald green eyes glimmered in the powerful light like no other animal of the prairie could . . . or should. For these were the eyes of one of the rarest free-ranging mammals in the world, certainly the rarest on the North American continent. And these eyes gazed out over the surrounding grasslands of the Conata Basin/Badlands region of southwestern South Dakota for the first time in over thirty years.

The black-footed ferret (*Mustela nigripes*) was first described in 1851 by the legendary naturalist, John James Audubon, and John Bachman. A member of the weasel family, the black-footed ferret has since been identified as the only ferret native to North America. The more common domestic ferret is most closely related to the Old World Siberian polecat (*M. evermansii*), rather than to some North American mustelid cousin. The black-footed ferret is unique among weasels in its highly specialized reliance on a singular habitat type: prairie dog towns (*Cynomys* spp.). Black-footed ferrets are adapted to preying on prairie dogs for food and using underground burrow systems of prairie dogs for shelter and family-rearing.

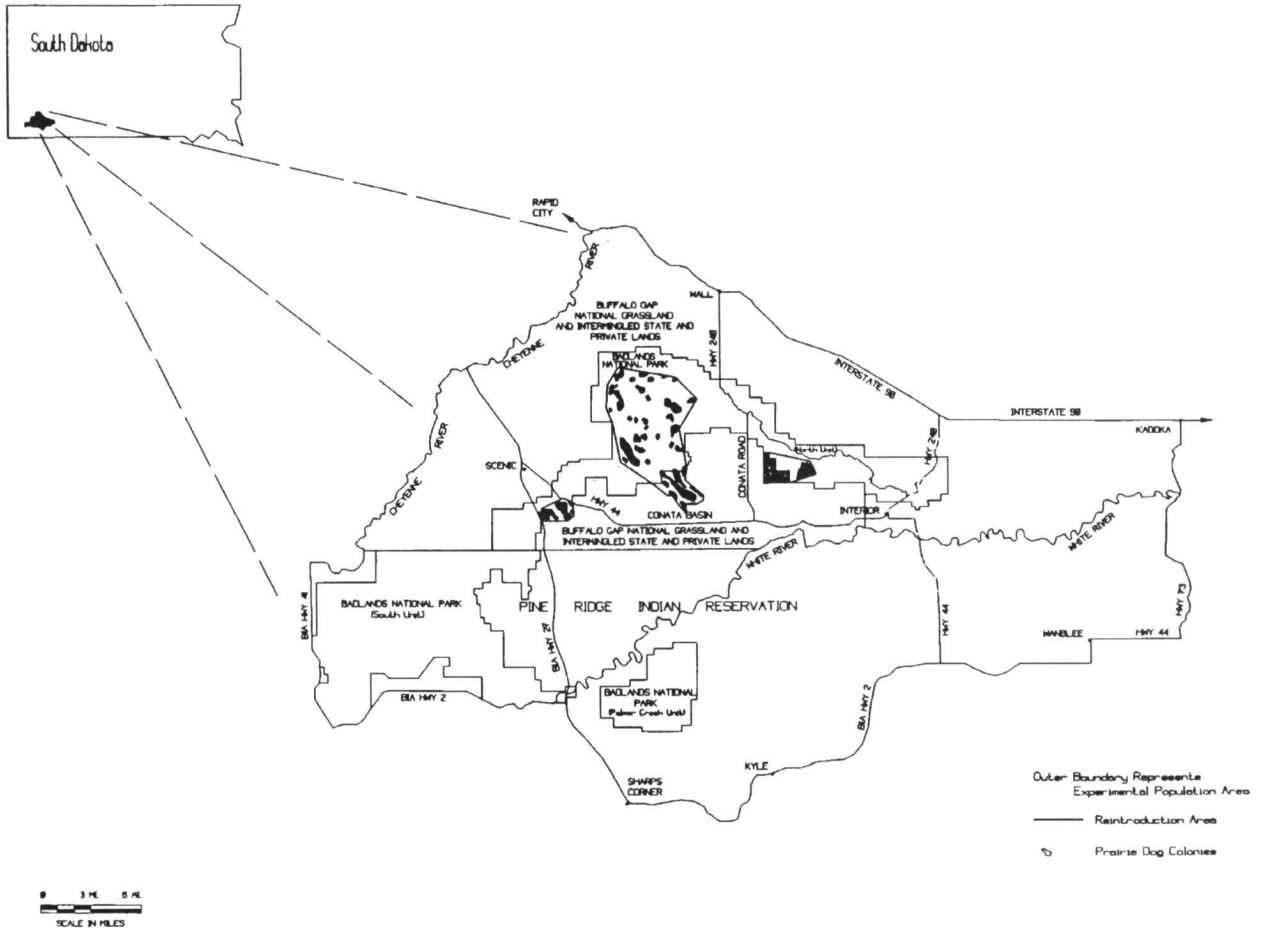
At one time, it would have been a superb strategy for the black-footed ferret to exploit such an abundant and seasonally reliable source of food and shelter represented by prairie dog communities. Over 100 million acres of prairie dog towns were dispersed across the Great Plains in the late-nineteenth century. However, early settlers viewed the intensive burrowing and grazing disturbances by this colonial, native rodent as incompatible with agrarian land uses. Intensive efforts to chemically and mechanically eliminate local prairie dog populations generated an unforeseen consequence: massive reduction and fragmentation of the habitat base for historically-associated wildlife like the black-footed ferret. Compounding the problem was likely secondary poisoning of ferrets during prairie dog control programs, as well as the introduction of sylvatic plague and canine distemper to the prairie dog and black-footed ferret communities. Diseases continue to represent an important

threat to national recovery of the species. As the prairie dog went, so went the black-footed ferret. The ferret has been federally listed as endangered since 1967.

A veil of mystery continued to surround the black-footed ferret over the century following Audubon and Bachman's initial description. The species was thought to be historically rare, or at least poorly understood owing in part perhaps to its largely nocturnal habits and absence from early fur harvest records. Some Plains tribes reportedly used black-footed ferrets for ceremonial purposes. More contemporary sightings were occasionally reported across the species range, but confirmation of local populations was extremely elusive. That changed dramatically with the discovery in 1964 and subsequent field observations over several years of a population centered in Mellette County, South Dakota. At last the world had some reliable information about the ecology of the black-footed ferret, particularly its habitat relationships. As in a cruel twist of fate, the South Dakota population began to disappear and attempts to captive-breed a few survivors ended in futility with the death of the last captive ferret in 1979.

The species was widely believed to be extinct with the demise of the South Dakota black-footed ferrets, until the accidental discovery in 1980 of a small population outside of Meeteese, Wyoming, near the edge of the animal's historical range. As experienced a decade earlier in South Dakota, the Meeteese population also began to disappear. This time, the causes were confirmed as local outbreaks of canine distemper and plague. By 1986, the remaining eighteen survivors had been removed from the wild in a second attempt at captive breeding the species and averting extinction. Today, this captive breeding program is international in scope with seven facilities in the United States and Canada. The relative success of this effort–compared to the earlier attempt with the South Dakota ferrets–provided the opportunity to seriously pursue re-establishment of the species back into the wild. The national recovery plan calls for a minimum of ten discrete populations and 1,500 animals distributed across the historic range of the species. The first ever attempt at black-footed ferret reintroduction began in the Shirley Basin, Wyoming, in 1991.

Ranked in 1989 by a national recovery team as possessing one of the highest potentials for black-footed ferret recovery in North America, the Conata Basin/Badlands recovery area in southwestern South Dakota encompasses portions of the Buffalo Gap National Grassland and Badlands National Park (see map). This area is distinguished by its combination of high quality prairie dog habitat, extensive public land base, absence of plague in the prairie dog populations, and the historic presence of black-footed ferrets. Following a five-year interagency planning and public involvement process, the U.S. Fish and Wildlife



Service, U.S. Forest Service, and National Park Service collaboratively released in 1994 an Environmental Impact Statement formally identifying the Conata Basin/Badlands recovery area and proposing reintroduction of black-footed ferrets as a "non-essential, experimental" population. This designation would provide management flexibilitiy to optimize recovery efforts, while removing some restrictions associated with an endangered species and easing concerns of local landowners and public land users. Additionally, initial releases would be confined to the Badlands National Park portion of the greater Conata Basin/Badlands reintroduction area.

Since fall of 1994, seventy juvenile black-footed ferrets have been released into Badlands National Park. Following the initial released in 1994, two litters of wild-born black-footed ferrets were sighted in late-summer 1995. Subsequently, eighteen free-ranging black-footed ferrets were detected during surveys conducted mid-winter 1995-1996. Additional ferrets will be released annually for several years in an attempt to establish a self-sustaining population. Releases in 1996 have been proposed for both the Badlands National Park and Buffalo Gap National Grassland. Reintroduced animals are monitored to determine dispersal patterns, habitat use, and sources of mortality. Different release techniques will continue to be used to determine for this site and recovery sites in other states what reintroduction strategies seem to work best. Despite the important advancements toward recovery of the black-footed ferret in recent times, even today the fate of the species is precarious at best. Ongoing reintroduction programs in Wyoming, Montana, South Dakota, and, beginning in 1996, Arizona, strain the capacity of the breeding facilities to supply even minimally suitable numbers of reintroduction candidates per site annually. There is also a tremendous work load at the reintroduction sites, for pre-reintroduction preparation, implementing releases, and conducting proper post-release monitoring to adequately track recovery progress. All of these activities that represent site-level recovery require strong policy and fiscal support. Diseases such as plague remain serious obstacles to recovery in many areas in the species historic range. Finally, without broad understanding of, and acceptance for, conserving the prairie dog ecosystem at regional scales, current localized efforts to recover the extremely endangered black-footed ferret may temporarily delay, but are unlikely to prevent, the demise of the species in the wild once and for all.

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(Continued from page 211 EVP's Report)
of Land Management, Natural Resource Conservation Service, Montana Woolgrowers Association, Montana Department of Fish, Wildlife and Parks, Montana Department of Environmental Quality Nonpoint Source Program, Montana Farm Bureau, Montana State University, U.S. Forest Service and Montana Fisheries Society worked together diligently to develop a process to establish standards for livestock grazing practices that would consider the resource values and the livestock industry's needs.

The Natural Resource Conservation Service's (NRCS) new Standards replaces previous existing NRCS Grazing Standards and updates the State of Montana's Agricultural Best Management Practices for livestock grazing. These voluntary practices for livestock grazing are designed to protect water quality, fisheries and aquatic habitat, and riparian areas. These are basic grazing and riparian guidelines that apply to all land ownership's in Montana. Some folks refer to these as minimal standards because more specific standards may apply to specific rangeland sites. Their use should be encouraged by all livestock operators and landowners.

This was a tremendous accomplishment and obviously not an easy one by virtue of the time required to achieve it. I would think such agreements would be useful in other states. Communications are vastly improved when everyone uses the same words and standards for describing any set of practices. Coordinated Resource Management Process is a powerful tool.

Annual Meeting in Rapid City. This is my last opportunity before the meeting to call your attention to the annual meeting in Rapid City. I urge the entire rangeland family to consider attending the 1997 annual meeting in Rapid City, South Dakota. The many activities associated with the 50th anniversary celebration of SRM will make this a special and unique event. The facilities available in the newly remodeled Civic Center are truly outstanding. Access to modest lodging and meal costs, and close proximity to recreational activities in the Black Hills are a drawing card in and of themselves. Now, add a diverse and outstanding program and what do you have—a meeting that will be both socially and professionally rewarding. See you in Rapid City.—**Bud Rumburg,** Executive Vice President, SRM

Drought in New Mexico: Prospects and Management

Jerry L. Holechek

Drought and low cattle prices have long occurred together in New Mexico. They have always been the nemesis of both rangelands and ranchers. Past periods when severe, extended drought conditions prevailed include the 1860s, 1890s, 1930s, 1950s, and 1970s. The long intervals between droughts allows lessons from the past to be overlooked or forgotten at the very time when they are most useful.

It has been my experience that range management is more a game of managing climatic and financial risks rather than of maximizing forage production and harvest efficiency through aggressive of practices such as seeding, brush control, fertilization or intensive fencing and water development (Holechek 1996). Studies by Lantow and Flory (1940), Reynolds (1954), Boykin et al. (1962), and Shoop and McIlvain (1971) all demonstrate that drought planning is the critical element of ranching survival in the southwestern USA.

Drought has now plagued New Mexico rangelands for the third straight year. This year (1996) it was generalized across the whole state, until late June, while in 1994 and 1995 it occurred primarily in the southern half of the state. Most of the state did receive normal or above precipitation during July through September of 1996 To make matters worse cattle prices are down 35% from the 1992–1993 peak and grain costs (corn and wheat) are nearly double those of 1995.

Many ranchers face the dilemma of whether to restock, or to hold present livestock under hopes of rainfall and higher cattle prices next year. All this raises the questions of what are the prospects for precipitation, higher cattle prices, and lower supplemental feed prices going forward. Another question I will address is what management strategies have worked best for New Mexico ranchers in past droughts.

Climate Factors

An examination of climatic records shows that severe extended droughts lasting 4 to 6 years occur about every 40 years in New Mexico. The drought of the 1950's lasted 6 years (1951–1956) with 1956 the driest year in the eastern part of the state. Ten year periods with well above average precipitation have been followed by 10 years when drought prevailed. Because the 1984-1993 period was extremely wet (27% above average precipitation across the state) and extended droughts (4–6 years) appear to occur at intervals of about 40 years, the prospect of greatly improved precipitation conditions does not seem particularly good for the next few years.

Climatologists relate the present drought forecast to the "La Nina–El Nino cycle". This is a 22 year cycle characterized by 11 wet years (El Nino) and 11 dry years (La Nina) that affects the Central Great Plains and southwestern USA. Basically the explanation centers around spots on the sun that change their polarity every 11 years. This in turn causes a cooling in the South American Pacific Ocean, which results in high pressure systems that deflect air flows from the Gulf of Mexico. The bottom line is that at 20–24 year intervals these forces have brought drought to Arizona, New Mexico, and west Texas.

Presently climatic forecasts project relatively dry conditions for 1997 and 1998 in the Central Great Plains and southwestern USA. Whether this means a complete lack of rain or just below average precipitation is uncertain.

Cost Containment Strategies

In terms of cattle prices, there could be some improvement starting in fall 1996 based on Cattle Fax reports. Generally down trends in cattle prices last 3–5 years with uptrends occurring after enough liquidation has occurred of the nation's beef cow herd to relieve the oversupply problem. There was substantial liquidation of cow herds in Texas, New Mexico, and Arizona during the spring of 1996.

Regarding harvested feed cost, most forecasts indicate no major changes in hay or corn prices. However there is uncertainty here since climatic conditions across the USA will drive harvested feed prices as well as cattle prices.

Another critical aspect of the drought problem involves forage production. Even with above average rainfall and good grazing management, forage production has been only about half the 10 year average in the first year after extended drought based on several studies in New Mexico and other western states (Herbel et al. 1972). This is because of death loss and weakness in primary forage grasses. About 5 to 7 years are required for full rangeland recovery from severe drought. Rangelands grazed conservatively or moderately produce more forage during drought than those heavily grazed (Klipple and Costello 1960, Paulsen and Ares 1962). Their recovery is also much more rapid after drought. Ranchers are cautioned not to increase stocking rates too soon before recovery from drought has started.

If drought persists through the summer of 1997 or 1998, it is probable that severe mortality will occur in primary forage plants such as black grama in the southern part of New Mexico (Herbel et al. 1972). This could reduce long term grazing capacity to 50–60% of pre-drought levels in the post-drought period. Ranchers need to be prepared for this possibility.

The Political Position

The USDA-Emergency Feed Program warrants discussion. This government program has provided ranchers with 50% of the range forage deficit in cash reimbursements or harvested feed during drought (Holechek and Hess 1995). It was discontinued by congress as of May 31, 1996. However New Mexico congressmen were planning to introduce legislation to bring it back for one year. These plans have been put on hold due to rainfall this summer, and economic evaluations we have sent them. My economic analyses for southwestern New Mexico show that ranchers who have held most of their livestock and used the Emergency Feed Program since summer, 1994 would have severely accentuated their financial losses, compared to ranchers who quickly destocked their rangeland in accordance with range forage and did not use purchased feed.

Estimations of harvested feed costs for maintaining livestock during the drought will vary with location and type of operation. However, based on $125 per ton hay and $270 per ton cottonseed meal cubes, the cost per cow per day is $1.25 with 75% supplementation (Davis 1996). That would be about 17.4 pounds of hay and 1.2 pounds of cottonseed meal cubes per cow per day. On this basis it would cost about $9,375 per month to maintain a 250 animal unit herd with 25% reliance on range forage. With full feeding the cost would go to about $12,500 per month. With use of the USDA Emergency Feed Program the cost would be reduced to about $4,500–$6,500 per herd per month or $20–25 per animal unit per month. Even with the USDA-Emergency Feed Program, the costs of maintaining livestock with harvested feed for more than a few months quickly become overwhelming.

Strategies for Survival

Basically the best strategy for New Mexico Ranchers in this and the 1950's drought (Boykin et al. 1962) would have been to reduce the breeding herd by 35-50% when drought became apparent. This is because forage production has typically been reduced 50–75% during drought compared to pre-drought periods (Herbel et al. 1972, Pieper et al. 1991). Reducing livestock in accordance with forage availability rather than holding livestock and providing them harvested feeds has been the best drought strategy financially and biologically because harvested feed costs have increased and cattle prices have declined as drought increased in severity (Boykin et al. 1962). The more ranchers invest in purchased feed and the lower livestock prices become, the more reluctance there is to sell livestock. This has often resulted in severe rangeland degradation and in some cases death of livestock when the rancher ran out of money to purchase additional feed but did not want to sell livestock at give away prices. Ranchers who maintain livestock on harvested feed should confine them to avoid damage to the range. Herbel et al. (1984) provides a good evaluation of confinement strategies for livestock during drought in New Mexico.

Some ranchers in New Mexico have held livestock on pastures where forage is depleted without supplementation in hopes of rainfall. They need to keep in mind that once animals lose 15–25% of normal body weight their recovery will be slow and costly (Young and Scrimshaw 1971, Holechek et al. 1995). Animals losing 30% or more of normal body weight will nearly always die (de Calesta et al. 1975). Ranchers who allow their livestock to get into poor condition may find it difficult to sell them at any price. In both Texas and New Mexico mature cows sold for as little as $10-13/CWT in spring, 1996. Excessive weight loss by livestock should be avoided by either selling them or providing them with maintenance feed.

Herd composition can play a critical factor in managing drought risk. Ranchers who maintained the breeding herd at 50% of grazing capacity in the pre-drought period would have done much better financially than those who tried to maintain it near capacity during the 1950's drought (Boykin et al. 1962). Increased calf carry over, and purchase of yearlings, during years of average or above-average rainfall and complete sale of calves and cull cows during severe drought was the most profitable way to adjust to fluctuating forage resources.

One common thread that binds the various drought management papers together is the advocacy of conservative stocking before, during, and after drought (Lantow and Flory 1940, Reynolds 1954, Klipple and Costello 1960, Boykin et al. 1962, Paulsen and Ares 1962). From both vegetation and financial standpoints, this appears to be the key to drought survival. Boykin et al. (1962) evaluated survivors of the 1950's drought from the standpoint of their ranch management practices. The four ranchers studied firmly believed that conservative stocking was the critical element in their survival. The success of the "Grass Bank" ranchers in southwestern New Mexico during the present drought tends to confirm the importance of maintaining a forage reserve, or being understocked as some would call it.

Conservative stocking involves 30–40% use of the current year standing crop of the primary forage species (Klipple and Costello 1960, Paulsen and Ares 1962) (Figure 1). In arid and semi-arid areas there appears to be little advantage to heavier use levels in terms of higher net financial returns or lighter use levels in terms of increasing range condition and forage production or reducing financial risk. Forage plants on conservatively or lightly stocked ranges actually seem to do better during and after drought than those on areas with no grazing (Paulsen and Ares 1962, Ganskopp and Bedell, 1981). In drought, residue or stubble may be a more appropriate criterion than utilization

Fig. 1. *The effects of conservative and heavy stocking on black grama rangeland in southwestern New Mexico (photo taken by Jerry Holechek on May 23, 1996).*

standards if new growth is minimal. Grazing should be discontinued if average plant heights fall below 2 inches on short grasses, such as blue grama or 4–6 inches on midgrasses such as sand dropseed. These same height guidelines apply to initiation of grazing on new growth after rainfall has occurred.

I believe range managers, particularly those on public lands, should be oriented towards preventing natural resource degradation, and minimizing producer economic risk rather maximizing forage harvest efficiency by livestock. I hold the opinion that continuation of livestock grazing on public lands will depend heavily on ranchers demonstrating good stewardship. Based on history the success of range management strategies is much more determined by the drought years when times are hard, rather by a run of wet years when high livestock prices prevail.

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Lessons to Learn: Thinking Like a Mountain

Cristy Brown

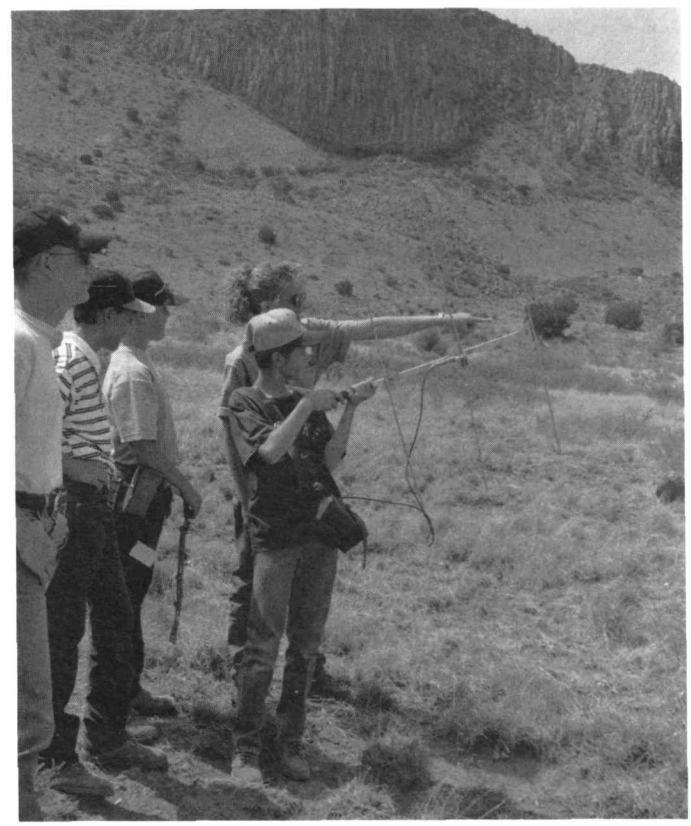
Only the mountain has lived long enough to listen objectively to the howl of the wolf —
Aldo Leopold,
"Father" of Wildlife Management

Is hunting OK?
Is predator control good or bad?
Is "conservation" better than "preservation"?

In traditional learning environments these questions would be answered, but only with: "yes, hunting is OK", "predator control is good", and "conservation is better than preservation". There can be another combination of answers, but no matter what answers are taught, there is one question that typically is not answered and that is "Why?".

Since my high school graduation I have been rather surprised. I realized that in many of my classes more emphasis has been placed on teaching students *what* to think rather than *how* to think. Facts are important when it comes to physical sciences or history but on more complex subjects, i.e., ecology, facts alone just don't cut it. The ability to reason among various alternatives must be learned. It is important for youth to learn to make decisions and focus on the big picture. Both of these abilities can be accomplished by honing in on critical thinking skills. The Bobwhite Brigade recognizes "critical thinking" as the basis of teaching teens to "think like a mountain". Why is hunting OK? Why is predator control good? Why is conservation better than preservation?

Cristy Brown (right) explains the importance of croton as a quail food plant to Lacey Parker at the 1st Battalion of the East Texas Bobwhite Brigade. Each "covey" of cadets is required to submit a plant collection as part of their assignment.



Cristy Brown (pointing) instructs a group of 4H students in radio telemetry at the Elephant Mountain Wildlife Management Area near Alpine, Tex. during a recent Trans-Pecos Wildlife Camp.

Hatched in 1992 under the wing of Dr. Dale Rollins, the Bobwhite Brigade is a week-long intensive training for youth on the habitat and management of the bobwhite quail. In addition to quail management, cadets learn valuable media and leadership skills and, at every opportunity, critical thinking skills. The reasoning behind all the empha-

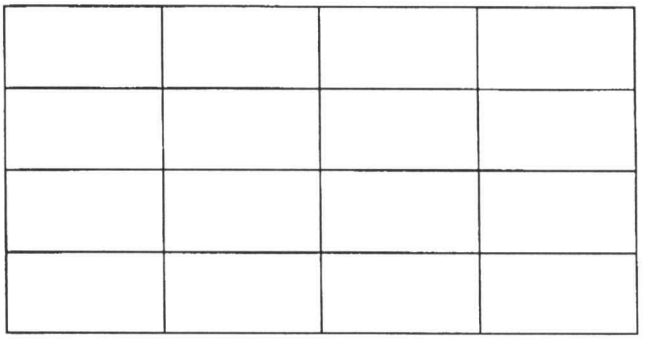
Cristy Brown (left) and Dayna Carter use their puppet "Dale the Quail" to explain the importance of forbs for quail. Cadets are required to give at least three educational programs upon completion of the Bobwhite Brigade.

sis on critical thinking is that today's youth are experience poor. "The lack of experience [in today's youth] provides a poor foundation for critical thinking skills" according to Dr. Ron Howard, Ext. 4-H Specialist. I began pouring my foundation for critical thinking three years ago through working with the Brigade. The Bobwhite Brigade's motto is *Tell me I forget; Show me I remember; Involve me and I understand.* Gaining this experience is a progression. As a cadet, I had fun participating in all the field exercises at camp. As an assistant "covey" leader, I worked to help the new cadets gain the most from their Brigade experiences. As an instructor, I realized that my past experiences had provided a strong foundation for critical thinking skills.

Through my involvement with the Brigade I have been asked many questions. Probably the most frequent query is, "Why spend a week studying one bird?". An answer I like to give refers to one of the field exercises at camp. Penned the "Dummy Nest Appraisal", cadets break into their "coveys", i.e., study groups, and set off on a pseudo-treasure hunt to find twelve simulated quail nests. With their treasure map in hand, the cadets discover one nest after another destroyed by varmints. Each time they must stop and try to identify what predator destroyed their nest of chicken eggs. At the first two or three nests, cadets are usually pretty hesitant to come to any conclusions, but as they progress they learn to look at egg shell fragments, distance of egg dispersal, and even tracks in the dirt. The ability of a high school student to look at evidence and arrive at an educated conclusion is something that is not "just about one bird". These thought processes of being able to look at evidence and draw an educated conclusion can be compared to the scientific method. Once the method is learned, it can be applied to any type of problem solving.

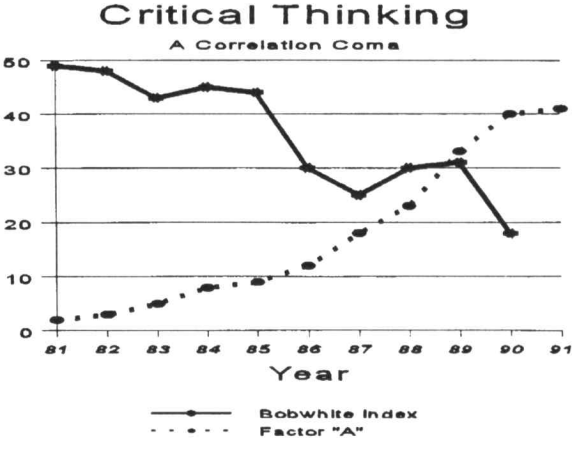
Critical thinking is not limited only to the field exercises. Everyday there is some type of critical thinking exercise, whether it be a seemingly simple exercise like:

How many squares do you see in the figure below?



(*Yes I do say seemingly simple because there are at least 30 squares in that picture!*)

Or one that is more difficult like distinguishing a cause/effect relationship versus two factors that may be only correlated.



This graph is based on actual data take from a 1991 article by Dr. Lenny Brennan at the University of Florida. The bobwhite trend is established from "Christmas Bird Counts" that have been conducted for many years. Examine this graph and describe the relationship between bobwhite abundance and "Factor A".

What do you think "Factor A" really is?
(a) raccoon numbers
(b) hunting license sales
(c) rabies cases
(d) Quail Unlimited membership figures

(*Despite what it may look like, Factor A doesn't affect the quail population. Factor A is not the raccoon population but the number of Quail Unlimited members! The two are correlated, but there is no "cause/effect" relationship.*)

Fidel Hernandez, a graduate student at Texas A&M University, takes aim at a "quail" in an exercise called "Run for Your Life." This activity illustrates the relationships among quail, hawks and brush cover. Quail are safe from hawks when they make it to a loafing covert (hula hoop).

Cadets get experience in critical thinking at all levels. At camp it would not be unusual to have breakfast interrupted with a "silver bullet", "My name is Cristy Brown and my silver bullet is: *Never tell someone how to do something. Tell them what to do and they will surprise you with their ingenuity*. That was said General George S. Patton and what this means is...".

Sir Isaac Newton was a master of critical thinking. That is evident from his three laws of motion. At the Bobwhite Brigade, cadets challenged his very popular third law that states: *For every action there is an equal and opposite reaction.* For Sir Isaac's world of laboratories and experiments this law worked without a hitch, but when dealing with wildlife this is not always the case. During a session on habitat appraisal, it was easy to see that if there was not sufficient ground cover many things would be affected. There would be massive erosion problems, no vegetation for livestock to graze, and no screening cover for quail. The revised law for wildlife should read: *For every action there are many reactions*. The ability to think critically opens one's eyes to more of these reactions.

The Bobwhite Brigade isn't the only youth camp recognizing the necessity of critical thinking. I was able to assist at the Trans Pecos 4-H wildlife camp this summer in Alpine. This camp approaches critical thinking skills by way of role playing and a mock trial. The trial centers around some type of controversial issue that strikes a few emotional chords. This year's topic was no different: the reintroduction of the Mexican Wolf into Texas! Each camper is given a new identity and he must prepare a testimony to defend his stance on the issue. This activity can be especially challenging for those campers who are faced with defending a position they personally oppose. When under questioning, some campers really get enthusiastic about their part and make up answers when they are not sure, while others squirm and use the unfailing answer, "I don't know!". Learning to put their personal feelings aside and think like

Meredith Todd (left) and Miranda McIntire "half-cut" a mesquite to improve its growth form as a loafing covert for bobwhites. Half-cutting is one option for improving loafing cover in areas dominated by regrowth mesquite.

their new identity, campers are given a crash course in real world critical thinking. At one point during camp, standing atop Elephant Mountain near desert bighorn sheep and looking up at unfathomable stars, campers gain a new perspective and its easy for them to wonder "Why?". The view from a mountain is all encompassing. Critical thinking is thinking like a mountain.

As I throw my grappling hook across the mountain of high school years to college, I realize more and more the necessity of critical thinking and problem solving. The Bobwhite Brigade has helped me in learning to listen and think objectively. Armed with silver bullets, a strong foundation of experiences, and the answer to "why?", I am on my way to thinking like a mountain. Though I realize I will never actually be infinitely wise, I recognize the truth in Mr. Leopold's saying that, "Only the mountain has lived long enough to listen objectively to the howl of a wolf."

Author, who attended the Bobwhite Brigade, is from Willis, Texas.

The Bobwhite Brigade: Tomorrow's Leaders 'In the Boot'

Dale Rollins

Never having served in the military, I may have a naive opinion about exactly what's involved at 'Boot Camp.' I envision a group of young adults being challenged physically, emotionally and mentally. Through a grueling schedule the cadets improve both as individuals and as teammates. I see a hard-as-a-rock drill instructor shouting at the top of his lungs demanding every ounce of strength, ability and endurance from his pliable young troops. I see camp survivors who discover they can do much more than ever imagined prior to the camp. But why is it called Boot Camp? Because you've got to be tough as a boot to survive the training? Because somebody (i.e., the 'D.I.') is 'booting' you every step of the way? Or perhaps it's because you're issued two pairs of boots and you wear them continuously for six weeks. After having 'commanded' five battalions of the Bobwhite Brigade, a week long boot camp on quail management, I propose an alternative hypothesis.

Switch your thoughts from olive drab green (military) to chlorophyll green (plants). Botanically, we speak of grasses being in the 'boot' stage. The 'boot' is a transition stage in which the grass is about to reveal its seedhead (or inflorescence as it's known by agrostologists). The seedhead lies encased within its grassy sheath, only a slight swelling which goes undetected by all but the most astute observer. Within a couple of days, however, the seedhead emerges from the seclusion of its sheath to fulfill its destiny: to propagate the species. Stamens wave in the wind disseminating their pollen. Pistils await the germ that will give rise to fertile caryopses (seeds).

This same metamorphosis occurs within Bobwhite Brigade cadets. Through a rigorous curriculum of quail biology, applied ecology (including range management), critical thinking and leadership skills (public speaking, team building), cadets emerge from their chrysalis on the road to self confidence as inspired, effective missionaries for conservation. Upon graduation from the camp, cadets are required to present at least three educational programs for various groups. Scholarships and the opportunity to return as an 'Assistant Covey Leader' entice students to complete additional programs. The six returning Assistant Covey Leaders for the 4th Battalion had conducted a total of two hundred and ten educational programs. Another thing about the boot stage relates to the 'quality' of the grass for forage purposes. Grasses are most nutritious when harvested in the boot stage. Once the seedhead emerges, protein content of the forage drops by as much as forty percent in a matter of days. While growth (tonnage) continues to increase with age (up to a point), quality goes downhill rapidly. No matter how much fertilizer is added at this point, quality continues to slip away until the crop is swathed and new growth is initiated.

Think of a grass seedhead, any seedhead. Which species come to mind? The 'turkey foot' of big bluestem? The golden panicle of yellow indiangrass? The regimented spikelet of sideoats grama? All are fine specimens, some even pretty and showy, as grasses go. Others are more timid. Take sand dropseed for example. One of the botanical clues for identifying sand dropseed is that the seedhead doesn't completely emerge from the sheath. Never. Oh, the seeds are produced and disseminated, and the species thrives throughout the southern Plains. But you don't think of sand dropseed when you think of seedheads, do you? Switchgrass, eastern gamagrass, little bluestem, blue grama, even johnsongrass, yes . . . but not dropseeds.

> ***"Nature is an open book for those willing to read. Each grass-covered hillside is a page on which is written the history of the past, the conditions of the present, and the predictions for the future."*** **— J. E. Weaver**

So what does all this have to do with the Bobwhite Brigade as a 'boot camp' on quail management? Quite a lot I think. We all experience 'boot stages' in our lives . . . times when we are on the threshold of blooming. Sometimes we emerge with the splendor of yellow indiangrass or sideoats grama. We are spotted easily, even by the most casual observer. Other times, we only emerge partially like the dropseeds, producing our seeds and fulfilling our destiny with little fanfare or attention. One day we're high quality and nutritious, days later we're a source of filler and fiber.

Over the last four years, I've shared the soil with some one hundred and fifty high school youth under some rigorous growing conditions. I've watched as inflorescences emerged, realizing their new-found potential. I've measured the growth of productive individuals in fertile environs. I've observed teamwork and synergisms where none grew before. I have witnessed that indeed the 'whole is greater than the sum of the parts.'

Some of these students were bluestems, others dropseeds, but all yielded fruit. Some will become as eastern gamagrass, highly productive and palatable; others will become as buffalograss, sturdy and dependable. All will claim their place on life's range.

"Anyone can count the seeds in an apple, but no one can count the apples in a seed."
—Anonymous

Each cadet is assigned a 'silver bullet' (an inspirational quotation) that they must commit to memory and recite at my request. Through the words of conservationists like Aldo Leopold, Theodore Roosevelt and even Will Rogers the cadets learn from leaders of the past, and how their messages are just as appropriate for today's world. Through an introduction to silver bullets, we believe the cadets go away armed with ammunition for life. A series of 'conservation cadences' has also been drafted to reinforce comradery among 'coveys' while disseminating the message of wise use at the same time.

"Gardens are not made by singing 'Oh how beautiful' and sitting in the shade." **— Rudyard Kipling**

Pardon my pride in this budding nursery, and excuse the spring in my step. Five years ago, I would have lamented that I didn't have time to get involved with any youth education camps, no matter how noble the cause. Too busy. After recent adrenaline highs in the sweltering one hundred and fourteen degree Texas sun, and twenty-hour days with sixteen-year olds, I'm not sure I have time for anything else but youth work. I used to wonder how folks like Barron Rector and Don Steinbach keep on going like the Energizer rabbit, but now I sense their source of energy and vitality: youth, Society's boot stage.

I often hear philanthropists say they want to 'give something back' to their alma maters, be it a shrine or a scholarship. I will never bequeath six-figured sums to mine, but I hope to give something back to those who will prosper from deciphering one of nature's mysteries, stepping into the whirring wings of a covey rise, spotting the goodbye wave of a whitetail's flag, or hearing a coyote's howl or a sandhill crane's chorus. And perhaps you can too. If you're not actively involved in some aspect of youth education, you owe your profession an apology. The seedbeds have been prepared. Don't wait to be drafted. Volunteer.

"Children are our signature to the roster of history." **— Aldo Leopold**

It's the toughest week you'll ever love.

For more information on the Bobwhite Brigade, contact **Dale Rollins at TAEX, 7887 N. Hwy. 87, San Angelo, TX 76901 or on the Internet at 'd-rollins@tamu.edu.'**

Bobwhite Brigade cadences — Vol. I

In keeping with the 'bobwhite boot camp' theme, it's important to stress motivation and teamwork at every opportunity while learning the ecological lessons of life. At the fourth Battalion of the Bobwhite Brigade, the Bobwhite Covey (under the able leadership of Dana Novak) crafted a cadence and marched to it at the quail supper. To demonstrate that indeed 'imitation is the most sincere form of flattery', I drafted the following cadences when returning to San Angelo from the 1st Battalion of the East Texas Bobwhite Brigade (a seven hour drive). The end of every stanza was 'sound off, one, two, sound off, three, four, bring it on down now, one, two, three, four . . . one, two...three, four... It was an honor and a privilege to have served as their Drill Instructor. — DR

I don't know but it's been said,
there's a group named Quail Unlimited.
Noble folks from all around,
promoting conservation that is sound.

I don't know but I've been told,
about a man named Leopold.
Wrote an ethic for the land,
taught us how to understand.

I don't know but I just heard,
about a man named Herb Stoddard.
In his book now he did tell,
all about the bobwhite quail.

Texas ranchers they've got class.
Bobwhite quail nest in bunchgrass.
Cattle grazing is okay,
if it's done the proper way.

If your quail you would protect,
habitat you cannot neglect.
Food and shelter, water too,
There's lots of things that you can do.

A quail's life is full of tests,
Many critters break up their nests.
Possums, skunks and raccoons too,
It's enough to make a bobwhite blue.

A bobwhite quail has many needs,
insects, greens and forb seeds.
On your next outdoor excursion,
note how they need interspersion.

Bobwhite cadets give many talks,
everything from plants to hawks.
Displays, speeches, seeds and slides,
about the habitat where the quail resides.

Left, left, leave some brush left.
Left, left, leave some brush left.
If you think that quail are neat,
please don't clear all of that mesquite.
Loafing cover, plum and lote.
Save a little, don't miss the boat.

A Marine's motto is 'Semper fi',
always faithful til you die.
Commitment is what it's about,
that is why we march and shout.

Mean Gene the Bobwhite Marine,
leads a life that's pure and clean.
Taught us all to give a hoot,
Showed us the 'Bobwhite Salute.'

Have you heard about the tale
of a puppet named 'Dale the Quail.'
Two girls named Dana did profess,
he was the key to their success.

All across this great nation,
we're in need of conservation.
In Texas progress is being made,
Thanks to the Bobwhite Brigade.

I don't know but I've been told,
the Bobwhite Brigade is solid gold.
If you want to be real cool,
follow us cause we rule. — DR

Author is Professor and Extension Wildlife Specialist, Texas Agricultural Extension Service, San Angelo, Tex.

Credibility and the Business of Range Professionals

R. K. Heitschmidt

To address the question as to how the range profession might establish greater levels of credibility with public agencies, other professional organizations, and the general public, requires we first understand clearly what is meant by credibility. According to the American Heritage Dictionary of the English Language (1973), **credibility is worthiness of belief**. Thus, the real question we are asking is: How do we get people to believe us?

To address this question I have chosen to use Steven R. Covey's book, *The 7 Habits of Highly Effective People*, (1989) as a foundation. This approach was suggested to me by my friend and colleague, John Walker, and I am grateful to him for the suggestion. In my preparation I found Dr. Covey's paradigm an effective means for organizing my thoughts. I believe Dr. Covey provides us with some very effective guidelines for making **paradigm shifts**.

The manner in which we see the world varies depending upon our individual paradigms. A **paradigm** is a model, an explanation, or a theory about something. It is a map of how to solve problems, how to get from point A to point B, etc. Unfortunately, our paradigms are sometimes our problem in that we have the wrong map. As such, viable solutions to our perceived problems are often difficult to attain, and as Albert Einstein observed, "The significant problems we face cannot be solved at the same level of thinking as we were at when we created them." This is what the *Seven Habits of Highly Effective People* is all about. It provides us with some fundamental "people" skills needed to solve problems. In many instances it requires a change in the way we look at problems, that is, a shift in paradigms. It says "If you want to be trusted, be trustworthy. If you want the secondary greatness of recognized talent, focus first on primary greatness of character."

HABIT 1 - Be Proactive

Proactivity means we are **responsible** for our own lives. Our behavior is a function of our decisions, not our conditions. We have the initiative and the responsibility to make things happen. Look at the word responsibility - "response ability" - the ability to choose our response. Proactive people recognize their responsibility. We are what we are today because of the choices we made yesterday.

Viktor Frankl, a Jewish psychologist and former prisoner in the death camps of WWII, suggests there are three central values to life: 1) **experiential**, that is, what happens to us; 2) **creative**, that is, what we bring to our life; and 3) **attitudinal**, that being, our response to life's circumstances such as how we might respond to imprisonment in a Nazi death camp. From Dr. Frankl's experiences and observations, he suggests the most important of these three is attitudinal. He and others contend that it is not what happens to us that is important, but rather it is how we respond to what happens to us.

Proactive people focus their attention on things they can do something about (i.e., Circle of Influence) whereas reactive people focus on things that they have very little control over (i.e., Circle of Concern). Thus, proactive people are **influential** whereas reactive people are **passive** participants in life.

And, so it goes with professions and organizations. If our professional discipline (i.e., rangeland management) and society (i.e., SRM) want to have professional credibility, we must be proactive. We must take responsibility for whom we are and focus our activities on those things that we can change. We must take responsible positions on matters related to the stewardship of rangeland resources. We need to offer solutions not excuses to problems. If we want to be trusted, we must first be trustworthy!

HABIT 2 - Begin With the End In Mind

To begin with the end in mind means to start with a clear picture, image, model, or vision of our destination. It is based on the principle that "all things are created twice," that is, there is firstly the mental creation, i.e., the picture, followed by the physical creation.

Habit 2 is based firstly on the principles of leadership which develops the image or first creation. Management is the essence of the second creation, that being, getting the job done. **Management** is doing things right; **leadership** is doing the right things!

Mission statements are an extension of Habit 2. Effective mission statements are based on set principles, that is, principles that do not change. Dr. Covey believes much of IBM's long-term success is related to the underlying principles girding their mission statement which states that IBM stands for three things: the **dignity** of the individual, **excellence**, and **service**. These represent IBM principles and they do not change. Moreover, successful mission statements must reflect everyone's belief just not management's. They must involve everyone because without involvement there is no commitment. No involvement, no commitment!

So what is our profession's vision as it relates to credibility? Is credibility an important principle that will help us better meet our professional mission or is the primary reason we desire credibility is so we can be right? Are we willing to commit the time and energy required to engage in visioning activities designed to elucidate clearly our collective goals and missions? What is our vision?

HABIT 3 - Put First Things First

Habit 1 says, "You are the creator. You are in charge. You are the programmer." Habit 2 is the mental creation. It is based on imagination and it says "Write the program." Habit 3 is the physical creation, the fulfillment of Habits 1 and 2. It says, "Run the program." It centers on how we manage ourselves. It involves doing things of importance, that is, things that produce desired results.

So if credibility is important to our profession, we need to do something about it. We must recognize we are responsible for what we are, that we are in charge (Habit 1). We must have vision, that being, we must want to be credible representatives of rangeland stewardship activities (Habit 2). And to fulfill this vision, we must begin to focus our attention firstly on doing those things that will produce desired results (Habit 3).

HABIT 4 - Think Win/Win

Habits 1, 2, and 3 are habits that produce **private victories**, that is, they are habits that help us "get our act together." Habits 4, 5, and 6 are habits that produce **public victories**, that is, habits that help us to successfully interact with other people. Dr. Covey suggests that successes arising from Habits 4, 5, and 6 are largely dependent upon building an **emotional bank account**. An emotional bank account is a metaphor that describes the amount of trust that's been built up in a relationship. It's the feeling of safeness you have with another human being. People develop emotional bank reserves by being courteous, kind, honest, and committed to others as opposed to being dishonest, disrespectful, and threatening. The six major ways we can make deposits to the Emotional Bank Account are: 1) understand the individual; 2) attend to the little things; 3) keep commitments; 4) clarify expectations; 5) show personal integrity; and 6) apologize sincerely when you make a withdrawal.

Win/Win is a frame of mind and heart that constantly seeks **mutual benefit** in all human interactions. It is based on the paradigm that there is plenty for everybody, that one person's success is not achieved at the expense or exclusion of the success of others. It is a belief in the **third alternative**, that being, it is not your way nor my way, but rather **our way**!

The principle of Win/Win embraces three interdependent dimensions of life. It begins with **character** and moves toward **relationships**, out of which flow **agreements**. It is nurtured in an environment where structure and systems are based on Win/Win. And it involves process; we cannot achieve Win/Win ends with Win/Lose or Lose/Win means.

So what have we done recently as a profession and society to develop Win/Win situations as they relate to our credibility? Have we explored fully opportunities to develop Win/Win agreements with our "detractors"? Do we have the character (i.e., integrity, maturity, and abundance mentality) to explore Win/Win opportunities with other individuals and organizations?

HABIT 5 - Seek First to Understand, Then to be Understood

"Seek first to understand" involves a very deep paradigm shift. We typically seek first to be understood. We typically do not listen to understand; we listen to reply. We are usually speaking or preparing to speak. Mark Twain recognized this fully when he stated that "the fact we have two ears and one mouth ought to be a clue" to appropriate avenues of communication.

Dr. Covey suggests we usually listen at one of four levels. We either: 1) ignore the other person; 2) pretend we are listening; 3) selectively listen; or 4) attentively listen. But seldom do we practice **empathetic listening**, that is, listening with the intent to understand. Successful empathetic listening provides humans with psychological survival, that is, human understanding, affirmation, validation, and appreciation. Only physical survival is a greater need than psychological survival; thus, meeting others' psychological needs is a prerequisite for understanding.

Dr. Covey believes seek first to understand is a mark of a true professional. It is the first step to achieving Habit 5 and the first step to creating a Win/Win situation. The second step is to be understood. It takes **consideration** to understand; it takes **courage** to be understood. Habit 5 is also in the center of our Circle of Influence. If we can learn to understand firstly, our level of influence grows dramatically.

The obvious question relative to Habit 5 is: Do we really understand our critic's position? Have we made every effort to understand their feelings, their thoughts and values, or has our emphasis been on making certain they understand us first? Does Habit 5 provide us opportunities to improve our credibility by improving fundamental relationships?

HABIT 6 - Synergize

Synergy means the whole is greater than the sum of its parts, and when properly understood, synergy is the highest activity in life. When we communicate synergistically, we are simply opening our minds and hearts and expressions to new possibilities, new alternatives, new options. It requires enormous personal security and openness and a spirit of adventure.

The essence of synergy is to **value differences**, human mental, emotional and psychological differences. The key to valuing those differences is to realize that all people see the world, not as it is, but as they are. If we think we see the world as it is, why would we want to value differences? A truly effective person has the humility and reverence to recognize their own perceptual limitations and to appreciate the rich resources available through interaction with the hearts and minds of other human beings.

Unless we value the differences in our perceptions, unless we value each other and give credence to the possibility that we're both right, that life is not always a dichotomous either/or, that there are almost always third alternatives, we will never be able to transcend the limits of that conditioning. When we initially see only two alternatives, ours and the "wrong" one, therein lies an opportunity, that

being, to discover the synergistic third alternative. There's almost always a third alternative, and if you work with a Win/Win philosophy and really seek to understand, you can usually find a solution that will be better for everyone concerned.

Question: What synergistic activities has the range management profession in general, and SRM specifically, undertaken recently to enhance their credibility as rangeland stewards? Are we willing to trust other organizations at a high enough level whereby we would be willing to cooperate fully with them in developing Win/Win situations? Is SRM mature enough to undertake such a course of action?

HABIT 7 - Sharpen the Saw

Habit 7 focuses on preserving and enhancing the greatest asset we have, that being **ourselves**. It involves **learning**, **committing** to what we have learned, then **doing**, **relearning**, **recommitting**, and **redoing** time after time after time. It's renewing the four dimensions of our nature - physical, spiritual, mental, and social/emotional. This is the single most powerful investment we can make in life; **investing in ourselves**, the only instruments we have with which to deal with life and to contribute to life fulfilling activities.

The physical dimension involves caring effectively for our physical body. The spiritual dimension is our core, our center, our commitment to our value systems and its renewal provides renewed leadership and purpose to our lives. Renewal of the mental dimension is continuing education. And the social/emotional dimension centers on the principles of interpersonal leadership (Habit 4), empathic communication (Habit 5), and creative cooperation (Habit 6). Renewal of the social/emotional dimension involves renewed commitments to serving others for as N. Eldon Tanner said, "Service is the rent we pay for the privilege of living on this earth."

In light of Habit 7, one wonders if our profession has spent appropriate amounts of resources in renewal activities. Are we continuing to hang on to our historical roots and our founding traditions with undo tenacity thereby diluting our effectiveness as credible spokes people for rangeland stewardship issues?

Conclusions and Suggested Actions

How does the range profession establish professional credibility with agencies, organizations, and the public? I suggest we consider the following actions as appropriate starting points.

1. We must **take responsibility**, develop a **powerful vision**, focus on actives that **make a difference**, develop **Win/Win opportunities**, develop **empathetic listening skills**, learn to capture value of **human differences**, and **learn**, **commit**, **do**, **relearn**, **recommit**, and **redo**. We need to focus our attention on building coalitions with other organizations having mindsets similar to our own. And we must not become discouraged on this journey in the absence of quick fixes because "**small steps** over time really do make **big differences.**"
2. We need to continue to **hold firm** to our science as the foundation of sound rangeland management strategies and tactics and to **guard against** the temptation to change our story depending upon the audience. Problems associated with overgrazing and general abuse of rangeland resources by agriculturalists (i.e., livestock graziers) must be addressed with the same level of commitment as problems arising from the overgrazing of such national treasures as Yellowstone National Park, for "if we want to be **trusted** we must first be **trustworthy.**"
3. We need to consider ways in which we might **change our image** so as to enhance others' first impression of our profession. How about the ***Journal of Rangeland Science***, the official scientific journal of the **Society of Rangeland Stewardship**? And what about a **new logo**? Does the **Trail Boss** readily portray our profession's commitment to multi-use rangeland stewardship values?
4. We need to consider **sponsoring Super Bowl XXXI**. I recognize most will consider this suggestion as approaching the absurd and that it is. But my point is: **credibility can be bought**! Consider Steve Forbes and the idea of a flat income tax. Like it or not, his money has "assisted" him in gaining some level of credibility and it is important we recognize the need for our profession to expend some "advertising" funds in our efforts to attain new levels of credibility. It seems important also that we recognize that SRM is never going to be able to capture substantial "advertising" opportunities at an annual dues rate of $50!
5. We need to consider **hiring credible professionals** to address such questions as: How do we establish professional credibility with agencies, organizations, and the public? Although I would like to believe that the articles written for and presented in this symposium are all credible and subsequently helpful to our profession and SRM, I know for a fact that they were "cheap" to come by. My question is: Do we spend adequate amounts of available resources (e.g., time and money) on professional development? Would we benefit by hiring trained professionals to address such professional issues as addressed in this symposium? It is good to see the Leadership Development Workshop being offered as a part of our annual meeting, but I wonder if more of our efforts should not be focused in this direction? If we assume generally that rangeland scientists are below average social scientists, then we might conclude that this symposium was of "below average" quality because the questions posed in this symposium were of a social nature and the "professional" respondents were of a rangeland scientist nature. Granted they were cheap, but still of a rangeland scientist nature! Just a thought.

Lastly, I believe it important that we understand that many professional, scientific-based organizations are currently facing the same "credibility" challenges as SRM. For example, the Council for Agricultural Science and Technology (1996) recently sponsored a Leadership Conference for

technical and professional food, fiber, environment, and agriculture related societies. Delegates from the 48 participating societies reached a number of understandings including the following: 1) they need not "go it alone" when facing workplace changes; 2) other societies are facing the same or similar challenges; 3) cooperation and collaboration between societies and among their members are necessary; 4) member needs are changing more rapidly than their societies are able to respond; and 5) traditional approaches to strategic planning, mission writing, and vision statements are not adequate to contemporary challenges.

My point is: we are not in this alone! Other societies are facing similar challenges and that provides opportunities for us to grow with them.

In summary, I believe we simply need to develop **proactive attitudes**, identify clearly who are our **customers**, within the realization that we cannot be all things to all people, and move forward with a **Win/Win** strategy. We need to adopt a **Seek First to Understand**, **Then to be Understood Attitude** and guard against the idea that "telling is teaching." We need to adopt Pogo's eternal optimist's philosophy that "life is a series of insurmountable opportunities." And finally, I believe it imperative we understand the old adage that "whether we think we can or cannot, we are correct." I choose to believe that **together** we can. What do you choose to believe?

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Editor's Note: This paper is based on a presentation given in the symposium "Molding a Contemporary Image for Our Society and Profession" at the SRM Annual Meeting in Wichita, Kansas.

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I certify that the statements made by me above are correct and complete –*Charles B. Rumburg,* Managing Editor.

Requiem for Range? Will Our Profession Survive into the Next Century?

Winifred B. Kessler

A requiem for range? I just do not find death to be a fitting metaphor for what is occuring in the profession. The requiem metaphor assumes that our profession was born to a particular life span, thrived for several decades, and is now in a senescent period with certain death ahead. A much more fitting metaphor to describe current developments in the range profession is that of evolution and extinction in the face of change.

Range is not the only profession feeling threatened in this fast-changing world. In a 1993 commentary in the *Journal of Forestry*, I offered the following comments to the forestry profession:

Change is not only a fact of life, it is the essence of life. Like organisms and ecosystems, professions can only survive and grow by adapting to the changing environment that is the context for their existence (Kessler 1993a).

Can there be any doubt that this statement applies equally to range science and management as to forestry, or to any other profession for that matter? As in the case of forestry, I believe that potential for growth in the range profession is enormous, given the increasing importance of rangelands in the lives and livelihoods of the world's peoples. For the range profession to remain viable in the 21st century however, it must adapt in ways that will keep it robust and relevant to the problems that face society.

Our profession is in a period of identity crisis because the reasons that society needs range professionals are changing dramatically. If we are willing and help society meet these needs, then we will thrive as a valuable part of society. If not, we deserve to go extinct, and surely we will. The outcome is up to us. Are we up to the challenge? Or will the range profession, like so many species in Earth's history, fail to adapt to the changing world that is the context for our existence?

The Reasons Why Society Needs Range Professionals Have Changed.

Rangelands are becoming more scarce, more stressed, and more precious to the people who must share them with a growing human population. As the world becomes crowded, many people are viewing rangelands in a much different way than before. This changing view of rangelands is illustrated by an experience I had about 20 years ago, on an airline flight from Utah to Texas. As the airline droned along, the passenger beside me looked out the window and gasped "My God, look at that!" I quickly leaned toward the window, expecting to see something very unusual. My eyes saw nothing but a huge expanse of rangeland, quite pleasing to my biased eyes.

"What?" I asked. With exasperation in her voice, the passenger replied "Look at all that *wasteland*, that *nothingness."*

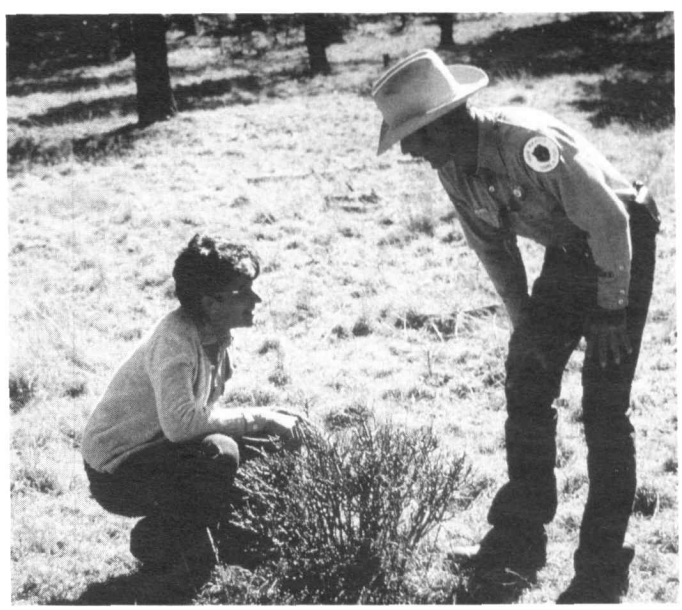
"That's not wasteland," I replied. "That's rangeland."

"But what's it good for?" she asked.

I hesitated for a moment, feeling duty bound to launch into a discourse about the importance of rangeland in the lives of rural people, of its vital services in maintaining watershed health, of its scenic and open space values, and of the wealth of native plants and animals that live in rangelands. But, I was a bit tired, and I didn't think she wanted to hear about those things anyway. So I simply replied, "Cows live out there. You can produce meat for the market."

"Oh, I hadn't thought about that. Thank goodness! I feel much better now" was her reply.

Undoubtedly, there are still many people who share this passenger's view of rangelands as vast places that aren't really good for much else, so you might as well use them to grow livestock. That perspective is much less prevalent than 20 years ago, however. An important part of the changing environment for rangeland management is a growing appreciation of rangeland ecosystems as having uses, values, and ecological services that go well beyond the traditional uses of meat, fiber, and forage production.



The fundamental reasons that society needs range professionals are changing dramatically. Photo by W. Kessler.

The range profession has embraced concepts and approaches of "multiple use management" in recognition that rangelands are useful for more than livestock grazing. But, multiple use is no longer enough; many people today value rangelands for more than the sum of their uses. Rangelands are recognized as complex and fragile systems that are well adapted to the harsh environments in which they evolved. Many people find aesthetic beauty in rangelands and in the animals and plants that cannot be supported elsewhere. There is growing recognition of the vital ecological services provided by rangelands.

Many people today value rangelands for much more than the sum of their multiple uses. Photo by W. Kessler.

The environment for rangeland science and management is clearly changing, and changing social values are key elements in that alteration. Yet, social research has only recently emerged in the range literature; for example, the set of articles in the January 1996 issue of the *Journal of Range Management*. In introducing these studies, Mitchell and Brunson (1996) observe that "whatever the reasons, we lag far behind several other natural resource professions in exploring interrelationships between the human and bio-physical dimensions of our discipline."

Society's needs regarding rangelands have grown immensely in recent years. This has resulted in new expectations for what range scientists and managers should emphasize in their work. People need range professionals to develop an understanding of the processes that underlie health and sustainability of native rangeland ecosystems; they want this knowledge to be applied in management approaches that will ensure the long-term health and productivity of the land. Restoration of degraded rangelands is a high priority. Restoration of forage production capacity is not enough; today's views of rangeland health include the full diversity of native plants, animals, and ecological processes and functions.

Concepts of rangeland health and sustainability extend to people, too. Rangelands are not just part of our biological heritage, they are part of our historical and cultural heritage as well. My own appreciation of this has grown enormously through my international work in such environments as India and Mongolia. For many of the world's peoples, rangelands cannot be separated from their history, cultural identity, livelihood, and basic sense of self and place.

I believe that the importance of these people/land relationships have been ignored or misrepresented here in North America. This is unfortunate, and has often placed ranchers in conflict with the rangeland protection movement. In my opinion, the range profession has erred in consistently referring to "the industry" when presenting the social and economic side of rangeland management. It has been our habit to rationalize livestock grazing on the need to sustain a viable industry when our real concern is for ranching families who, in the course of making a living from the land, represent a way of life that society should value and strive to sustain. If the issue is a way of life that we value, than we need to talk about people and their relationships with the land.

We Are Well Equipped for the New Challenges.

Change is not new to the range profession. In a 1993 *Rangelands* article, I described ways in which the profession has evolved during the past decades (Kessler 1993b). The early focus of range science was on native plant communities. Books and monographs published in these early

For many of the world's peoples, rangelands cannot be separated from their history, livelihood, and basic sense of self and place. Photo by W. Kessler.

years were ecological treatises that remain today as classics.

I feel privileged to have studied under range professors whose own thinking and research were well rooted in native rangeland ecology. Institutions vary greatly, but speaking from my own experience, you just cannot get a better ecology education than from a good range program. A good range program is one that looks at ecosystems in their entirety, and concerns itself with the health, diversity, and sustained productivity of native rangelands that are a precious part of our biological and historical heritage.

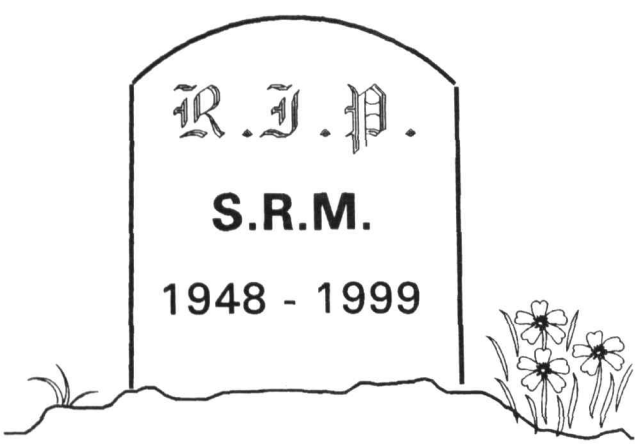
The range profession had evolved from an ecosystem approach, in its early years, to a distinctly agricultural mode (Kessler 1993b). I do not suggest that agricultural production has no place in our profession. But, if a focus is maintained on efficient production of forage and livestock crops, will range professionals be needed and valued by society in the 21st century? Yes, but the need will be no different from the various other classes of farmers who concern themselves with commercial production of crops. In my opinion, the range profession has a unique calling and a great deal more to offer society.

If We Don't Meet the Challenge, Others Will.

If the range profession does not expand its mandate, will society's rangeland needs and concerns go unheeded? Of course not. If range professionals are not up to the challenge, others are!

I mentioned earlier that other natural resource professions have gone through a similar identity crisis to what range is experiencing now. In the case of forestry, the question was nearly identical: will foresters be farmers, concerned with producing crops of wood fiber? Or, will they help society meet its diverse needs for the world's forests? In many parts of the world, the forestry profession has accepted a much larger mandate in response to pressing environmental, economic, and social issues.

About 10 years ago, the wildlife profession felt seriously threatened by the emergence of an upstart new organization, the Society for Conservation Biology. The new society faulted the wildlife profession for its preoccupation with game species, and for paying scant attention to greater concerns such as ecosystem health and the worldwide decline in biological diversity. Lively dialog in the *Wildlife Society Bulletin* revealed a wide range of opinion among wildlife professionals. Some responded with outright denial; others defected to the ranks of the conservation biologists. When the dust settled, however, the Wildlife Society responded in a positive and proactive manner. An *ad hoc* committee was appointed to address the issue, a Position Statement on Conserving Wildlife Diversity was passed in 1992, and the purview of wildlife research and management broadened to include a wide variety of species and conservation concerns. The prevailing view today is that "the goals, objectives, and philosophical positions of wildlife managers and conservation biologists. . .are in very close alignment" (Scott et. al. 1995). Many professionals maintain memberships in both the Wildlife Society and the Society for Conservation Biology.



As society struggles with increasingly complex problems concerning natural resource management, range professionals have a golden opportunity to use their ecological understanding and practical experience in ways that will benefit the land and the people who depend on rangeland resources. Will the profession adapt and fill the new needs? If not, it may be of consequence to no one but the range profession itself. If we go extinct, I doubt that we will be missed.

Others are already moving into the new niche. For example, range professionals may not consider livestock grazing as a major conservation biology issue, but conservation biologists do. There has been considerable coverage of the subject in *Conservation Biology*, the journal of the Society for Conservation Biology, starting with Tom Fleischner's article on the "Ecological costs of livestock grazing in Western North America" (Fleischner 1994). At its 1994 annual meeting, the Society for Conservation Biology passed a policy statement and resolution on livestock grazing (Brown and McDonald 1995).

A recent editorial in *Conservation Biology* posed this question: "Should conservation biologists link arms with activists in efforts to reform grazing practices?" (Noss 1994). Overall, the editorial emphasized the urgent need for increased research and professional opinion to effect improvements in rangeland policy and management. I found it distressing that the proposed partnership was limited to activists, with no mention of roles for range professionals.

The conservation biologists are not the only ones moving into the new range niches. The 1995 publication entitled "Defending the Desert" proposes bold strategies and actions to conserve biological diversity on Bureau of Land Management (BLM) lands in the southwest (Cooperrider and Wilcove 1995). Did the BLM produce this book? Or, the Society for Range Management? Guess again—it was a publication of the Environmental Defense Fund.

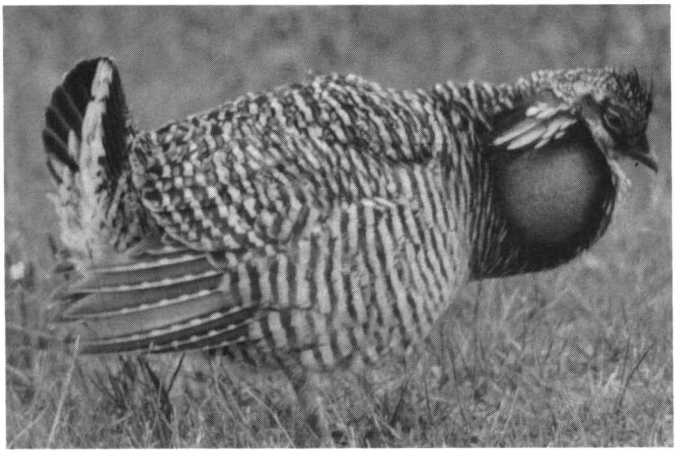
How do ranching families fit into the new era of native rangeland restoration and conservation? It is still common for the range profession to skirt this question by identifying "the industry" as the key rationale for livestock grazing. This simply is not a compelling argument anymore, especially where public lands and resources are involved. Meanwhile, organizations such as the Nature Conservancy are telling the story of ranching families as essential players in the conservation future of native rangeland ecosystems.

For over half a century, the Nature Conservancy has remained squarely focused on a conservation mission to "preserve plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive." Given this clear protection mandate, the feature theme of the July/August 1995 issue of *Nature Conservancy* magazine might seem incongruous. The cover photograph is of a beautiful rangeland scene, complete with cows and what can only be described as a real-life version of the Trail Boss. The feature article, entitled "Good Guys in the Badlands," gives a moving account of how ranching families, conservationists, and government officials are working together toward shared goals for wildlife conservation, range ecosystem health, and secure family livelihoods.

Readers of *Conservation Biology* are also being exposed to these ideas: "The best way to preserve the open spaces, arid ecosystems, and diverse biota of the Southwest is to keep rural people on the land" (Brown and McDonald 1995). Most range professionals understand the vital stewardship role that ranchers can serve, but we do a poor job of communicating these values and relationships. Fortunately for rural people, the story is starting to be told by others.

Evolution or Extinction?

Extinction is a sad thing. The Attwater's prairie chicken is a remarkable bird that consumed my research energies during the early 1970s. Despite the dedicated efforts of scientists, managers, and conservationists, the bird has steadily declined to levels from which it may not recover. Changes in the prairie chicken's environment happened so fast that by the time people decided to take action, it was already too late to turn things around.



Unlike the endangered Attwater's prairie chicken, for the range profession the ability to adapt and thrive is largely a question of will. Photo by W. Kessler.

The range profession is much better off than the Attwater's prairie chicken. While it is true that change is happening at frightening speed, it is within our ability to adapt and thrive in the new environment. Already the changes are underway. The new book, *Biodiversity on Rangelands*, brings together the work and experience of range researchers, planners, and practitioners in an interdisciplinary examination of rangeland biodiversity (West 1995). Range ecosystem health is a major thrust of range classification and management (Busby and Cox 1994). *Rangelands* articles such as Knight (1995) are engaging readers in discussions of environmental and professional ethics. And, there is an increasing appearance of social research in the *Journal of Range Management*.

These are just a few examples of what I hope is a larger evolutionary process. Unlike the Attwater's prairie chicken, the ability of the range profession to adapt and thrive is largely a question of will.

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Livestock Grazing in Wildland Fuel Management Programs

Jason Davison

Fuel management programs that utilize livestock are going to be much more important in future land planning activities for several reasons. According to BLM and Forest Service data, the number of acres burned by wildfire annually are on a long-term upward trend. The fires which do occur are larger and more intense. Federal funding for wildfire suppression has leveled out and with federal budgets shrinking, funding will probably decrease in the future. Federal agencies, environmental groups, and professional societies are calling for increased controlled burning, and fuel management programs to reduce the intensity of fires. At the same time we are losing many traditional vegetation management tools.

Why are the Fires More Frequent and Severe?

The primary reason fires are burning more acres and becoming more severe is due to changes in fuel loads and arrangements (Peters and Bunting 1994, Whisenant 1990). Large areas once dominated by herbaceous vegetation are now dominated by woody species. Most researchers believe this change was caused by heavy grazing pressure in the late 1800's which reduced fine fuel loads and vigorous fire suppression which continues today. The result was reduced fire frequencies, which in turn allowed sagebrush and juniper cover to increase tremendously. Grazing pressures which originally reduced fine fuel loads have decreased significantly during the past 30 years and fine fuels including cheatgrass are again filling the interspaces between the shrubs allowing fires to spread. When ignifition occurs in these areas increased fuels result in fires that are very destructive to the existing perennial vegetation and extremely difficult to control.

Another important factor is the amount of rangelands that are dominated by annuals has increased tremendously during the past 30 years (Young and Tipton 1990). Annuals such as cheatgrass, are capable of producing large amounts of fuel. They form a continuous arrangement of fuels which allows easy ignitition and the rapid spread of fires. Once an area has been converted to an annual type due to fire the fire recurrence period can be very short. With each new fire more perennial species are lost and more surrounding areas are converted to annual rangelands (Peters and Bunting 1994, Whisenant 1990, Young and Evans 1978).

Responses to Increasing Fire Frequency and Severity

Numerous groups and individuals are calling for major changes in current fire management procedures in response to the increasing danger of uncontrollable wildfires. Almost all of the groups are calling for fuel management programs including increased use of prescribed fire to reduce the available fuel loads. Some examples include the report of the Interagency Management Review Team (IMRT) from the South Canyon, Colorado fire. This team composed of representatives from the USFS, BLM, NPS, USFWS, NWS, made several recommendations. Among them was the following concerning fuels management, "The IMRT strongly recommended that both departments begin taking immediate steps to reduce fuel loads and actively pursue the reintroduction of fire into all aspects of land management." A 1995 draft Federal Wildland Fire Management Policy and Program Review also discussed fuels management. In part it stated, "Some areas will need immediate management intervention to prevent high-intensity fire and maintain their sustainability as healthy ecosystems." Interior Secretary Bruce Babbit stated in the July–August 1995 issue of *American Forests*, "If we gave it (prescribed fire) just a fraction of the time and energy that our predecessors put into the fire exclusion campaigns, prescribed fire would soon take its rightful place on the land management agenda," and Carol Rice owner of a fire management firm near Oakland, California stated in the June 1994 issue of *American City & County*, "Vegetation management legally enforced when necessary, is still the best fire prevention tool."

Fuel Management Options

Several options exist for reducing fuel loads on rangelands. Vegetation control with herbicides can be effective if the proper material is used at the right rate. However, public sentiment towards widespread herbicide use is largely negative due to perceived environmental dangers. Also, many chemicals have been lost due to a lack of reregistration. Mechanical control is possible but, heavy equipment cannot operate in many areas due to soil damage and topography. Hand treatment to reduce fuel loads is highly selective, can be applied on all terrain, but is normally cost prohibitive. Prescribed fire is gaining favor in many locales but has several drawbacks. It is risky to use due to the ever present danger of escape and the resultant liability. Personnel qualified to conduct prescribed burns are in short supply. The smoke generated by prescribed fire is another

real hurdle that must be addressed. Regulations such as those found in the clean air act and public outcry over the pollution caused by smoke may limit the amount of prescribed fire that can be used in any given region. Burning may also provide a competitive advantage to cheatgrass in communities that have been invaded by this plant.

On the other hand, properly managed livestock grazing can achieve many of the desirable outcomes related to fuel reduction without all of the problems inherent in the other options. Some advantages include: selectivity which can be achieved by managing the time and type of livestock used, low probability of environmental damage, cost effective when compared to other techniques, generally available at most locations and, the existence of a large number of personnel experienced in grazing management.

Examples of Fuel Reduction Programs Using Livestock

An extensive literature and "personal contact" search for fuel reduction programs using livestock in the Pacific Northwest turned up every few examples. In fact, very few fuel reduction programs of any kind were located, which supports the need identified by the various groups previously mentioned. However, one example where livestock plays an important role in reducing fire danger is on Idaho Fish and Game lands near Boise. Cattle and sheep supplied by private livestock operators are used to manipulate vegetation for wildlife and reduce the danger of wildfire. The greenstripping program developed by the Bureau of Land Management in Idaho relies on grazing animals to reduce fine fuels in the strips by grazing and trampling and has demonstrated some success in slowing fire spread.

Most of the successful programs that use livestock to reduce fuel loads and fire danger are found in California. That fact is not surprising when one considers the widespread urbanization that has occurred and the damage that results when wildfires burn homes and people instead of sagebrush. The East Bay Regional Park District, which manages several parks around San Francisco, uses cattle to reduce fine fuels and goats to reduce brush on over 50,000 acres. The livestock are allowed to graze under leasing arrangements which not only reduce fire hazard but net the District in excess of $300,000 annually (Budinski 1995). The Tahoe and Angeles National Forest use sheep to control grass and brush on fire breaks. They are so important to fire control efforts in the Angeles and Tahoe Forests that the grazing fees are commonly waived and/or ranchers have been paid to graze their sheep. In Canada, the sheep are so valuable in vegetation management that ranchers are paid an average of $5 per sheep, per month to reduce understory competition and fire danger. Other pertinent examples exist in Arizona, New Mexico, and Texas. These examples are highlighted to demonstrate that using livestock to reduce fuel loads is not only feasible but desirable in many places.

Cheatgrass Dominated Sites

Cheatgrass dominated rangelands continue to increase in size throughout the entire Intermountain west, especially in the Columbia and Great Basin regions (Monsen 1994, Pellant and Hall 1994). Fires occurring on low elevation rangelands which receive less than 14 inches of annual precipitation, and with established populations of cheatgrass, often result in a conversion from sagebrush-bunchgrass communities to annual dominated grasslands (i.e. cheatgrass). The existing data indicates that these native rangelands once converted to an annual type will normally remain an annual community unless massive expenditures of resources are applied (Friedel 1991, Laycock 1991). These annual grasslands burn more frequently than surrounding native rangelands. Each burn reduces the surviving perennial vegetation while at the same time converting more of the surrounding shrub-bunchgrass communities into an annual community (Whisenant 1990, Young and Evans 1978). The increased fire frequency and conversion results in forage losses, increased erosion, increased fire danger to adjacent residences, weed invasions and most importatly loss of diversity of plants and animals. In this case, livestock grazing used to reduce fuel loads, fire occurrence and severity, and prevent adjacent shrub-bunchgrass lands from burning should be the foremost priority on these lands.

Low elevation ranges on which cheatgrass has excluded almost all desirable perennial species should be managed as an annual grassland with the primary goals of reducing fuel loading, and providing maximum grazing opportunities consistent with long-term protection of the site. Grazing plans on these annual rangelands which include annual deferment or rest, are likely to increase the fire danger with no benefit to the few perennials which may still occur (Young and Tipton 1990). The primary considerations for

protecting an annual grassland is the maintenance of enough litter to protect the soil, and adequate seed production to maintain the stand. Research results delineating the utilization levels required to achieve the fore mentioned items are unavailable for annual grasslands dominated by cheatgrass. Experience leads one to believe that annual use levels between 60 and 70 percent will not result in long-term damage to cheatgrass stands.

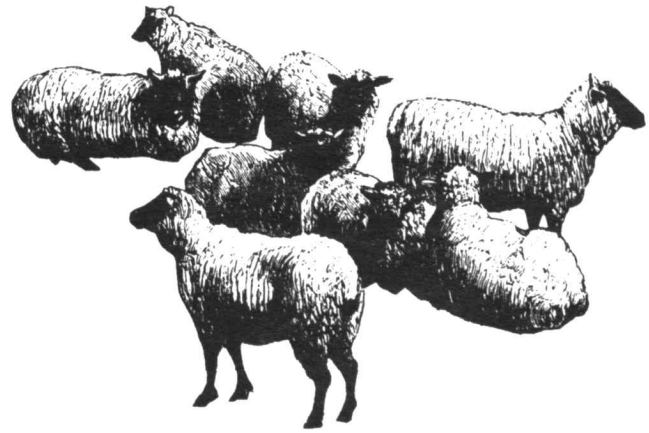
Proper management of these ranges requires more flexibility than on perennial ranges. The area of use, season of use, and stocking rates vary yearly due to precipitation amounts and timing. Water may need to be hauled and temporary fencing established to achieve the desired use levels. These factors increase the costs of using these areas. However, these costs must be compared with the benefits obtained. These benefits may include: reductions in winter feed requirements for livestock, improved nutritional status of livestock during the spring, grazing deferment on adjacent perennial rangelands, lowered fire suppression costs, and protection of the surrounding shrub-grassland ecosystem.

Sagebrush-Bunchgrass Sites

Livestock used to manage fuel loads in the sagebrush-bunchgrass sites surrounding annual cheatgrass ranges can be important in controlling fire frequency and intensity. Successful ignition and burning of most sagebrush-bunchgrass rangelands is dependent primarily on the amount and continuity of the herbaceous fuel loads found within a sagebrush stand (Whisenant 1990). Sagebrush-bunchgrass sites in a pristine or high seral state normally have a long burn interval due to diverse population of widely spaced bunchgrasses and relatively low sagebrush canopy cover. The grasses provide a low level of fuel continuity and remain green through much of the fire season. These factors combined with sparse sagebrush cover reduce the possibility of catastrophic fires and allow a long interval between fires.

Unfortunately several factors are now in place to degrade the ideal situation described. Much of the low elevation sagebrush-bunchgrass range in the Intermountain west is in a low seral condition with excessive sagebrush canopy cover and little perennial grass as an understory. Range sites in mid-seral stages with good perennial grass populations and relatively high sagebrush canopy cover are often no longer grazed at utilization levels adequate to reduce fine fuel loads. Cheatgrass is expanding its range throughout the Intermountain west. This is important as the cheatgrass dries early in the fire season and provides the continuity necessary for rapid fire spread to the existing shrubs.

On sites with excessive sagebrush canopy cover but adequate remnant populations of desirable bunchgrasses, winter sheep grazing may provide an option to reduce the sagebrush cover (Welch et al. 1987). Reducing the sagebrush cover before a fire will reduce the intensity and spread of the fire. It will also benefit the existing bunchgrasses.



Utilization levels on upland sites have decreased markedly on most federally controlled lands. In Nevada, total cattle numbers have fallen by 210,000 head between 1982 and 1994. Sheep numbers have dropped from 129,000 to less than 91,000 head during the same period. A similar trend is evident in Idaho, Washington and Oregon (Bay 1995). Reduced livestock numbers, and management prescriptions aimed at protecting unfenced riparian areas, have resulted in much lower utilization levels on the uplands and an accumulation of old herbaceous materials. This material in combination with cheatgrass provides an ideal fuel to rapidly spread throughout an otherwise healthy sagebrush-bunchgrass community.

The management strategy under this scenario should be to reduce the frequency and size of fires that occur in these types. Due to the tremendous amount of land involved and current livestock numbers available, a priority system identifying areas to be "treated" with livestock grazing will need to be established. The priority areas could then be utilized in a season and level that would reduce the continuity and amount of fuel available. Removing the livestock while adequate soil moisture remains to allow regrowth of perennials is critical. Additional costs will probably be inccurred under such a management system. But, the costs are minimal when compared to those associated with either the loss of these communities or with trying to restore them using normal revegetation practices.

In summary, existing data makes a clear case for the fact that fires are increasing in frequency, size, and intensity. These fires are resulting in increased danger to firefighters, and losses of irreplaceable vegetative communities through conversion to annual grassland or other low seral states. Fire occurrence, frequency, intensity and size is dependent in large part to the fuel complex present. Individuals, organizations and agencies who influence fire management policies are calling for fuel management schemes to reduce the damages caused by uncontrollable wildfires. Managed livestock grazing is currently being used in limited amounts in North America and Canada to reduce fuel loads and fire danger. Greater use of livestock to reduce fire danger is possible and desirable on western rangelands and becoming more important as other vegetative management

options are reduced due to public resistance and excessive costs. The increased use of livestock to reduce fire danger will require increased management to achieve fuel reduction objectives but, the increased costs are small in comparison to the damage occurring on western rangelands and the costs of rehabilitation on burned areas.

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Grazing the Hill

Vivan M. Jennings
Washington Representative
The Public Rangeland Management Act (PRMA) Issue

An issue is often defined as a point in question, or a matter that is in dispute on the public agenda. It would seem that due to the diversity of SRM membership, we clearly have a matter concerning SRM support for PRMA that is in dispute. Obviously, there are strong feelings on several sides of the PRMA issue.

Issues do not remain unresolved over time. They have dimensions of time and intensity. Issues need an appropriate amount of attention so they don't become unmanageable over time. The reason, is that peripheral issues are around us all the time. We don't give much attention to them in this stage, since divergent interest in the issue has not risen to an intense level of major concern. Such was the situation with the issue of rangeland management. SRM Board action shows that the management of rangelands has always been an issue and that action was previously taken to establish appropriate SRM policy. It did not surface as an emerging major issue until after the SRM summer meeting in San Antonio.

What's important now, is to not let this become a major or critical issue that causes organizational disrepair before it's resolved. This is why the action of SRM President John R. Hunter is the right one and very important to achieve a feeling of mutual gain by the various interest concerned about what will happen with the likely to emerge Public Rangeland Management Act of 1997. President Hunter has called for the SRM Public Affairs Committee and the SRM Advisory Council to address PRMA and to provide collective advice to the Board so they will be better informed of the collective wisdom of the membership before commenting on the benefits and concerns associated with passing the Act.

An additional point to consider is that this may not be a negotiable issue where everyone comes to consensus. Rather, it may be one where there are mutual gains to be achieved which will have benefits for most parties involved, rather than providing only winners and losers. This needs to be a healthy debate, which will build organizational vitality within SRM.

Unless there are issues such as this and a healthy debate and resolution of the issue, the organization will not be vibrant and healthy. This needs to be viewed as a healthy process which President Hunter has called for within the organization.

USDA Secretary's Memorandum on Sustainable Development

On October 23,1996, Secretary of Agriculture, Dan Glickman, issued a Secretary's Memorandum on Sustainable Development to be effective immediately. The purpose of the memorandum is to state USDA's support for policies programs, activities, and education in sustainable development, including sustainable agriculture, sustainable forestry and sustainable rural community development.

The stated policy says that USDA is committed to working toward economic, environmental, and social sustainability of diverse food, fiber, agriculture, forest and range systems. It further states that USDA will balance goals of improved production and profitability, stewardship of the natural resource base and ecological systems, and enhancement of the vitality of rural communities. Also, that USDA will integrate these goals into its policies and programs, particularly through interagency collaboration, partnerships and outreach.

The first thing to happen will be the establishment of the position of Director of Sustainable Development.. The position will report to the Chief Economist, Kieth Collins. The Director will be responsible for leading and coordinating cross-mission area work in sustainable development and will represent the Department in both domestic and international arenas.

The Director of Sustainable Development will also serve as chair for a newly established USDA Council on Sustainable Development. Appointments will come from within USDA. The Council will be the forum for policy and program development, implementation and evaluation on issues deemed important.

U.S. Forest Service Range Management Vision

According to Bertha Gillam, Director of Range Management, USDA Forest Service, National Headquarters in Washington D.C., a renewed vision will continue to target an ecosystem approach toward rangeland management and stewardship. Gillam's vision is to concentrate on promoting an improved and consistent rangeland inventory and monitoring system essential for information needed to improve rangeland health.

Important on-going objectives of the Forest Service are: to provide forage for domestic livestock; to provide forage for wildlife needs; and to provide vital support for communities within the capabilities of rangeland ecosystems.

The Forest Service will continue to emphasize the management, protection, and restoration of rangelands, particularly riparian areas, to ensure healthy and producive systems, says Gillam. To accomplish this, Gillam points out, will require cooperative work with other agencies to achieve an integrated approach. This will be increasingly important with the noxious weed management program.

Gillam emphasizes that some characteristics of the Forest Service's range management program that continue to be important are: a strong commitment to coordinate with others; to actively seek opportunities for partnerships with others in pursuing mutual goals; and to strengthen the use of science in rangeland management decisions.

Gillam points out that there is a growing recognition of the unique and special resources that are contained in America's prairie ecosystems. This is expected to be recognized by a continuing and growing emphasis on grasslands and their value within the Forest Service.

The recent establishment of the National Grasslands Council is an example of the importance the Forest Service has placed on grassland and prairie resources under their care.

Gillam believes that as the American Society grows and changes, the value of its public lands, including the National Grasslands and National Forests, will grow. The demands and expectations of the public will also grow and change, and, according to Gillam, the Forest Service will be responsive. Part of that response will be the use of grazing to meet, and be in concert with, other social needs.

Pulling Together - A National Strategy for Invasive Plant Management

Because it is a silent invasion, many people have not recognized the steady encroachment of invasive plants. Anyone who has seen kudzu along the roadside and hydrilla in aquatic environments recognizes their invasive nature and the damage they can cause to the surrounding ecosystem. Less well known to some people, are plants of regional importance such as purple loosestrife, leafy spurge, spotted knapweed, yellow starthistle, and Asiatic bittersweet. The invasion of these and many other less known, but equally as damaging, invasive plants is causing billions of dollars in lost revenue and control costs. Direct control measures in 1993 are estimated to be between $3.6 and $5.4 billion dollars. On rangeland, invasive plants crowd out more desireable and nutritious forage plants, cause erosion problems and may poison some wildlife and livestock species.

"Pulling Together: National Strategy for Invasive Plant Management" presents a nationwide strategy of prevention, control, and restoration. The National Strategy will deal with identifying potentially invasive plant problems and will outline measures to control or eradicate those that are already a problem. An additional goal will be to restore full function to degraded agricultural lands, rangelands, forests, and ecosystems. Opportunities for partnership, education, and research are highlighted under each objective.

For this effort to be successful, it will require bringing together organizations and individuals with a complex set of interests at the local, state, and national levels. A cooperative effort between private land owners and operators, consultants, industry and government will be needed to face this serious national problem.

The National Strategy is in its final draft stage of development. There are currently 35 non-Federal and 21 Federal agencies endorsing the strategy. These are federal, state, and local agencies and affiliated organizations with an intense interest in supporting a nationwide Strategy. Printing of the document is presently scheduled for December, 1996.

SRM was one of the first groups to recognize the importance of a national plan by endorsing the Strategy. All groups which support the management of invasive and noxious weeds are invited to endorse the Strategy by becoming signatories. For more information contact: Sean Furniss, U.S. Fish and Wildlife Service (703) 358-2043; Deb Hayes, U.S. Forest Service (202) 208-3038; or Lee Otteni, Department of Interior (202) 205-0847.

Invasive Plants - Changing the Landscape of America

Agencies within the U.S. Departments of Agriculture and Interior are developing a new weed fact book, Invasive Plants: Changing the Landscape of America. Plans are for the publication to be available traditionally and also on the Internet. The publication will ask readers to ascribe to a National Code of Ethics on Invasive Plant Management. The purpose will be to aid in the sustainability of agricultural production and to protect the biodiversity of our managed and native ecosystems in the United States.

The publication will focus on understanding the problem and evaluating impacts, status, and trends of invasive plants in managed and natural ecosystems.

A first draft is in the process of editing, Randy Westbrook, USDA - APHIS and Bob Eplee, USDI - BLM have been working on the book nearly full time, with plans to complete the process by the end of November, 1996. Plans are for a spring of 1997 publication date.

Washington Profiles

Starting with the previous issue, we will profile individuals located in the Washington DC area, who have responsibility for leadership and management of programs of interest to Society for Range Management members.

Bertha Gillam

Bertha Gillam currently serves as the Director of Range Management, USDA Forest Service, National Headquarters in Washington D.C., a position she has held since July,1994. As Director, she provides executive leadership for the stewardship and management of public rangelands and natural resources. She brought to this position a widely varied background and a wealth of knowledge and experience in public involvement, cooperative planning, and is a proven leader in designing and implementing programs. She is the first woman to hold this position. Prior to being named to her present position, Bertha served from 1991-94 in the Washington office as Assistant Director of Land Management Planning and Acting Director of Ecosystem Management. From 1988-91, Bertha served as Forest Supervisor on the Bitterroot National Forest in

Hamilton, MT, where she received recognition for her successful negotiations with polarized public interest groups, and for her work with local community leaders to strengthen the economic health of communities.

Her other assignments have included: Deputy Forest Supervisor, Wasatch-Cache N.F., Salt Lake City, UT; District Ranger, Custer Ranger District, Black Hills N.F., Custer, S.D.; Range Conservationist, Pawnee National Grassland, Arapaho-Roosevelt N.F. and Resource Staff for Range, Wildlife, Minerals and Timber Sale Administration, Bearlodge Ranger District, Black Hills N.F. She began her Forest Service career in 1977 on the Bighorn N.F., Sheridan, WY, where she served as Forest Botanist, Range Conservationist, and on the Land Management Planning Staff.

Bertha is a native of Missouri. She received a B.S. in Botany/Biology and Education in 1970 and a M.S. in Botany/Ecology in 1972, and completed two years of doctoral work, all at Montana State University. She completed Range Management studies at the University of Wyoming and at Colorado State University. She is an alumnus of the Federal Executive Institute.

Bertha co-authored "Forested Ecosystems" of the book Managing Forested Lands for Wildlife. The book was published jointly by the U.S. Forest Service Rocky Mountain Region and Colorado Division of Wildlife. She has been honored with a Leadership Award of Quality Land Stewardship and Conservation Leadership and for Superior Range Management.

Bertha has been a member of the Society for Range Management since 1979, served as Secretary of the Wyoming Chapter, and currently serves as a member of the Society of American Foresters, International Women's Forum, American Association of University Women, and Senior Executive Service Association.

Silent Auction Benefits Endowment Fund

A special feature at SRM's 50th Anniversary Meeting in Rapid City will be a Silent Auction. Many valuable and attractive items will be available including original paintings, wood carvings, Indian dolls, blankets, horse tack, vactions on working catting ranches and sight seeing flights over the Rockies and Cascades. Each SRM section as well as individual members have donated a wonderful array of items for the auction. Proceeds go to SRM's Endowment Fund which will benefit the Society for years to come.

Come to the trade show in Rushmore Hall of the Civic Center from noon Sunday (2/16) to 5 p.m. Tuesday (2/18) to see these great auction items and place your bids. Winners will be announced Tuesday evening at the President's Reception.

Requiescat in Pace

by Robert L. Ross

The profession of range management lost one of its most dedicated participants November 2, 1996. At age 85 **Edwin A. McKinnon** passed away in Calgary, Alberta, Canada. He is survived by his loving wife, Margaret, and sisters, Isabelle Bishop, Jean McKenzie and Freda Hurst. He was predeceased by his first wife, Harriet, in 1983.

Ed was born in Dalmead, Alberta, on August 26, 1911, a son of the pioneer family of Lachlin and Sarah McKinnon. He was associated with the LK family ranch before establishing his own ranch operation at Airdrie, Alberta, from which he retired to Calgary in 1968.

Ed McKinnon has had a tremendous influence in community affairs. He has been an outstanding leader in the Western Stock Grower's, Calgary Exhibition and Stampede, Calgary Chamber of Commerce, International Rangeland Congress, Stockmen's Memorial Foundation, Breed Associations, Foothill Forage Co-operative Association, etc.

Ed's international interests and contacts has been a very good influence on the SRM and its members. Through his leadership and influence the Society has grown internationally.

Ed has been a rancher all his life and was very influencial and well known by ranchers, livestock people and other business people throughout western Canada, the U.S.A. and many other parts of the world. He has done a good job of carrying out range management practices on his own ranch operation. His ranching interests were not just centered around livestock but included multiple use of the rangelands. He was an excellent liaison between ranchers, environmentalists and other segments of the Society.

In 1976 Ed was honored as a Hall of Fame member of the Northern International Livestock Exposition. He was a life-time member of the prestigious Calgary Stampede Committee. He was selected as an SRM Fellow in 1977 and in 1987 he received the coveted Frederic G. Renner Award.

Ed McKinnon was a life member of the Society for Range Management and served as its international president in 1985-86. He was also president of the International Mountain Section of the Society for Range Management and received the Outstanding Rangeman of the Year Trail Boss Award in 1985.

Ed had traveled world-wide—all over Canada, U.S.A., Mexico, Europe, United Kingdom, Fiji, New Zealand, Australia, Japan, China, etc. He was very effective in promoting world-wide understanding of the rangeland resources.

Characteristics of Ed McKinnon can be summed up in a phrase: He embraced the world with warmth, kindness and caring; his love of nature, and the conservation of the land he loved so dearly were always uppermost in his life. Ed cherished his family and many, many friends throughout the North American Continent. He will be sorely missed.

Current Literature

This section has the objective of alerting SRM members and other readers of *Rangelands* of the availability of new, useful literature being published on applied range management. Readers are requested to suggest literature items—and preferably also contribute single copies for review—for including in this section in subsequent issues. Personal copies should be requested from the respective publisher or senior author (address shown in parenthesis for each citation).

Adaptation of Forage Kochia Accessions Across an Environment Gradient in Rush Valley, Utah; by E. Durant McArthur, Stewart C. Sanderson, and James N. Davis; 1996; Arid Soil Res. & Rehab. 10(2):125-138. (USDA, For. Serv., Intermtn. Res. Sta., Provo, Utah 84601) The germplasm "Immigant" was one of the better performing accessions, but an accession of *K. prostrata* ssp. *grisea* was one of the top ranking accessions at each site.

Adjuvant Effects on Imazethapyr, 2, 4-D, and Picloram Absorption by Leafy Spurge *(Euphorbia esula)*; by W. Mack Thompson, Scott J. Nissen, and Robert A. Masters; 1966; Weed Sci. 44(3):469-475. (Thompson: Dept. Plant Pathol. & Weed Sci., Colo. State Univ., Ft. Collins, Colo., 80523)

Commingled Grazing as a Risk Factor for Trichomonosis in Beef Herds; by John M. Gay, Eric D. Ebel, and William P. Kearley; 1996; J. Amer. Vet. Med Assoc. 209(3):643-646. (Dept. Vet. Clinical Sci., Washington State Univ., Pullman, Wash. 99164) Commingling herds greatly increased the incidence of trichomonosis; authors recommended that ranchers who cannot avoid commingled grazing minimize the risk of trichomonosis by minimizing the number of herds grazed in common, particularly during the breeding season.

Controlling Herbaceous Competition in Pasture Planted with Loblolly Pine Seedlings; by James D. Haywood; 1995; USDA, For. Serv. Res. Note SO-381; 4 p. (USDA, Southern For. Expt. Sta., T-10210 U.S. Postal Services Bldg., New Orleans, La. 70113) "Landowners who want to continue grazing cattle as pastures convert to pine will have to accept a reduction in pine survival and less seedling height growth."

Coyote Movements in Relation to the Spatial Distribution of Sheep; by John A. Shivik, Michael M. Jager, and Reginald H. Barrett; 1996; J. Wildl. Mgt. 60(2):422-430. (Dept. Environ. Sci., Policy, and Mgt., 145 Mulford Hall, Univ. Calif., Berkeley, Calif. 94720) Territoriality in coyotes did not limit coyote access to sheep.

Desired Future Conditions for Pinyon-Juniper Ecosystems; by Douglas W. Shaw, Earl F. Aldon, and Carole LoSapio (Tech. Coord); 1995; USDA, For. Serv. Gen. Tech. Rep. RM-258; 226 p. (USDA, Rocky Mtn. For. & Range Expt. Sta., Ft. Collins, Colo. 80521) Papers of a symposium directed to the management of pinyon-juniper ecosystems in the Southwest.

Detection of Yellow Starthistle (*Centaurea solstitalis*) and Common St. Johnswort (*Hypericum perforatum*) with Multispectral Digital Imagery; by Lawrence W. Lass, Hubert W. Carson, and Robert H. Callihan; 1996; Weed Tech. 10(3):466-474. (Dept. Plant, Soil, and Entomol. Sci., Univ. Idaho, Moscow, Ida. 83844)

Determinants of Cow-Calf Pair Prices; by Joseph L. Parcell, Ted C. Schroeder, and Frina D. Hiner; 1995; J. Agric. & Resource Econ.20(2):328-340. (Dept. Agric. Econ., Kan. State Univ., Manhattan, Kan. 66506) Cow breed, age, health, condition, horns, frame, and whether cow had been bred back along with calf weight, health, and frame were significant price determinants.

Differences in Home Range and Habitat Use Among Individuals in a Cattle Herd; by Larry D. Howery, Frederick D. Provenza, Roger E. Banner, and Cody B. Scott; 1996; Applied Anim. Beh. Sci. 49(3):305-320. (Dept. Rangeland Resources, Utah State Univ., Logan, Utah 84322) "Given the high degree of home range fidelity. . ., we submit that selective culling may effectively change cattle distribution and decrease the use of riparian areas."

Effects of Mountain Lion Predation on Bighorn Sheep in the Sierra Nevada and Granite Mountains of California; by John D. Wehausen; 1996; Wildl. Soc. Bul. 24(3):471-479. (Univ. Calif., White Mtn. Res. Sta., 3000 E. Line St., Bishop, Calif. 93514) Mountain lion predation apparently caused the abandonment of winter range in one area and halted a previously successful bighorn restoration program in another area.

Effects of Prescribed Burning and Cattle Grazing on Deer Diets in Louisiana; by Ronald E. Thill, Alton Martin, Jr., Hershel F. Morris, Jr., and Austin T.Harrel; 1995; USDA, For. Serv. Res. Paper SO-289; 13 p. (USDA, Southern For. Expt. Sta., T-10210 Federal Bldg., New Orleans, La. 70113) Burning temporarily increased P and protein levels in deer diets; cattle grazing at moderate levels did not adversely affect deer nutrition.

Efficiency of Production in Cattle of Two Growth Potentials on Northern Great Plains Rangelands During Spring-Summer Grazing; by E.E. Grings, R.E. Short, M.D. MacNeil, M.R. Haferkamp, and D.C. Adams; 1996; J. Anim. Sci. 74(10):2317-2326) (USDA-ARS, Ft. Keogh Livestock & Range Res. Lab., Miles City, Mon. 59301) Growth potential of sire for suckling calves and steers and cow size for cows affected intake of rangeland forage in summer but did not affect efficiency of production from rangelands.

Establishment of Native Semidesert Grasses into Existing Stands of *Eragrostis lehmanniana* in Southeastern Arizona; by Sharon H. Biedenbender and Bruce A. Roundy; 1996; Restoration Ecol. 4(2):155-162. (School of Renewable Nat. Resources, Univ. Ariz., Tucson, Ariz. 85721) Possible revegetation strategy: (1) spray emergent Lehmann lovegrass seedlings and surviving plants with herbicide during the summer rainy season after spring burning and (2) sow native grasses in early August of that year or June and August of subsequent years until consistent precipitation produces a native grass stand.

Golden Eagle Predation on Domestic Calves; by Robert L Phillips, John L. Cummings, Gloria Notah, and Curt Mullis; 1996; Wildl. Soc. Bul. 24(3):468-470. (USDA, Denver Wildl. Res. Center, P.O. Box 25266, Denver, Colo. 80225) This study documented that "golden eagles do kill calves."

Long-Term Harmful Effects of Crested Wheatgrass on Great Plains Grassland Ecosystems; by Peter Lesica and Thomas H. DeLuca; 1996; J. Soil & Water Cons. 51(5):408-409. (Div. Biol. Sci., Univ. of Mont., Missoula, Mont. 59812) "We presently lack the knowledge to determine the long-term effects of crested wheatgrass on the Great Plains." Suggested for reading; then draw your own conslusions!

Compiled by John F. Vallentine, Emeritus Professor of Range Science, Brigham Young University, Provo, Utah 84602.

Observations of Sheep Foraging in Familiar and Unfamiliar Environments: Familiarity with the Environment Influences Diet Selections; by Cody B. Scott, Roger E. Banner, and Frederick D. Provenza; 1996; Applied Anim. Beh. Sci. 49(2):165-171. (Dept. Agric., Angelo State Univ., San Angelo, Tex. 76909) The results "suggest social factors can override food references in a novel environment, but food preferences may be more influential in food selection in a familiar environment."

The Oklahoma Ratite Industry; by Michael R. Dicks, and Patrick R. Snell; 1996; Okla. Agric. Expt. Sta. Res. Rep. P-950; 24 p. (Agric. Mailing Room, Okla. Agric. Expt. Sta., Stillwater, Okla. 74078) A status report on the emerging industry of producing ostriches, emus, and rheas in Oklahoma..

Performance of Sheep Grazing California Annual Range; by R. E. Rosiere and D.T. Torell; 1996; Sheep & Goat Res. J. 12(2):49-57.(Rosiere: Agric. & Nat. Resources, Tarleton State Univ., Stephensville, Tex. 76402) "Stocking rate is a notable management factor for sheep production on annual range. . . Improvement of annual grassland by fertilizing and seeding to subterranean clover is an effective way to increase turnoff of lambs and wool."

Plant and Animal Constraints to Voluntary Feed Intake Associated with Fibre Characteristics and Particle Breakdown and Passage in Ruminants; by J.R. Wilson and P.M. Kennedy; 1996; Aust. J. Agric. Res. 47(2):199-225. (Division Trop. Crops & Pastures, CSIRO, 306 Carmody Rd., St. Lucia, Queensland, Austr. 4067) Evaluated plant structural influences on the fragmentation patterns of forage and how constraints to fiber breakdown and passage may be overcome in the future.

Post-Drought Vegetation Dynamics on Arid Rangelands in Southern New Mexico; by Carlton H. Herbel and Robert P. Givens; 1996; N. Mex. Agric. Expt. Sta. Bul. 776; 102 p. (Agric. Mailing Room, N. Mex. State Univ., P.O. Box 30003, Dept. 3AE, Las Cruces, N. Mex. 88003) Based on 21 years of plant cover and 32 years of yield data, great vegetation changes resulted from the 1951-56 drought; and these changes were persistent on some sites.

Potential for Controlling the Spread of *Centaurea maculosa* with Grass Competition; by John L. Lindquist; Bruce D. Maxwell, and T. Weaver; 1996; Great Basin Nat. 56(3):267-271. (Lindquist: Dept. Agron., Univ. Neb., Lincoln, Neb. 68583) Smooth brome, but not bluebunch wheatgrass or Idaho fescue, materially suppressed spotted knapweed under controlled environmental conditions.

Prescribed Sheep Grazing to Suppress Cheatgrass: A Review; by Jeffrey C. Mosley; 1996; Sheep & Goat Res. J. 12(2):74-81. (Dept. Anim. & Range Sci., Mont. State Univ., Bozeman, Mont. 59717) "Prescribed sheep grazing can be used to suppress cheatgrass density, growth, and seed production. Prescribed sheep grazing can also help extend fire-free intervals by disrupting fine-fuel continuity and reducing fine fuel loads. Finally, prescribed sheep grazing can improve the efficacy of artificial seedings."

Relationships between Graminoid Growth Form and Levels of Grazing by Caribou (*Rangifer tarandus*) in Alaska; by Eric S. Post and David R. Klein; 1996; Oecologia 107(3):364-372. (Dept. Biol. & Wildl., Univ. Alaska, Fairbanks, Alaska 99775) The study suggested "that caribou are sensitive to local variation in forage quality and quantity, preferentially use those sites with higher returns of nutrients and minerals, and have the potential to enhance graminoid growth on sites that are inherently more productive."

Response to Selection for Reduced Grass Tetany Potential in Crested Wheatgrass; by K.H. Asay, H.F. Mayland, and D.H. Clark; 1996; Crop Sci. 36(4):895-900. (USDA-ARS, Utah State Univ., Logan, Utah 84322) Suggested that selection for reduced grass tetany potential would likely be accompanied by improved forage quality in the Hycrest breeding population.

Rhizobacteria as Biocontrol Agents of Weeds; by Robert J. Kremer and Ann C. Kennedy; 1996; Weed Tech. 10(3):601-609. (USDA-ARS, 144 Mumford Hall, Columbia, Mo. 65211) A review directed to providing background on the use of rhizobacteria in biological weed control and to examining the potential for integrating bacterially based biological control into weed management programs.

The Santa Rita Experimental Range: History and Annotated Bibliography (1903-1988); by Alvin L. Medina; 1996; USDA, For. Serv. Gen. Tech. Rep. RM-GTR-276; 67 p. (USDA, Rocky Mtn. For. & Range Expt. Sta., Ft. Collins, Colo. 80523) Provides its history of research, an environmental description, and a discussion on vegetational changes along with a complete listing of scientific publications relating to SRER.

Seasonal Changes in Yield and Nutritional Quality of Cicer Milkvetch and Alfalfa in Northeastern Saskatchewan; by H.A. Loeppky, S. Bittman, M.R. Hiltz, and B. Frick; 1996; Can. J. Plant Sci. 76(3):441-446. (Agric. and Agri-Food Canada, Melfort, Sask. S0E 1A0)

Some Aspects of Constraint to Forage Consumption by Ruminants; by R.H. Weston; 1996; Aust. J. Agric. Res. 47(2):175-197. (45 Park St., Glenbrook, New South Wales, Austr. 2773)

Species Interactions on the Biome Transition Zone in New Mexico: Response of Blue Grama (*Bouteloua gracilis*) and Black Grama (*Bouteloua eriopoda*) to Fire and Herbivory; by Rusty J. Gosz and James R. Gosz; 1996; J. Arid Environ. 34(1):101-114. (Biol. Dept., Univ. N. Mex., Albuquerque, N. Mex. 87131) Concluded that black and blue grama have significantly different responses to environmental variation and disturbances such as fire and grazing.

The Use of Fire in Forest Restoration; by Colin C. Hardy and Stephen F. Arno (eds.); 1996; USDA, For. Serv. Gen. Tech. Rep. INT-GTR-341; 86 p. (USDA, Intermtn. Res. Sta., 324 25th St., Ogden, Utah 84401) Papers of a 1995 symposium directed to synthesis of knowledge and applications of fire as an agent of both disturbance and ecosystem restoration in forest ecosystems of the northwestern U.S.

Variation in Bitterbush (*Purshia tridentata* Pursh) Crude Protein in Southwestern Montana; by Carl L. Wambolt, W. Wyatt Fraas, and Michael R. Frisina; 1996; Great Basin Nat. 567(3):205-210. (Dept. Anim. & Range Sci., Mont. State Univ., Bozeman, Mont. 59717)

Weed Control for the Preservation of Biological Diversity; by John M. Randall; 1996; Weed Tech. 10(2):370-383. (The Nature Conservancy, Plant Biol. Sect., Univ. Calif., Davis, Calif. 95616) Considers (1) how weed invasions degrade biological communities and displace native species, (2) how wildland managers approach weed control, and (3) unusual weed problems wildland managers face.

Winter Foraging Response of Elk to Spotted Knapweed Removal; by Michael J. Thompson; 1996; Northwest Sci. 70(1):10-19. (Mont. Dept. Fish, Wildl., and Parks, 3201 Spurgin Road, Missoula, Mont. 59801) Knapweed removal attracted elk, possibly resulting from its removal per se, increase in the standing grass crop, and/or improved forage quality characteristics.

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