Rangelands

Society for Range Management

Volume 7, No. 6
December 1985

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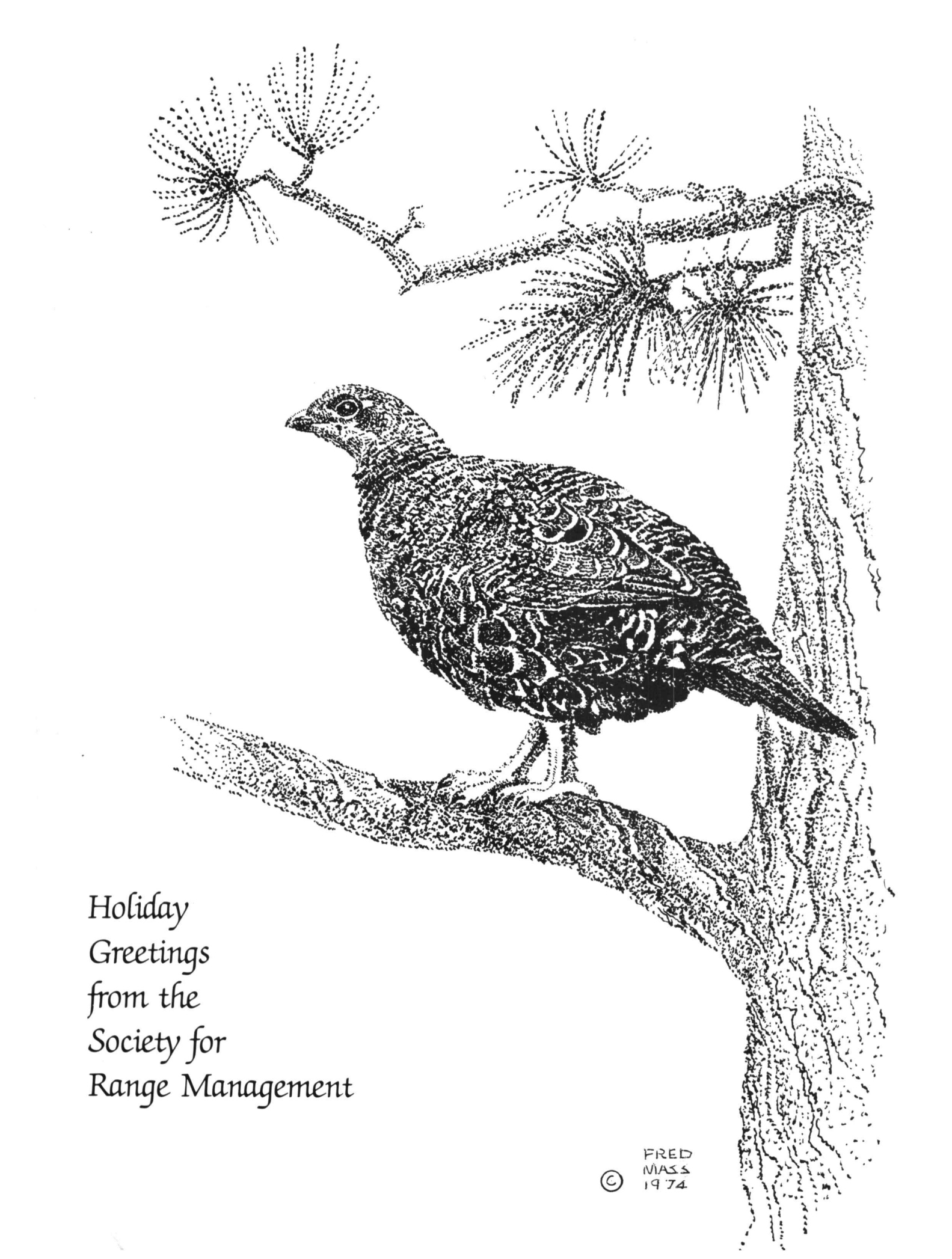
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—to develop an understanding of range ecosystems and of the principles applicable to the management of range resources;

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

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

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

—to promote professional development of its members.

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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 of a nontechnical nature and germane to the broad field of range management. Editorial comment by an individual is always welcome and subject to acceptance by the editor, will be published as a "Viewpoint."

RANGELANDS

Published bimonthly—February, April, June, August, October, December

INDIVIDUAL SUBSCRIPTION is by membership in the Society for Range Management.

LIBRARY or other INSTITUTIONAL SUBSCRIPTIONS, on a calendar year basis, are $30.00 in the United States, $40.00 in all other countries. Payments from outside the United States should be remitted in US dollars by international money order or draft on a New York bank.

BUSINESS CORRESPONDENCE, concerning subscriptions, advertising, back issues, and related matters, should be addressed to the Managing Editor, 2760 West Fifth Ave, Denver, Colo. 80204.

EDITORIAL CORRESPONDENCE, concerning manuscripts or other edited matters, should be addressed to the Technical Editor, 780 West Cool, Tucson, Arizona 85704

RANGELANDS (ISSN-0190-0528) is published six times yearly for $30.00 per year by the Society for Range Management, 2760 West Fifth Ave., Denver, Colo. 80204. SECOND CLASS POSTAGE paid at Denver, Colo.
POSTMASTER: Return entire journal with address change—RETURN POSTAGE GUARANTEED—to Society for Range Management, 2760 West Fifth Ave., Denver, Colo. 80204.

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COVER: Irene Graves meets a bashful kangaroo on a 'grass roots' tour of Australia after the International Rangeland Congress last May. See accompanying story on page 243. Photos by James Field of Sydney, Australia.

Australia at Ground Level

Irene Graves

After the first International Rangeland Congress (IRC) at Denver in '78', Australia '84' reverberated in the minds of many range people. When the first information and tour flyers came out, we all started planning. I sent one to a friend who had lived in Australia. He answered, 'Tours have a way of stopping at the most expensive hotels, the best restaurants, and seeing the country from 16,000 feet—go at ground level.'

Fifty hours of travel brought me from Nebraska to Adelaide, Australia, for the IRC, May 13-18, 84. The preliminary session and the following concurrent sessions gave a complete, concise view of Australian history and landscape from 16,000 feet. The startling part was how closely related the problems of range degradation, mineral exploitation, revegetation, and tourism are to ours. In this sense we are truly cousins.

After the meeting I slowly packed my belongings, taking the time to prepare myself for entry to the unknown. Somewhere north, in the semitropic grassland, a family was expecting me. How was I going to get there? It was University swap back (final exam week) and all public transport was full. The Australian Reservation Committee came to my rescue by arranging for me to ride with one of the SRM members to the Charleville Experimental Station where I could get a bus north.

One look at the sports car which would carry me 1,200 miles to Charleville, Queensland, (a nation apart like Texas) told me I would see Australia at ground level—3 inches above it. A second look at the driver (the first of many hosts I would have) told me I would hear the heartbeat of the country. He was a true Aussie, rawboned, bronzed, and bearded. He possessed a deep sense of national pride, an extensive knowledge of his native home and range, all of which he gladly shared with his 'American Cousin.'

We left the cultivated gardens and coastline of European-flavored Adelaide for the interior. The horizon rolled softly by with the harmonious texture only an ancient landscape can possess. Two volcanic cones lent the only sharp contrast to the horizon on the entire trip. The red brown soil is of low fertility and every crop has to be fertilized, even the fields of wheat whch lay in fallow strips of red and gold. Fat, sleek Hereford and Shorthorn cattle grazed in brown, dying grass. Soon the grass's lignin content would rise, reducing its nutritional value; then cattle would be supplemented with molasses and urea. May is the beginning of winter, the end of the rainy season. Presently, they are in a drought. Drought here is spoken of in terms of years (7-year cycles) not seasons as in the U.S.

We are now in the semiarid woodlands. I ran through ants in my bare feet to photograph a flowering Acacia tree. 'Does everything here bite or have thorns?' I yelled. 'If it didn't it wouldn't be here,' came the cool reply.

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A live bore (artesian well) in northwest New South Wales feeding a narrow ditch which will water livestock for miles.

How true that is for this land where the vegetation evolved without the grazing pressures of ungulates. The importation of and overgrazing by hoofed animals has degraded the rangeland for the profit of man, allowing the invasion of bush—'bush' not brush. The bush is so thick one cannot ride a horse through, it let alone rope a beast. We stopped at a station (ranch) and the grazer (manager) explained how they catch cattle. 'We ride or run along side the bullox (steer), grab the tail, throw him to the ground and sit on him. Can only do it twice, then they get wise. When possible we fence the water hole with trap gates where the cattle can walk in but not out.'

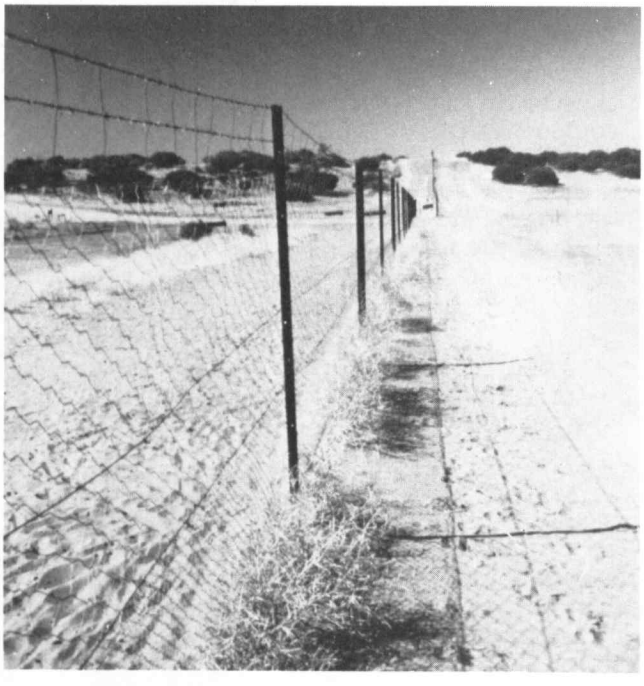
I tried not to stare at the jackaroo's (cowboy's) attire. I was having difficulty adjusting to men in singles (a skimpy tank top), shorts, bushboots, shapeless bush hat and a sweater—it's winter.

At our last stop I stared 60 feet up the windmill tower to a 24-foot fan which turned the opposite of those in the northern hemisphere. 'We have bigger ones', my host assured me. 'They have to be big because there is so little wind and the bore (well) is 500 feet deep. Much of the time diesel motors are used to pump the water into large storage tanks from which water trickles into watering troughs to limit evaporation.'

Other places are more fortunate. In Mitchell, grass (Aristida) country, the bores are artesian. Narrow ditches are dug out from the bores as far as the water will run, 3 to 9 miles,

and the cattle water from them as they pass through the paddock (pasture).

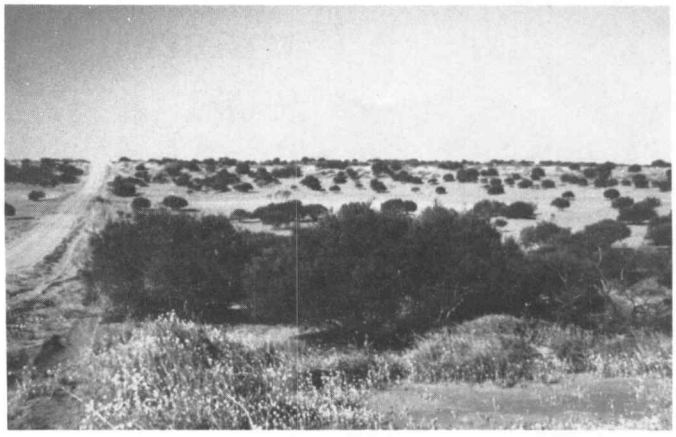
With a new family expecting me on the east coast, I said goodby. The bus headed northeast to Rochampton via Greyhound through speargrass country, an interesting propagation of mankind. It seems that speargrass (a super needle and thread grass) is fire climax. When the grazers burned the dry grass to obtain fresh green forage, they encouraged the growth of the unpalatable, sore-inducing grass. The spear-like seedhead infests the wool, penetrates the skin and creates sore; thus raising sheep is unprofitable. The only other nonweather factor reducing sheep production are the dingoes. These wild dogs immigrated to Australia with the Aborigines. The legendary 'Dingo Fence' between New South Wales and South Australia is still maintained (South Australia has the dingoes; New South Wales and Queensland don't want them.)



This legendary "Dingo Fence" separates Queensland from South Australia. Note the tracks are on the South Australia side.

Northeastern Australia has a subtropical climate. The heat and humidity take a toll on man and beast. The traditional Queensland house was build for ventilation. Four rooms were held 7 feet above the ground by 18 inch diameter Eucalyptus poles. Later when more money was available, a 12-foot veranda was added to encompass the four rooms with shade. The final touch was adding a wood or wrought iron lattice work to the enclosure. With the coming of running water, the bath and utility room was put on the ground level. It was on a midnight trip 'downstairs' that I met face to face with a fruit bat who slept over the toilet. (P.S. Don't close the lid).

Like houses, cattle breeding has adapted to the climate. *Bos inducus* cattle are better suited than the traditional *Bos taurus*. These tall, deviled-horned creatures have a loving disposition, resistance to ticks, internal parasites, buffalo flies, and to mustering (gathering or handling). They are very hard to handle when they feel confined and almost impossible to muster with dogs. My host, an innovative cattleman, was proud of his 'crush' (chute and headcatch) and 12-foot high yards (corrals).



Mulga bush and acacia extend mile after mile, making up a typical scene of South Australia grazing land.

He carefully explained: 'People here believe if you catch a cow by the head she will kill herself. Guess that's true is she has never been handled. Most people here don't know how many they have or if they do, don't have the yards to handle them.'

Since the majority of the cattle have Zebu blood, cows tend to calve every other year. The bullox run on the range until three years of age or when they can be caught and taken to slaughter, shipped to US and ground with American tallow —'international crossbreeding.' The major breeding debate is whether to have big high growth animals (Brahma) or smaller low producing animals (Red Syndy) which can live through the droughts.

Time for a spot of tea and a move on south to Bundaberg for a day with the extension agent, who of course is in dress shorts, a sweater and bush hat. The project for the day was to divide a 50-acre ryegrass center-pivot irrigation system into four pastures for rotational grazing. By theory the system was to roll over an electric fence. After tea, study and work, we started the system. The fence lay down as the system rolled over it, but instead of returning to the original upright position, jumped six feet into the air and lay flat on the ground. Another spot of tea and hinged posts succeeded in keeping the fence upright. Most of the fences are made of hardwood posts, too hard to drive a staple in. Holes are drilled into the post and a quarter of a mile of barbed wire threaded through them. To electrify, just attach a 'fencer unit'.

My next host family had four generations living on the original homestead settled in 1872. They raised sugar cane, Afrikander cattle, native and South African grass seed. Like US, although diversified, they are facing financial difficulty and realize how close their problems are to ours.

Many times the sugar caners told me, 'We are not going to borrow ourselves out of business like our American cousins.' I hope they can hold out.

Australia is a beautiful land, with deep feelings of national pride and concern for the world about them. I was honored to be referred to as one of their 'American Cousins.' Having been there, having sat at their tables and walked in their footsteps I saw Australia at 'ground level' and came home with a new appreciation for the abundance in the US.

Arroyo Formation, Juab County, Utah, 1983

James L. Baer

The 1983 water year in Utah was the wettest since precipitation records have been kept. Storms were not only more frequent than normal but many were also more intense. In some areas, mountain creeks that normally ended on alluvial fans now carried enough water to traverse the alluvial fan into nearby arroyos. These arroyos in normal years have short-lived streams or flash floods in their channels. During wet years, like 1983, they can have sustained flows for several days to a few weeks. These sustained flows can cause rapid headward and channel erosion. Such was the case for Chriss Creek in Juab County, Utah.

Chriss Creek drains a relatively small drainage basin of approximately 12 square miles. In normal years its water seldom reaches more than 1.3 miles beyond the mountain front and is lost into the alluvial fan. The channel beyond this point is poorly defined and in many places overgrown with sagebrush. At a point approximately 1.3 miles southwest of where the channnel character is lost another channel appears. This channel differs in two main ways from its discontinuous upstream channel. It has shallow cross-section with a depth to width ratio of 1:15 and a slope of 26 feet per mile. The upper channel has a depth to width ratio of 1:8 and a slope of 110 feet—over four times greater than the lower segment. Because the lower disconnected segment is so shallow with a low gradient it was inferred that it did not carry significant runoff. In all probability this lower channel carried periodic flows of groundwater during times of high watertable.

Prior to June, 1983, this lower channel segment extended for another 2.5 miles where it connected with a steep arroyo with a slope of 130 feet per mile and a depth to width ratio of 1:3. It was from this intersection that the rapid headward erosion began sometime in late May to early June, 1983.

On June 11, 1983, while conducting a field geology class, I happened upon a waterfall in Chriss Creek. The waterfall had developed over a 17- to 20-foot elevation difference and the newly developed arroyo differed markedly in size and shape with the upstream channel. The waterflow, which at that time was flowing approximately 55 cubic feet per second was eroding the streambed at a high rate. After a short observa-

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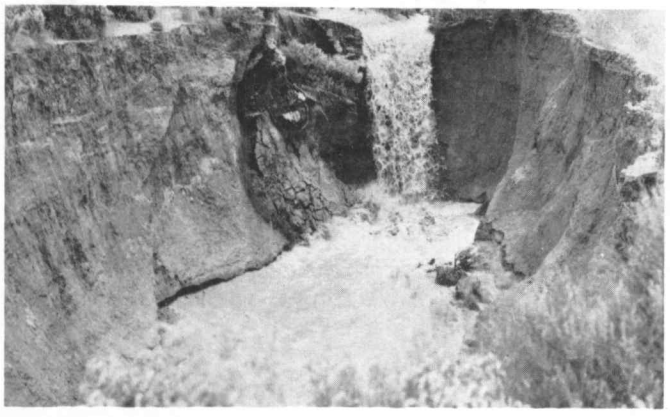
Editor's Note: Readers may wish to see the article "Gully Erosion" by E. Arthur Bettis III and Dean M. Thompson, which was published in *Rangelands* 7(2):70-72.

Waterfall as it was at the beginning of first observation, June 11. Fall is nearly 20 feet.

tion period, I decided to mark the erosion progress. In the next four days, June 11 through June 15, 1983, I was able to observe and measure the erosion rate three times for periods up to six hours long. During these periods, I recorded the erosion process by photographs and taking measurement every 30 minutes. Markers were placed at the location of the waterfall at the time of the last observation and again upon return and the distance difference measured by steel tape. I found the rate of erosion to be surprising.

On June 11, the erosion was observed for six hours. The rate of headward erosion was 4.7 feet per hour with a volume of 1450 cubic feet of material being eroded per hour. The process was unvarying. The waterfall developed a 10 to 14 foot wide plunge pool at its base where this whirling water would undercut both banks as well as upstream. The material being eroded was wet, unconsolidated silt with lenses of



Bank erosion occurred by undercutting and gravity fall of blocks. Here a block falls from the left bank during the first day of observation, June 11.

fine sand and occasional thin gravel layers. This material was easily eroded by the moving water. But it was the caving from the banks that was the major contributor to erosion volume. These blocks would fall at a rate as high as one every three minutes. Some blocks were 16 feet long, 13 feet high, and 3 feet deep. The area was covered with sagebrush at a density of one per 30 square feet. There were also small patches of grass that dotted the landscape. The plants offered little impedence to the advancing erosion primarily because the cutting took place 10 to 12 feet below the root systems of the sagebrush. The sagebrush served mostly to hold together the blocks before they fell into the stream. The sagebrush crested blocks would sometimes serve as temporary dams that would block the stream momentarily. Eventually, the water would spill over the debris and within a few minutes there would be no trace of the block as the detached sagebrush plants washed downstream. Occasionally, these sagebrush plants would hangup and create an eddy or small whirlpool in the stream. This would allow the stream to undercut the bank downstream from the waterfall and cause isolated blocks to fall, further widening the new channel. Crude measurements of the water volume indicated approximately 55 cubic feet per second going over the fall. At this time the water was falling between 18 to 20 feet.

During the 48 hours that followed, the channel cut headward nearly 440 feet at a rate of 9.1 feet per hour and a volume of approximately 3100 cubic feet per hour was carried away. By now, the erosion had progressed so far upstream that a

Headward erosion as seen from the spot of figure 1 on June 13. Waterfall has moved 440 feet upstream in 48 hours.

picture taken from the spot of the first day's observation did not show the waterfall. During this period, the erosion had cut into a nearby road, threatening safe passage.

The second period of observation, June 13, was 5.5 hours in length. The erosion scheme was the same, but the rate had increased over four times. Headward erosion was 21 feet per hour, and the eroded volume had increased to 7,100 cubic feet per hour. The fall had decreased slightly to 16 feet, but the average channel width had increased to 21 feet. The approximate rate of water flow had increased to approximately 70 cubic feet per second, and the water level was noticeably higher in the upstream channel.

No observation could be made for the next 52 hours because of other responsibilities. Upon return to the site on June 15, the waterfall was much less (Fig. 4). During the 52

Waterfall at time of last day of observation, June. 15. Fall is now just less than 6 feet. Erosion had taken away part of nearby road.

hours, the headward erosion had progressed another 597 feet at a rate of 11.5 feet per hour, nearly 10 feet per hour less than the previous observation, clearly showing the erosion rate was lessening. During the four hours of observation on June 15, the headward erosion was progressing at 0.7 feet per hour—virtually a snail's pace. The stream was now to

where it occupied less than its prescribed channel and was flowing approximately 36 cubic feet per second and the fall was 6 feet and decreasing.

During the 115.5 hours from the first observation to the last, the channel cut headward 1210 feet, or an average of 10.5 feet per hour. Approximately 395,000 cubic feet of material was removed during this time at an average rate of over 3410 cubic feet per hour. Examination downstream showed that an additional 3,300 feet of new channel had been eroded during this erosional phase in late May-early June, 1983, and an estimated 1,580,000 cubic feet of material (total) was washed downstream. The channel was approaching the point of no fall. The new channel has a slope 60 feet per mile.

Chriss Creek is presently dry, but forecasts indicate that runoff in the spring and summer of 1984 for this part of Utah is expected to be equal or greater than 1983. The case of Chriss Creek was only one of several rapid erosion creeks in central Utah during 1983. This erosion could be minimized by upstream diversion of placing hard-to-erode material at the head of the arroyo.

Percent Composition versus Absolute Units of Measurement—A Viewpoint

E. William Anderson

The 1983 report by S.R.M. Range Inventory Standardization Committee (RISC) recommends some worthwhile improvements in concepts and definitions applicable to contemporary rangeland procedures. Of these, the terms range condition, ecological status, and resource value ratings are significant and require attention to several factors, one of which is the procedure used to document the make-up of a plant community.

Historically, the degree to which each species occurs in the plant community has been expressed in terms of percent composition. For example, guides to determining range condition (RISC recommends the use of the term ecological status) have shown the percent composition of each species in the potential natural plant community (PNC). Range condition class has been determined by comparing the percent composition of species, or groups of species, in the present plant community with that of the PNC for the site being rated. Trend in range condition has been judged on the basis of changes in percent composition of species as compared to previous readings. The identification of decreaser and increaser species and their dynamics in the stand has been based on comparison of percent composition of these species in the present plant community with that of the PNC.

While composition is a useful term when used properly, e.g., 40% of the total canopy cover (or other absolute measurement) consists of grasses (or a species), it is not a quantified or absolute measurement. It merely expresses the relative proportion of one species, or a group of species, to the total of all the species in the plant community. The total composition of all species always equals 100%, irrespective of the make-up or density of the stand. As the RISC report states, 'specifying the amount of a species in a plant community implies that an absolute measure is required, rather than a species list or the composition alone'. Quantified or absolute measurements of a species include cover, density, frequency and weight. Non-quantified measurements of a species include cover classes, dominance ratings and percent composition.

Using percent composition as a measurement of a species involves a number of erroneous interpretations. This is illustrated by Figure 1 which depicts three hypothetical plant communities: A, B, and C. For illustration purposes, each plant community consists of the same two major species; one large, the other small.

Plant community A has twice as much total quantity as plant community B for a given area, yet the proportion of the large species to the small species is identical in both plant communities: 70% composition large species and 30% composition small species. This points out that percent composition does not necessarily reflect the density of a species in the plant community.

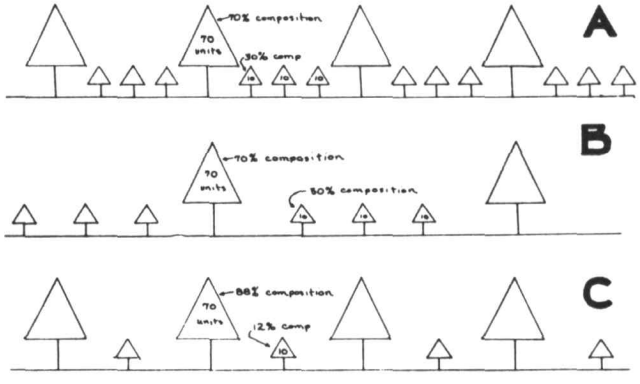


Fig. 1: *Three hypothetical plant communities consisting of the same two major species; one large, the other small.*

Numerous reports cite changes which have occurred in plant communities in terms of percent composition. This is a useful way of describing, in general terms, what has taken place. Nevertheless, the quantitative measurements of such changes should be made available for scrutiny because changes in composition do not necessarily coincide with quantitative or physical changes that take place. A comparison between plant communities A and C in Figure 1 illustrate this point.

Plant community C represents a deteriorated stage of plant community A in that two thirds of the small species has been destroyed, hypothetically, by past grazing. Quantita-

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tively, the small species has been reduced to one third of what it was in plant community A, whereas no physical change in the large species has taken place. The proportion of the large species in plant community C is larger as a result of reduction in the small species. Total units were reduced from 100 (in A) to 80 (in C) by the loss of the small species. The result is that 70 is a larger proportion of 80 units than it is of 100 units.

To describe these changes from plant community A to plant community C, in terms of percent composition, it would be said that the large species has increased from 70% composition to 88% composition and the small species has decreased from 30% composition to 12% composition as a result of past grazing. This is true. Actually, however, there has been no physical change in the large species. It was the small species that changed and, even though it was reduced to one third of its original amount, which was 30% composition, it now constitutes 12%, instead of 10%, of the composition of plant community C.

This illustrates how the arithmetic of computing proportion of a total, which is what percent composition is, can create an incorrect interpretation of the data and precludes the use of percent composition as a measurement of ecological dynamics within a plant community. Quantitative or absolute data are needed to measure the make-up of plant communities.

The hypothetical changes cited from plant community A to plant community C occur in actuality as illustrated by Figure 2. These three photos are of the Arid Rolling Hills ecological site in northcentral Oregon. This site occurs at an elevation of about 700 to 2000 feet, precipitation averages 9 to 11 inches which occurs between October and May, and the growing season begins about the first of March and ends about the middle of June. The top photo shows the site in Excellent condition (RISC recommends the use of the term PNC) in which bluebunch wheatgrass and a dense understory of Sandberg bluegrass dominate the cover. The middle photo , taken on a long-time sheep ranch, illustrates how heavy spring-time grazing by sheep for many consecutive years has depleted the preferred forage—Sandberg bluegrass—but not affected the stand of bluebunch wheatgrass. The lower photo, taken on a long-time cattle ranch, illustrates how heavy spring-time grazing by cattle for many consecutive years had depleted the preferred forage—bluebunch wheatgrass—but not affected the dense understory of Sandberg bluegrass. The large plants in the lower photo are primarily gray rabbitbrush. This phenomenon is known as class overgrazing which is depicted in different ways according to ecological site, season of use and class of grazing animal.

The RISC report, fortunately, has focused widespread attention on the need to clarify concepts and terminology to be consistent with contemporary resource management. Accordingly, the historical use of percent composition to represent the amount of each species in a plant community deserves careful scrutiny. Continuing the misuse of a perfectly good term—percent composition—by using it as a measurement should not be continued merely because it has become common through historical use. Now is the time to correct this procedure in those localities where the need is evident.

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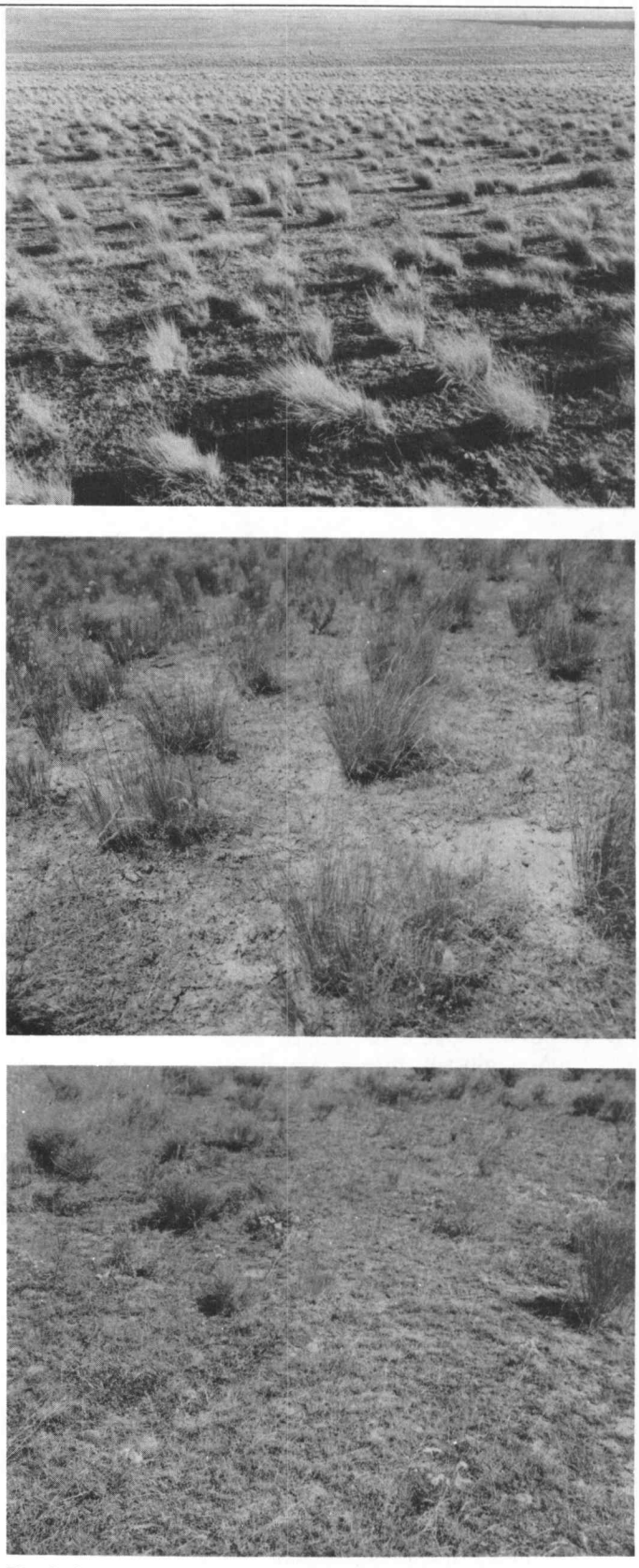

Fig. 2: *An arid ecological site in northcentral Oregon showing (top photo) the approximate potential plant community of bluebunch wheatgrass and understory of Sandberg bluegrass; (middle-photo) the stand of bluebunch wheatgrass virtually the same as for PNC but the stand of Sandberg bluegrass much diminished; and (bottom photo) the reverse, in which Sandberg bluegrass stand is virtually the same as for PNC but the bluebunch wheatgrass stand is much diminished.*

Wildlife Science: Gaining Reliable Knowledge

H. Charles Romesburg

Editor's Note: This is an abridged version of H.C. Romesburg's prize-winning article "Wildlife Science: Gaining Reliable Knowledge" that appeared in the *Journal of Wildlife Management* 45(2): 293-313. 1981. The article was condensed by approximately 50% from the original paper by Dr. Romesburg with the permission of the Wildlife Society. While this paper is primarily written about wildlife science, the message contained in the article applies to many environmental sciences, including range.

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Like the Kaibab deer herd, progress in wildlife science may be headed for a crash under the weight of unreliable knowledge. Knowledge, the set of ideas that agree or are consistent with the facts of nature, is discovered through the application of scientific methods. There is no single, all-purpose scientific method; instead, there are several, each suited to a different purpose. When the set of scientific methods is incomplete, or when one method is used for a purpose better fit by another, or when a given method is applied without paying strict attention to the control of extraneous influences, then these errors of misuse cause knowledge to become unreliable.

Unreliable knowledge is the set of false ideas that are mistaken for knowledge. If we let unreliable knowlege in, then others, accepting these false laws, will build new knowledge on a false foundation. At some point an overload will occur, then a crash, then a retracing to the set of knowledge that existed in the past before the drift toward unreliability started. Every field that loses quality control over its primary product must undergo this kind of retracing if it is to survive. Of course, some unreliable knowledge inevitably creeps in—a researcher makes a systematic error here, or fails to do enough replications there. All science is prone to human error, and minor retracing continually occurs. But I think part of wildlife science's knowledge bank has become grossly unreliable owing to the misuse of scientific methods, and major retracing is inevitable.

I read published dissatisfaction on seemingly isolated topics as being symptomatic of past misuses of scientific method, e.g., Chitty's (1967) and Eberhardt's (1970) complaints over the continued confusion between correlation and cause-and-effect, Bergerud's (1974) case against the reliance on induction to generalize laws to the exclusion of testing research hypotheses, Hayne's (1978) dissatisfaction with poor experimental designs, Krebs' (1979) frustration with virtually every aspect of small mammal ecology, Caughley's (1980) claims that most large mammal studies "coalesce into an amorphous mass of nothing much" and that white-tailed deer (*Odocoileus virginianus*) and *Drosophila* are the most studied and least understood of animals, and Eberhardt's (1975) skepticism about the predictive value of computer simulation models of ecological systems.

What are these misuses of scientific method? Of the 3 main scientific methods used in virtually all fields, i.e., (1) induction, (2) retroduction, and (3) hypothetico-deductive (H-D), wildlife science uses the 1st and 2nd methods but almost never the 3rd. Induction and retroduction, by themselves, are inadequate for discovering some kinds of knowledge. Instead of realizing this limitation, wildlife science routinely stretches induction and retroduction beyond their limitation as knowledge-finding tools and unreliable knowledge results.

Let me show how this occurs by explaining each method. The method of induction (Hanson 1965, Harvey 1969) is useful for finding laws of association between classes of facts. For example, if we observed over many trials that the amount of edge vegetation in fields was positively correlated with an index of game abundance, we would be using induction if we declared a law of association. The more trials observed, the more reliability we'd attribute to the law. The method of retroduction (Hanson 1965) is useful for finding research hypotheses about processes that are explanations or reasons for facts. For example, if we observed birds caching seeds more on south slopes than on north slopes (facts), and our best guess for the reason of this behavior (our research hypothesis) was that south slopes tended to be freer of snow than north slopes, we would be using the method of retroduction to generalize a research hypothesis about a process providing a reason for the observed facts of bird behavior. The method of retroduction is the method of circumstantial evidence used in courts of law. Retroduction is not always reliable, because alternative research hypotheses can often be generated from the same set of facts.

The H-D method (Popper 1962, Harvey 1969) complements the method of retroduction. Starting with the research hypothesis, usually obtained by retroduction, predictions are made about other classes of facts that should be true if the research hypothesis is actually true. To the extent that experiment confirms or rejects the predicted facts, the hypothesis is confirmed or rejected. Thus, the H-D method is a way of gauging the reliability of research hypotheses acquired by other means.

Wildlife science's workhorse is the method of induction. I believe it is used in a way that gives reliable knowledge. However, induction has a limitation: it can only give knowledge about possible associations between classes of facts. Although this is undoubtedly useful for decision making (e.g., the correlation between a fish's weight and its length is a money-saving association), it cannot give knowledge about the processes that drive nature. Consequently, you can use induction repeatedly without diminishing the question "Why?". When we ask "Why?" we are asking for an explanation, an abstract process that provides a reason for

the facts. If the human mind didn't beg for reliable explanations, the method of induction would suffice. That not being the case, the method of retroduction was invented. It is reliable enough to be used in courts of law but, by itself, it is not reliable enough for science. Science has the most stringent standards of all endeavors. If courts of law followed science's strict standards, suspects identified through retroduction would be set free, and their guilt decided in accordance with whether or not the life of crime predicated for them turned up in future facts. That is, the courts would test a retroductively derived hypothesis using the H-D method.

Because wildlife science hardly uses the H-D method, it is stuck with no way of testing the many research hypotheses generated by retroduction. Herein lies the main cause of unreliable knowledge. The research hypotheses either are forgotten, or they gain credence and the status of laws through rhetoric, taste, authority, and verbal repetition. Leopold's (1933) book *Game Management* lists 9 entries under "hypothesis"; I think none has ever been tested by the H-D method. Errington's (1945) threshold-of-security hypothesis, a hypothetical process of winter mortality, is often stated as a law, but it is a retroductively derived hypothesis, and it strictly speaking, remains untested.

The normal pattern of university graduate and faculty research—spending hundreds of hours watching, describing, and quantitatively recording the habits of animals, relating their habits to environmental facts, analyzing the data using a computer and contemporary statistical analysis, and then drawing conclusions from patterns in the summarized data— produces reliable knowledge to the extent that induction and retroduction, properly used, will allow. But for me the reliable parts, inductively derived correlations about events, are often not interesting or even useful, whereas the interesting parts, the retroductively derived reasons for what is going on, are often unreliable speculation. The H-D method is a way of raising the reliability of this speculation and, hence, the overall reliability of our knowledge. It is not a cure-all. It cannot suggest good questions for research. It cannot be used to test every conceivable research hypothesis, for reasons of exprimental costs and lack of creativity on the part of researchers. It can be misused like any other method of science, but it can also lead to the discovery of reliable knowledge about processes.

The remainder of this paper will (1) explain the H-D method in detail; (2) show why the kind of general-purpose data routinely collected by game agencies is inadequate for testing research hypotheses; (3) show how an understanding of the H-D method resolves persistent confusions in wildlife science thought; and (4) contrast science with planning.

Essentials of the H-D Method

Terms critical to understanding the H-D method must first be defined: viz., theory, research hypothesis, and test consequence. The term *theory* means a broad, general conjecture about a process. For example, the Lotka-Volterra competition equations (Emlen 1973) represent a theory about the process of competition between 2 animal species. A *research hypothesis* is a theory that is intended for experimental test; it has the logical content of the theory, but is more specific because, for example, the location and animal species must be specified. A research hypothesis must be tested indirectly because it embodies a process, and experiments can only give facts entailed by a process. The process itself is abstract, removed from the senses, and nonfactual. The indirect test is conducted by logically deducing 1 or more *test consequence(s)*, i.e., predicted facts, such that if the research hypothesis is true, then the test consequence(s) must be true, and the test consequence(s) must correspond to a feasible experiment, e.g., one that is not technologically impossible or so costly as to be impracticable.

For example, consider the question of how salmon find their way upstream to their home spawning grounds. The answer "Salmon navigate by vision alone" is a research hypothesis (*H*), i.e., a conjecture about a process of navigation. A test consequence (*C*) is "A group of salmon that has been captured and blinded as they begin their upstream migration will not reach their home tributary spawning grounds in numbers greater than expected by chance, whereas a nonblinded control group of equal size that was spawned in the same tributary as the blinded fish will return to their tributary in numbers greater than expected by chance." The fact of the test consequence *C* must then be obtained by experiment, e.g., tagging smolts before their migration to the lake or ocean, recapture of those returning to spawn, and subsequent recapture of blinded and control-group salmon after they have swum upstream.

The determination of whether or not *C* is true or false by reference to experiment requires a *statistical hypothesis* to be tested, e.g., the null hypothesis H_0,: "Control and blinded salmon return in equal numbers." Thus, a research hypothesis is a conjecture about a process, whereas a statistical hypothesis is a conjecture about classes of facts entailed by the process. In general, alternative test consequences can be used to test a research hypothesis. For example, an alternative test consequence is "When ink is metered into the stream so that vision is totally impaired, the fish will not reach their spawning tributary in numbers greater than expected by chance."

Because a test consequence prescribes the experiment necessary to ascertain the truth or falsity of *C*, the H-D method demands creative thinking. Creative researchers will search for test conclusions that require experiments beset by minimal statistical noise, that are cheap to perform, and that allow tight control of extraneous influences (note that the 2nd test conclusion is not as good as the 1st, because it doesn't allow for a control group). Successful researchers are defined, in part, as those who make a career of choosing the right trade-offs between these usually conflicting considerations.

The experiment's outcome determines whether *C* is judged to be true or false. If *C* is true, then *H* can be either true or false, and we say that the evidence supports or confirms the truth of *H*, i.e., is consistent with *H* being true. For example, consider the hypothetical limiting case in which somehow the truth or falsity of *C* is known with certainty, i.e., no test of a statistical hypothesis is required. If *C* turns out to be true, i.e., fewer blinded than nonblinded return, then support for the conjecture *H* that "salmon navigate by vision

alone" is evidenced. Further, the more replications carried out with the same outcome, the stronger the support is, although the the truth of *H* can never be declared with certainty because it is possible, for example, that *H* might really be false but other factors, such as a propensity for blinded fish to die, could be making *C* true.

On the other hand, if *C* turns out to be false, then *H* is false, provided that none of the background conditions required to make *H* entail *C* are violated. For example, if *C* is false, i.e., blinded and nonblinded return home in equal numbers, then *H* is false provided that *H* really does entail *C*. If blinded fish exhibit a schooling behavior not dependent on vision and get home by tagging along behind sighted fish, then of course, *C* being false is not justification for the statement that *H* is false. An experimenter can never gain complete assurance that the statement "The truth of *H* entails the truth of *C*" is true. Thus, even *C* being false does not provide complete assurance that *H* is false. However, the more certain a researcher is that the background conditions are indeed true, the more certain he will be in pronouncing *H* to be confirmed when *C* is true, and *H* to be falsified when *C* is false.

The details of the H-D method that fill out this brief outline are covered by Popper (1962), Platt (1964), Baker and Allen (1968), Harvey (1969), Medawar (1969), and Rachelson (1977). Bergerud (1974) used the H-D method to design a hypothesis test about the processes that cause caribou (*Rangifer tarandus*) populations to decline.

USES OF GENERAL-PURPOSE DATA

I call the kind of data routinely collected by game agencies "general purpose data." I ask whether they have scientific uses. Can they be used with the method of induction, method of retroduction, and the H-D method to discover reliable knowledge? The answer is yes and no.

I can see the method of induction being used with these data to obtain reliable laws, e.g., the correlation of the number of dead fawns with snow depth and duration. On the whole, however, I see unreliable knowledge resulting when the method of retroduction or the H-D method is used with these data. To understand a process of interest the process must be isolated from other processes by exacting experimental control. However, general-purpose data are not collected under controlled conditions.

Used with general-purpose data, the method of retroduction contains the flaw of incorporating the effects of unknown factors into the derived research hypotheses. Similarly, the H-D method can only produce reliable knowledge when background conditions are held to a tight tolerance. If the tolerance is lost, then the researcher will probably conclude something that in essence is more a result of error than substance. It goes beyond reasonable doubt for researchers to assume that nature delivers tightly controlled experiments without prompting. The creation of knowledge of processes from general-purpose data is therefore suspect.

History illustrates the pitfalls of loosely applying the H-D method to general-purpose data. Lauckhart (1955) and Lauckhart and McKean (1956) interpreted data from pheasant population studies as supporting the threshold-of-security hypothesis, but the pheasant population data of Wagner et al. (1965) and Wagner and Stoker (1968) were interpreted as not supporting the hypothesis. Who can say that unknown factors are not giving conclusive results when there either are none or truly conclusive results are being obscured by errors?

OTHER PROBLEMS WITH WILDLIFE SCIENCE

Wildlife science has other problems befitting analysis. I will cover problems with concept definition, confusion between cause-and-effect and correlation, use of slipshod experimental controls, and the fixation on statistical methods.

Problems with Concept Definition

Key wildlife science concepts suffer from multiple and unclear definitions. For example, nearly 3 decades ago Edwards and Fowle (1955) concluded that more than a dozen different meanings of the concept "carrying capacity" were in use, and that most were vague and almost meaningless. They tried to right the situation by proposing a new, clearer definition. They failed; the confusion is undiminished today.

There is a mistaken belief that a profession sets the meanings of its concepts by decree. To be accepted, a concept must have appeal, and it can gain the necessary appeal in 2 ways. First, the concept can function in an inductively established law. For example, if it could be shown that a given definition of carrying capacity entered into inductively established laws with other concepts such as time, then the concept would gain appeal. Second, the concept can function in a law established by the H-D method. For example, if a given definition of carrying capacity functioned in a theory with other concepts, and if the theory became law through experimental test, then the concept would gain appeal.

The history of science shows that most of the concepts with staying power are those that function in laws established by the H-D method. For example, the concept of mass is substantiated by Newton's and Einstein's laws. When wildlife science decides to propose and test theories built around different concepts of carrying capacity, then the correct concept will emerge in those theories that pass experimental muster. When a science has no way of telling when a theory and the concepts it integrates are in error, then it has no way of telling which concepts are right.

Cause-and-effect vs. Correlation

One of the aims of wildlife science is to find cause-and-effect relationships among variables, for when cause-and-effect is found, then control may be possible. To say that a change in variable A causes a change (effect) in variable B, i.e., that B depends on A, requires a particular experiment: we merely introduce a change in A and see whether a change in B follows. If this occurs, and if in a control unit or group the variable A was not changed and a corresponding change in B did not follow, then we have evidence that A causes B. If A unerringly causes B over many trials, then at some point the

method of induction leads to the pronouncement of a causal law.

This is the basic method used in clinical experiments in medical research (Feinstein 1977:17-70). The variables A and B can be either binary or continuous. An example using binary variables is: A is a treatment variable taking on the states of (1) treatment applied of (2) treatment not applied, and B is an effect variable taking on states of (1) an effect is observed and (2) no effect is observed. An example using continuous variables is: A is the energy (kcal/kg) in a diet fed to deer and B is the change in a body weight (kg); Verme and Ozoga (1980) performed this type of study for white-tailed deer fawns under well-controlled conditions.

Chitty (1967) has proposed a similar but weaker method for binary variables. It differs from the method above in that nature selects the 2 settings of the supposed cause. Nature often won't yield control in field studies, so this design has appeal. The weakness, however, is that the data can follow the pattern required for saying A causes B, yet if we could seize control of A ourselves we might find that varying A produced no effect on B, i.e., the supposed cause-and-effect relation could stem from a 3rd variable that caused A and B to covary.

The scientific literature contains many examples of correlations between 2 continuous variables A and B being interpreted as one variable causing the other. For example in wildlife science, Eberhardt (1970) took 3 articles to task for inferring the existence of density-dependent regulation of populations from correlations. Bergerud (1974) questioned the logic in 2 articles in which observed correlations between fecal-pellet counts and the abundance of lichens were used to suggest that caribou require lichens for survival. And, Wagner (1978:198) used a correlation between the annual instantaneous rate of change in coyote (*Canis latrans*) populations and a black-tailed jack rabbit (*Lepus californicus*) population index to conclude that jack rabbit numbers are a determinant of long-term coyote density, and concluded that "if the mean jack rabbit densities over a period of years were increased, annual rates of change in coyote numbers would be largely positive for the years immmediately following."

Let us examine this last example in some detail. Clearly, there is a better but more expensive way to test the hypothesis that jack rabbit numbers are a determinant of long-term coyote density. The hypothesis would be supported if we took control of rabbit numbers and showed that changes made in levels of stocking were accompanied (with suitable time lags) by changes in coyote density. Failure to observe the effect, i.e., if coyote density followed no pattern as we changed stocking, would (if it could not be explained away as statistical noise) disprove the hypothesis.

On the one hand, we have an expensive experiment that can give reliable knowledge and a less expensive experiment involving correlations. Which is the better approach? Reliable and expensive? Or less reliable and less expensive? Depending on the costs, the case can be made either way. It is obvious, for example, that medicine could, at high moral and social costs, design experiments capable of producing reliable knowledge on the possible cause-and-effect link between cigarette smoking and lung cancer. But the costs are too high, and therefore medicine is restricted to making less reliable statements based on correlations observed in an uncontrolled setting. It is important to note that they chose this over the alternative of not studying the problem.

Correlation between 2 variable A and B, although a necessary condition for causality, is not sufficient. There is, however, justification for looking for correlations. Correlations offer weak support for making statements using the terms "causes," "determines," or "depends upon," but the history of science is replete with strong pronouncements of cause-and-effect based solely on correlations, only to find that later studies showed no such link.

Consequently, cause-and-effect should not be strongly stated when correlation is the sole evidence. If, however, a correlation is accompanied by other evidence (e.g., other corroborative evidence, the elimination by control of other variables conceivably responsible for the correlation, the demonstration of the correlation under a wide variety of circumstances that allow other possible influences to vary), and logically the dependence makes sense (e.g., the jack rabbit is a staple in the coyote's diet), then support for cause-and-effect is strengthened. Depending on the supporting evidence, the phraseology should range, I think, from "weakly supports," when a correlation is the sole evidence, to something short of "strongly supports," when correlation is accompanied by a variety of independent corroborating evidence. "Strongly supports" should be reserved for direct demonstration of cause-and-effect.

Thoughtful Use of Experimental Controls

I have selected 2 cause-and-effect studies, one from medicine and the other from wildlife science, to demonstrate the effect of experimental control on gaining reliable knowledge. The medical study (Nelson et al. 1980) tests the research hypothesis that the Leboyer Method of delivering babies in a dark, quiet environment results in the babies growing up to be healthier and calmer. One group of mothers received the Leboyer Method of delivery, the other group a conventional delivery, and the well-being of the babies was assessed for some months afterward and compared. The Leboyer Method had no effect. Thoughtful use of experimental controls greatly increased the reliability of the resultant knowledge. All conceivable alternative determinants of the babies' future health and calmness were controlled: the same obstetrical practice and the same delivery room were used, the group of mothers was selected on the basis of sharing certain common characteristics possibly related to the supposed effect, and the mothers were randomly assigned to the 2 methods of delivery.

Now consider a comparable study on the effects of vegetation interspersion on pheasant abundance (Taylor et al. 1978). Interspersion on a land unit in crops changed over a 20-year period, and an index of interspersion correlated with a pheasant density index. The authors conclude that the relationship is "useful for predicting changes in pheasant density, given anticipated land-use changes." How much more reliable the statement would be if controls had been used, if matched land units similar in all conceivable determinants of pheasant density except edge had been used and

the experiment conducted over the same time period. Looked at another way, suppose the medical study had been done the way the wildlife study was, not paying strict attention to controls. It would go something like this: a group of mothers who happened to be handy would be given the Leboyer Method of delivery in different hospitals by different obstetricians; 20 years later other mothers would get conventional deliveries; the well-being of the babies produced by the 2 groups would be compared. If medicine wanted unreliable knowledge, this is how they could go about getting it.

Research needs to be done correctly the first time. For example, Boag and Lewin (1980) tested the efficacy of different objects in deterring waterfowl from using natural and polluted ponds. They conclude their article with an apology for not doing the study under strictly controlled conditions: "... the causal elements in the corrlation reported herein need to be tested by using experimental and control ponds in given time period and thus avoid the necessity of using the same pond successively as a control and then as an experimental pond." I prefer conclusive over nonconclusive studies. Studies saying "here's how we did it; now here's how you can do it right" leave me cold not because they are wrong but because progress is unnecessarily retarded.

The reliability of knowledge is only partially determined by the dedication of researchers. No amount of dedication can make up for lack of experimental controls. In some studies the expense required to achieve control is not worth the expected gain in reliability. But for myself, I would rather see a handful of studies containing highly reliable knowledge than scores of studies containing something less. I would trade all of the studies that have been done on edge and interspersion for one carefully controlled study.

Fixation on Statistical Methods

In the wildlife literature of the past decade one finds an increasing use of nonparametric and multivariate statistical methods and computer analyses. There can be no doubt that progress in planning and scientific understanding is aided. I have noticed, however, scientific studies that lacked thought and were dressed in quantitative trappings as compensation. It's easy to collect data, perform statistical tests of hypotheses of the "no pattern" variety, and restructure the data using a computer. But all studies must be able to stand up to the question "So what?". I think that too many can't.

The mind must direct research. The processes of upstream salmon navigation are well understood (Hasler 1966, Hasler et al. 1978) because this research was directed at answering specific questions. Every phase of this research—from the initial generation of alternative research hypotheses explaining possible navigational mechanisms to the subsequent tests of these hypotheses using the H-D method—has been guided by a repeating cycle of questions, tentative answers, and tests of research hypotheses. Statistical analyses and the computer played an essential, but secondary, role. The questions and research hypotheses always directed the subsequent quantitative analyses.

Turning the process around and putting the quantitative analysis first is a quantitative natural history study. This can play a vital role at the start of research into an area where little is known by suggesting questions or research hypotheses. This is not bad, but it is time to shift the emphasis to hypothesis testing rather than hypothesis creation; otherwise we'll become swamped with untested ideas. In short, quantitative data analyses that are window-dressing should not be tolerated, those that are natural history studies should be tolerated, and those that play a role in the testing of research hypotheses should be encouraged.

Science and Planning

Science and planning are the respective domains of wildlife science and wildlife management. These domains are philosophically distinct, yet because each shares many of the same activities and tools, viz., data collection, statistical methods, and computer simulation models, their differences often pass unnoticed. Yet criticism of the use of commmon tools is baseless unless these differences in how the tools are used are understood.

Science and planning are different kinds of decision-making. Science (the H-D method) exposes alternative theories to facts, selects the best theory, i.e., that which agrees closest with fact, and gives it the name "law." Planning exposes alternative images of a future possible world to the decision-maker's values, or preferences, and selects the best image, i.e., that with the highest value. The essential difference is that science uses fact as its standard for selection, whereas planning uses values.

The images in planning are composed of scientific knowledge, common sense rule-of-thumb knowledge, and theories that are as yet untested, i.e., hunches (Boulding 1956, 1980). Because the image of the status quo will change over time due to influences outside the planner's control, planning is often necessary to counter these uncontrollable influences. Man's imperative to plan is so strong that planning routinely goes on even when scientific knowledge is totally absent from the planner's images. When the imperative to plan takes hold, a planner will enter into the planning process with the best knowledge, tools, and thought at hand, regardless of how imperfect they are. For example, this nation's macroeconomic policy is largely geared to project images made by computer simulation models of the economy. Yet the elaborate mathematical equations comprising these models represent untested economic theory, and by even the loosest standards of science their predictions fail to agree with economic fact as revealed in the future. Or consider that alternative plans for deployment of land-based intercontinental ballistic missiles are characterized by little scientific knowledge (Feld and Tsipis 1979): the probabilities of destroying the other side's missiles are crude hunches, and the probabilities of how the other side will target its missiles are based on a common-sense image of rational behavior. Finally, a recent wildlife management text (Giles 1978) draws only minimally upon the thousands of scientific articles that have appeared over the years in this journal. Yet no one would argue that planning for economy, defense, or wildlife should not be undertaken until every part of the images used in planning is substantiated by scientific study.

Science uses relatively absolute and tight tolerances for deciding which theories and hypotheses should be called law. Planning does not use tolerances for deciding what is the best plan, but instead defines "best" as relative to the set of alternative images. Thus, science many never arrive at laws in certain areas for no theory may be within the tolerance for truth, but planning will always arrive at a best plan. Although science and planning share common tools, science and planning have different norms for certifying ideas, and hence criticism of these tools must take into account the domain of their use.

Conclusion

Because the wildlife literature is taken as a role model for what wildlife science ought to be, and because it does not place the H-D method in a prominent role, widespread use of the H-D method is not guaranteed. I think the natural place to break this circle is in university education. As it now stands, education in the natural resource fields (almost everything I've said in this paper applies to the way all environmental sciences conduct themselves) does not provide training in scientific methods. Many, if not most, wildlife graduate students do not even understand the differences between induction and deduction.

Training is needed in all phases of science, and these principles need to be carried through in all wildlife courses. Students must be trained in the creative arts of asking the right questions, creating research hypotheses, using the scientific methods of induction and retroduction and the H-D method, designing efficient experiments (so as to avoid firing a cannon at a fly), and recycling the procedures so that the endless cycle of question and answer forms a unified whole. Students also must be trained in the ethics of science and planning; their teachers need to demonstrate these ethics in living form.

Wildlife science must try the H-D method. Without it the ability to detect errors in pronouncements of laws, the self-correcting feature science must have, is fatally lacking. All learning takes place in a feedback system in which ideas and reality interplay. The method of retroduction coupled with the H-D method is such a feedback system. Uncouple them and the ability to learn, to tell error from truth, is hindered, if not destroyed.

By themselves, scientific methods are impotent. Skills in using methods are the catalysts of potency. If, in a half century, the H-D method has been tried and shown to be impotent, then its judges must show that the cause was not the impotency in the skills and dedication of those who tried it.

I regard medical science and wildlife science as fields with equal potentials for achieving reliable knowledge. I think, however, that medicine has come closer to its potential, whereas wildlife science has lagged. I think medicine owes it success to the strict attention it pays to scientific method. Scores of books on the philosophy of clinical experiments have been published, yet I know of few comparable books in the natural resource sciences. Medical science obviously cares for and is committed to the quest for reliable knowledge. It is a good role model.

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Range Management: A Viable Science or an Indian Fakir Psuedo Religion

Dan Fulton

In our attempt to corral a few of the Sacred Cows which our good intentions have turned loose in the 100 years that have elapsed since this Range business started spreading over the Plains, it might be helpful if we look back into our history to see how we got here. That way we might see what we did wrong, regard some of our problems, wonder what brought them about, and speculate on possible ways to reach our objective.

In the early days of the Society there was considerable discussion on a name for the Society, whether to include *Management* in the name and whether to call it *Rangeland* or to call it *Grassland*. I feel very strongly that it was of some consequence and that we did reach the right decisions in both of these matters.

Then there were two schools of thought on membership requirements. When the subject of membership came before the meeting there was general agreement that 'technical' ranchers be admitted to membership but a proposal was made from the floor that only 'Conservation Ranchers' be admitted after examination by Society representatives showing that they had a 'good crop of grass.'

Fred Renner was the presiding officer and he 'innocently' suggested that this sounded reasonable but pointed out that in our democratic organization any such requirement ought to be applied to all members. He went on to say that if it were applied to land use project managers, national forest supervisors and regional graziers, the Society might find itself in the position of having to refund the membership dues of many who had already joined. In the ensuing laughter the group voted the broad membership requirements which we still have today.

But even after that there continued to be some dissatisfaction with ourliberal membership policy. This is indicated by a letter written by Fred Renner in 1950 expressing his thoughts on the subject. Here is a sentence from the letter:

> I am convinced that the conservation job in this country will never get done until the ranchers and other people who live on and make their living from the land assume the major responsibility for the job and undertake to get it done.

The author may be contacted at 27540 Grosse Point, Sun City, Calif. 92381.

Going through the pages of our publications we find this thought expressed over and over. In the February 1980 issue of *Rangelands* is an article by John Merrill, who became our President in 1981. From this I quote:

> . . .the task was too enormous for anyone but the individual landowners and operators themselves to accomplish. These farmers and ranchers had the desire, ability, and economic incentive to do a better job for themselves, their families and their communities. . .

In the March 1984 issue of the *Journal of Range Management* we find the President's Address by Gerald Thomas and again I quote:

> . . .[we need to] emphasize the term 'management.' Research, understanding, management are our focus—not protection, per se.
>
> In keeping with the 'management' theme we still need to place more emphasis on service to users of range land-particularly the livestock sector. . . . I still have a serious concern that the goal of certain environmental interests is to eliminate domestic livestock from public range lands.

As a long-time user of range lands I am acutely aware of the necessity of ownership or some form of stable, secure tenure to practice Range Management. This was pointed out in my book, *Failure on the Plains,* which Danny Freeman reviewed in *Rangelands*, August 1982:

> Fulton strongly believes that the long-time maintenance of the public rangelands in the Northern Great Plains rests almost entirely upon the rancher, the user of the land. Government can not do this job. It is the man on the ground who will get the job done. He says, 'A big step in the right direction will be to give the user longer tenure.'

Why has the rancher not had tenure? Obviously it is not possible to develop and manage any natural resource without tenure. You can't manage it and you can't finance or spend the capital, the money needed for development of the land without tenure. Our government has always encouraged long and stable tenure of cropland for crop farmers. Sometimes it has been said nobody wanted tenure of the land on the Plains. As recently as June, 1984 I heard Secretary of Interior Bill Clark call it, 'The land nobody wanted.'

Is history what historians say it is, or is it what we who lived there have experienced? To use the vernacular of the attorney-at-law, 'Let's look at the record.'

The record is that ranchers have been trying for over 100 years to get tenure of grazing lands, and have had capital to

fence it, develop stockwater, and improve it for grazing use. Throughout this period the federal government has, almost always, done everything possible to prevent rational grazing use and development.

The Bison Edition of John Bratt's *Trails of Yesterday*, published by Nebraska Press in 1980, has an introduction by Nellie Snyder Yost, in which this daughter of cowboy Pinnacle Jake (she was a friend of, and observed the work of, Mari Sandoz, daughter of homesteader Old Jules, tells of the importance of the John Bratt book in the Northern Great Plains ranching story.

Bratt in 1866, at age 24, hired out to drive an oxen team from Nebraska City to Fort Phil Kearney in Wyoming. In 1870 he began construction of "The Home Ranch" of sod with port holes to stand off Indian attacks. To quote from the book:

> In 1885 . . . John Bratt & Co. bought from the Union Pacific Railroad Co. 123,673 acres of land . . . which we fenced, thus enclosing with the government sections nearly 250,000 acres, but we never built a stick of fence on government land.

That would make a little under 400 square miles or, if in a square tract, about 20 miles on a side. The story is synopsisized in Yost's introduction:

> Cattlemen, no longer threatened by marauding Indians, developed one of the greatest cattle empires in history. . . . But their reign was brief . . . the ranchmen [gave way to] the men with plows. . . . In time, as most of the rangeland proved its unfitness for farming, the big ranches would take over again. . . .

Another historical classic of the northern plains range story was put out by Nebraska Press, Bison Book edition, in 1962, entitled *Reminiscences of a Ranchman* by Edgar Beecher Bronson. A third book entitled, *Bartlett Richards, Nebraska Sandhills Cattleman* by Bartlett Richards, Jr., with Ruth Ackerman, was published by Nebraska State Historical Society in 1980. I wrote a review of this book which was printed in *Rangelands*, August 1983.

Bronson bought cattle in Wyoming in 1877. By 1882 he had a prosperous range operation in the Sandhills of northwest Nebraska; then, because it was impossible to secure tenure of an area necessary for a viable livestock operation, he sold out. As he said in the book, "Nothing else for it, Johnny; we could scrap Indians and rustlers but we can't stand off grangers and Uncle Sam's land laws. Under the law they have all the rights; we have none. . . . "

Soon Bartlett Richards was part owner and manager of the operation which Bronson had sold. Richards's father was a Congregational minister who died when Richards was 10 years old, leaving the family in moderate circumstances. Richards had gone West in 1879 for a year before entering college.

Richards named the ranch the Spade and developed it by, "fencing, drilling wells, constructing reservoirs, erecting windmills, developing hay meadows, building quarters for his workers, stringing telephone lines, and a multitude of other tasks." But, as Bronson pointed out in his book, ranching could not be done without violating the law. Bartlett Richards was sent to jail in 1910, where he died before his sentence was completed.

My father, after considerable effort, raised enough money to pay his passage from Scotland to America. By 1890 he had risen to the position of sheepherder of a band of sheep on Milk Creek in southeastern Montana. By the time I was born in 1904, he had purchased checkerboarded railroad land. He spent the rest of his life on this ranch and I was there until 1959. In "Failure on the Plains," and an article, "Rangeland Tenure: A Study in Failure," which was published in the Centennial issue of *Montana Stockgrower* in 1984, I point out that there never was a law making it possible for us to attain tenure. Miners and crop farmers were also trepassers on the public domain. Miners and crop farmers were legalized, but rights for livestock operators were never recognized. Bartlett Richards, Jr., in preparing the book about his father, had written to Ferry Carpenter, the organizer of the Taylor Grazing Districts. Ferry replied in two letters, portions of which were quoted in the book, telling that three administrations had ordered the fences down, Grover Cleveland in 1885, Teddy Roosevelt in 1901, and Harold Ickes in 1936.

By 1950 I had bought all the public domain remaining in our ranch. The federal government had come in and purchased scattered lands throughout the area. There were no specifications or definitions of land to purchase. They bought whatever was offered when money happened to be available for the purchase. For no visible or logical reason we still had scattered tracts of federal land within our privately owned lands which we had owned for 40 years. We had no meaningful tenure of that scattered land.

During the period of the 40's and 50's, I was a member of a national group known as the Stockmen's Grazing Committee. The Committee was made up of two groups, the National Cattlemen's Association and the National Woolgrowers Association. The members were all long-time residents and livestock operators of the range area, who loved the country, and all of whom were very knowledgeable of the area and of the problems involved. Our objective was to develop and attain some form of tenure so operators could manage their ranches for continuous productive use, and so that it would be economically feasible and possible for them to develop and improve them. We didn't plan to take over Yellowstone Park, we only wanted tenure approaching what other forms of agriculture had always enjoyed.

We were unable to establish any dialogue with the federal administrators. The only reaction we got from them was "In-Service Only" material which came to my attention after it was all over. The high point of this material was: "Warning—Bull is Loose, Don't Eat any Corral Dust." To make a long story short, nothing came of our effects.

This anti-domestic-livestock syndrome which has been so significant throughout our history was augmented in 1936 by the Forest Service report *The Western Range*. This report stressed what was perceived as depletion of plant cover by domestic livestock grazing. I and most other domestic livestock graziers felt the point was overstressed. The livestock industry put out a pamphlet *When and If It Rains* to put forward the thought that the loss in density was due to climate as well as to grazing. Our pamphlet was ridiculed in about the same manner as was the Stockmen's Grazing Committee leasing proposal.

With this background it is interesting to read the article by Branson and Miller in the January 1981 Journal of Range Management:

> Some studies have shown that vegetation changes caused by drought alone may be more dramatic than changes attributed to

grazing effect . . . in the short grass type near Hays, Kansas (Albertson and Weaver 1942)

Plant cover 1932 pre-drought

Ungrazed Moderate Heavy

89% 85% 80%

And in 1939 after six years of drought was

22% 27% 18%

Sometimes it seems that the anti-range-livestock syndrome is based as much on emotion as on science. A long time ago, I attended a meeting and had the pleasure of visiting with James Malin, a life-long plainsman and professor of history at University of Kansas. His integrity and knowledge of the field of plains dry-land history was obvious and overwhelming. Malin believed that the Progessives and the New Dealers seized upon Turner's "closed space" ideas as justification for "totalitarian planning." Recently University of Nebraska Press has printed, *James C. Malin, History and Ecology, Studies of the Grassland* edited by Robert P. Swierenga. The editor's introduction (from which I copied much of the first part of this paragraph) is worth the price of the book. The last words of this introduction are:

> He [Malin] wrote: "Few scientists are trained in history and social science, and likewise, few historians and social scientists have training in science." This statement is unfortunately almost as true today as when Malin first wrote it in the mid-1940s.

I know they won't, but every person connected with resources of the Plains should read the books listed below under, "Literature Cited."

My friend Dr. M. M. Kelso was an economist in the New Deal Brain Trust days. He had a daughter, Jeanne, who went to Australia, got a job as a governess in the outback, married the sheep foreman, and now she and her husband, Hadden Mims, own and operate a sheep station in central Queensland. In 1981 we visited them at their home station. Their success is described in an article, "Success at Last—On the Mitchell Grass Downs," printed in the April 1982 issue of Rangelands. Jeanne and Hadden Mims operated on land owned by the state of Queensland under a long-term renewable lease covering a 50-square mile tract. The lease included provisions for compensation for improvements and was not too dissimilar to what the Stockmen's Grazing Commitee had proposed in the 1940s. This observation in Australia leaves very little room for doubt that a system such as the Stockmen's committee had proposed could have worked here.

In the United States one small part of the problem was the fact that local taxes for schools and roads were financed in considerable part by ad valorem taxes on the land, and the lands were often assessed as crop lands. This led to fear by federal land users of having to pay a high property tax if they had ownership or some other form of stable tenure. Needless to say, the bureaucrats were not above advertising and using this factor to antagonize and divide the stockmen on these issues.

When I started preparing this paper I recalled Hadden Mims saying that their local taxes applied on ranch lands equally whether they were owned in fee simple or were leased from the state. I wrote Hadden to be sure I was right so I could quote him. Hadden replied under date of October 19, 1984. I will quote portions of his letter:

> All land is subject to local government taxes which we call Shire Rates or Council Rates. The rates are levied on the "unimproved value of the land" and are paid by the owner or lessee regardless of the title. [We have converted] our original 30 year Crown lease, to the present title of "Grazing Homestead Freeholding lease" . . . with annual installments, but I have the option to pay it out, in full, at any time I want to. If I chose to pay it out tomorrow to "Freehold," the local government taxes would not be affected.

Another big part of our problem in the U.S.A. was the AAA "farm program" which came into being in the 30's. This Agricultural Adjustment Act was passed in early New Deal days. It provided for payments to farmers of money raised by a processing tax. This law was found unconstitutional by the United States Supreme Court in 1936. The Congress immediately replaced it with the Soil Conservation and Domestic Allotment Act which did the same thing as the previous law but there was no processing tax and the payments to farmers were called convservation payments. In this form the law was found constitutional by the Supreme Court. In 1959 I wrote a letter to the editor published in The Westerners New York Posse Brand Book, Vol. six, No. Three. Here is the part I quoted in *Failure on the Plains:*

> . . . Today the boys plow up the grass, blow away the soil, and get ASCP payments, Conservation payments and Soil Bank Payments. . . . Nor is . . . revegetation nearly so effective at holding down the soil as the native vegetation, such as the range barons, like my father, maintained on the land on which I live today. Actually, history exists in the mind of man quite apart from what actually occurred in by-gone times. This is necessary to fill a need in the mind of man. Man, today, to satisfy his own ego and to furnish himself a reason for existing, must have that horrible picture of the range baron who ruined the land and the grass. So the rancher, who maintains native range in good condition, gets only condemnation, while the farmer, who denudes it and blows it away, gets conservation payments. I most proudly plan to continue my career as an anti-Conservationist. I don't want to denude good range land even to get conservation payments.

Nobody paid any attention to that. But if I had been smart I would have kept the wheat acres I had, plowed up and developed more—undoubtedly I could have made a million dollars, maybe two!

After my review of the Bartlett Richards book was published, I received a letter from Roche Bush. Roche was a rangeman, a Charter Member of our Society, who started out as a trainee in 1944 at Montpelier, Idaho, where he first met Fred Renner. Roche was interested in Bartlett Richards because his father, Joe Bush, had worked for Richards from 1901 to 1905. Joe Bush was a half-breed Indian who left his home in Colorado at the age of 14. Working as a cowboy and bronc stomper, he worked north to Belle Fourche, Miles City, and back to Deadwood where he met and married Roche's mother in 1900. In 1901 they went to work at the Richards ranch, Roche's father as foreman and his mother as cook. In 1906 Joe Bush purchased his own ranch.

Roche Bush edged his way up through the ranks of government service until 1974, when he became Regional Range Conservationist at Portland, Ore., where he spent he last 5 years of his SCS career, with responsibility covering all 13 western states. Along with his most interesting letter, Roche sent a clipping from the national newspaper USA Today Nov. 2, 1983, issue. The article was headed Petroleum County, Montana, *ranchers at war with sodbusters*. It told of John Greytak, "king of the sodbusters" plowing up 25,000

acres of rangeland and saying that he would continue to plow, plant, and participate in the federal crop payoffs as long as the system was there.

Last December, while we were in Iowa visiting our daughter Dorothy Carpenter, the *Des Moines Register, December 3, 1984, quoted Agriculture Secretary John Block:*

> *I don't think acreage control has served the wheat industry very well. People are still plowing up virgin grassland to plant wheat.... Obviously, they think there's more return in it than growing grass. and if these government programs pull land into wheat, the problem is going to compound.*

It is a little difficult to develop much confidence in this sort of government planning. What is the answer? It really doesn't make much sense to put those who improve rangeland in jail to die and pay conservation payments to those wo plow it up and allow it to blow away. Maybe we need a little genetic engineering to put an iota of common sense into the system.

In the 1930's and early 1940's the government needed carrying capacity figures for subsidy purposes. This is told by our Society President Harold Heady in his column which appeared in the August 1980 issue of Rangelands. He (Harold) was a student then and the figures they came up with "were inaccurate in technique and did not account for either seasonal or annual variations in resources.... Inventory procedures today are little better than they were 40 years ago."

In *Failure on the Plains* I tell of the Rivenes method. Dave Rivenes was one of the bright young men the SCS sent into our area in the 1930's. Instead of counting the grass, applying the factors, and coming out with an AUM figure, Dave put down the AUM figure first, then juggled the little figures to fit. In that way he always got the right answer the first time. Dave quit the SCS but continued to live in Miles City, where he and his wife Ella became famous as the operators of the world's best-known Pa and Ma television station.

Dave and Ella have sold the TV station, KYUS, pronounced cayuse like a broomtail horse, and the October 1984 issue of the Montana State alumni publication contains an article headed, "God bless you all" telling about Dave and Ella and the TV station. Of Dave, it tells that when he was hired in 1934, "He managed all the grazing districts throughout eastern Montana and is still considered by many old-timers to be the best range manager they'd ever known."

Recently a State court in Montana has made a ruling allowing public access to water courses on private-owned land under the interstate commerce clause of the Constitution and other decisions (State or Federal) have ruled that anything big enough to float a log is an Interstate watercourse. I don't know much about these rulings but the scuttlebutt is that rancher dissatisfaction with the rulings has resulted in less rather than more access to the private lands where so much of the antelope and deer hunting occurs. We need the help of the farmers and ranchers for that too. They know the obvious, that unrestricted access is not compatible with management.

The point is, to date, we have been more successful as Fakirs than as Viable Range Scientists, and we haven't even got to the grizzly bears, which are bringing about abandonment of grazing areas on public lands and closing of campgrounds in Yellowstone Park. When we were trailering in Mexico we went to Chichen Itza where the Mayans had appeased their Gods by throwing their fairest young maidens into the Sacred Well. I have heard rumors that our grizzly bears prefer fair young maidens too.

As far back as 1917 brucellosis was diagnosed and reported in Yellowstone Park buffalo by U.S. Bureau of Animal Industry and nothing has been done to clean it up. Brucellosis of course is known to transmittable to both domestic livestock and to human beings. The only remedy appears to be to build a fence around Yellowstone Park or Homo sapiens will be an endangered species.

Our most insoluble problem is the fragmentation of our public lands which resulted from the things we have discussed. No method has been devised to put Humpty-Dumpty together again. "Key tracts" occur in infinite patterns so turning a "free market" loose in these fragmented lands could result only in spite bidding and worse.

The only rational solution is to give these scattered tracts to the rancher who owns the land around them or to lease to him at nominal rental. The emotions which Gifford Pinchot's and Hugh Bennett's good intentions have released is the real Frankenstein which makes solution so difficult.

There is one hopeful sign. We have a group of scholars who are promoting New Resource Economics, known in real New Deal fashion as NRE. These new scholars are going back to some of the basics including Adam Smith and they lean to the theory that the user must have tenure if we are to attain rational use of natural resources.

I am confident our Society will continue to make progress toward our worthwhile objectives. Continued research and extension will bring greater fulfillment of human needs in contrast to daddy-knows-best-programs which discourage production for human needs besides being detrimental to the resource.

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Computer Programs for Range Management

E. T. Bartlett

The interest in and use of computers in business management has increased rapidly over the past decade. The number and availability of computer programs or software is increasing daily, although only a few programs have been specifically developed for conservation and range management. Many of these computer programs are available to the individual businessman such as the rancher and to agency personnel. In a recent issue of *AgriComp*, a magazine on farm computing, there were advertisements for over 20 different software packages by 14 firms. AGPROS, a computer software company in Texas, lists 114 programs that could be used by ranchers (AGPROS 1982); few of these programs deal with range management.

The interest in developing programs for range livestock management is increasing. More individuals are pursuing applied software for the Western rancher. This article discusses the purpose and availability of some different computer programs that could be helpful to ranchers and range managers.

Classification of Programs

I have classified computer programs by two characteristics: (1) what type of machine (hardware) is required? and (2) what is the purpose of the programs?

The type of machine can be divided into two major classes, mainframe computers and microcomputers. **Mainframe computers** are the large computers found in government agencies, large businesses, and universities. These expensive machines require space and staff to keep them running. Range managers in agencies have access to mainframes through terminals. Ranchers are not going to buy them; however, there are several software packages for mainframe computers that ranchers can use. In many instances, the rancher provides information to another person (extension agent, consultant, banker, or agency employee) who knows how to use the program.

Microcomputers are relatively small, usually fitting a small desk or table, and are inexpensive compared to the large machines. Software for these machines is usually easy to use and oriented toward the individual, family, or small business.

I have adopted Kothmann's (1983) subject area classification of **software**. He classified software as dealing with information systems, business management, production decision aids, office operations, education, and recreation. Of the six areas, I will concentrate on the first three and include examples of computer software in each.

Information Systems

Information systems include software dealing with market and commodity reports, weather reports, news reports and other reporting services in information systems. Three examples of systems that are currently being used in agriculture in the West are AGNET, DIALCOM, and AGRIDATA.[1] All are on large mainframe computers and are accessed by telephone and computer terminal or microcomputer.

AGNET was developed by the University of Nebraska, Lincoln, in partnership with other states and supported by the Old West Regional Commission. It is currently being used by personnel in several states, primarily Nebraska, Colorado, Montana, North Dakota, South Dakota, Washington, and Wyoming. AGNET is an interactive system which contains over 100 programs. Included are programs containing market information with specialists' comments, Extension reports, news stories, and a list of hay for sale and pasture for rent. AGNET is supported by the Cooperative Extension Service, and you should contact your County Agent or State Agricultural Economics Specialist to discuss availability in your area.

The U.S. Department of Agriculture used a subsystem of DIALCOM, a commercial information system. The subsystem contains information programs containing USDA news releases, Crop Reporting Board reports, Foreign Agricultural Service reports, outlook and situation summaries, regional news releases, market reports, and even the morning news highlights. The Cooperative Extension Service uses this system, and can provide you with information concerning reports from the system. It is one source of information for Extension newsletters.

AGRIDATA is an example of a commercially available information system. Reports are available in the area of commodity modity markets, weather reports, news articles, and the futures market. Electronic mail and an education subsystem are also available.

Information systems also include other data bases that deal primarily with literature. DIALOG is commercially available and has literature databases on numerous topic areas. USDA Forest Service supports WESTFORNET, which contains natural resources literatures.

Business Management

There are numerous programs that are applicable to agribusiness management. Of the 114 programs listed by AGPROS (1982), over half are business management programs for the rancher or feeder of beef cattle or sheep. The AGNET system contains over 20 financial programs which include cash budgeting, comparative financial statements, analysis of alternative financing methods, cash flow analysis, purchasing analysis of equipment and land, and economic analysis of beef and crop production.

Numerous business management and economic analysis programs have been developed by universities and private

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[1]Use of trade names was done only to help the reader to understand this paper. The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by the author or the university is implied.

software companies. The prices of the different packages vary tremendously, as well as the analysis capabilities. Programs are written with different operating systems. You should check to make sure programs are compatible with your computer system. Some also require other software systems or support systems to manage the information. These are called data management systems. A common type of data management system for business management is the spreadsheet. Some spreadsheets on the market are VisiCalc, VisiFile, Apple Business Graphics, Multi-Plan, Lotus 1-2-3, and Symphony.

The Cooperative Extension Service is developing business management systems for ranching, and Oregon State University has developed a budgeting system for microcomputers. Personnel from the University of California, Oklahoma State University, and Texas A & M University are currently developing the Microcomputer Budget Management System (MBMS). This program will allow ranchers to project costs and returns for different enterprises, whole ranch analysis of cash flow, net worth, and income statements.

Texas A & M University has a finance package which contains programs on agricultural loan analysis, evaluation of loan alternatives, and calculation of future and present values. More information can be obtained from the Extension Data Center Computer Services Unit, USDA Building (Rm 135), College Station, TX 77843.

The University of Idaho has programs available that can assist ranchers on machinery acquisition analysis, machinery cost analysis, cattle feeding analysis, breakeven feeder analysis, and enterprise budgeting. These microcomputer programs are available from Agricultural Communications Center, 111 Agricultural Sciences Building, University of Idaho, Moscow, ID 83843.

Production Decision Aids

Software packages that help ranchers make better decisions are difficult to separate from other types of software, as all should give the rancher more, and we hope, better information. I have included software that deals with herd records, herd and grazing management, and forage balance.

Several record-keeping programs are available on the AGNET system. In addition, Colorado State University has a program on beef performance which was adapted from a University of Idaho program. This program helps increase culling efficiency. Currently, ranchers submit information on data forms to Fort Collins, where it is processed on a mainframe computer. Reports are then returned to the rancher. While this system is only available to a limited number in Colorado, software has been adapted to microcomputers.

Numerous other herd record-keeping programs are available commercially such as bull record-keeping systems. Texas A & M University has a program that calculates adjusted 205-day weaning weights and provides information on performance evaluation.

A cow-calf management program and a stocker grazing management model have been developed at Kansas State University. Both are available from the Extension Service at Kansas State University.

Another range management program is Grazi Data. This program was developed to facilitate planning and record keeping in Texas. Animal and forage records are maintained, and animal requirements are balanced with forage availability. The program can be used to simulate alternative grazing management plans and to consider options before committing yourself to any grazing management program.

Individuals at Oregon State University have also developed a forage-animal requirement program. This should be of particular interest to public land users, as federal forage is an important aspect considered in the program.

COPLAN is a program that can be used for ranch planning. It is being used by the Soil Conservation Service in conjuction with ranchers. The program uses a mainframe computer and requires assistance in entering information and interpreting results.

This brief discussion has only described a few of the many software packages that are available. There are numerous references available that describe different packages. Most State Cooperative Extension Services publish a newsletter on computer programs. These newsletters describe different programs, provide evaluations and provide information on where to obtain programs. There are also magazines, newsletters, and software directories; a list of some of these sources is attached as an appendix. Also attached as an appendix is a list of some programs that are currently available and costs, if known.

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Computer Programs Related to Range and Ranch Management[2]

I. Information Systems

A. Systems Name: AGNET Available in Nebraska, Colorado, Montana, North Dakota, South Dakota, Washington, and Wyoming. Contact Extension Service in these states. In other states, contact can be made to AGNET, Rm. 7 Morrill Hall, NDSU, Box 5655, Fargo, ND 58105.

Initial subscription fee of $50 and first year's subscription fee of $25. In 1984, the average per hour expense for running programs wa $11 per user.

B. System Name: DIALCOM Available to USDA personnel.

DIALACOM is an information system available to USDA personnel and other major subscribers. It contains situation and outlook reports, the USDA daily newsletter, daily market results, and the National Agricultural Library bibliographies as well as specialized data bases for extension personnel.

C. Systems Name: AGRIDATA For more information AGRIDATA's address is 330 E. Kilboin Ave., Milwaukee, WI 53202 (800-5589044)

[2]Many more programs are available in the private sector, but only a few have been listed. The use of trade names has been done only to help the reader. The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by the author is implied.

Start up fee of $75 plus $39/month. Discounted 7- and 12-month packages are $199 and $399, respectively. Connect time is $28.19/hr. for 300 baud and $39.24 for 1200 baud (includes use of toll-free number). Varying fees for each report access.

D. Systems Name: DIALOG For more information and a catalog, write to DIALOG Information Services, Inc., Marketing Dept., 3400 Hillview Ave., Palo Alto, CA 94304

DIALOG offers more than 175 databases which can be used for literature searches, business reports, and directories of career opportunities and foundations and grants. DIALOG is one commerical vendor of databases.

E. Systems Name: WESTFORNET Available at various WESTFORNET Service Centers of USDA Forest Service.

WESTFORNET is an information system which does computer literature searching as well as other information support services for Forest Service employees, State Foresters, and more recently, Bureau of Land Management employees.

II. Business Management

A. Source: AGNET (See I.A.)

1.Program name: FINANCE
Purpose: Designed to help ranchers make financial projections and budgets. The program is a series of 15 subprograms that cover subjects such as cash budgets, loan analysis and projections, cash flows, and depreciation.

2. Program name: PLANPAK
Purpose: To provide a computerized budgeting procedure for comparing physical and financial characteristics of a ranch organization with alternative organizations. Permits the user to estimate future profitability, debt servicing ability, and solvency characteristics of the ranch operation.

3. Program name: PLANTAX
Purpose: To consider tax consequences of changes in current year on possible federal income taxes.

4. Program name: COWCOST
Purpose: To estimate production and marketing costs associated with a beef cow-calf enterprise. Variable costs plus straight line depreciation on capital improvements are included.

5. Program name: CALFWINTER
Purpose: To estimate production and marketing costs of wintering calves.

6. Program name: GRASSFAT
Purpose: To estimate production and marketing costs of pasturing yearling calves during the summer.

7. Program name: FEEDMIX
Purpose: To formulate least-cost balanced rations. BEEF for feedlot operations and RANGE for beef cows and calves.

8. Program name: EWECOST
Purpose: To estimate production and marketing costs associated with a ewe-lamb enterprise.

9. Program name: BUYLAND
Purpose: To estimate the maximum price per acre to bid for a specific parcel of land. Predicts cash flow requirement if maximum bid is paid.

Microcomputer Programs

1. Program name: PASTEST
Purpose: To generate establishment budget for range and irrigated pasture.

Computer Requirements: Supercalc

Availability: On request, Mel George, Extension Range Specialist, Univ. of Calif. at Davis.

Cost: Nominal

2. Program name: RANGEIMP
Purpose: To evaluate range improvement alternatives using amortization.

Computer Requirement: CP/M and BASIC

Availability: On request, Mel George, Extension Range Specialist, Univ. of Calif. at Davis.

Cost Nominal

3. Program name: F.A.R.M. (Farm Accounting and Records Managements)
Purpose: A cash accounting program designed for farmers and ranchers without an accounting background.

Computer Requirement: Apple II Plus, IIe or IIc; 48k with 2 disk drives. Or, IBMPC and PC Jr. with 2 disk drives.

Availability: Shipped on receipt of order, Specialized State Systems, 160 S. 300 K., Kaysville UT 84037

Cost: $395.00

4. Program name: FINANCIAL ANALYSIS
Purpose: To detail annual financial analysis of farm or ranch business. It summarizes cash flow, calculates income and expenses, computes returns to investment and net worth, analyzes debt servicing capacity and present key financial ratios.

Computer requirement: IBM-PC and LOTUS 1-2-3.

Availability: On receipt of order, Karen Homan, Extension Computer Application Specialist, Colorado State University. (Original version developed at the University of Minnesota).

Price: $7.50 for CSU version.

5. Program name: FINANCING LAND SALE ANALYSIS
FINANCING LAND PURCHASE ANALYSIS
Purpose: Two progams use after-tax cash flow and net present value to evaluate land purchase and sale financing alternatives.

Computer requirement: CP/M-80, CP/M-86, or MS-DOS, 64k, 1 disk drive; printer optional.

Availability: Extension Computer Technology Group, Texas A&M University.

Cost: $30 plus $25 disk set-up fee. ($20 for Texas residents).

6. Program name: BREA (Beef Ranch Economic Analysis)
Purpose: A computerized worksheet of ranch profitability and resource use. Calculates net ranch income, net return to family, labor management, net return to equity, and return to total investment.

Computer Requirements: IBM-PC, Supercalc III

Availability: March 1985, Extension Service, Department of Agricultural and Resource Economics, Oregon State University.

Cost: Unknown

7. Program name: K-FARM
Purpose: Financial and resource analysis.

Computer Requirement: CP/M or MS DOS

Availability: After field testing, Extension Agricultural

Economics, Kansas State University.

Cost: Unknown

8. Program name: FENCING COST CALCULATOR
Purpose: To estimate materials and investment requirements and annual costs of a fence. Allows analysis of different types of electric and non-electric fences.

Computer Requirement: CP/M-80; CP/M-86; or IBM-PC DOS version 2.0 only.

Availability: Extension Computer Technology Group, Texas A&M University.

Cost: $15 plus $25 disk set-up fee ($10 for Texas residents).

9. Program name: CATTLE FEEDING ANALYSIS
Purpose: To analyze costs and returns of cattle feeding and to determine breakeven price for placement of cattle in feedlots.

Computer Requirement: Apple II, II+, or IIe with DOS 3.3.

Availability: Agricultural Communications Center, University of Idaho.

Cost: $10.

10. Program name: BREAK-EVEN FEEDER ANALYSIS
Purpose: To evaluate opportunities in backgrounding calves by determining feed, nonfeed and break-even costs.

Computer requirement: Apple II, II=, or IIe with DOS 3.3.

Availability: Agricultural Communications Center, University of Idaho.

Cost: $10

11. Program name: ENTERPRISE BUDGET WORK-SHEET
Purpose: To estimate cost of production and profitability of an enterprise.

Computer requirement: Apple II, II+, or IIe with DOS 3.3.

Availability: Agricultural Communications Center, University of Idaho.

Cost: $10

Production Decision Aids

A. Source: AGNET (see I.A)

1. Program name: RANGECOND
Propose: To help calculate range condition and carrying capacity of native range. Based on Soil Conservation Service Range Site Guides.

2. Program name: BEEFGROWER
Purpose: To simulate beef cattle growth from an initial weight given environmental temperatures, feedlot conditions and ration specifications. Frame size, nutritional background, sex, and compensatory growth are considered.

3. Program name: COWGAME
Purpose: To simulate the selection process in beef herds. To teach how to utilize beef herd performance factors in selecting cattle.

4. Program name: BHPP/BHAP
Purpose: To generate, store and analyze individual rancher's beef herd data. Designed for commercial cow herds.

5. Program name: WEAN/YEARLING
Purpose: Beef herd performance programs for purebred herds.

6. Program name: RANGERATIONS
Purpose: To balance rations for beef cows, wintering calves, horses, and sheep.

7. Program name: CROSSBREED
Purpose: To help select breeding stock which will achieve desired changes in herd, and to plan crossbreeding programs. To forecast how 3 different crossbreeding systems will work within an individual's cow management regimen, using feed available on the ranch.

B. Microcomputer Programs

1. Program name: PASTURE INVENTORY
Purpose: To maintain pasture use records in terms of animal performance, capacity and residue at the end of use.

Computer requirements: CP/M and DBASEII

Availability: On request, Mel George, Extension Range Specialist, Univ. of Calif. at Davis.

Cost: Nominal

2. Program name: FORBAL
Purpose: Worksheet to balance forage availability against animal requirements in AUM's.

Computer requirements: CP/M and SuperCalc.

Availability: On request, Mel George, Extension Range Specialist, Univ. of Calif. at Davis

Cost: Nominal

3. Program name: SQUIRREL
Purpose: To examine ground squirrel control methods and population dynamics on alfalfa fields.

Computer requirements: CP/M and BASIC

Availability: On request, Mel George, Extension Range Specialist, Univ. of Calif. at Davis

Cost: Nominal

4. Program name: FEEDSTORIS
Purpose: To indentify alternatives of balancing feed resources and animal requirements and to determine impacts on net income.

Computer requirements: Apple and VisiCala

Availability: On request, Paul McCawley, Extension Range Specialist, Utah Stat Univ.

Cost: Approximately $5

5. Program name: Overstory-Understory Relations
Purpose: To predict understory production.

Computer Requirements: Apple soft

Availability: On request, Jack Nelson, Forestry and Range Management, Washington State Univ.

Cost: No charge

6. Program name: RANGEVEG
Purpose: To summarize and list vegetation data collected for monitoring range plant response to grazing and yearly environmental fluctuations.

Computer requirements: DBASE II, 256K.

Availability: Available by rancher request through Cooperative Extension, Univ. of Ariz.

Cost: To be determined.

7. Program name: GraziData
Purpose: To establish grazing data inventories by pasture

and grazing system, to calculate livestock numbers by kind and class of animal based on forage availability and the animal's forage requirements, to evaluate alternate grazing plans, and to maintain accurate, useable records of grazing by pasture and grazing system and by kind and class of animal.

Computer requirements: Apple II, II+, or IIe; 48k; 1 or 2 disk drives; 40 to 80 column screen; printer with parallel interface card.

Availability: Range Management Software, 1216 So. Ridefield, College Station, Texas 77840

Cost: $125

8. Program name: COPLAN
Purpose: To determine animal requirement with range forages and supplements on the basis of dry matter and protein availability, and to determine economic feasibility of range improvements and animal alternatives.

Computer requirement: Written in Standard ASCII FORTRAN IV. Has been used on various mainframes.

Availability: Range Science Dept., Colo. State Univ.; other versions available at other locations. Available to SCS personnel through SCS.

9. Program name: 205 DAY WEANING WEIGHT AND PERFORMANCE ANALYZER
Purpose: To calculate the adjusted 205-day weaning weights and weight ratios for a group of calves and to allow the user to sort the calves by size, sex, and dam.

Availability: Extension Computer Technology Group, Texas A&M University, College Station, TX

Cost $40 plus $25 disk set-up fee ($25 for Texas residents).

10. Program name: BULL GAIN TEST ANALYSIS
Purpose: To assist cattle producers who are in the business of selling breeding bulls to maintain records of some performance measures related to yearling bulls.

Computer requirements: CP/M-80 version 2.2; 56k with microsoft BASIC 5.2.

Availability: Extension Computer Technology Group, Texas A&M University.

Cost: $15 plus $25 disk set-up fee ($10 for Texas residents).

The Grazing Land Simulator

John R. Lacey, Kris M. Havstad, and John R. Amend

Grazing lands have historically been held in low esteem by the general public. This philosophy has been responsible for the inconsistent political policies and inadequate fiscal support that has characterized grazing land management. Consistent policies and adequate funding will not be possible until urban youth, consumers, adult groups, and policy makers recognize the value of the food, fiber, water and recreation provided by grazing lands, and understand some of the basic principles of grazing land management.

It has been difficult to increase the public's understanding of grazing land. The urban population has become proportionately larger than their rural counterpart. Funding to train instructors and develop appropriate educational materials for the urban classroom has been inadequate. More excitement, challenge, and vividness is needed to stimulate the interest of the general public, and to encourage more instructors to teach grazing land management.

As a direct response to this need, a Grazing Lands and People project has been implemented at Montana State University. The key to this educational project has been the development of a Grazing Land Simulator. This effort was made possible by financial support from Cooperative State Research Service, National Cattleman's Association, Cooperative Extension Service, Bureau of Land Management, Bureau of Indian Affairs, US Forest Service, and the Soil Conservation Service.

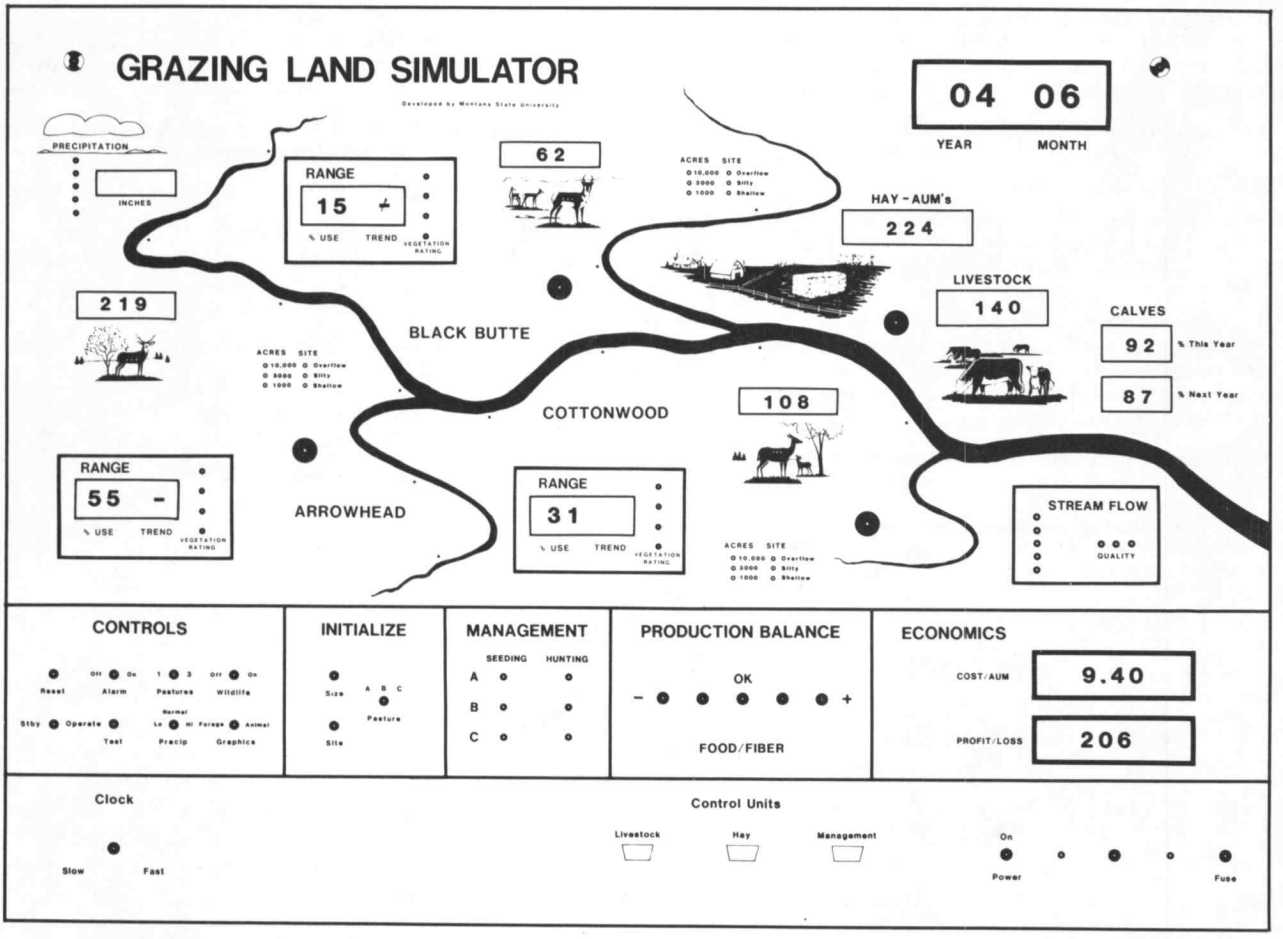
The authors are Extension range management specialist; associate professor, Department of Animal and Range Science; and professor, Chemistry Department, respectively, at Montana State University, Bozeman.

What Is the Grazing Land Simulator?

The simulator is a digital computer that models the ecology of rangeland. Although the present model is programmed with data from southeastern Montana and has a Northern Great Plains flavor, data form other locations can easily be incorporated into the program. Thus, the Grazing Land Simulator has wide applicability.

This simulator differs from standard digital computer simulations in that (1) it has a clock that records the the months and years during a run—each biological event is synchronized with the appropriate passing month (about 8 seconds per month); (2) it presents information on all of its variables simultaneously during the run; and (3) participants may interact with the model at any time by using simple controls to implement their grazing management decisions. It is not an answer-giving machine. It is a problem-causing machine. As the simulator operates, the challenges of managing range, wildlife, and livestock in an environmentally sound manner develop naturally. Participants are confronted with problems, make decisions, and are forced to live with the consequences of their actions.

The front panel of the Grazing Land Simulator depicts a ranch with three pastures—Arrowhead, Black Butte, and Cottonwood. Size and range site for each pasture is set at the beginning of the simulation. Wildlife populations, percent use, range trend, and vegetation rating are influenced by environmental factors and change as the simulator proceeds



The front panel of the Grazing Land Simulator. This version, approximately 18 X 24 inches in size, is mounted in an aluminum suitcase for easy portability and contains two digital computers using approximately 102 K of memory.

through a run. These relationsips can be easily monitored by observing the respective display.

A clock in the upper right corner of the panel shows passage of time in months and years, and a display in the upper left records the amount of annual precipitation. The quantity and quality of run-off water is shown by a downstream display in the lower right, and the balance between food and fiber production and population demand is shown by a balance indicator in the lower center. Animal health and reproductive capability can be monitored by watching the small colored lamps located in the animal's body.

Decisions concerning management of livestock, wildlife, and grazing land are made by participants using small handheld control consoles. The economic impact of these management decisions—cost per animal unit month, project percent calf crop for the current and coming year, and cumulative profit or loss, are displayed on indicators in the lower right. Long-term cause and effect relationships are visible as the simulator plots amount of precipitation, number of animals grazing, and forage production and use on a color graphic display.

Is the Grazing Land Simulator an Effective Tool?

You bet it is! The Grazing Land Simulator was rated the "best program" at the 1983 North Dakota Youth Range Camp. Participants ranged from 14-18 years in age.

The simulator has also proven effective with urban sixth graders. Their perception of the simulator as a teaching tool is reflected in the following note:

Dear Mr. Lacey,

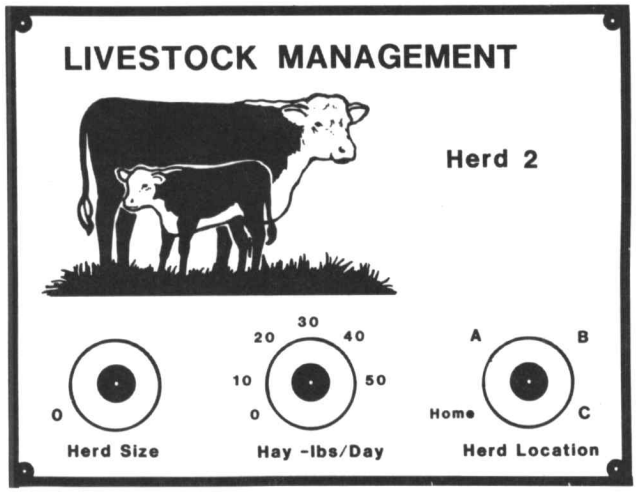
I sure liked the presentation. It was very interesting and I learned a lot. I sure wish we could have had more time. I wanted to see how you operate the cows. I hope you can come again. !PLEASE!

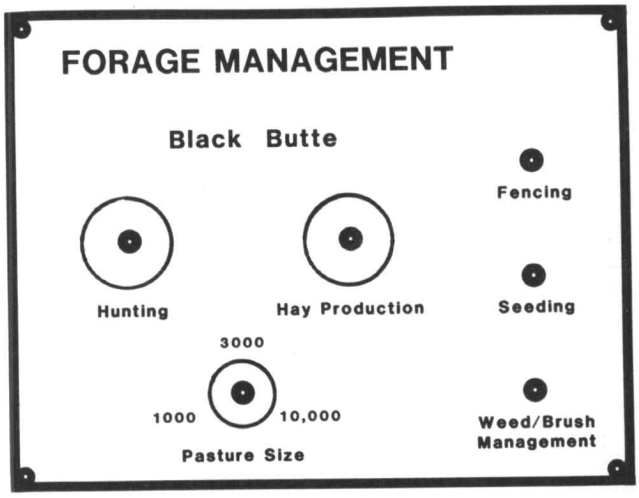
The simulator was used in a biology class at the Bottineau Branch of North Dakota State University in the fall of 1984. Student comments indicated that the simulator was equally effective in this situation,

". . . very helpful in giving an overall picture into ecosystems."

"This lab was very interesting because you had to manage the ecosystem yourself."

"I thought the range computer was the best thing we've done all year."



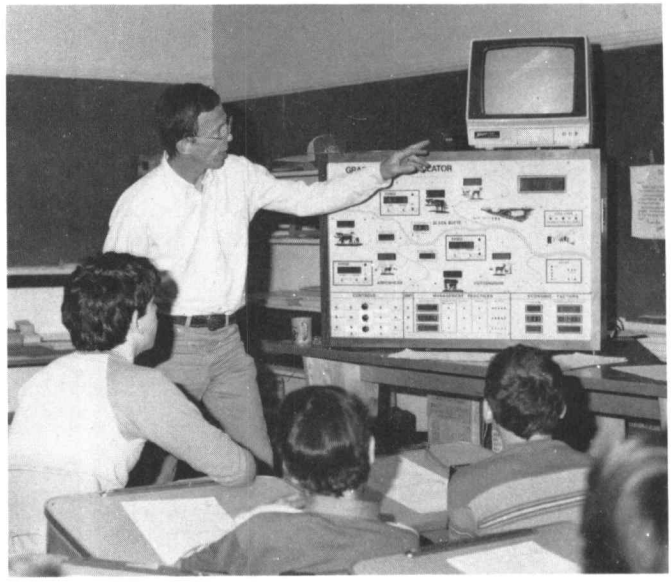


Small control consoles are used by participants to implement management decisions.

"I didn't realize there were so many things involved."
". . . it helped me understand the processes in an ecosystem better."

The merit of computer simulation as a teaching tool was formally evaluated by Dr. Dennis Cartwright at the University of Idaho in 1980. His evaluation was done with an energy simulator that modeled energy resource/demand situations. A group of college students was tested and carefully divided to assure that both groups contained individuals with similar skills in abstract reasoning. One group of the students participated in a slide-illustrated lecture concerning energy resources and exponential growth, while the remaining students participated in the Energy-Environment Simulator presentation. Instructors for both presentations were chosen on the basis of similar ability and educational background, and the same principles and concepts were included in both presentations. After the presentation, both groups of students were given an examination to determine their understanding of energy problems and concepts.

The mean score for the simulation group was 17.6 percent higher than that of the lecture group, indicating that the simulator was slightly more effective at developing conceptual understanding than was the lecture presentation. However, significant differences became apparent when a statistical regression was made correlating the student's abstract reasoning ability with his or her score on the energy concept awareness examination. Students with high abstract reasoning ability scored equally well whether they participated in the simulator or slide-lecture presentation. However, when the students with lower abstract reasoning ability were compared, the group participating in the simulator presentation scored significantly higher than the group receiving the slide/lecture presentation. This experiment was significant at the 0.05 level, meaning that here was only a 5 percent chance that the conclusions were due to random statistical variation.



Grazing Land Simulator was an effective teaching tool in a sixth grade classroom at Bozeman, Mont.

Why Is the Simulator an Effective Tool?

The first step in any learning process involves gaining the student's attention and interest. If the student does not perceive the problem as interesting and significant, little learning will be accomplished. The simulator's panel design and visual impact gains immediate attention and the structure of the problem area is communicated. Users realize that they are faced with a computer model of a ranch, and that they can control some of the variables. They are going to be participants, not observers.

The importance of active participation and immediate feedback cannot be over-emphasized. The simulator offers opportunity for input and presents concrete information. While making decisions, the users are simultaneously synthesizing data and evaluating alternatives. Thus, users with lower abstract reasoning ability gain the conceptual understanding expected only from those who can reason at a more abstract level.

What about the Future?

Three Grazing Land Simulators are presently being

rotated around Montana. Usage is expected to increase as the number of potential instructors (school teachers, range conservationists with federal and state agencies and extension service personnel) increase. For further information, contact Natural Resources Education Project (Phone: 406-994-5380), 127 Gaines Hall, Montana State University, Bozeman, Montana 59717-0003.

It seeems that the effort to upgrade existing educational material on grazing land management into an attractive, contemporary, well-illustrated package needs to be continued. But why not also incorporate the Grazing Land Simulator into the overall educational system? Our experience confirms that it is instructive, informative, and interesting. It creates interest and clearly illustrates the importance of grazing lands and the fundamental principles of grazing land management. Without doubt, the Grazing Land Simulator is potentially valuable as an educational tool.

Pearls of Wisdom from the Conference

Multispecies Grazing: the State of the Science

Frank H. Baker

The following statements are the report of a conference held June 25-28, 1985.

Eldon White, American Sheep Producers Council. Care must be given to build upon the tried and true practices of yesterday by adding the latest technology in the area of multispecies grazing.

John Merrill, National Cattlemen's Association. Our objective is to increase biologic and economic efficiency of livestock users. The bottom line is how to select livestock to most efficiently harvest and market available forage on a sustainable basis, with minimum inputs, for a relatively stable market and for a profit. The application of good ecology and good economics will go far toward assuring the survival and success of livestock producers.

Walter Wedin, American Forage and Grasslands Council. Multispecies grazing aids in reducing insults to the environment such as soil and water loss and pesticide application. This objective can be supported by everyone.

Peter Jackson, Society for Range Management. Four cardinal rules can help achieve the real potential of multispecies grazing: (1) pick and choose carefully among the new advances in technology, (2) diversify, (3) be conservative and plan ahead, (4) work hard.

Donald Davis, Texas A&I University. If prevention and control of diseases and parasites are combined with proper management of habitat, animal losses in most cases can be minimized.

Lynn Drawe, Welder Foundation. If a rancher wants to 'have his cake and eat it too' in terms of livestock and wildlife, he must select management goals and use available knowledge to work toward them.

Ronald H. Thill, Forest Service. The potential for combined production of timber, livestock, and wildlife in the South is unexcelled by any other region of comparable size in the country. Increasing resource demands will ultimately dictate greater reliance on integrated management strategies for southern forests.

The Multispecies Grazing Conference was developed in response to livestock producers' inquiries as to whether combining sheep with cattle would improve the economic efficiency of midwestern farms. We came together to summarize the state of the science for the benefit of U.S. livestock producers and key individuals in research and education. The interest in the subject matter and the concept motivated the following organizations to support the conference by providing travel support, speakers, and participants:

Agricultural Research Service, USDA
American Forage and Grasslands Council
American Sheep Producers Council
Colorado State University
Extension Service, USDA
Forest Service, USDA
Hawkeye Institute of Technology
Kerr Foundation
Iowa State University
Mississippi State University
National Cattlemen's Association
Oklahoma State University
Oregon State University
Radakovich Hereford Farm
Rob and Bessie Welder Wildlife Foundation
Society for Range Management
Texas A&M University
Texas A&I University
Texas Christian University
University of Arkansas
Winrock International

The Sheep Industry Development Council provided special financial support to assist with publication and travel costs.

The 30 Conferees from key areas of the United States met at Winrock International in June 1985. They included (1)

selected livestock producers with experience in managing units using more than one species of animals, (2) scientists in the plant and animal sciences and economics, (3) education specialists, (4) leaders of cooperating organizations. The following questions served as a guide for the conferees:

(1.) Can economic efficiency and productivity of livestock ranching and farming operations be improved in this decade by increased multispecies grazing?
(2.) Is multispecies grazing beneficial for cattle enterprises? For sheep enterprises? For rangeland and pastures?
(3.) Is current knowledge of multispecies grazing adequate or is lack of knowledge a constraint for designing systems for commercial operations?
(4.) Are extension methods adequate for designing systems for commercial operations?
(5.) Can concerned specialists develop a plan for using multispecies grazing concepts to improve the future of U.S. animal agriculture?

Relevant research data and producer experiences for both arid and humid areas of the country were reviewed, evaluated, and summarized. Both a research strategy and an education promotion strategy were developed as outputs of the conference. Summaries of the presentations and discussions are presented below.

Biological Efficiency of Rangelands—C. Wayne Cook

The biological efficiency of the range ecosystems and other ecosystems (ranches and farms) involving plants, domestic animals, and game animals, is best evaluated by measuring yield of products exported from the systems on a sustained basis. The net monetary return to the overall management of the systems (profit or loss) provides very useful data for ranchers and farmers.

The mix of plants and animals used is very important to the success of the system. The similarities (overlaps) and differences of diets of the various species of grazing animals are very important in the use of the plant materials available in the systems. The plant materials are considered in three broad categories of grass, forbs, and browse. Cattle use mainly grass, a few forbs, and a small amount of browse. Sheep also favor grass but consume much more forbs and browse than cattle. It has been estimated that there is a 35% overlap in diet between cattle and sheep. Goats consume almost as much browse as grass in their diets with forbs making up a very low percentage. Deer favor browse and forbs as major components of the diet. Thus, the manager of a livestock unit (ecosystem) should select the mix of animals for the unit based on the types and volumes of plant materials available. Animals that produce twins or triplets that grow rapidly but nurse their mothers relatively short periods are said to be highly efficient.

Multispecies Grazing Research in Texas and the Southwest—Charles A. Taylor, Jr.

Forage selection by grazing animals is influenced by the interaction of several animal and plant factors. These include forage quality and availability, animal-prehensible-grazing ability, biting or pulling materials from the plant, animal anatomy, (teeth, lips, and mouth structure), secondary plant metabolites, topography, animal agility, physical plant properties, and animal competition.

Management practices of controlling grazing pressure and animal mixture influence diet selection, immediate and long term vegetation changes, and animal foraging. As available vegetation decreases, dietary overlap among cattle, sheep, and goats increases, particularly in drouth and dormant growth periods. Mature forage will not support high levels of animal production. Allowing animals to select the most nutritious parts of vegetative material is vital in successful production systems. Knowledge of animals and range is essential to determining the most desirable mix of grazing animals in any given ranch situation.

Cattle and Sheep Behavior on a New Mexico Range—D.M. Anderson

Cattle eat more grass and drink more water than sheep. Consumption by grazing animals is influenced by grazing time, eating rate, and bite size. Senses of sight, sound, smell, and taste influence an animals's behavior. Smell and taste influence diet selectivity. Light is a key factor in triggering daily grazing. Temperature (either high or low) reduces energy expenditure. Age, breed, and physiological factors influence dominance, travel, and intake. Pasture size, herd or flock size, forage quality, vegetative types, and physical structures influence where animals graze. The distribution of cattle and sheep in grazing pastures vary for different seasons of the year.

Multispecies Grazing on Public Lands of Utah and the Western States—James E. Bowns

Research and observations have shown that combining animal species is valuable in range management. Great potential exists for use of multispecies grazing of livestock and wildlife to maintain forage production and species diversity. Land managers should recognize the value of multispecies grazing and be encouraged to apply this concept to the public lands.

Combined Cattle and Sheep Grazing in the Intermountain Region—John Etchepare

Our ranch experiences show that combining cattle and sheep offers the most efficient way to harvest the forage available on our rangeland. Decisions on grazing management are dictated by weather, time, year, and types of forages. Sometimes cattle follow sheep through the ranges whereas at other times the reverse is true or the two are combined in the pasture. Under our multispecies program we are running more total animal units than we could with a single species. We are obtaining better economic returns, more uniform use of forages, and improved control of poisonous plants (larkspur and leafy spurge). Unfortunately, in Wyoming and Montana the gains through the use of multispecies grazing are lost or overshadowed by the ineffectiveness of the predator-control program. Predator losses must be controlled if the use of multispecies is to be used by ranchers of the region.

Multispecies Livestock Systems in New Zealand—Howard H. Meyer

New Zealand farmers use multispecies grazing to maximize profit in producing and marketing more forage through

livestock. The complementarity and ratios of species used result in the highest overall returns, even though one species may appear to be less profitable individually than another. The farmers feel that the flexibility allowed by the use of multiple species makes such systems more easily managed than the single species operations. The systems may include one species following another through a pasture (cattle after sheep or vice-versa) or grazing of the species in common. Farmers make decisions as to which strategy is most appropriate on specific pastures.

Advantages of the Multispecies Systems in New Zealand are:

1) Complementarity: this is due to the differences in preferences for plant species, ability to digest various types of forage, and the patterns of forage harvesting (grazing).

2) Improved pasture management and forage production: this influences productivity through species composition and the maintenance of the plants in a vegetative state. The use of cattle on rough terrain to control pasture growth is more economical than the use of mechanical harvesting of surplus growth.

3) Diversification and income stability: marketing multiple products tempers the volatility of the export market prices due to worldwide production patterns and international policies. Timing of sales to improve cash flow is important and easier accomplished with multiple products.

4) Parasite management: through the use of more than one livestock species, the combination of the grazing management techniques with strategic use of anthelmintics optimizes control of the internal parasites.

Disadvantages of the Multispecies Systems in New Zealand are:

(1) Increased facility costs: this is due primarily to the cost of fencing and handling facilities for the 2 species. (2) Reduced efficiency within each species: this is due to the reduced volume of each species in the operation with some loss in volume discounts on services and materials (vaccines, drenches, and supplies). (3) Labor conflicts: this can be a problem if calving and lambing occur at the same time. (4) Increased management skills: this is due to the increase in required knowledge of nutrition, diseases, breeding practices, and marketing.

Multispecies Systems for California—Robert H. Blackford, Jr.

Adding some sheep to cattle or some cattle to a band of sheep on individual range areas on our ranch has increased the carrying capacity and income returns by 15 to 20%. Our operations include 3 types of livestock ranges: (1) low foothills that we use in winter and spring, (2) mountain ranges for summer and fall, and (3) irrigated valley pastures for summer grazing. We have greater success combining sheep with mature cows and their calves than with yearling cattle. Yearlings are more playful and spooky when they encounter people and some injuries to lambs resulted. Cows without Brahma blood are more docile and better suited for the dual grazing. We needed some added fencing and corrals to combine cattle and sheep. We feel we suffered less predator problems when cows and calves were with the sheep. Some cows with new calves will chase coyotes away.

Multispecies Grazing in the Southeastern States—Hudson Glimp and J.W. Essig

The Southeast is the most rapid lamb-consumption area of the United States. Sheep numbers are rather low and cattlemen have almost no experience in sheep production. Technical constraints are not a factor limiting expansion of sheep and goat production of the area. Changing attitudes, developing market structures to take advantage of marketing opportunities, and developing the education resource base for farmers are needed to institute changes. Multispecies grazing can be an important part of the changes in the livestock industry of the region.

Adding Sheep to Cattle for Increased Profits in Virginia—S.H. Umberger, B.R. McKinnan, and A.L. Eller (abstract from a Virginia Extension leaflet.)

Many dairy and beef cattle producers in Virginia could realize greater profits from the same pasture inputs by adding sheep to their farm as a supplementary enterprise. The addition of one sheep per cow unit or equivalent animal unit without increased pasture acreage is indicated by research. This two-enterprise system improved pasture conditions and is estimated to increase economic returns per acre by 29% compared to cattle alone. It is based on (1) complementarity in grazing ability, (2) control of weeds through sheep grazing the forbs, (3) complementarity in grazing locations: sheep prefer high ground and will graze on areas where cattle manure has accumulated whereas cattle prefer lower, wetter areas. The multispecies system requires (1) improved fencing and facilities, (2) increased management skills, and (3) improved predator control compared to cattle alone.

Summary of Multispecies Research Strategies—J.L. Schuster

Multispecies grazing management evolved in regions with diverse vegetation types and suitable climates. A system involving cattle and sheep has been dominant; in the Southwest goats have been an additional component. Wildlife such as deer have generally been incidental to these systems, but recent economic pressures dictate that wildlife be included where present.

Research to provide the technology needed to implement multispecies enterprises involves interdisciplinary teams and must examine all resources of the region under consideration. The integrated systems approach required includes (1) component research to determine basic production data for soil, forage, and animal responses in different geographic regions plus the relevant sociological influences; (2) interaction research to study the relationships and interactions between components of the multispecies production systems; (3) integrated plant/animal-production systems research to develop management systems and techniques adaptable to the short-term and long-term goals of the people of the region plus the economics of the systems; and (4) technology transfer research to develop the educational and communications strategies and message components needed to inform selected audiences of physical and biological research findings and their applicability to various regions and situations.

Summary of Multispecies Education and Promotion Strategies—S.A. Ewing

Well-managed multispecies grazing allows more efficient use of land and feed resources than does single-species grazing. It thus improves the competitive position of enterprises dedicated to using ruminants for food and fiber products. This approach to land use may enhance the environment for wildlife and offers an effective means of biological control of many undesirable plant species.

Guidelines for developing programs to improve awareness of opportunities, benefits, and technology associated with multispecies grazing are:

(1) Prepare a document described as a prospectus on multiple-animal species management in improved resource use in agriculture.

(2) Prepare multispecies factsheets that amplify the major points in the prospectus.

(3) Make existing and additional management documents available for interested users.

(4)Develop educational materials for:

4-H, FFA, and other youth groups.

Any interested audiences.

(5) Each state is encouraged to identify producers who have successfully adopted multispecies grazing, research, and demonstration locations, and other possibilities for 'on-site' observations, field days, and shortcourses.

Deer Management on the Bonnie Hills Ranch

Cuatro Patterson

For many years, my forefathers have managed their own livestock to make sure the ranch was run well and the herds were always improved on. They personally made sure that any inferior or nonproducing females were culled, and they would also select the finest males they could find to sire the herds.

After a considerable amount of soil erosion (which resulted in the depletion of the better grasses) occurred on our ranch, my forefathers decided to embark upon range management. With the combination of livestock and range management, they felt that they were doing their utmost as far as range economics was concerned. One of the latest management practices they have embarked upon is that of deer management.

To the generation of my great-grandfather and grandfather, deer management was an unheard of practice. When they were young men, deer management was not anticipated because there were so few deer then that the deer herd was not considered an economic factor to the livelihood of ranching.

I would like to explain how and why we are trying to have a good deer management program on our Bonnie Hills Ranch, which is located in the hill country of the Edwards Plateau in South Central Texas. Our ranch, which we acquired in 1976, has been in the family for approximately one hundred years. The ranch had been under the ownership and management of my great uncle for many years, and during this time there was virtually no deer management on the ranch. The only established hunting guidelines were to allow the killing of bucks of eight points or more, and to disallow the killing of does and spikes.

After one year on the ranch we realized that the deer herd had been neglected. This was the first step in beginning the deer management program. However, before we could solve the problem we had to analyze it and determine the correct actions to take.

With the help of our county agent and the Texas Agricultural Extension Service, we learned that three tasks must be carried out to have an effective program. First, our herd should be within or below the carrying capacity of our range. If the herd exceeded the carrying capacity, we needed to reduce it to a proper level during the next hunting season or there would be too much competition among the bucks in the herd, resulting in poor development of antlers. Secondly, we needed to maintain a ratio of one buck to one or two does. This ratio has no magical properties; it simply allows you to carry the maximum number of deer and maintain the quality at the same time. Thirdly, the bucks taken should be only the very small and the very large. The middle age bucks should be left to grow, age, and develop massive antlers.

We began our program by making a spotlight census count each fall to determine how many deer were on the ranch and what the ratio of bucks to does was. After we had done this, we reviewed these findings with our hunters and entered into a five-year contract based on the apparent needs of our deer program.

Our census revealed that we had far too many deer for our carrying capacity. This meant that our hunters needed to kill a large number of does and inferior bucks. This was something we had never done before. In this contract with the hunters, we chose to limit the bucks killed the first two years to seven points or less. This plan would work in two ways. We would be eliminating many of the inferior bucks while leaving the larger ones to grow and serve as the herd sires. We promoted the killing of does by requiring each hunter to kill at least one doe before they could kill a buck.

A very important part of our deer management program was maintaining accurate records. We aged, weighed, and

measured all deer that were killed. These measurements included the spread, beam circumference, and the length of the main beam on all the bucks.

When we had collected all the data on each hunt, we would review this information with each group of hunters. Because of the records we kept, we could tell each individual about his kill.

Our hunters became so involved in our progress, they elected to continue the practice over the remaining three years of their contract. We continued our census and the collection of the data. The program began paying off sooner than we anticipated. By the fourth year, we were permitting the hunter to kill a trophy buck along with a doe and an inferior buck. They were most pleased with the results.

After five years of the deer management program, everyone associated with it feels that the original objective has been met and that the entire effort was totally worthwhile for both the hunters and the landowner. Our herds are improved along with the availability of forbs and browse. The ranch is now manageable and our hunters are involved. All of this allows us to deduce that our deer management program has been a success.

Saying the program had paid off sooner than we expected by no means implies that our job was finished. A deer management program is and will have to be continuing practice. It is a very rewarding project when you can see the remarkable improvement in your herd. Although an effective deer management program may be somewhat of a sacrifice for a period of time, the profits are high.

An effective deer management program now will not only generate benefits for our generation, but for the generations to come.

Editor's Note: The preceding paper by Cuatro Patterson received Third Place in the 1985 High School Youth Forum paper competition held at Salt Lake City, Utah. He is from Hunt, Texas.

Scientists Look For Speed In Quarter Horse Muscle

A clue to whether a horse should be on a race track or on a ranch is in the muscle, a New Mexico State University study is showing.

Drs. Tim Ross and Joe Armstrong, along with graduate student Craig Wood, are studying muscle fibers in racing Quarter Horses to find out whether successful horses have a different muscle fiber type than do horses that are not successful at the track.

"One of the ideas behind this research is to find a tool that can be used to determine whether a horse should be put in a certain training program—whether a horse would be a better sprinter than long-distance runner, for example," Wood said. "It also could give a breeder something to look at in addition to pedigree and conformation when he has to decide whether to sell or keep a yearling."

Samples taken from hip muscles indicate successfully raced Quarter Horses, those with a track speed index of more than 80, do have a different type of muscle fiber than unsuccessful Quarter Horses.

Scientist have identified three important muscle fibers. These are slow-twitch fibers which contract slowly and have the greatest oxygen supply; fast-twitch, low oxidative fiber which contract quickly due to their enzymatic makeup; and fast-twitch, high oxidative fibers which contract quickly and have high oxygen delivery.

Their research shows that successfully raced Quarter Horses have more fast-twitch, high oxidative muscle fibers than fast twitch, low oxidative fibers and a low percentage of slow-twitch muscles.

In contrast, unsuccessfully raced Quarter Horses have more fast-twitch, low oxidative muscle fibers than fast-twitch, high oxidative fibers. They also have more slow-twitch muscle fibers than do successfully raced horses.

The procedure used to take muscle samples for the study was not harmful to the horses and was reviewed by a veterinarian before being used, Ross noted.

Researchers inserted a biopsy needle into the same area of the middle gluteal muscle of each horse and took a sample about one-quarter of an inch long and one-eighth of an inch in diameter. A horse uses the middle gluteal muscle during running to push or propel himself through a stride.

Although each muscle sample was small, the samples were large enough to use in several lab analyses. Paper-thin strips were cut from each sample and stained so that muscle fiber types could be identified under microscopes.

While the scientists are confident this sampling procedure will not affect the racing performance of a horse, they chose retired racing Quarter Horses for this study. Horses from New Mexico horse ranches, including the Jones Ranch at Tatum, the T & R Racing Stables and NMSU Horse Center at Las Cruces, and My Rocking R Horse Farm at Berino, were sampled.

"Some of these horses had very good speed records; one had a speed index of 104," Ross said "We feel we had a very good distribution for this study."

Future studies will focus on whether samples from different locations of the middle gluteal muscle exhibit the same muscle fiber distribution.

Researchers also would like to sample yearlings and carry the research through training periods. The effect of training on muscle fibers is unknown, but might change the muscle fibers, Wood said.

"This sampling procedure has potential to be used as a guideline for what fibers to look for, but there's a lot of work to be done before it could be used to predict a runner," Ross said. —*Tina Prow*

Legislative Log

Legislative Log for December *Rangelands* as of October 31, 1985

The first session of the 99th U.S. Congress struggled with several issues including budgets. They were unable to pass the annual appropriation bills for F.Y. 1986 by September 30. As a result, a continuing resolution authorizing operations at the 1985 level, from October 1 through November 14, 1985, was passed. Congress had expected to adjourn by mid October but it now looks like some time in November or even later. Following are a few highlights on pending legislation and current issues.

Senate May Avoid Floor Battles on Fiscal 1986 Appropriations Bill

Faced with a bunch of nasty floor battles over the fiscal 1986 appropriations bill (HR 3011), key Republicans may take the easy way out and wait for a continuing resolution, lobbyists are speculating.

By this theory Sens. James McClure (R-Id.), chairman of the Interior Appropriations subcommittee, and Sen. Mark Hatfield (R-Ore.), chairman of the full appropriations committee, may opt to wrap the House version of HR 3011 into a multi-department continuing resolution.

McClure and Hatfield would still have to fight the House in a conference committee over such public lands issues as national forest roads and wild horses and burros. But the miniconference would be preferable to internecine warfare on the Senate floor, goes this theory.—*Public Land News.*

On the Fireline by Neil Sampson

The House of Representatives has finished its work on the 1985 Farm Bill and the Senate is due to begin debate sometime around October 24, so it appears that a Farm Bill by Christmas is a real possibility. Whether or not the President will veto the first attempt is still a question, of course, but our sources around Washington think that most of the major objections have been overcome, and the bill has a fair chance of passage.

For conservationists, this Farm Bill contains a major, historic departure in terms of USDA programs; one we are hopeful will succeed where prior efforts have not. This Farm Bill and water programs that tie conservation incentives directly to farm programs and the quality of the land involved. Both of these are important factors.

In previous years, farmers could get USDA program assistance on just about any land. It didn't matter whether it was a steep hillside that was causing severe erosion problems; a sand pile that was blowing and burying a neighbor's land; or a wetland that was vital to a community's water supply. If the farmer plowed it, he could get loans, commodity price supports, or cost-sharing from the federal government.

The 1985 Farm Bill is the beginning of the end for that situation. Within a decade, USDA is going to be out of the business of subsidizing bad land management. They won't prohibit it, but at least they will quit spending public money to promote it. That is good news for conservation.

The other good news is that the new conservation programs will probably not need a special appropriation before they can begin being effective. That has proved a major problem in recent years. In the 1981 Farm Bill, for example, several excellent conservation programs have never been implemented because there was no money available.

This year, the new Conservation Reserve (which we hope could result in several million acres of trees being planted on marginal land) will get its start under USDA's existing commodity program authorities. The Senate version is clear on this point; the House a little less clear. But what is clear is that Congress has bitten the bullet on conservation in the 1985 Farm Bill, and that is good news all around.—*AFA's Resource Hotline.*

Conservationists Say No to Rangeland Bill

A group of conservation organizations informed members of Congress in early September that a draft rangeland bill circulated by public land committee and subcommittee chairmen in the House and Senate was unacceptable to the organizations.

The draft bill, according to the organizations, was erroneously represented as consensus legislation, agreed upon by conservation interests and livestock interests using public grazing lands.

The coalition of conservation organizations told members of Congress that no such consensus had been developed because conservationists and livestock interests could not agree on two key issues, that grazing fees should be raised to their fair market value and that district grazing advisory boards should be abolished.—*Journal of Soil and Water Conservation.*

Water Pollution

Anyone who has worked with improving water quality in our nation can feel a pat on the back after reading this month's report from the Environmental Protection Agency. All the conservationists who have talked about the importance of 'fishable' and 'swimmable' waters can know that over three-quarters of the rivers, lakes and coastal water assessed are now in that category.

But the EPA report also talks about the unsolved problem of nonpoint source pollution. That pollution may come from agricultural lands, construction sites, forest logging or mining operations. Whatever the source, finding ways to halt this pollution is a major challenge for conservation districts, state agencies, and the Soil Conservation districts, state agencies, and the Soil Conservation Service.—NACD—Tuesday Letter.

Administration Firm on National Interchange, Yielding on O&C?

Administration officials say they do not intend to convert their Forest Service and BLM land exchange to a series of state-by-state proposals.

Key Hill aides freely predict that a national proposal, as the Forest Service and BLM have thus far constructed, will go nowhere in Congress. The Hill aides say it is not politically possible to trade, say, BLM land in Oregon for national forest land in Wyoming.

The politically acceptable way to do the job is with state-by-state recommendations, as in the Forest Service RARE II wilderness recommendations, the aides say. An administration official suggests Hill aides are splitting hairs. 'From a practical standpoint Congress is going to do it state-by-state no matter how we submit it,' one administration official told *Public Lands News*.

If the administration is unwilling to yield on a national recommendation, it may be willing to give on the most controversial of the Forest Service and BLM proposals — the transfer of O&C lands in Oregon and California from BLM to the Forest Service. BLM Director Robert Burford and Forest Service Chief Max Peterson met with Sen. Paul Hatfield (R-Ore.) October 10 on the issue, said an aide to Hatfield. No details of the Burford-Peterson presentation were available but the aide said a 'new proposal' was outlined.

BLM and the Forest Service have already backed off the transfer of the Prescott National Forest in Arizona. They are under intense pressure not to transfer the Big Horn National Forest in Wyoming, the Modoc National Forest in California, and the Toiyable and Humboldt National Forests in Nevada.

BLM and the Forest Service are still putting the finishing touches to interchange and an environmental statement that will accompany it. The agencies still must first submit their recommendations to the secretaries of Interior and Agriculture. Meanwhile, Congress continues to throw darts at BLM and the Forest Service. Both the House-approved version of the fiscal 1986 appropriations bill (HR 3011) and the Senate Appropriations Committtee version would provide no money to the agencies to carry out the interchange. And HR 3011 carries instructions not to move on the interchange until Congress says so.—*Public Land News*

Environmental Problems Confront Global Residents

Soil degradation through erosion, desertification, pollution, salinization, subsidence, and conversion of land to urban uses are among the serious environmental problems facing the world, according to the Organization for Economic Cooperation and Development, Paris, France.

Air and water pollution, noise, toxic chemicals, and hazardous wastes remain global problems and water, land, forest, and wildlife resources need better management, concludes OECD in its second report on the environment, 'The State of the Environment 1985.'

OECD in the report lauds progress over the last 15 years in cleaning up rivers, city air, municipal wastes, and protecting natural areas. But many 'black spots' remain, the organization says, including:

Air pollution from the annual emission of 55 million tons of sulphur dioxides, 37 million tons of nitrogen oxides, and 38 million tons of hydrocarbons in OECD countries.

Millions of households — 35 percent of the population in the United States, France, Germany, Sweden, and England and 65 percent of the population in Japan, Belgium, Greece, Italy, Portugal, and Spain — are without access to wastewater treatment facilities.

Intense traffic noise is the lot of 110 million people in OECD countries.

Hazardous wastes moved within and between countries and existing toxic chemicals pose serious health and environmental risks.

Erosion and desertification are affecting hundreds of thousands of square miles of farmland in OECD countries, principally in the United States, Australia, and Mediterranean countries.

On a global scale, impacts of chlorfluorocarbons on the ozone layer and increased carbon dioxide concentrations in the atmosphere have serious climatic implications.—*Journal of Soil and Water Conservation*

DEADLINE DATES FOR *RANGELANDS* AND *JRM*

Items such as columns, advertisements, announcements, lists, and reports must be in the Denver office by the following dates to ensure publication in the respective issues of *RANGELANDS:*

April—**March 5**
June—**May 6**
August—**July 2**
October—**Sept. 3**
December—**October 28**

Position announcements must be in the Denver office by the following dates to be published in the respective issues of the *JOURNAL OF RANGE MANAGEMENT:*

March—**February 5**
May—**April 9**
July—**June 4**
September—**August 8**
November—**October 8**
January 1986—**December 12**

Publications will normally be mailed by the 11th of the month of publication. Allow at least 2 weeks for delivery in the US.

Current Literature of Range Management

This section has the objective of alerting SRM members and other readers of **Rangelands** to 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 parentheses for each citation).

Common Herbaceous Plants of Southern Forest Range; by Harold E. Grelen and Ralph H. Hughes; 1984; USDA, For. Serv. Res. Paper SO-210; 147 p. (USDA Southern Forest Expt. Sta., T-10210 Federal Bldg., 701 Loyola Ave., New Orleans, La. 70113) Provides illustrations, descriptions, and evaluations for 125 herbaceous plant species of pine and pine-hardwood forests of southeastern U.S.

Conversion of Arizona Chaparral to Grass Increases Water Yield and Nitrate Loss; by Edwin A. Davis; 1984; Water Resources Res. 20 (11):1643-1649. (USDA, Rocky Mtn. For. & Range Expt. Sta., Ariz. State Univ. Tempe, Ariz.) The results of a study using karbutilate to bring about site conversion.

Eastern Redcedar in Oklahoma Conference: Proceedings, February 20, 1985, Stillwater, Oklahoma; by R.F. Wittwer and D.M. Engle (Eds.); 1985; Okla. Coop. Ext. E-849; 98 p. (Mailing Services, Okla. State Univ., Stillwater Okla. 74078; $3) Deals with the biology, ecology, and management in the Southern Great Plains of eastern redcedar, which is regarded as an effective species for windbreaks and conservation plantings but a pest on rangelands.

Equipment and Calibration: Granular Applicators; by L.E. Bode and S.L. Pearson; 1985; Ill. Agric. Ext. Cir. 1240; 10 p. (Bulletin Room, Coop. Ext. Serv; Univ. Ill., Urbana, Ill. 61801) A practical manual on applying dry, premixed granular pesticides.

Estimating Postfire Changes in Production and Value of Northern Rocky Mountain-Intermontain Rangelands; by David L. Peterson and Patrick J. Flowers; 1984; USDA, For. Serv. Res. Paper PSW-173; 19 p. (USDA, Pacific Southwest For. & Range Expt. Sta.: P.O. Box 245, Berkeley, Calif. 94701) Presents a simulation model along with evaluational results in six major rangeland types.

Flora of the Fort Stanton Experimental Ranch, Lincoln County, New Mexico; by Toutcha Lebgue and Kelly W. Allred; 1985; N. Mex. Agric. Expt. Sta. Res. Rep. 557; 132 p. (Bulletin Room, College of Agric., N. Mex. State Univ., Las Cruces, N. Mex. 88003) Includes identification keys from family to species, brief diagnosis for each species, and vegetative keys for woody plants and grasses.

Forage Yields Improved by Site Preparation in Pine Flatwoods in North Florida; by Clifford E. Lewis, Benee F. Swindel, Louis F. Conde, and Joel E. Smith; 1984; Southern J. Applied For. 8(4):181-185. (USDA, Southeastern For. Expt. Sta., Gainesville, Fla. 32611) Compared results over 3 years following two methods of timber harvest, two intensities of site preparation, and planting of pines.

Integrated Brush Management Systems for South Texas: Development and Implementation; by C.J. Scifres, W.T. Hamilton, J.R. Conner, J.M. Inglis, et al.; 1985 Texas Agric. Expt. Sta. Bul. 1493; 71 p. (Bulletin Room, Texas Agric. Expt. Sta., College Sta., Texas 77843) Presents an integrated, interdisciplinary approach to using brush control in an overall ranch management context.

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

Management of Subclover in Pine Forests; by Mark K. Johnson, Henry A. Pearson, Kenneth F. Ribbeck, and Lee G. Davis; 1985; La. Agric. 29(1):3-4, 24. (Agric. Expt. Sta., LSU Agric. Center, Baton Rouge, La. 70803) Concerns establishment, yields, and economics of growing subclover under pines thinned for sawlog production.

Market Values of Ranches and Grazing Permits in New Mexico, 1984; by L. Allen Torell and John M. Fowler; 1985; N. Mex. Agric. Expt. Sta. Res. Rep. 570; 10 p. (Bulletin Room, Agric. Expt. Sta., Las Cruces, N. Mex. 88003) Examines and discusses the current trends of ranch prices and grazing permits in New Mexico.

Modeling Dietary Preferences of Range Cattle; by Richard Senft; 1984; Amer. Soc. Anim. Sci., West. Sect. Proc. 35:192-195. (Utah State Univ., UMC 48, Logan, Utah 84322) Presented and evaluated preliminary, predictive models of dietary preferences as correlated with crude protein content and availability of forage plants.

Nebraska Poisonous Range Plants; by Patrick E. Reece and Charles P. Moser; 1985; Neb. Coop. Ext. Cir. 85-198; 12 p. (Bulletin Room, College of Agric., Univ. Neb., Lincoln, Neb. 68503) Presents information on Nebraska poisonous plants and how they affect livestock; especially for use by livestock producers and veterinarians.

Plant Growth Regulator Effects on Forage Quality of Tall Fescue and Bermudagrass; by J.J. Slade and J.H. Reynolds; 1985; Tenn. Farm & Home Sci. No. 134, p. 19-23. (Bulletin Room, College of Agric., Univ. Tenn., Knoxville, Tenn. 37901) Evaluated the effects of chlormequat, glyphosine, mefluidide, ethephon, and endothall on forage yields and organic matter constituents.

Plant Succession Following Control of Western Juniper (*Juniperus occidentalis*) with Picloram; by Raymond A. Evans and James A. Young; 1985; Weed Sci. 33(1):63-66. (USDA, Agric. Res. Serv., 920 Valley Road, Reno, Nev. 89512) Quantified the changes in species composition and production of herbaceous vegetation following control treatment.

Potential Returns for Landowner Management of Wildlife; by James E. Knight; 1985; N. Mex. Agric. Ext. RITF Rep. 19; 19 p. (Bulletin Room, Col. Agric., N. Mex. State Univ., Las Cruces, N. Mex. 88003) Presents five economic return strategies for landowners through wildlife.

Private Rangeland Improvement in the Great Plains: An Analysis of Investment Needs in 1985 and 1990; by Giles T. Rafsnider, Melvin D. Skold, and Donald T. Pendleton; 1985; J. Soil & Water Cons. 40 (4):367-369. (USDA, Econ. Res. Serv., Washington, D.C.) Investment estimates based on projections of rangeland acreages converted to cropland and projected growth in beef cattle numbers.

Reclamation on Utah's Emery and Alton Coal Fields: Techniques and Plant Materials; by Robert B. Ferguson and Neil C. Frischknecht; 1985; USDA, For. Serv. Res. Paper INT-335; 78 p. (USDA, Intermtn. For. & Range Expt. Sta., 507 25th. St., Ogden, Utah 84401) Presents conclusions from several studies on alternative methods of site preparation and broadcast seeding, soil amendments, and plant species.

Renovating and Reseeding Mountain Range and Pasture with No-Till Methods; by Daniel J. Drake, Roger W. Benton, and Donald Lancaster; 1985; Univ. Cal., Davis, Range Sci. Rep. 4; 4 p. (Coop. Ext., Univ. Cal., Davis, Cal. 95616) General guidelines for using no-till plant establishment techniques.

A Revised Checklist of the Plants of the San Joaquin Experimental Range; by Jeanne Hebert Larson, John Stebbins, and William L. Porter, Jr.; 1985; Calif. Agric. Tech. Inst. CATI/850303; 38 p. (School of Agric. & Home Econ., Calif. State Univ., Maple & Shaw, Fresno, Cal. 93740) A revised checklist of botanical and common names along with minimal habitat, flowering period, and abundance information.

Selected Forage Values of Understory Plants in Thinned Cove Hardwoods on Three Sites; by Richard F. Harlow; 1985; USDA, For. Serv. Res. Note SE-328; 5 p. (USDA, Southeastern For. Expt. Sta., 200 Weaver Blvd, Asheville, N.C. 28804) Established baseline nutritive values of selected deer forages and related to nutritional adequacy during late summer.

A Summary of Research at the Manitou Experimental Forest in Colorado; by Howard L. Gary; 1985; USDA, For. Serv. Gen. Tech. Rep. RM-116; 24 p. (USDA, Rocky Mtn. For. & Range Expt. Sta., 240 W. Prospect St., Fort Collins, Colo. 80526) Reviews past research on grazing management and watershed management and describes current research at the Manitou station.

Utah Flora: *Chenopodiaceae;* by Stanley L. Welsh; 1984; Great Basin Nat. 44(2):183-209. (Dept. Botany & Range Science, Brigham Young Univ., Provo, Utah 84602) Describes the family and each of its genera and species occurring in Utah; provides keys to the 18 genera, 56 species, and 13 infraspecific taxa included.

Vertebrate Fauna of the San Joaquin Experimental Range, California: A 50-Year Checklist; by Don A. Duncan, Lyman V. Ritter, and Thomas F. Newman; 1985; Calif. Agric. Tech. Inst. CATI/850901; 41 p. (School of Agric. & Home Econ., Calif. State Univ., Maple & Shaw, Fresno, Cal. 93740) This works updates earlier checklists, provides additional information, and includes new species sighted.

Weed Control and Revegetation Following Western Juniper (*Juniperus occidentalis*) Control; by James A. Young, Raymond A. Evans, and Carl Rimbey; 1985; Weed Sci. 33(4):513-517. (USDA, Agric. Res. Serv., 920 Valley Road, Reno, Nev. 89512) Evaluated weed control and revegetation techniques in western juniper woodlands following control by herbicidal, mechanical, and wood-harvesting procedures.

Who Gains (or Loses) When Big-Game Uses Private Lands? by Darwin B. Nielsen, Denny D. Lytle, and Fred Wagstaff; 1985; Utah Sci. 46(2):48-51. (Bulletin Room, Coll. of Agric., Utah State Univ., Logan, Utah 84322) Examined costs and related benefits of big game animals on private lands and related to future changes in size of local herds.

President's Notes

During the second week of September, I traveled with the Alberta Farm Writers on their tour down north to the Peace River country. We departed from the Edmonton Municipal Airport on September 11, at 4:00 p.m. We headed northwest over the town of Peace River, then followed the MacKenzie Highway to High Level where we bedded down for the night.

The MacKenzie Highway was constructed between 1945 and 1947. It was to service a vast area east of the Alaska Highway, opening up new areas for farming, lumber and mining while connecting Ft. Vermillion to the outside world. The only previous connection of this area was by the Athabasca River which flows north and was a good method for bringing supplies down the river from Ft. Edmonton, but was not much use for pushing products upstream to markets. There was a winter road that helped some and then, of course, there were airplanes.

High Level was established after 1950 and services a large farming area. Agriculture has a long history in the North Peace River region beginning in the later part of the 17th century around the settlement of Ft. Vermillion. The Catholic mission there played an important role in the development of the area, supplying garden produce and flour from grain growing in the area, which was ground in their own mill, to European and Indian inhabitants. A wheat sample sent from here won world honors at the Centennial Exhibition in Philadelphia in 1876. We saw a billboard in the town advertising their 200th year of farming in this area. This celebration will be held in the month of July, 1986.

This area is more than 800 miles north of the border crossing at Coutts and is over 2,500 feet lower in altitude than Calgary. In the middle of summer they get long hours of sunlight — up to 20 hours at the peak — so they have long days.

Flying over the area at this time of year, when the trees are wearing their fall colors, is breathtaking. The dark pines and spruce mixed with the fading green of the tamaracks that are ready to drop their needles, surrounded by cottonwoods in their orangey-green and on the higher ground, the abundance of aspen with colors of dark green tapering into light yellow, then solid gold with some pink, the deeper red of the dogwood and chokecherry bushes, broken only by the blue waters of the lakes and rivers stretching forever it seemed into the horizon, was I think, the most striking of any view that I have ever gazed upon. Yes, even more than the Gateneau Hills of Quebec. The only thing more satisfying is the view of the rangelands with hills, valleys, streams, and a population of livestock.

I would like to mention the membership renewal that was mailed a short time ago. It needs a payment to go with it. It reminds us how much good we receive from belonging to the SRM. If you have beefs or bouquets or even some ideas that you think the SRM could use, write them down and send them along. We need to have more input from members and this would be a nice time to get it done. Another reminder is to fill out the membership data so the computer can get on stream. Above all, mail early and keep your journals coming. We have found that some of the lost journals occur because of late renewals.

At the end of October, I am away to visit with the New Mexico Section; on the 3rd of November, I am going to Orlando to meet with the Annual Meeting Committee and see first hand the facilities for our February meeting; on the 5th, I am booked to go to the National Range Conference in Oklahoma, and; on the 8th I will be in Denver at the meeting of the Colorado Section. I hope to get a little time at the Denver office when I am there. How much simpler it was when I could just drive to Lethbridge to the International Mountain Section and be home the next day.

I am looking forward very much to attending these meetings and visiting with the members in their own localities. I have not been able to travel as much as I would have liked, but I have used the phone and my phone bill has gone up. When I pay these in Canadian funds it gives the Society a good discount on the exchange.

I do hope that the attendance at the National Range Conference in Oklahoma doesn't stop some of our members from going to the Annual Meeting in Florida. The committee down there has worked real hard to assemble a good program and need a good turnout to make it work, so stretch your budget a little and attend both meetings. **—Edward A. McKinnon,** President, SRM

The Executive Vice-President's Report

It's December and another year is coming to an end, which reminds me of an old hired man we had on the ranch for many years. Every December Christy would say, "Darn it, Mr. Pete, winter is almost here. It sure makes a man wonder where his summer wages went." I guess we all have those thoughts, but after you have the opportunity of working in the South or Southwest in the autumn time, it really comes home to you.

I have had the privilege of participating in Section Meetings, conferences, and reaccreditation visits this fall down there, and it was pleasant to say the least. When the time comes to decide which college or university to attend or send your children to, the ones that SRM has accredited are hard to beat, especially in the Southern areas in the winter and the North in the summer. Perhaps that is why we have so many address changes to make every year. What do you think?

While I'm on the subject of winter or the end of the year, we have just about completed the annual maintenance of the Denver Headquarters. I believe you will be pleased when you stop by to find the parking lot freshly paved, the building painted, and our heating system renovated. These chores are expensive but very necessary if we are to keep up the value of our property.

I'm pleased to report that the 1986 dues are coming in in good shape. I would like to thank everyone who paid early or on schedule. It certainly makes the office work more smoothly and saves time and money.

We have also had a good response on the completion and return of the green information sheets. Thank you for that also.

But please don't let down. We need help from the other members who for some reason haven't gotten around to sending in their material. The sooner it comes in, the sooner the staff can have our computer membership program up and going.

Speaking of dues, you might be interested to know that a good number of members have sent in contributions to the Endowment Fund with their dues. These contributions not only show the loyalty and support of our membership but hasten the day when the income from the endowment will make a major impact on the SRM budget. I feel that I can express the gratitude of everyone in SRM to these generous people.

Orlando—I'm really pleased that so many folks have indicated to me that they will be there in February. If you haven't checked it out carefully, particularly in the October *Rangelands*, you will find that in spite of the distance and keeping in mind modern day costs, it is not an overly expensive Annual Meeting. But when you consider all the opportunities for pleasure and seeing a very unique part of our nation it's a down-right bargain.

Also, don't let those kids get ahead of you. At every school or Section Meeting where I have had the chance to visit with them, they have simply taken the bit in their teeth and figured out a way to get there.

There is no question that I enjoy traveling to Section meetings and representing our Society, but it certainly raises havoc with my office schedule, particularly with the time it takes to read our Journals, but I get it done.

I hope you people, especially the producers, have taken the time to go through the September *JRM*. If you haven't yet, let me recommend just one article to get you started. On page 395 there is an article that a lot of ranchers who are having trouble should have read. It is titled 'The Influence of Several Range Improvements on Estimated Carrying Capacity and Potential Beef Production.' Now that is only one and you will find others which are equally good, so give it a try. Those graphs and tables won't hurt you.

I hate to close on a down note, but darn it, we can all do better on signing up new members. I'm going to think of something to get you all going. It just isn't that hard and we really have something to offer, so please give those membership people a hand. They are working like dogs, or at least they keep telling me they are, and they need you badly.

Well, thanks again for all your confidence. I may not say so often enough, but I truly appreciate it.—**Peter V. Jackson**, Executive Vice President, SRM

Frasier's Philosophy

At a recent range workshop, the question was raised as to why the ideas discussed were not being used in actual practice. The ideas presented were technically sound and probably the proper approach. There were probably several reasons for not implementing ideas but I do know that in some instances the technical information is not compatible with the local social and economic factors. Let us remember that the user of the land stays behind when all the "experts" leave. For a user to adopt a practice or idea it must be (A) technically sound, (B) economically feasible, and (C) socially acceptable. The user must be able to live with the results in bad times as well as in good times.

Work hard and save your money and when you are old you will be able to buy the things that only the young can enjoy. —Bits & Pieces, The Economic Press, Fairfield, New Jersey

NOTICE TO MEMBERS

A Glossary of Terms Used in Range Management is being revised. Members are urged to submit suggested terms and definitions for consideration by the committee. Examples of terms not presently included in the **Glossary** include: Riparian, paddock, cell, remote sensing, reclamation, motte, and mixed brush.

Can you think of other terms that should be included? If so, please send your list of terms and suggested definitions to:

Pete W. Jacoby, Jr.
Chairman, Range Term Glossary Committee
P.O. Box 1658
Vernon, TX 76384

Statement of Ownership, Management, and Circulation

(Act. of August 12, 1970, Sec. 3685 Title 39, United State Code)

1. *Title of Publication:* Rangelands
2. *Date of Filing:* September 24, 1985
3. *Frequency of Issue:* Bimonthly
4. *Location of Office of Publication:* 2760 West Fifth Ave., Denver, Colo. 80204
5. *Location of General Business Office:* Same
6. *Name and Address of:*
   Publisher: Society for Range Management, 2760 West Fifth Ave., Denver, CO. 80204
   Editor: Gary Frasier 780 W. Cool Dr., Tucson, Ariz. 85704
   Managing Editor: Peter V. Jackson III, 2760 West Fifth Ave., Denver, Colo. 80204
7. *Owner:* Society for Range Management, 2760 West Fifth Ave., Denver, Colo. 80204
8. *Known Bondholders, Mortgagees, etc:* None
9. *For Completion by Nonprofit Oragizations Authorized to Mail at Special Rates:* The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purpose have not changed during preceding 12 months.
10. *Extent and Nature of Circulation*

	Avg. for 12 months	Actual for issue nearest filing date
A. *Total copies printed*	5,991	5,800
B. *Paid Circulation*		
1. Dealers, counter sales	0	0
2. Mail subscriptions	5,176	5,107
C. *Total paid circulation*	5,176	5,107
D. *Free distribution*	15	9
E. *Total distribution*	5,191	5116
F. *Copies not distributed*	800	684
G. *Total*	5,991	5,800

I certify that the statements made by me above are correct and complete.—*Peter V. Jackson,* Exective Vice President.

The 1986 SRM Annual Plan of Work

Fee Busby, First Vice President

Other articles in this section discuss the long-term plan of the Society and the committee structure designed to accomplish the plan. Using the long-term planning process allows the officers, the committees and the Denver Executive Office to maintain a steady, consistent program of managing the Society and promoting the profession of range management. The long-term plan is accomplished through the actions of all Society members, but it is the organized work of the appointed committees, elected officers, and paid staff that provides the solid base for our growth and development.

Each President of the Society uses the long-term plan to guide the development of an Annual Plan of Work. The purpose of this article is to share the major components of the Plan of Work I have recommended for 1986. I have not listed all of the proposed actions that will be conducted this coming year. Much of our work is vitally important organizational maintenance that has been described in the Committee Purpose Section of the accompanying article. I have listed major actions that I have recommended we accomplish this year. I have not listed them in any priority order. Not all committees and groups are identified. Omission of a group should not be interpreted as a low priority for the group because if all committees and groups don't perform their basic purpose well, the Society will not be strong enough to accomplish the major thrusts. I have also encouraged each committee to identify and implement major thrusts committee members believe are important to the SRM.

An important action the Officers and Denver Office must take is improved communication of Society business to all members. This and the other articles in this section are an attempt to do this. You are going to soon see additional news of Society business distributed through the *Rangelands* and *Journal of Range Management* mailings. Promotion of the profession of range management by the SRM cannot be successfully accomplished unless all Society members are well informed about Society activities.

Also, membership in the Society is not rewarding for the individual unless he or she feels informed enough of SRM activities to become active at the Section or Society level. In addition to our effort for improved communications with all members, the Denver Office has changed the job of one staff member from clerical to membership service. These new efforts, plus work by the Membership Committee in member recruitment and retention, should allow the Society to experience steady growth during the next several years.

The officers must do a better job of conducting Society business. This certainly includes our becoming better organized and better time managers so more can be accomplished in the time available for meetings. We must help committees and the Advisory Council so decisions can be finalized and put into action in a more timely fashion. We have already taken actions to communicate assignments to committees and other groups and will work throughout the year to facilitate communication among the committees and groups who do the bulk of the SRM work.

We need to develop more and better leaders for the Society. We particularly need to work on this at the Section level. I firmly believe that the "rubber hits the road" in the Sections. This is where grassroots efforts are so important to inform decision-maker and the general public about rangeland use and management. If we are not effective at the Section level, then our work to promote range management in Washington, D.C., Mexico City, Ottawa, and other national capitols will only be partially successful. The Advisory Council which is made up of Section officers needs to establish leadership development as one of its major goals.

The Society must become a more effective voice for the profession of range management. We must do a better job of explaining rangeland use and management to the general public and to policy makers. The Information and Education, Public Affairs, Planning, and Finance Committees have been asked to develop specific plans to guide the SRM in establishing paid public information and national office liaison staff positions. Previous committee actions indicated this is the direction the SRM should take to expand our public and policy education efforts.

The Society for Range Management dropped "American" from its name in 1971 to indicate that rangelands were a worldwide resource and the Society was an international organization to promote proper management and use of these lands throughout the world. We have made progress since that time to develop a more international orientation toward our work, but I think we still have a long way to go. I have asked the Affiliations Committee to determine if there are international organizations with which we should have an official affiliation. For instance, I believe if we are going to be officially affiliated with the National Cattlemen's Association of the United States, then we should also be associated with the cattlemen's organizations in Canada, Mexico, and other nations having a large membership in the Society. I have also asked the Affiliations Committee to review the appropriateness of some of our current affiliations.

I have asked the International Affairs Committee to make a special effort to get the **Journal of Range Management** into libraries of foreign universities where range management or closely related disciplines are taught. All of our committees have been asked to consider how they can give more attention to the international issues.

The SRM has a very active student membership. The Society has done a good job of providing activities that allow our students to participate in the SRM. The Society needs to expand job opportunities for these students. Efforts need to be taken to explain to prospective employers the qualifications possessed by the range management graduate and to

determine jobs range graduates would qualify for if minor changes were made in the standard curriculum. The Employment Affairs and the Student Affairs Committees have been asked to lead these efforts. In addition, the Employment Affairs Committee and the Denver Office have been asked to explore the feasibility of establishing a computerized, phone accessible, range jobs bulletin board. Such a computerized bulletin board would allow a much more timely handling of vacant positions and job wanted announcements.

In addition to expanding the job market for range graduates, I believe it is time the SRM, through the Professional Affairs Committee, evaluates the impact of three programs the Society initiated in previous years. In 1975-79, the SRM led the way to have standards for the U.S. Government Range Conservationist positions upgraded. We completed an evaluation last year on the effect this change had on educational programs. I think we need to determine what effects, if any, upgrading of standards has had on the range management profession. Similar evaluations need to be made relative to the Range Consultant Certification and the Range Curriculum Accreditation programs.

The Society must expand through the Research Committee its efforts to increase funding for rangeland related research and extension education. It often seems foolish to have our Public Affairs Committee, Washington Liaison, Executive Vice-President, and others working with various decision-makers to educate them about the pros and cons of proposed legislation or administrative actions when we really don't have the necessary research base to address the issues. Until research efforts are expanded, I see many range management decisions based on emotion rather than fact. I believe the SRM as a professional organization has a responsibility to see that adequate research information is available and that the information is shared through extension education programs.

I believe the SRM must continue to monitor legislative and administrative actions that will affect the use and management of rangelands. The Public Affairs Committee must develop educational statements in response to proposed actions so that Society policy and positions are considered in the policy development process. I have challenged the Public Affairs Committee to determine how we can expand our policy education efforts beyond the United States. This is certainly a priority effort if we are to become an effective international organization.

In summary, the SRM has a good long-term plan. I believe that the actions I've described above are consistent with the long-term plan and are legitimate priorities for the SRM to seek to accomplish in 1986. I know that I am going to enjoy working with the many SRM members who will dedicate their time and effort to these projects. Please let me know if you see problems in the program I've recommended for 1986 or if you believe our planning process has missed important issues or activities that the SRM should address. The Society belongs to you — the membership. Your elected, appointed and paid leadership needs your guidance.

Society for Range Management Organization and Planning

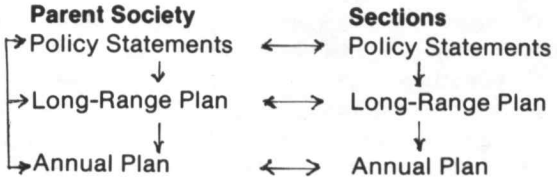
Jack R. Miller, Second Vice-President

We have long recognized the importance of annual and long-range plans for charting the direction of the SRM and maintaining continuity from year to year. This is especially important in our Society because of the decentralization of the Section activities and change-over of officers and committee membership.

With this in mind, the SRM Planning Committee has developed a planning package for use by the officers, committee chairmen/women and Sections which includes a planning process, long-range plan and provision for annual plans. The planning package has been approved by the Board of Directors with the recognition it is a dynamic process that must be reviewed and updated currently.

The Board of Directors feels all members should be aware of the planning direction of the SRM so that we may be more effective in pulling together toward common goals. To that end, a brief summary is provided for your information.

Planning Process:



SRM Mission

To promote recognition and understanding of range environments throughout the world; to foster public understanding and appreciation of the economic and social benefits derived from proper use and management of the range resource; and to provide for services and activities that will enhance knowledge and expertise of range managers.

SRM Long Range Plan

Goal 1: Gain Recognition of the Value and Importance of Rangelands.

Objective A - Develop Policy and Statements

Objective B - Develop and/or update position statements for distribution and use by Society, Sections, and Members.

Objective C - Provide and maintain full-time Washington, D.C., liaison for United States and work towards establishing liaison positions in other provincial/national capitals.

Objective D - Review and provide technical comment on effects of proposed agency regulations and policies on range resource and uses.

Objective E - Provide technical review of range (grazing) proposals being considered by legislative bodies: provincial, state, or national.

Objective F - Develop and maintain a list of key individuals and groups involved in rangeland legislation and policy decisions at national and state levels.

Objective G - Emphasize professional contacts with larger range operators and absentee owners to gain maximum return in resource improvement.

Goal 2: Gain Recognition of the SRM as the Respected and Authoritative Leader For Management of Rangelands.

Objective A - Work with Federal & State resource management agencies to develop a national range extension policy that provides for the dissemination of range and grazing technology to livestock producers and others.

Objective B - Promote coordination, cooperation and consultation with related natural resource organizations and efforts which will further the goals and ojective of SRM.

Objective C - Provide mechanism to recognize contributions to range management through various incentives and media outlets.
Objective D - Provide employment services for those desiring to utilize such an opportunity.
Objective E - Provide additional information concerning range management and commodity outputs that can be derived from it to urban populations, particularly schools and youth groups.

Goal 3: Encourage a Sound Basic and Applied Research Program Aimed at the Expansion of Rangeland Management Knowledge.
Objective A - Establish research needs priorities from an international standpoint.
Objective B - Work with agencies, schools, and other organizations to insure that high-priority recognition is given to range research needs.
Objective C - Seek standardization of range management terminology and range inventory guidelines.
Objective D - Summarize current state-of-the-art technology for efficient inventory and monitoring of range resources, i.e.: satellite imagery, computer programs, etc.
Objective E - Make available to range managers guidelines and suggestions for use of current technology.

Goal 4: Strengthen and Improve Society Membership Base and Operations to Better Accomplish Long-Range SRM Objectives.
Objective A - Achieve a membership of 10,000 by 1990.
Objective B - Attract and retain membership.
Objective C - Adapt to recognition that a smaller base for new members is resulting from decreased university enrollments/graduations and from decreased job opportunities in governmental agencies.
Objective E - Provide Sections with membership recruitment material.
Objective F - Review SRM Articles of Incorporation and By laws for adequacy in dealing with present day needs and issues, plus business-management needs.
Objective G - Conduct annual communications workshops for Section Newsletter Editors and other interested members. (I & E and newsletter workshops merged.)

Goal 5: Provide Opportunities for Technology Transfer for all Those Interested in the Science And Application of Range Management Information.
Objective A - Publish Journal of Range Mabagement.
Objective B - Publish Rangelands Magazine.
Objective C - Publish special publications relating to the art and science of range management.
Objective D - Reprint pertinent publications.
Objective E - Increase subscriptions to the Journal of Range Management and Rangelands.
Objective F - Implement ongoing publications policy.
Objective G - Assure continued high quality of SRM publications (non-journals).
Objective H - Work to develop compatibility and exchange of published resource information among countries.
Objective I - Reorganize and make available for use the SRM library (now boxed at Utah State University). Library of USU - custodian.
Objective J - Establish SRM as the focal point for range science information.
Objective K - Assist in establishing and maintaining a computer-based technical information file named CORR (Communication on Renewable Resources). The cost of creating original records is to be borne by the Forest Service, BLM, SCS, and BIA.

GOAL 6: Maintain SRM in a Financially Sound and Growing Situation with Adequate Denver Staff and Facilities.
Objective A - Develop and execute an efficient personnel, financial, and facilities program.
Objective B - Develop alternate funding sources to conduct SRM programs.

GOAL 7: Develop SRM Program to Provide a Basis for Increasing and Improving the Professional Level of Individuals and Institutions Associated with the Science and Management of Range.
Objective A - Actively seek and promote establishment of range curricula in universities/colleges outside of the United States.
Objective B - Maintain Range Consultant Certification Program to provide service to those wishing to qualify.
Objective C - Provide Range Course Accreditation Program for schools offering range management curricula.
Objective D - Provide technical support to Office of Personnel Management on rating criteria for Range Conservationists.
Objective E - Provide for continuing education opportunities.
Objective F - Support and promote establishment of additional opportunities for professional activity.
Objective G - Foreign membership category.
Objective H - Provide activities and training for youth by SRM-sponsored events.
Objective I - Locate and develop opportunities for SRM input into youth activities of other organizations.

Society for Range Management Committee Purposes and Structures

by K. Rene Crane, Administrative Assistant

The purpose of this article is to outline the objectives and structure of committees utilized by the Society for Range Management in the development, as well as the accomplishment, of SRM goals and objectives. These committees are only briefly described here as to their basic functions and assignments; however, upon request from the SRM office more specific information can be provided.

The standard committee membership consists of nine members, three members appointed each year for a three year term by the First Vice-President. Their terms of service will begin in the year the First Vice-President shall preside. There are three basic types of committees: standing, ad hoc, and advisory. Standing committees are designed to fulfill the ongoing needs of the Board of Directors and the Society on a continuing basis, while ad hoc committees are normally established to fulfill specific needs of the Board of Directors and are appointed by the President to complete their assignment during his term, unless the committee is continued at the request of the Board. Sub-committees are normally a function of standing committees. The advisory councils, panels, and boards are requested to make recommendations based on special areas of experience on behalf of members.

Standing Committees are as follows:

Annual Meeting Committes (appointed by the President, the members of which are representative of the specific geographic location approved by the Board of Directors for the SRM Annual Meeting) plans, coordinates and manages all facets of the Annual Meetings.

Budget Committee (composed of the officers of the Board of Directors and the Executive Vice-President) establishes, reviews, and analyzes the Society's budget to ensure that it is balanced annually.

Election Committee (appointed with four members from the Denver area, plus the Executive Vice-President) counts ballots and verifies election results for the position of Second Vice-President and two positions for Director.

Employment Affairs Committee (standard) designs and implements programs promoting the employment of professional range managers. Establishs or improves programs which are aimed at communicating job opportunities to employers and employees through advertising in SRM publications, provides interview services at the SRM Annual Meetings and contacts; filed and maintained at the SRM office.

Finance Committee (six members, appointed to serve indefinite terms) develops, reviews and analyzes the financial policies and positions of the Society, as well as potential funding.

Honor Awards Committee (standard) provides the Board of Directors with recommendations for award presentations to be made on behalf of the Society. In addition, the committee makes nominations from the SRM membership for awards presented by affiliated interest groups.

Information and Education Committee (standard, additional representation from each of the Sections) promotes recognition of the value of proper range management and of SRM as the source of professional expertise on range management practices. Develops and implements programs of an informational and educational nature to be used by the Society, as well as the general public.

International Affairs Committee (standard) provides information and guidance to the Board of Directors as to the international aspects of range management and positions the Society may consider relative to these matters.

Membership Committee (standard, with representation from each of the Sections) reviews, analyzes and implements programs on membership needs, policies, recruitment and retention.

Nominating Committee (standard) annually provides the Board of Directors with nominations for the positions of Second Vice-President and two Directors.

Planning Committee (seven members, with two members being appointed each year to serve three years, plus the Executive Vice President) develops and reviews short-term goals and long-range objectives, as well as priorities and procedures for accomplishing these goals and objectives.

Producer Affairs Committee (standard) advises and councils the Board of Directors on the pertinent needs and issues of range livestock producers that require SRM attention.

Professional Affairs Committee (standard) develops programs for improving professional standards and professionalism of range managers, as well as promoting public awareness of the need for continued quality range management.

Public Affairs Committee (standard) develops resolutions, position and policy statements to be used by the Society on public policy education programs.

Publications Committee (standard) recommends to the Board of Directors those publications which should be sponsored and/or financed by the Society, as well as developing standards for publication quality.

Research Affairs Committee (standard) emphasizes, coordinates and prioritizes the need for range research and related projects on a national and international level.

Student Affairs Committee (standard, with various activity leaders) develops, coordinates and implements student activities such as the High School Youth Forum, University Student Conclave, Plant Identification Contest, Range Management Comprehensive Examination, and Graduate Student Contest.

Boards, Panels, Councils, Liaison

Advisory Council (Past President, President, President-Elect of each Section) serves in an advisory capacity to the Board, recommending actions and/or policies to the Board as representatives of the membership at large.

Council of Past Presidents (SRM Past Presidents) serves in an advisory capacity on the preservation of SRM history, endowment fund management and general promotion of the art and science of range management.

Affiliations (appointed) serves as SRM liaison to other related professional societies and/or associations.

Editorial Board — Journal of Range Management (Editor, plus 12-member board appointed to serve two years) obtains, reviews and selects professional articles to be published in the JRM.

Editorial Board — Rangelands (Editor, plus 12 member board appointed for three-year terms) provides high quality articles for publishing through soliciting, reviewing and editing.

Range Management Consultants Certification Panel (appointed for indefinite terms) reviews and recommends actions on applications from potential range management consultants.

Range Curricula Accreditation Panel (appointed for indefinite terms) evaluates applications from colleges and universities for accreditation.

Any women interested in filling out a questionnaire on women in the profession of range management, please contact: Katherine A. Mitchell, Box 614, Mesilla, NM 88046.

Montana's Tried-and-True Range Education Program

What keeps a range education program alive for nearly ten years? Many Montanans could answer that question. They've watched "Montana Range Days" grow from a two-day event with forty participants to a three-day program drawing three hundred people!

Chuck Pluhar was Garfield County Range Committee chairman at Jordan in 1977. That committee decided to invite most of eastern Montana to their range tour, and so Montana Range Days was begun. They hosted the event again in 1978 and decided it should be rotated to a different community every two years. Five county range committees have taken a turn at producing Montana Range Days since then.

Promotion by Northern Ag Network of Billings has made "Montana Range Days" a household word across the state. Taylor Brown and Conrad Burns talk about MRD on their radio farm broadcast several times a day the month before the event. They bring broadcasting equipment to Range Days and include interviews with participants as they air their regular broadcast. Northern Ag Network is also the main fundraiser for MRD. They contact statewide agribusinesses and ag organizations for support.

Getting funds together is a big concern for the local MRD committee. The $10,000 budget covers meals, supplies, publicity, and awards. Besides Northern Ag Network's fundraising, the committee members drum up local support. This year two grants were received from Burlington Northern and from a State fund. Donations keep the registration cost per participant down to $15.00.

Twenty people form the committee that started planning for Range Days to be held in Baker, Montana, two years ago. After putting on the show in June of 1985, they are ready to make the tenth anniversary Range Days next year better than ever. Committee assignments are made early-on in the planning, and members follow through on their duties throughout the year. This makes preparations go smoothly, and committee members are enthused about working on a project that promotes their livelihood.

Next June, grade school and high school students and adults will gather for the tenth annual Montana Range Days. Some will enter the speech contest, where the winner goes on to national competition at the Society for Range Management meeting. 4-H and FFA teams will vie for a trip to the Old West Regional Range Judging Contest. Nine-to-thirteen year-olds will get a chance to hear first-hand what range specialists have to say about range management. Many of the participants have been to previous Range Days, and many will return again.

Thirty instructors from various government agencies, universities, and private range-related businesses lead workshops on plant identification, plant growth, geology and soils, range sites, condition, and stocking rates, and range planning. Participants rotate in groups through the workshops, breaking for socializing and good meals of range-fed lamb and beef. The last day of the event, everyone enters competition for awards. Plaques made by local FFA chapters are given to the winners.

Since Baker is so close to North and South Dakota and Wyoming, those states have been invited to attend. This effort increases communication between the states, and promotes Montana's very successful range education program. We Montanans are proud of Montana Range Days, and we think every state should have a program like this! **—Jan Weight,** SCS Conservationist

California's Youth Camp

The first Range Youth Camp was held June 18-24, 1985, at the Elkus 4-H Ranch, Half Moon Bay, California. Nine young people enrolled from many different locations in California. The campers learned about range history in California, plant identification, range cattle and sheep production, range wildlife, range planning and operation, water development, fencing, prescribed fire, forest grazing, range management on public lands, and careers in range management.

The instructors for camp were from the University of California, Berkeley and Davis, U.S. Forest Service, Cooperative Extension Farm Advisors, California Department of Forestry, U.S. Soil Conservation Service, and Rancher Pat Rookus from Half Moon Bay.

Most of the students were sponsored by California Resource Conservation Districts. The RCD's sponsoring young people to the range youth camp were: Yolo County RCD, Florin RCD, Mojave Desert RCD, Mariposa County RCD, Fall River RCD, and Santa Maria Valley RCD.

All campers were awarded certificates of completion. The top two campers were given special certificates of merit and special belt buckles from the California Section, the Society for Range Management. The San Mateo County RCD presented a $50 savings bond to the top camper.

Mary Kimball, Woodland, California, was first place camper and Thomas Tilton, Jr., was runnerup from Mariposa, California. Mary will be the California delegate to the Range Youth Forum at Orlando, Florida, in February 1986.

Range Youth Camp was sponsored by the California Section of the Society for Range Management and 4-H Cooperative Extension. **—W. Peden,** Camp Director

Kansas Holds 25th Range Youth Camp

It was a special year for Kansas Range Youth Camp. This was the 25th year that the Camp was held at Rock Springs State 4-H Center and included one camper whose father had attended 23 years ago. Thirty-six young men and women attended the Camp from Kansas.

The campers received training in the art and science of range management. Special emphasis was placed on the importance of range plants, their identification, and value for grazing. Campers learned to identify eighty major grasses, forbs, shrubs, and trees which comprise the range ecosystem throughout the state.

Many topics were covered during the session. Indoor and outdoor discussions were held concerning plant structure, range ecology, soils, range sites, and range condition. Additional subjects included plant physiology, stocking rates, grazing distribution, rotational grazing systems, livestock management, and rangeland wildlife.

A Friday tour featured a visit to the KSU Range Research Unit where Dr. Clenton Owensby explained research programs such as planned spring burning, intensive early grazing, and rotational grazing with cow-calf herds.

The campers toured the 6,500-acre Simpson Ranch near Junction City with ranch manage George Jury. He showed the group many aspects of applied range management. The group looked at brush control, water developments, range re-seeding, late spring burning and rotational grazing system. George is a sound range manager and promotes the concept of range management in the ranching industry.

Norm Doehring, Deputy State Conservationist of the Soil Conservatin Service, was on hand to present awards to the top fur contestants in the plant identification contest. The winner were: Chris Lehman, Leroy, Kansas; Mark Dahlsten, Lindsborg, Kansas; Kelly Doerksen, Meade, Kansas; and Greg Wolf, Quinter, Kansas. Mark Dahlsten was also selected as "Outstanding Camper". **—Steven Ekblad,** Chairman,1985 Range Youth Camp

Society Reactivates SRM History Archive in Laramie

Since 1956 the Society for Range Management has maintained an historical Archive for *unbound* papers, correspondence, and other documents of SRM officers, committee members, and some section as well as individual member materials through an agreement with the University of Wyoming in Laramie. These materials are stored at the Archives-American Heritage Center in the University's COE Library. Early collections include an assortment of early historic papers up until the early 1970s, when we apparently forgot about preserving our history.

The Officers and Directors of SRM recently mandated that steps be taken to preserve SRM's history and have reactivated the SRM historical archive depository for receiving and preserving appropriate historical materials.

Accordingly, unbound correspondence, reports, and background papers concerning Society business, planning, meetings, actions, projects, and committee activities; particularly about first-time events, major accomplishments, and persons associated with them should be retained and sent prepaid to Dr. Herbert Fisser, SRM Archive Curator, c/o Range Management Division, University of Wyoming, University Station P.O. Box 3354, Laramie, Wyoming 82071. When feasible, loose papers such as letters and committee records should be assembled in archive papers fashion, stapled or clasped to firm backing by topic or committee and year, and provided with a cover sheet identifying the main topical index, the specific topical subheading, and year(s); for example in this pattern:

MEMBERSHIP COMMITTEE
Annual Report
1978

Diverse papers, particularly those covering a wide range of subjects and topics which come before a director or officer, bound between stiff covers and indexed are acceptable although often less usable due to the difficulty of searching and reproducing specific items. Papers filed in manilla file folders are also usable but are probably better identified by temporary "Post-it" stick-on labels, thus leaving the permanent indexing open for the Curator.

Generally, photographs and memento and artifact objects having historical significance are not to be preserved in the SRM History Archive but should be sent to the Executive Vice-President in Denver for inclusion in the Memorial Room at SRM Headquarters.

Historic information is best accessed from the SRM History Archive by coming to the Archives-American Heritage Center in the COE Library at the University in Laramie, identifying yourself as a Society member, and asking to research the desired materials. The University Archivist and SRM Archive Curator will have a master index to help you locate specific material. Only in a case of real emergency might it be feasible for either of the archivists to be of further assistance. Materials may be perused in the reading rooms of the Library and library staff will duplicate material upon request at a cost of 10 cents per page, but materials cannot be removed from the Library.

Recently several boxes of accumulated Society papers were transferred to the SRM Archive in Laramie from SRM Denver headquarters signifying a reactivation of our Society's History Archive in cooperation with the University of Wyoming. Archive Curator Herb Fisser and the officers and Directors of SRM invite you to avail yourself of these newly restored arrangements and help your Society preserve significant documents and records of historic importance.

Overseas Positions

The following letter may be of interest to members considering overseas positions.

Dear Mr. Jackson:

I have just returned from an FAO expert consultancy for the Saudi Arabian Range and Animal Development (SARAD) Research Centre in Al Jouf, Saudi Arabia. In setting staffing requirements for the second phase (1986-1990) operation of the centre, several range management/livestock production related post were identified. I volunteered to assist in finding suitable candidates for these posts, and to that end, would appreciate the help of the SRM in locating first class staff for what I consider a most interesting and challenging opportunity in international research.

The indicated International Staff posts are Chief Technical Advisor, Range Ecology, Range Management, Fodder Crops Specialist, Sheep and Goat Production Specialist, Camel Production Specialist, Animal Health Specialist, Soil and Water Conservation Specialist, Wildlife Specialist, Extension and Training Specialist, Range/Livestock Economist, and (possibly) Biometrician. The Range Ecology and Range Management posts will be filled by incumbents, but the remainder will be required beginning in April 1986. The Chief Technical Advisor should be an experienced researcher, capable of giving advice and direction on a rather wide range

of research activities including range improvement; grazing trials; sheep, goat and camel nutrition and grazing studies; and soils and water studies. One candidate has been tentatively proposed, but others are still being sought. Candidates for the other posts should be qualified, experienced researchers in their respective fields. As English language schooling in Al Jouf does not exist, applicants with either grown or pre-school children may be expected to fare best. Living and working facilities at the Centre are first class.

Recruitment is being handled jointly by the Food and Agriculture Organization and the SARAD Research Centre. Accordingly, inquiries may be addressed as follows:

c/o Mr S. Badawi
Operations Officer
AGO
Food and Agriculture Organization (FAO)
Via delle Terme di Caracalla - 00100 Rome
Italy

or Mr.Abdu Al-Assiri
National Director
SARAD Research Centre
P.O. Box 322
Sakaka - Al-Jouf
Kingdom of Saudi Arabia

I will also be happy to answer questions related to activities of the SARAD Research Centre, recruitment, living conditions, and how to proceed with an application for one of the posts.

Your sincerely,
Robert W. Roberts
Natural Resources Consultants
P.O. Box 1853
Corvallis, Ore. 97330

The Department of Animal and Range Sciences of South Dakota State University is initiating a search for a new faculty member with Range Science expertise. The position will be on tenure track with a 12-month split appointment in teaching and research. For further information contact:

Dr. John R. Romans, Head
Department of Animal and Range Sciences
Box 2170
South Dakota State University
Brookings, SD 57007

Dispute Resolution Conference

Third National Conference on Environmental Dispute Resolution, is scheduled for May 29 and 30, 1986, in Washington, D.C. A conference for business leaders, environmentalists, public officials, attorneys, planners, and others interested in new approaches for resolving environmental disputes, it is sponsored by The Conservation Foundation. Early registration is urged. Registration fee: $195 (after May 5, 1986: $245).

For further information about the conference, please contact Gail Bingham, Senior Associate, or the Conference Manager, at The Conservation Foundation, 1255 23rd Street, N.W., Washington, D.C. 20037; tel (202) 293-4800)

POSITION ANNOUNCEMENT

DEAN OF THE COLLEGE
OF AGRICULTURE AND BIOLOGICAL SCIENCES
SOUTH DAKOTA STATE UNIVERSITY

South Dakota State University invites applications/nominations for Dean, College of Agriculture and Biological Sciences. Multi-purpose university with 7,000 students; 1,300 are in the College of Agriculture and Biological Sciences. College composed of twelve departments offering a variety of undergraduate and graduate degrees.

Responsibilities: Leadership to faculty, creating positive environment. Leadership and coordination for quality of programs, research through the Agricultural Experiment Station and service through the Cooperative Extension Service. Overall responsibility for budget and public relations. May have direct supervision for the Cooperative Extension Service. Reports to the Vice President for Academic Affairs.

Qualifications: Earned doctorate in discipline recognized in the College and distinguished record in at least two of the three areas of teaching, research, or extension required. Qualification for rank as a Professor (10 years of relevant experience), significant administrative experience, demonstrated activity in professional organizations and U.S. Citizenship or permanent visa also required. Familiarity with latest national and international trends in agriculture and biological sciences and with Land-Grant philosophy desired.

Salary: Negotiable and commensurate with qualifications.

Starting Date: July 1, 1986

Applications/Nominations: Nominations include telephone number and address of nominee. Applications include vita and names and addresses of 5 references. **Deadline January 15, 1986, or until suitable candidate found.** Send to: Carol J. Peterson, Ph.D., Search Committee for Dean of Ag and Bio Sciences, South Dakota State University, Box 2275, Brookings, SD 57007. *SDSU is an Affirmative Action/Equal Opportunity Employer (female/male). Women and minorities encouraged to apply.*

RESEARCH ASSOCIATE IN RANGE ECOLOGY with the Range Science Department, Colorado State University. The responsibilities of this position will be to supervise field studies related to the ecology of disturbed lands. Specific activities will be centered upon studies dealing with the above- and below-ground structural and functional dynamics that govern secondary succession. Working knowledge of ecological principles, experience in field vegetation and soil sampling, quantitative analysis, manuscript and proposal preparation, and proven leadership abilities are essential. Minimum requirements include a Ph.D. degree in range ecology or closely related field. Salary commensurate with experience and training. *Send letter of application, resume, transcript, and three letters of reference to: Dr. Edward F. Redente, Department of Range Science, Colorado State University, Fort Collins, Colorado 80523.* **Applications must be received by February 28, 1986.** CSU is an EEO/AA employer. E.O. Office: 314 Student Services Building.

Requiescant in Pace

Roche D. Bush, a charter member of SRM, died suddenly on May 4, 1985, in Portland, Oregon. Roche, pronounced 'Rock,' was born on a ranch in northwestern Nebraska, near Harrison, on April 7, 1917. The family moved to a ranch near Pineville, Wyoming, when he was still a young child, where he grew up. He was proud of his family, and of is Indian heritage. His great-grandfather was a French trapper, and his great-grandmother a Shoshone Indian.

Roche devoted his life to range management, and worked for 33 years in range conservation for the Soil Conservation Service. His first permanent job after graduating from Utah State University was at Montpelier, Idaho, in 1944. He worked in Idaho until 1948, when he was transferred to Bieber, California, later becoming a district conservationist there. He left the Service from 1951 to 1955 to ranch in Surprise Valley, Nevada, an area near Cedarville, California, but was forced out of the ranching business from a series of dry years. He returned to the Service as range conservationist for central and northern California at Placerville, then served as state range conservationist for California in 1965, and state resource conservationist in 1972. In 1974, he was promoted to regional range conservationist at Portland, Oregon. He retired in 1979, with his wife, 'Sunny,' a college sweetheart, at Portland, Oregon.

An active and long-time member of SRM, Roche participated in state and national meetings. In 1985, he attended the national meeting in Salt Lake City. For several years, he assisted students of the Humboldt State College range plant judging team at national meetings.

Several tecnical papers were published by Roche. He was instrumental in developing a balanced grazing system for annual California range with his other plant science associates, titled, 'The Three-Point Range Program.' This was one of the ealry efforts to use range fertilization as an integral part of a grazing system. Livestock were rotated from fertilized annual range to non-fertilized annual range and to established Hardinggrass pasture. The system increased the length of the growth period, forage quality, and total of forage production compared to conventional grazing on annual range.

Roche had a high degree of creative imagination coupled with an equally high degree of common sense. He had a pleasing personality, and a dry sense of humor which everyone enjoyed. He will be greatly missed by all who knew him.

Reginald M. DeNio, 74, an internationally recognized expert in range management, died at his home in Spokane.

DeNio was born Aug. 25, 1910 in North Dakota. He was graduated from North Dakota State University in 1934 and later attended the Harvard Business School Management Program.

DeNio moved to Spokane in 1950, and from 1950 to 1954 was supervisor of the Colville National Forest. During the 1950's, he directed the task force that battled the most serious spruce bark beetle epidemic in the history of the Forest Service. The epidemic covered Washington, Montana, Idaho and North Dakota.

From 1960 until his retirement in 1971, DeNio served as director of range management for the U.S. Forest Service in Washington, D.C.

DeNio was instrumental in starting a forestry program at Rogers High School, and also helped establish a forestry program at Spokane Community College.

He served as a consultant on range management to the United Nations, and was the official U.S. delegate to international grassland conferences in Finland and Australia.

DeNio was an organizer of the National Range Management Society, a charter member of the National Cattleman's Association and a member of the National Woolgrower's Association. He was awarded national fellowships for exceptional service to the Society for Range Management and the Society of American Foresters.

DeNio is survived by his wife, Eleanor; a daughter, Ruth McCombs of Spokane; a son, Jean H. DeNio of Nine Mile Falls; two brothers; 11 grandchildren and seven great-grandchildren.—**The Spokesman Review**

The following Life Members were omitted from the previously published list: *Gary E. Larson* and *Dan Ratliff.*

Grass Systematics Symposium

The Smithsonian Institution in conjunction with the American Institute of Biological Sciences and the National Science Foundation will sponsor an international symposium on grass systematics and evolution at the Smithsonian in Washington, DC, from 27-31 July 1986.

The economic and ecological importance of grasses has promoted extensive research on their structure, reproductive biology, biochemistry, evolution, genetics, and systematics. At this meeting, more than 40 of the world's authorities on grass biology, including Richard W. Pohl and G. Ledyard Stebbins, Jr., will gather to summarize recent research, identify current problems, stimulate new research, and facilitate the international and interdisciplinary exchange of ideas and data.

Housing for participants will be available at George Washington University, Washington, DC, and registration will cost $75.00. For further information contact Louise Salmon, Meetings Manager, AIBS, 730 11th Street, Washington, DC 20001-4584. Tel: 202/628-1500.

New textbook-reference book
from the Society for Range Management

Range Research: Basic Problems and Techniques

Edited by C. Wayne Cook and James Stubbendieck

- hard bound
- illustrated
- extensive bibliography
- index

This major revision of an earlier publication of the National Academy of Science presents steps in research planning, evaluation of results, and methods and procedures in range research, including sampling techniques and experimental design. Chapter titles include: The Range Research Problem, Assessment of Habitat Factors, Methods of Studying Vegetation, Studies of Root Habits and Development, Methods of Measuring Herbage and Browse Utilization, Livestock Selection and Management in Range Research, Methods for Studying Rangeland Hydrology, Economic Research in Range Management, Sampling Methods with Special Reference to Range Management, Experimental Designs, and Problems Involoved in the Application of Research Techniques in Range Management.

The book, 336 pages, is designed to serve as a reference guide for range research methodology and as a textbook for advanced students who anticipate careers in this increasingly important field. (Scheduled for mid-January availability.) $25 (US) hard-bound.

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North Central Section - SRM
9129 N. 91st Street
Milwaukee, WI 53224
(414)355-2992

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Lee Manske
North Dakota Chapter - SRM
Dickinson Experimental Station
Box 1117
Dickinson, ND 58601
(701)227-2348

Pacific Northwest
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SRM's terrific Trail Boss insignia on light blue or tan T-shirt.
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Steve Keady or Ed Fredrickson or Jeanne Farrell
Pacific Northwest Section - SRM
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(503)754-3341

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Club President
Animal & Range Sciences Department
Box 2170
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Utah Section - SRM
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Patty Smith
University of Wyoming Student Chapter
2458 N. 9th, #73
Laramie, WY 82070
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