Rangelands

Society for Range Management
Vol. 21, No. 6, December 1999

High School Youth Forum Papers

Biological Weed Control
A Look at Threats to Livestock Grazing
NUTBAL: Ins and Outs of a Rancher's Profit

Volume 21 No. 6
December 1999

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

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EDITORIAL CORRESPONDENCE, concerning manuscripts or other edited matters, should be addressed to the Technical Editor, 7820 Stag Hollow Road Loveland, Colorado 80538.

RANGELANDS (ISSN-0190-0528) is published six times yearly (February, April, June, August, October, and December) by the Society for Range Management, 445 Union Blvd., Suite 230, Lakewood, Colorado 80228, Phone 303-986-3309. PERIODICALS POSTAGE paid at Denver, Colorado and additional offices.

POSTMASTER; Return entire journal with address change—RETURN POSTAGE GUARANTEE—to Society for Range Management, 445 Union Blvd., Suite 230, Lakewood, Colorado 80228.

Rangelands

FEATURE ARTICLES

DEPARTMENTS

COVER

FRONT COVER: Mule deer bucks on the property of East and West Ranching Co. This ranch is located in the Cypress Hills of Alberta. Photo by Hyland P. Armstrong
BACK COVER: Winter of 96/97, town of Leola, McPherson County, S.D. Photo by Bruce S. Healy

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The objectives for which the corporation is established are:

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

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

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

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

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

—to promote professional development of its members.

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

Rangelands

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Executive Vice-President's Comments

During the past several months SRM has been involved in a number of activities relating to rangelands and research.

The H. John Heinz Center for Science, Economics and the Environment, recently released a study that provides a foundation for periodic reports on the state of the Nations ecosystems. This first effort draws data from public and private sources to describe croplands, forests, and coasts and oceans. The 2001 version will analyze three additional systems: freshwater; arid lands and rangelands; and cities and suburbs.

We have been in contact with the folks at the Heinz Center since last spring to assure SRM involvement in the report on arid lands and rangelands. Teams are composed of representatives from business, government, academia, and environmental organizations. A design committee guides the development of a conceptual framework, and expert technical work groups are responsible for developing the specific reporting measures for each system, identifying data sources, and conducting required analysis.

In October we met with the Heinz Center staff to discuss SRM's involvement in the rangeland report. At this meeting we recommended an extensive list of SRM members as possibilities for membership on both the design committee and work group. Because of our diverse organization we were able to recommend Society members across all categories of business, government, academia, and environment.

Why did we go to this effort? It is important to continually remind those who take on natural resource projects that SRM is still the best source of expertise in areas related to rangeland ecosystems. Our committee on Range Assessment and Monitoring will be involved with the effort.

In a similar effort we have also made nominations for members to serve on the federal Invasive Species Advisory Committee. Early in the year the President signed Executive Order 13112, dealing with invasive species. In developing a process to implement that order, an Interdepartmental Invasive Species Council was formed. The Secretary of the Interior, acting as administrative lead for the Council, requested nominations for qualified persons to serve as members of an Advisory Committee. Again, it was important for SRM to react to this opportunity to participate in this important task. Our Invasive Species Committee did a fine job of preparing our response.

In September, the Agricultural Research Service held a planning meeting to identify and prioritize future research needs in rangelands, pasture, and forage areas. The effort was to improve the agency understanding of customer needs, and promote coordination among ARS scientists and other public and private groups. SRM was well represented at this meeting. Official representatives were Kendall Johnson, Research Affairs Committee Chair Lynn Drawe, and myself. In addition, the conference was well attended by dozens of other members who were representing their employment and businesses.

SRM's input was guided by information prepared by the Research Affairs Committee, which recommends that priority for future research in the near term be directed at developing new and practical ways of measuring vegetation, invasive species, ecological sustainability, systems approaches, and water quality. A longer-term look would add economic sustainability and problems of urbanization to that list.

This was a very well organized exercise and the agency had participation and input from over a hundred "customers". They processed this input in a very timely manner, and identified six components to their national program based on discussions at the workshop. These are: ecosystems and their management, plant resources, the grazing environment, forage management, integrated pest management, and integrated forage and animal production systems. All of the SRM recommendations will fit into these components.—**Craig Whittekiend**, Executive Vice President

TEAMWORK ON WYOMING RANGELANDS

Ronald H. Stellingwerf

Have you ever wished you knew what other National Forests around you were doing when you received a question or comment from a permittee or other interested publics regarding consistency? What about the concerns or rumors regarding your State Department of Agriculture, Stock Growers, Bureau of Land Management, University or Extension Service. While the National Forests in Wyoming haven't totally solved these communications voids, they have made a very large step in that direction.

On May 8, 1996 the Rocky Mountain and Intermountain Regional Range Staff Officers and Forest Range Staff Officers from throughout the State of Wyoming met in Casper to discuss a proposal to improve communications and increase uniformity across National Forest rangelands in Wyoming. The specific proposal was for creation of a Rangeland Management Service Team.

The consensus among those present at the Casper meeting was that the proposal had merit and we could make it work. It was agreed that we would recommend to our respective Forest Supervisors and Regional Foresters that they endorse the Rangeland Management Service Team concept. Meetings would generally be held twice a year at a central location. If issues warranted, special meetings could be called more often. Due to everyone's work load it was agreed the team chair would serve a one year term and then the chair would be transferred to another Team member. Needless to say both the Regional Foresters and Forest Supervisors fully supported the Team concept and committed the time and resources to make it work. The Wyoming Range Service Team was official.

The Teams mission, goal and roles statements:

Mission:

- Provide communication, coordination, oversight, direction, consistency and leadership for Forest Service rangeland management activities in Wyoming.

Goals:

- Improve dialogue and communication between the National Forests, other federal agencies, state agencies, the Governor's Office, industry, the general public and rangeland users.
- Improve statewide program consistency.
- Emphasize products and result oriented tasks (targets, permit administration, issue resolution).
- Breakdown Regional/Forest barriers.
- Work more efficiently, effectively and in a proactive manner.
- Interact proactively with key contacts. Inform and Educate.
- Deal with issue resolution through a common sense approach.

Roles:

- Provide leadership/guidance.
- Provide budget and program of work consistency.
- Provide training.
- Identify annual program emphasis and priorities.
- Share individual Forest uniqueness.
- Build a network.
- Provide appeal resources.
- Provide for dispute resolution.

The Team identified 11 Wyoming issues that needed to be addressed.

- Livestock/wildlife conflicts
- Self-monitoring standards
- Base property requirements
- Threatened &Endangered species (Grizzly guidelines, livestock carcass removal etc)
- Noxious Weeds
- Animal Damage Control Environmental Assessment development
- Forest Plan revisions, std etc.
- Doing business efficiently (non-traditional approaches to administration, NEPA, reporting, inventory) or how to get by in the 90's with less funding.
- National Environmental Policy Act and Allotment Management planning schedules.
- Brucellosis
- National Historic Preservation Act-Wyoming State Historic Preservation Office Memorandum of Understanding for allotment management planning.

The second meeting was scheduled to coincide with the Wyoming Stockgrowers winter meeting to save travel. Invitations were extended to the Wyoming Department of Agriculture, Bureau of Land Management, University of Wyoming, Extension Service, Stock Growers and Wyoming Game and Fish Department. White papers were presented on a Vacant Allotment and Base Property Policy for all Wyoming Forests. These documents were discussed, final recommendations made and agreement reached for a final package to be approved at the next meeting.

At the Stockgrowers meeting the Team nominated several livestock operators from both the sheep and cattle industry and three educators to receive "1997 Rangeland Stewards" awards. These awards consisted of Forest Service Centennial Spurs and a framed certificate. They were presented to recognized leaders in the industry and education fields for their dedication to sound resource management. The Team has presented these awards two out of the last three years when outstanding individuals were identified.

The 1997 summer meeting was tied into a field trip at The Nature Conservancy's Red Canyon Ranch. The formal business portion of the meeting followed the second day. All those attending gained insight into what management challenges the Red Canyon Ranch was facing and the progressive methods they were using to address these challenges. At the end of the

trip, the District Rangeland Specialist felt better about the decisions the District Ranger was facing and the Team and State personnel shared a common understanding of what was happening, why it was happening and what resource benefits could be expected from the management decisions that had been made.

The 1997 fall meeting hosted by the Bighorn and Shoshone National Forests' rangeland management programs included staff from the Washington Office. The tour focused on controversial management areas on both Forests. Management on these areas had been discussed at length with the concerned individuals, but not with all the players present on the ground at the same time where the problems could be "cussed and discussed" in person. It was generally felt that all those present left the meeting with a better understanding of why decisions were made. While, they may not have always agreed, everyone had a chance to express their views in an open professional manner. Attendance at both 1997 meetings included the Forest Service and representatives from the State of Wyoming, University of Wyoming, Extension Service, NRCS, Bureau of Land Management, livestock operators and several special interest groups.

Team accomplishments include:

- White papers prepared and subsequent policy developed for Regional supplements on vacant allotment policies and base property requirements.
- Initiated discussions with the Wyoming Game and Fish Department on Domestic/wild sheep conflicts and Elk/livestock conflicts (discussions are continuing).
- Committed to having one Team member represent all Wyoming Forests on State natural resource management committees:
  a. State Noxious Weed Committee
  b. Mediation Work Group
  c. Animal Damage Control Work Group
- Increased focus, acceptance and effectiveness of the Permittee Self Monitoring program.
- Coordinated an integrated approach designed by the Medicine Bow National Forest for developing Noxious Weed Management Plans and assessing the impacts of noxious weeds that have been incorporated by National Forests's in Wyoming and South Dakota.
- Presented Rangeland Stewardship Awards to:
  a. Dr. Mike Smith, University of Wyoming
  b. Professor Quentin Skinner, University of Wyoming
  c. Doug Reynolds, Carbon County Extension Agent
  d. Kelly Crane, State Range Extension Specialist
  e. Juaquin Michelena, Bighorn National Forest permittee
  f. David Garber, President, Bighorn National Forest Grazing Permittees Association
  g. Joel Bouseman, Bridger-Teton National Forest Permittee
  h. Truman Julian, Bridger-Teton National Forest Permittee
  i. Bob Budd, Shoshone National Forest Permittee
  j. Inyan Kara Grazing Association, Medicine Bow NF (Thunder Basin National Grasslands)
  k. Park Wood, Black Hills National Forest Permittee
- Increased uniformity in addressing issues across the State.
- Agency and Interest groups working with the Team:
  a. Wyoming Stockgrowers
  b. Bureau of Land Management
  c. Wyoming Game & Fish Department
  d. University of Wyoming
  e. Extension Service
  f. USDA-Wildlife Services (Previously Animal Damage Control).
  g. Wyoming Department of Agriculture
  h. Wyoming Wool Growers
  i. Nature Conservancy

HAS THE TEAM REALLY MADE A DIFFERENCE IN WYOMING? We think almost anyone you talk to will say that it has. The "Team Concept" has improved understanding and communications between all parties. We have a better understanding of our differences and if the differences are necessary, we can explain why. Nels Smith, President of Wyoming Stockgrowers spent 3 days with the Team at one meeting discussing issues. The meeting was very productive in understanding industry concerns and improving communications. As a follow-up from this discussion the Team is now meeting with the Stockgrowers executive board prior to their biannual meetings to discuss current issues. With the cross-section of the Wyoming Livestock Industry present, many issues or perspectives that most of us were never exposed to come out and are discussed in an open productive forum.

We can't say we always agree on all the issues discussed at our meetings, but with the improved communications and respect we've developed for each others opinions, our disagreements remain on a professional basis.

We don't have all the answers and we've missed inviting some individuals or groups that probably should be invited to attend our meetings. As we become aware of someone we missed or an issue arises that needs special representation, the Team is not bashful about extending invitations. Not everyone invited can or wants to attend. Not everyone can attend every meeting, but most feel the meetings are profitable enough that if an individual can't attend they will send a representative capable of representing their Forest or organization in the discussion of current issues before the team.

What makes the Team work? From our perspective all those in attendance are very professional, but at the same time know how to have fun. No one on the primary team, or those that have joined us and have become virtually a part of the team, see themselves as any better or different than anyone else. Everyone has a chance to speak and be heard. Through this channel we all have a better understanding of why the different individuals, groups or agencies view issues differently. To cite a recent example of how we work together--rumors were starting that could have very easily gotten out of hand and adversly affected relationships, two phone calls was all it took to resolve the issues. The relationship between Team members, the State and Stockgrowers proved very valuable and helpful in this instance.

Can the "Team" concept work for everyone, probably not. Team dynamics are important and won't be there for every team trying to start a process for improving communications. Our Team clicked and even with only two original Forest Service members still on the Team it is still working. Wyoming is reaping the benefits and the progress we've made to date will hopefully keep us going through the rough spots.

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Wyoming Range Service Team

Original Team Members	Current Team Members
Charlie Richmond, R-2 Range Staff	Dave Wheeler, R-2 Range Staff
Bob Hamner, R-4 Range Staff	Bob Hamner, R-4 Range Staff
Bernie Spanogle, Shoshone NF Resource Staff	Joe Hicks, Shoshone NF Range Staff
Ron Stellingwerf, Bighorn NF Range Staff	Dave Cawrse, Shoshone Resource Staff
Daryl Herman, Black Hills NF Range Staff	Ron Stellingwerf, Bighorn NF Resource Staff
Dave Myers, Medicine Bow NF Range Staff	Terry Padilla, Black Hills NF Range Staff
Debbie DesLaurier, Bridger-Teton Resource Staff	Bob Mountain, Medicine Bow NF Range Staff
	Jim Wickel, Bridger-Teton Resource Staff

More days were available for prescribed burning in short-leaf pine between April 1-20 than at any other period from January 1 to April 20, 1994 to 1998. In mixed prairie, more burn days were available in either January or February from January 1 to April 20, 1994 to 1998.

Weather Constraints to Scheduling Prescribed Burns

KEVIN W. ROBERTS, DAVID M. ENGLE, AND JOHN R. WEIR

Too frequently we hear about prescribed burns that escape control. Planning and successfully executing a prescribed burn requires considerable education and experience, but it sometimes seems that successfully scheduling a prescribed burn requires incredibly good fortune. Erratic weather combined with fire weather forecasts that are not completely dependable complicate scheduling a burn. Fire managers need greater reliability in assessing burning conditions going into the traditional fire season.

Prescribed burning is an economically efficient practice in our rangeland region that can be used to maintain grassland productivity and enhance livestock performance.

Burning is also an essential tool for managing critical habitats for native plants and animals.

We evaluated historical fire weather to determine when burns are more likely to be successful and when to avoid scheduling burns in periods with marginal weather conditions that increase the risk of fire escape. We selected four native ecosystems in Oklahoma and used a 5-year (1994-1998) fire weather data set spanning the customary dormant season burning period of January 1 to April 20.

The weather data were collected from the Oklahoma Mesonet, an environmental monitoring network of 114 weather stations that relays weather observations to a central computer every 15 minutes. We chose four of these stations to reflect the extremes in climatic and vegetation (climate-vegetation types) in Oklahoma. A Mesonet weather station was selected within the semi-arid shortgrass prairie, the semi-arid mixed prairie, the sub humid tallgrass prairie, and the humid short-leaf pine forest. Each Mesonet station records a suite of weather parameters at fifteen-minute intervals, which we used to determine the number of acceptable burn days in each of 4 burning periods (January, February, March, April 1-20). The five years of burning-season data included a wide variety of weather conditions. During the period Oklahoma experienced above and below average annual rainfall coupled with below and above average temperatures. We think the results of our investigation are applicable to conditions encountered in most years.

Determining Acceptable Burn Days

We used prescriptions for burning in Oklahoma native ecosystems as a basis to constrain the weather conditions we considered suitable to accomplish most burning objectives as well as to insure fire containment (Table 1). Using a

Table 1. Conditions suitable for conducting prescribed burns in grasslands and forests in Oklahoma that were used to constrain days selected as acceptable for burning. Conditions are derived from Bidwell and Masters (1993), Wade and Lunsford (1988), and Launchbaugh and Owensby (1978).

Factor	Conditions
Time period	Minimum window of 3 consecutive hours between 0900 and 1700
Temperature (°F)	≥ 35 and ≤ 80
Relative humidity (%)	≥ 25 and ≤ 75
Wind speed (mph)	≥ 5 and ≤15
Precipitation	None

Table 2. The number (average and range over a 4-year period) of unacceptable burning days, the primary weather parameter responsible for limiting burning, and the average number of days in which burning conditions, constrained by wind direction, are acceptable in 4 vegetation types over the period of January 1 through April 20.

		Unacceptable burning days			Acceptable burn days	
Vegetation type	Month	Average	Range	Limiting weather factor	South wind	North wind
Shortgrass prairie	January	14	11-16	High winds	6	8
	February	12	10-14	High winds	4	6
	March	18	16-20	High winds	3	5
	April (1-20)	11	7-17	Low humidity	2	4
Mixed prairie	January	13	5-22	High winds	9	6
	February	11	6-14	High winds	7	7
	March	17	16-19	High winds	7	6
	April (1-20)	11	9-13	High winds	5	4
Tallgrass prairie	January	14	12-16	Low temperature	7	5
	February	9	5-13	High winds	7	7
	March	14	12-17	High winds	7	7
	April (1-20)	10	8-11	High winds	6	5
Pine forest	January	26	21-28	Low winds	4	1
	February	25	23-26	Low winds	4	2
	March	22	16-25	Low winds	8	3
	April (1-20)	14	9-17	Low winds	6	2

computer spreadsheet we enumerated the number of days falling outside the range of suitable conditions. We also determined the most frequent weather condition associated with unsuitable conditions for each of the 4 dormant-season-burning periods. In doing so, we could predict the primary reason burning days were lost for each climate-vegetation type. Because burning a land management unit is often possible only with wind from a specific direction, we also constrained the data for wind direction and determined the number of acceptable burning days associated with either southerly or northerly winds. Some days were excluded for more than one factor (e.g., high winds and low relative humidity).

The Best Burning Period Differs Among Vegetation-Climate Types

Excessive wind speed was the primary weather constraint to prescribed burning in the vegetation-climate types we studied. Burning in March or April, which encompasses the preferred burning period to enhance livestock forage, presented problems for managers of shortgrass and mixed prairies because most days in these two periods experienced high winds (Table 2). Fewer days were outside prescription in January and February in the shortgrass prairie and mixed prairie, but high winds remained the primary weather constraint for these periods. Burning in the tallgrass prairie would be constrained less by weather during the month of February, when as few as 5 days were unacceptable during the 5 years of study. Burning in the pine forest was limited in each period by low wind speed, which is made even more difficult in this mountainous region because of topographic influences on local wind direction. Only in the pine forest did April 1–20 provide more acceptable burning days than the other three periods.

Adding wind direction as a constraint to acceptable burning conditions greatly reduced the number of acceptable days for burning, but the influence was most dramatic in the shortgrass prairie and pine forest. Requiring a south wind in the April 1-20 period resulted in only 2 acceptable burn days in the shortgrass prairie. Requiring a north wind for a January or February burn in the pine forest resulted in only 1 or 2 acceptable burn days, respectively. Managers of public forests consider January and February the most desirable burning periods because earlier dormant-season burns are less likely to disrupt nesting of ground-nesting birds. In the tallgrass prairie, where annual burning is an acceptable practice, constraining wind direction reduced acceptable burn days to no more than 7 for any burning period.

These data indicate that even though burning in a certain period may best meet management objectives, scheduling a burn is often complicated by weather limitations in this same burning period. Also, **managers should consider burning during alternative burning periods especially if the opportunity and relative advantages of burning in the particular year outweigh the relative advantages of burning in a particular burn period.** Finally, the burning period most likely to afford the greatest number of acceptable burn days differs among vegetation-climate type. Generalizations about appropriate dates of prescribed burning windows should account for these differences.

Literature on Fire Prescriptions

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Authors are undergraduate, Department of Zoology (Wildlife and Fisheries Ecology) and Professor and Station Superintendent, Division of Agricultural Sciences and Natural Resources, Oklahoma State University, Stillwater. The Director, Oklahoma Agricultural Experiment Station, approved this article for publication.

Stocking Desert Rangelands: What We've Learned

Jerry L. Holechek, Milton Thomas, Francisco Molinar, and Dee Galt

Five stocking rate studies from three different locations in the southwestern United States have arrived at essentially the same management recommendations. Desert forage plants can sustain about 40% use of annual herbage production. Use in the drought years approached 55–60% while use in the wet years was near 20–25%. The researchers recommended that desert ranges be routinely stocked for around 30–35% use of average forage production with some destocking in drought years. All the studies have indicated that conservative grazing is a reliable way to increase forage production and improve vegetation composition on degraded rangelands.

The selection of the correct stocking rate is the most important range management decision.

The selection of the correct stocking rate is the most important range management decision. Stocking rate selection is a major problem on desert rangelands in the southwestern United States, where forage production can fluctuate 100% among years (Figure 1). Ranchers on public rangelands are expected to comply with vegetation residue and stubble height guidelines to protect soil, watershed, and wildlife resources during periods of extended drought. There is less tolerance for heavy grazing near sacrifice areas (now called sensitive areas) such as creek bottoms, watering points, roads, and corrals. Grazing management plans must now include grazing intensity checks on an annual or semi-annual basis. Declining profit margins and public scrutiny are forcing ranchers to be more careful in stocking rate selection than in the past. At the same time, it is recognized that various rotation grazing systems cannot overcome the rangeland degradation associated with chronic overstocking.

Past long term research on stocking rate outcomes on desert rangelands is limited to three primary locations. These include the Desert Experimental Range in southwestern Utah (Figure 2), the Santa Rita Experimental Range in southcentral Arizona (Figure 3), and the Jornada Experimental Range and Chihuahuan Desert Rangeland Research Center (Figure 4) in southcentral New Mexico. Research involving replicated pastures assigned different stocking rate levels is available from the Desert Experimental Range and Chihuahuan Desert Rangeland Research Center. Studies on the Desert Experimental Range in Utah have involved wintering sheep while year-long cow-calf operations were evaluated in Arizona and New Mexico.

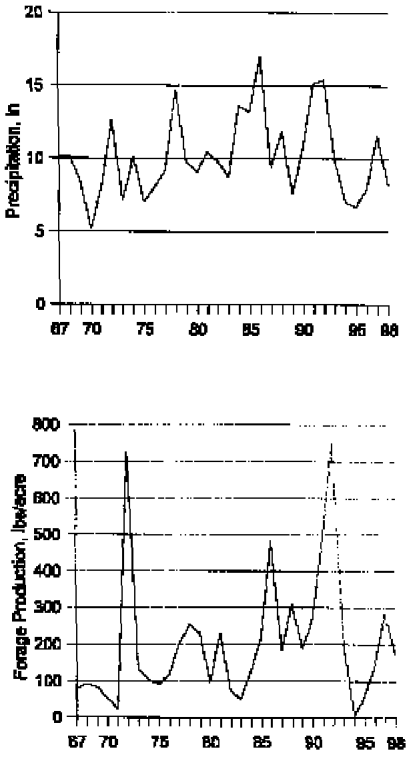

Fig. 1. *Annual precipitation and forage production for the 1967-1999 period on a conservatively grazed pasture on the Chihuahuan Desert Rangeland Research Center in south-central New Mexico. The top graph represents inches of rain and the bottom graph represents pounds of forage production per acre. Annual precipitation averaged 9.67 inches and forage production averaged 185 lbs/acre for the 30 year period. Sources for these data were Beck et al., 1987; Beck and McNeely 1993; and Molinar et al., 1999.*

Fig. 2. *A winterfat plant community under long term moderate grazing on the Desert Experimental Range in southwestern Utah (photo courtesy of Dr. Phil Ogden).*

Table 1. Influence of grazing intensity on winter sheep production at the Desert Experiment Range in Utah.

	Grazing Intensity	
	Moderate	Heavy
Duration of study (years)	13	13
Average precipitation (inches)	6.7	6.7
Utilization of forage (%)	35	60
Forage production (lbs/acre)	198	72
Ewe weight change (fall to spring) (lbs)	+9.3	+1.1
Average fleece weight (lbs)	10.6	9.7
Lamb crop (%)	88	79
Death loss (%)	3.1	8.1
Lamb weaned per ewe (lbs)	77.0	67.0
Net income (3,000 head flock) ($)	10,400	5,100
Net income/ewe ($)	3.45	1.69
Estimated net return ($/acre)	0.39	0.14

Source: Hutchings and Stewart (1953).

Desert Experimental Range

Primary results from the Desert Experimental Range reported by Hutchings and Stewart are summarized in Table 1. The moderate stocking rate was superior to the heavy stocking rate in vegetation, sheep, and financial performance characteristics.

Average percent use of all forages across years was 35 and 60% for moderate and heavy grazing intensities, respectively. Shadscale dominated vegetation composition, but winterfat was considered the most desirable forage species. Under moderate winter grazing, winterfat received 55% use of current year growth compared to 66% under heavy grazing. Winterfat production during the last year of study (1947) increased 54% over the first year (1934) under moderate grazing but did not improve under heavy grazing. The most striking improvement in forage production was the recovery of black sagebrush winterfat pastures (Table 2) under moderate compared to heavy grazing. Another interesting observation was that small rabbitbrush, an unpalatable species, drastically declined under moderate grazing but increased under heavy grazing. Follow up studies summarized by Blaisdell and Holmgren further confirmed these trends in vegetation productivity and composition.

In their recommendations, Hutchings and Stewart suggested that salt desert rangelands should be routinely stocked at 75% of grazing capacity. Grazing capacity refers to the maximum stocking rate possible year after year without causing damage to vegetation or related resources. This would involve about 35—40% use of winterfat in most years and 25—30% use of all forage species. Their rationale for this recommendation was that routinely stocking at capacity will result in overgrazing in one half the years and necessitate heavy use of supplemental feed. The extra herbage left from under grazing in the wet years will help plants recover from drought and build some feed reserves. Even with this approach some destocking will be required in 2 to 3 years out of every 10. After several more years of study on the Desert Experimental Range, Blaisdell and Holmgren strongly reaffirmed these same recommendations.

Santa Rita Experimental Range

The primary study evaluating grazing management on the Santa Rita Range involved 2 blocks with 3 pastures that were assigned to year-long, summer-fall, or winter-spring grazing by cow-calf herds. Over the 10 year study period (1957 - 1967), Martin and Cable reported that perennial grass cover and yield showed a strong decreasing relationship to increasing forage use. At the same time burroweed, an undesirable species, was positively associated with increasing forage use. Year-long pastures received lower forage use than those grazed seasonally. They, in turn, had higher perennial grass cover. Herbage yields on year-long pastures showed more increase than on seasonally grazed pastures. The authors concluded the consistency with which higher perennial grass

Fig. 3. *A long term moderately grazed pasture on the Santa Rita Experimental Range in southcentral Arizona (photo courtesy of Dr. Phil Ogden).*

Table 2. Herbage production per acre within a depleted black sagebrush-winterfat subtype in 1934 and after 4 and 13 years of grazing under moderate and heavy intensities.

	Initial Yield	Moderate Grazing		Heavy Grazing	
Species	1934	1938	1947	1938	1947
	(Pounds)				
Shrubs:					
Black sagebrush	21	45	296	14	28
Small Rabbitbrush	66	100	28	162	247
Winterfat	181	370	279	205	153
Other	3	4	4	4	4
All shrubs	271	514	604	381	425
Grasses:					
Galleta	3	6	3	5	3
Indian ricegrass	10	15	41	11	19
Squirreltail	3	4	28	1	5
Other	4	4	4	4	4
All grasses	16	25	72	17	26
Forbs:					
Globemallow	4	5	2	4	5
Russian-thistle	4	4	6	3	97
Other	4	1	1	4	1
All forbs	4	6	9	3	102
Total	287	545	685	401	553
Usable forage	142	284	443	161	168

Source: Hutchings and Stewart (1953).

cover and yield were associated with lower utilization levels was too great to be coincidental. On the basis of this study, the authors recommended that a 40% use level be used when assigning stocking rates.

Jornada Experimental Range

Over a 37 year period (1916–1952) forage plant basal cover and production responses to different grazing intensities were evaluated on 6 pastures stocked for 40% use of forage on an annual basis. Paulsen and Ares reported that black grama, the primary perennial forage grass, maintained the highest basal cover through time on conservatively grazed areas where use was about 35%. Black grama cover was lowest on heavily grazed areas (over 55% use) followed by intermediately grazed areas (40–55% use). It is important to note that protected areas maintained less black grama cover than those conservatively grazed.

Tobosa, the second most important perennial forage grass in the Chihuahuan Desert, maintained the highest basal cover under intermediate grazing (40–55% use). It is associated with lowland areas with clay soils where periodic flooding often occurs.

Important recommendations regarding stocking rates were made by Paulsen and Ares. Sampling errors in evaluating forage production, uneven distribution of cattle grazing, wind erosion, and rabbit and rodent use are unaccountable factors frequently overlooked. They suggested that a coefficient of 30% be used when stocking rates are assigned to black grama rangelands, and not more than 40% of the black grama be removed in any year.

Chihuahuan Desert Rangeland Research Center

A second study similar to Paulsen and Ares was conducted on the Chihuahuan Desert Rangeland Research Center adjacent to the Jornada Experimental Range. In this 10 year study (1954-1963) cattle grazing treatments involving 20, 35, 50 and 60 percent use were applied annually during dormancy to plots in 3 different pastures. At the end of the study in 1964 Valentine reported that light (20% use) and moderate grazing (35% use) produced 70% more forage than proper (50% use) and more than double heavy grazing (60% use). He concluded that conservative grazing involving about 30–35% use was a sound management approach for improving black grama rangelands.

Cattle Productivity and Financial Returns

Using computer simulations, Martin evaluated cattle productivity and financial returns under different stocking strategies in the Sonoran Desert. Initially, he concluded from previous studies that moderate stocking across years involves an average of 40% use of perennial grasses. He then went on to calculate net financial returns for cow-calf operations for a 29 year period (1941–1969) varying herd composition and level of stocking relative to the moderate rate (40% use). He based calculations on a 100 animal unit herd and assumed 90 percent calf crop, no death losses, and no influence of stocking rate on cattle productivity. He did acknowledge that in real world situations cattle productivity would be affected by stocking rate. His conclusions were: 1) the cow herd should be maximized rather than keeping a portion as yearlings; 2) flexible stocking is difficult to administer and has major hazards (introducing disease to the herd and reluctance to sell in dry years); and 3) constant stocking at 90 %

Table 3. Influence of grazing intensity on cow-calf production at the Chihuahuan Desert Rangeland Research Center in south-central New Mexico.

	Grazing Intensity	
	Conservative	Moderate
Duration of study (years)	6	6
Average annual precipitation (inches)	8.6	8.6
Utilization of forage (%)	33	45
Forage production (lbs/acre)(1995, 1996)	115	130
Forage production (lbs/acre)(1997, 1998)	197	176
Fall cow weights (lbs)	1,059	1,067
Calf crop (%)	85	78
Calf weaning wt. (lbs)	485	476
Net income/AU ($)[1]	52.50	8.50
Net income/acre ($)[1]	0.52	0.31

[1]Financial analyses are only for 1993 and 1994 (Source: Winder et al. 1999).
Sources: Molinar et al. 1999, Thomas et al. 1999, and Winder et al. 1999.

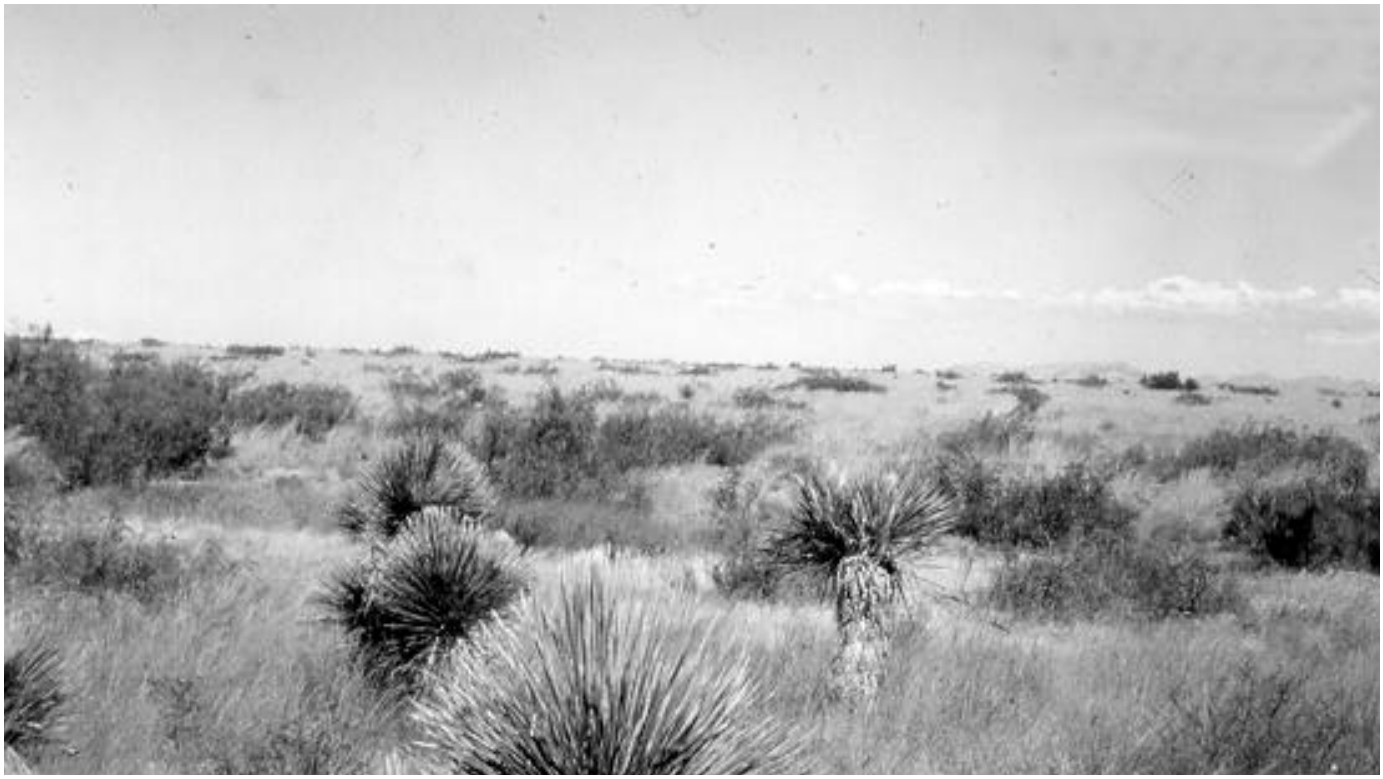

Fig. 4. *A long term conservatively grazed pasture on the Chihuahuan Desert Rangeland Research Center in southcentral New Mexico.*

of the proper level with some destocking under severe drought would yield the most income with the least risk. A relatively constant stocking rate that would use about 35% of the forage in an average year was considered the best approach.

Holechek examined the same issue for Chihuahuan Desert ranches in New Mexico using a different modeling approach. First he compared long term cattle productivity and financial returns from conservatively stocked pastures on the Chihuahuan Desert Rangeland Research Center with those of surrounding ranches. He found per acre returns on the experimental area were more than triple those of the surrounding ranches. This was due in large part to higher calf crops, higher calf weaning weights, lower supplemental feeding costs, and higher grazing capacity. He then assumed modest increases in calf crops (5%) and weaning weights (30 lbs) would occur if the surrounding ranchers reduced their forage use levels from 45–50% to 35–40%. Under his model, total net income immediately increased under the lower stocking rate compared to what the rancher previously received even though the ranch was supporting 20% fewer cattle. Further exposure to risk from drought and low cattle prices was reduced, and the probability of improved forage production was higher. This resulted in a team of researchers at New Mexico State University implementing a replicated long term stocking rate study on the Chihuahuan Desert Rangeland Research Center.

Current Research

We designed the current study on the Chihuahuan Desert Rangeland Research Center to evaluate the effects of 30% and 40% forage use levels on long term vegetation productivity, cow-calf productivity, and financial returns. A complete description of the study is provided by Winder et al. A design involving 2 blocks with 2 pastures each about 2,700 acres in size was used. Stocking recommendations of Paulsen and Ares and Martin and Cable are being closely followed. Each fall, on the basis of quantitative forage inventories, stocking rates are assigned. Depending on pasture stocking treatment, either a 30 or 40% harvest coefficient of current years growth of perennial grasses is used. Sale or retention of replacement heifers and old cows (8 years of age) is used to balance livestock numbers. In June, grazing intensity is evaluated using a combination of clipping, stubble height, and ocular reconnaissance techniques. A minimum stubble height of 3 inches for black grama and 6 inches for mesa dropseed is desired at all times. If stubble heights drop below 2.7 inches on black grama and/or 4.5 inches on mesa dropseed, that pasture is destocked for two consecutive growing seasons. Using these criteria, all pastures were destocked in summer of 1994 and moderately stocked pastures (40% use) had to be destocked in May of 1999. After livestock removal due to drought the pasture is rested for two growing seasons and then stocked in late fall in accordance with current year forage production.

A summary of our findings from initiation of the study in winter 1992 to spring 1999 is provided in Table 3. Our actual use levels have averaged about 10% higher (33 and 45% use) than our targets. We attribute this to forage loss from trampling, rabbits and rodents, and weathering. So far the 30% harvest coefficient has proven superior in vegetation productivity, livestock productivity, and financial returns. After drought in 1994 through 1996, forage production on the con-

servatively stocked pastures increased 71% (1997 and 1998) compared to 35% on those moderately stocked. Calf crops were more influenced by stocking than calf or cow weights. Our financial data cover only the first two years of study (1993–1994). We believe 1997 through 1999 analyses may show more financial benefit from conservative stocking than the 1993–1994 period because the moderately stocked pastures had to be completely destocked in June 1999 while only 40% of the cattle had to be removed from those conservatively stocked.

Management Implications

The effects of grazing intensity on livestock production and financial returns have been poorly understood. Here the research is remarkably consistent in showing that conservative grazing involving about 30–35% use of forage will give higher livestock productivity and financial returns than stocking at grazing capacity. This is because of higher calf/lamb crops, higher calf/lamb weaning weights, lower death losses, and lower supplemental feed costs. Large financial losses typically occur when livestock must be liquidated due to drought. Conservative stocking greatly reduces these losses compared to moderate stocking. This is because fewer animals must be liquidated during drought and repurchased after the drought ends. Typically, local cow prices are depressed during drought when most ranchers are selling cattle, and sky high afterwards when they are trying to restock their rangelands. In the favorable years, the extra income from stocking at capacity is small compared to the losses that can occur under drought.

Studies from Australia as well as in the United States have shown that in arid and semi-arid areas profit maximizing stocking rates are well below those that would degrade the rangeland resource. Rather than focusing so much on rotation grazing systems and trying to maximize forage harvest efficiency, we believe public rangeland managers and ranchers should place greater emphasis on keeping animal numbers in balance with forage supplies. Studies from desert rangelands in Arizona and New Mexico have shown no advantage of various rotation grazing schemes over continuous grazing in either vegetation or livestock performance. The critical aspects of range management in desert areas are to keep livestock in balance with forage supplies and well distributed over the range. In closing, we hope greater use will be made of the stocking rate technologies and the information we have reviewed in this paper.

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NUTBAL: In's and Outs of a Rancher's Profit

CODY COOK, HSYF

Would you scoop some poop to lower your feed costs? You bet!—that's exactly what many ranchers across the country are doing to help them support the decisions they make to meet the nutritional needs of their livestock. Are you feeding too much? Not enough? How do you know? It is no mystery that diet plays an important role in livestock development. Every cattleman knows the importance of good grass and supplements. What's not so obvious is how well grass and supplements work, or to put it another way, how well forage and feed meet animal nutritional demands. One way to obtain this information is to collect fecal samples and have a lab analyze the percentage of dietary crude protein (CP) and digestible organic matter (DOM). Many ranchers then use the Nutritional Balance Analyzer Program, called NUTBAL to help them make these decisions.

Economically meeting the nutritional requirements of livestock on grazing lands has always been a major problem for stockmen. Problems occur when forage quality does not meet the nutritional demands of the stock. Especially critical are the winter months and at calving. In 1994 the monitoring technique, NUTBAL, was offered to the ranching industry to help stockmen recognize when this situation exists and how to economically correct the problem. This system consists of two parts, NIRS and NUTBAL. Near Infrared reflectance spectroscopy (NIRS) provides an estimate of forage diet quality and NUTBAL provides a way to evaluate that diet quality relative to a group of animals under specific conditions. The combined NIRS/NUTBAL program is designed to monitor the changes in forage quality over time and match the nutritional needs of the livestock to the most economical feedstuff currently available.

Researchers have developed this method, which analyzes fecal samples of free-ranging livestock using near infrared reflectance spectroscopy (NIRS) to predict the dietary crude protein and the digestible organic matter of the animals diet. The NIRS process utilizes prediction equations that were developed from diet and fecal samples of livestock over a large variety of forage conditions. These equations have proven to be very reliable in predicting nutritional values under numerous conditions. Currently the Grazingland Animal Lab in the Rangeland Ecology and Management Dept. of the Texas A & M University performs nutritional profiling on livestock such as cattle, sheep, goats, bixon and is working on equations for elk and deer management. These profiling, shipping and handling methods have been tested throughout the U.S. and the world.

Texas rancher, Kevin Spreen was looking for a way to make his ranching operation more efficient and cheaper. His large pastures and year-round continuous grazing systems were not providing the most effective use of his grazing land and he also was looking for a way to reduce his winter feed costs. A workshop put on by the Natural Resources Conservation Service (NRCS) introduced Mr. Spreen to NUTBAL and the benefits of crossfencing and pasture deferment to improve forage quantity and quality.

Mr. Spreen owns a hereford-brangus cross herd on native rangeland in Runnels County. His winter feed program was based on 20% breeder cubes like the majority of ranchers in the area. He uses a fall calving season and was looking for a way to find out what his cows were getting from his grass and what they needed in the way of supplements. He also wanted a way to monitor the quality of his forage as he went forward with his planned grazing system. The NIRS-NUTBAL system has provided this service for him. In 3 years, Spreen has been able to shave $1300–1500 a month from his feed bill by using NUTBAL to fine tune when he fed protein supplements and when he needed to switch to high energy supplements. He has maintained a 95+% calf crop and kept his impressive weaning weights.

Let's explore the basics of the NIRS/NUTBAL system:

First, the stockman must collect fresh fecal samples from free-ranging animals that have been off of supplemental feed for 48-72 hours. The sample can easily be collected early in the morning prior to feeding. Locate 5 to 10 dung piles that are very fresh and still moist inside. Just gather a "heaping tablespoon" from each pile and combine in a plastic sealed bag. By mixing the samples together you can achieve a more accurate reading for the herd. Freeze and label the sample.

Completely **fill out** the Fecal Sample Information Form, that can be obtained at the NRCS office, with the client name, ranch name and location, sample id, date collected, vegetation etc. Place the form in the box along with the sample and ice pack. Always use a mail service that guarantees two-day delivery.

The lab will then **analyze** the information using NIRS equipment and determine the dietary crude protein and digestible organic matter values for each sample. This forage diet quality estimate is used in the NUTBAL program with animal and environmental information to estimate animal nutritional status.

Next, the rancher must provide **livestock case information** for nutritional profiling. This could be done by himself or a trained resource specialist. The case information includes the kind, class, breed and body condition of the animal to be monitored. Environmental conditions and the weight performance goals that the producer has for his livestock must also be entered.

The frame score or the skeletal cow size is determined by breed and height from the ground to the top of the hip bone. The height can easily be determined by using a set gauge on a fence or vehicle. This score needs to be as accurate as possible as it is used to estimate body condition score weight which is used to calculate maintenance requirements. Frame score is also used with calf weaning weight and age to calculate milk production requirements.

To successfully use NUTBAL, understanding Body Condition Scoring is necessary to set and monitor performance goals. It is important not to let a cow drop down below a body score of 4 before the next breeding season. When determining the Body Condition Score of a cow, if the 12th and 13th rib are still noticeable to the eye this would be considered a score of 4. When the 12th and 13th ribs are not visible to the eye and the backbone can only be felt with firm pressure this is considered to be a score of 5 or the optimum condition.

NUTBAL uses maximum daily temperature as a measure of temperature stress. Temperatures above and below the animal's comfort zone have a major effect on forage intake. Animals subjected to muddy, rainy or snowy conditions depress intake as temperatures decrease. The NUTBAL program allows adjustments for these conditions.

Finally, the sample results are entered into the program and used to create a nutritional balance report for protein and net energy. If a nutritional deficiency is apparent, NUTBAL is then used to develop a least-cost feeding alternative based on a supplemental feed list provided by the rancher.

The results have helped Spreen so much that he bought his own NUTBAL program. By owning his own program he sends off the sample to be analyzed and then can do all the calculating himself. He is now able to monitor two very important aspects of his operation-forage quality and livestock response to this quality.

One of the most frequently asked questions is how often should the samples be taken and when would be the best time to take them. The recommended schedule is to collect a sample once a month for the first year or two. During that time four additional samples may be necessary to detect unexpected events or transitional periods. Transitions occur with seasonal drying, cooling or warming trends. Unexpected events include an early freeze, mid-summer rainfall, ice storms, or exceptionally high acorn or mesquite bean drop. Costs per sample range from $23.50 for DOM and CP Analysis to $38.50 per sample for DOM and CP Analysis plus a printout of Crude Protein balance and net energy of maintenance with feeding recommendations. After the first year or two of monitoring it is recommended that routine sampling be continued but less frequently. Sampling in the second or third year should focus on transition periods and unexpected events that occur during traditionally high forage quality. After the second year, it is recommended that you only sample when major deviations are noted from the first 2 years. The key is to monitor the condition of the animal and the availability of the forage and keep good historical records to recognize significant deviations. The beauty of the system is that you can use the NUTBAL system to play "what if" games to help assess if the perceived conditions really matter or if you should collect a sample because you are too close to the edge of a problem.

The NIRS/NUTBAL nutritional management system allows the manager to assess a problem, formulate a solution, and move on to other pressing issues which occupy a manager's time. The "worry factor" in management is greatly reduced with a system that takes some of the guesswork out of one of the major items in the variable costs of raising livestock.

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The author would like to express his appreciation to Ron Vanicek, Natural Resource Conservation Service Specialist; Kevin Spreen, Texas Rancher; and Dr. Barron Rector, Texas A&M University Professor. All of these people provided him with materials and information to prepare this paper.

Editor's Note:
This is the 1st Place winner of the High School Youth Forum presentations at the 1999 SRM Annual Meeting, in Omaha, Nebraska, Feb. 1999.

DOES IT HAVE TO STOP?

A Look at Threats to Livestock Grazing

KRISTIN GUSTAD, HSYF

When my ancestors first carved a living from the western rangelands from Montana to Colorado, they fought harsh weather, desert-like environments, sagebrush higher than the tops of covered wagons, predators, and all odds to establish their families and produce life from a country which produced, according to their accounts, not even much wildlife, let alone agricultural crops. Now their descendants face an even more dangerous threat in the form of: "We're destroying the earth, and we're doing it for the sake of cattle. That's obscene and it has to stop. Now." Or so says a member of an organization called Rest the West. Is she right? Does livestock grazing really ruin the earth? Does grazing have to stop? Before we decide one way or the other, let's look more closely at the affects on the environment, and take a look at what legislation is doing to grazing.

Does grazing have to stop?

If you were used to the lushness of the Midwest and the east coast, and were to see much of eastern Montana and Wyoming, you might think that grazing really does ruin the earth. It's not exactly "grass taller than the trees,"or even green grass most of the summer, but it never has been. In fact, most all of the public land is what was unclaimed under the homestead act because farmers in the 1800's were unable to make a living on 160 acres of it! Much of the west is still just not suited for farming or developing. It is best suited for growing grass, and people just can't eat range grass. In fact, in Montana alone, 56 million acres, 60% of the state, is best maintained as native rangelands. But never fear, grazing animals can turn that grass into food people can eat.

Not understanding this principal was one of the bison's biggest problems. They would eat all there was in one place, leaving the land looking like a dust bowl, then they would have to move to a new place and not come back for a long time until the grass had a chance to regrow.

Whether some people prefer to overlook the valuable potential of range or are truly in the dark about it, they still fight livestock grazing. Some say, like a spokesman for the Oregon Natural Resources Council, "The cow is a very productive vegetation destroying machine; however, it is very ineffective in utilizing the vegetation as it uses very much of it. And in the arid west where you are talking about acres per cow instead of cows per acre, you are talking about a very fragile environment that did not evolve for grazing." Well, although many of the grazing animals today are introduced, grazing is not. Bison, deer, elk, and antelope have been here grazing as long as our history!

In fact, our arid western rangelands did evolve by **grazing itself, and grazing actually helps this environment.** An easy example of this is what happens to an unmowed lawn—well let's just say it isn't pretty green and lush, but the old grass chokes out the rest, weeds take over, and bare spaces increase. Before long it looks like it has a bad case of mange! I'll be the first to admit that some people misuse the land, but saying that is why rangelands should not be grazed is like saying we shouldn't have police officers because some of them misuse their power!

Another concern of the environmental extremists is that livestock push wildlife off the land and that they take their food. We would all miss the western wildlife if this was the case, but really livestock have helped their wild cousins in at least three ways. First, there is much of the grasses that the deer and elk dislike but the cows prefer. The differences in diets are sufficient to allow both livestock and wildlife to complement each other in utilizing and maintaining rangelands.

The second way in which livestock on rangelands help wildlife is through proper livestock management and monitoring changes. This means that the ranchers know that they need to manage their livestock and to rotate their pastures to allow maximum growth and potential. Since the cows don't know this, and the ranchers depend on the land's ability to continue to support livestock, the ranchers move their stock. Not understanding this principal was one of the bison's biggest problems. They would eat all there was in one place, leaving the land looking like a dust bowl, then they would have to move to a new place and not come back for a long time until the grass had a chance to regrow.

The third way that livestock help, rather than hurt, wildlife is that livestock are fed hay in the winter, and thus the deer and their friends also eat from hay fields in the summer, and have easy feed for the winter, because eating hay beats stripping bark from trees.

If ranchers were put out of business, then most of the land would become either overgrown, decadent, and non-productive, or would be subdivided. Even environmental extremists can see that building subdivisions over the land really would destroy the west and push wildlife off their lands! As a former Wyoming senator said about the concern of environmental extremists about public lands, "The reason they can care about it [federal land] is that good people have been running it for a century."

Grazing on public land has been a pressing issue in legisla-

tion for quite some time. Those opposed to grazing on public land have powerful Washington-based lobbies to influence not only legislation, which is voted on, but also regulation, which is not. Subtle changes in regulations of public lands which seem innocent on the surface can be, in real-life, devastating to healthy, productive use of the land. One example of this is the push to raise grazing fees to what opposition groups consider a fair market value, as compared to leased private lands which offer much more in exchange for their use than a percentage of the grass alone. Such price increases can drive operations out of business, especially since beef isn't worth very much—at the producer level any way, you can try 79 cents a pound as a rough figure to work with. But driving livestock producers out of business seems to be the actual objective of some groups.

A Colorado State University range scientist explained grazing in a way we can all see its importance, "If the grasslands are managed correctly, the American people can get a wonderful food and fiber only using energy from the sun."

More devastating to the use of public lands can be regulations such as, the new "Standards for Rangeland Health and Guidelines for Livestock Grazing Management," the Bureau of Land Management's rule book for Montana. Let's take a quick peek at a few of these "guidelines"for eastern Montana. On the surface, guidelines may seem harmless and even helpful, like "proper functioning condition of riparian areas," or "water quality meets Montana standards." We have to be concerned how these regulations are interpreted, like when a functional pasture is suddenly declared a "riparian area," or when a cow happens to defecate in a stream as someone is taking a water quality sample. The guideline list goes on, and so do the threats to grazing on our western range lands.

A Colorado State University range scientist explained grazing in a way we can all see its importance, "If the grasslands are managed correctly, the American people can get a wonderful food and fiber only using energy from the sun."

So back to the decision making. Does grazing on public land have to stop? Let's set aside the propaganda and decide. The facts show that grazing is a very important factor in the health and productivity of western grasslands. These lands evolved with grazing. Facts also show that grazing improves the vegetation quality and maintains the grasslands and wildlife populations that depend upon it; and most importantly, that grazing gives a wonderful, renewable source of food and fiber for people.

Does grazing have to stop now? No, of course not, it must continue to maintain the west!

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With thanks to the staff of: the USDA Fort Keogh Agricultural Research Station, the Miles City Field Office of the BLM, the Miles City office of the Montana State Fish, Wildlife and Parks, the Custer County Office of the MSU Extension Service and the Miles City FFA chapter advisors

Editor's Note:
This is the 2nd Place winner of the High School Youth Forum presentations at the 1999 SRM Annual Meeting, in Omaha, Nebraska, Feb. 1999.

Biological Weed Control

MATT OEDEKOVEN, HSYF

At the end of the 4th day I continued my usual nightly routine of coming in after dark, coughing and hacking. I could barely walk my back and shoulders ached so bad. I made it to my bed and crashed. I lay in bed unable to breathe and then it hit me, there's got to be a better way to control these noxious weeds.

If you have ever felt this way about controlling your weed problem you're not alone. However there is good news for those who seek it. Biological weed control is proving to be one of the most effective weed suppressants yet. And the good news is, you don't have to work hard to accomplish a lot. Today I want to tell you just a few of the benefits of using biological methods to control your weed infestations. But first let's take a look at how big of a problem noxious weeds really are.

The State of South Dakota only has 9 recognized noxious weeds. The 9 noxious weeds in order of economic loss are: Field bindweed, Canada thistle, Leafy spurge, Perennial sow thistle, Hoary cress, Russian knapweed, Spotted knapweed, Diffuse knapweed, and Purple loosestrife. Altogether these 9 plants cost farmers and ranchers in excess of 160 million dollars annually. You may ask how can 9 plants cause that much damage? But with four million South Dakota acres infested with these weeds it doesn't take much to add up all of the costs.

Nearly every state has some kind of regulation that noxious weeds be controlled. In South Dakota if you refuse to control an outbreak you will be subject to a $100 fine and or 30 days in jail. But the worst part is that your operation may be put into quarantine. This allows the noxious weed outbreak to be controlled on one site, but forces the producer to be shut down and not able to market their commodities. This would be a financial nightmare for anyone.

The most commonly used source of control has been chemicals, such as 2-4D and glygophosphate. Millions of dollars have been put into research to develop these chemicals, and millions of dollars have been spent applying these chemicals. However these substances are very risky to apply and to keep around your operation. When applying chemicals, there is always a chance of killing a non-target plant. Sometimes your favorite shade tree is sacrificed to control a small plot of Canada thistle.

A recent study showed that the average cost to apply chemicals is $72/acre. However one year will not control your stand of weeds. Field bindweed seeds are known to live in the soil for up to 50 years. It usually takes 5–10 years of diligent labor to control weeds and make sure they don't come back, and even then you have no certainty of the weed not returning. It is a very long term and expensive fix once you have weeds established.

Among other problems with chemicals is that they accumulate in the soil. This causes problems down the road and limits you to what you can plant on that land. If chemicals seep into ground water it will contaminate livestock watering facilities and even worse, your own drinking water.

So with all of the problems and uncertainties of chemical use, I'm glad to see the use of biological control being implemented. This is a much safer, more efficient way to control a stand of weeds. The two weeds I will be concentrating on will be Canada thistle and Leafy spurge because they are the most abundant in my county.

Canada thistle now infests 1,287,286 acres in South Dakota, and has caused a loss of over $48 million. There are now 4 different insects available on the market to control Canada thistle. They include Thistle stem gall fly, Canada thistle flower weevil, Canada thistle stem mining weevil, and Thistle defoliating beetle.

The Thistle stem gall fly creates a gall in the stem of the plant causing a nutrient drain and usually inhibits growth above the gall. This also leads to less seed production. The Canada thistle flower weevil feeds on the seed head and stops seed production. The Canada thistle stem mining weevil creates multiple exits from the stem allowing other biological control agents inside the plant. And finally the Thistle defoliating beetle feeds on the leaves of the plant causing water loss and plant trauma.

Leafy spurge has been targeted with many biological control agents. There are 7 products available for 1998. They include: 5 root boring beetles: Black dot spurge flea beetle, Amber spurge flea beetle, Brown dot spurge flea beetle, Brown-legged spurge flea beetle, and the Minute spurge flea beetle.

Root boring beetles lay eggs near the base of the plant and the larvae feed on secondary and primary roots. One type of Root borer, *Aphthona flava* reduced Leafy spurge canopy cover from 57% of an area to less than 1% in 4 years. The

Red-headed spurge stem borer's larvae mine through the woody stem of the plant. And the Spurge shoot-tip gall midge causes galls to form rendering seed production useless. Best results can be seen when more than one type of biological control is used. Also in areas that can be sprayed, biological control will help reduce the amount of chemicals needed to control the stand. In Idaho bio-control has reduced their use of chemicals by 60%.

Biological control is very helpful in areas where chemical use is not practical. Areas may be difficult to reach with equipment. The ecosystem may be very vulnerable in that area such as a stream running through a plum thicket. If chemicals were used the water would be contaminated and the thicket would most likely be wiped out. Also biological control is very easy to apply. In most cases it requires opening a styrofoam container and watching the insects go to work. There are absolutely no hazardous warnings to bio-control. The insects are host specific and there is no chance of killing a non-target species.

There have been many success stories since biological control became popular in the 1940s battling St. Johnswort. In Montana at the National Bison Range biological control alone has reduced a 9,000 acre infested area of Musk thistle to less than 25 acres. The US Department of Agriculture estimates that $155.6 million dollars is saved each year due to biological control across America.

So the next time you find yourself knee deep in noxious weeds without a clue of how to start, call your local extension agent for more information on how to get started with biological weed control.

Editor's Note:
This is the 3rd Place winner of the High School Youth Forum presentations at the 1999 SRM Annual Meeting, in Omaha, Nebraska, Feb. 1999.

Medusahead and Clay: The Rarity of Perennial Seedling Establishment

JAMES A. YOUNG, CHARLIE D. CLEMENTS, AND GLENN NADER

At one time it was quite common for range managers to rationalize the poor condition of a particular range site with the statement, "Give it a couple good wet years and you would not know this place". **In the Great Basin, the standard rancher prayer is for a few good warm spring rains as opposed to a downpour thunderstorm when the hay is mowed and in the field or 6 inches of snow during calving time.** Hay gets wet in the fields, cold storms happen during the early spring, but warm well distributed spring rains are very rare events.

Any serious student of the biology of temperate deserts of western North America, cannot help but be struck by the episodic nature of perennial seedling recruitment. Many species do not recruit seedlings to the stand every year. You can walk through many Great Basin plant communities and find the seedling age class of native perennials is completely absent on most years. Grant Harris pointed out many years ago that recruitment of bluebunch wheatgrass seedlings, especially in the face of competition from cheatgrass, is a highly episodic event conditioned by unusually favorable amounts and periodicity of moisture. Our experience has been, the drier the site the more episodic seedling recruitment becomes.

Our purpose is to describe the nature of the range site in the western Great Basin most frequently infested with medusahead and contrast perennial grass seedling recruitment during drought, modal, and exceptionally favorable seasons for seedling recruitment.

Medusahead

Medusahead is an annual grass native to Asia that first invaded the Mediterranean region and then was introduced to the western United States. Once established on rangeland sites, medusahead reduces harvestable forage for domestic and wild herbivores, greatly limits the establishment of seedlings of perennial species, and increases the chance of ignition and the rate of spread of wildfires.

Nature of Sites Infested With Medusahead

In the western Great Basin, medusahead usually invades sites already infested with the accidentally introduced annual cheatgrass. Cheatgrass is a highly successful competitor for soil moisture and it inhibits the establishment of seedlings of other annuals or perennials. Because medusahead matures about a month later than cheatgrass, it initially only replaces cheatgrass on soils with sufficient moisture holding capacity that some soil moisture remains after the maturity of cheatgrass. For years managers and scientists have noticed a strong correlation between medusahead dominance and clay textured surface soils. Medusahead plants have the root system to completely exploit all soil moisture in the soil profile and the plants have the inherent capacity to extract moisture from extremely dry soils.

Smectite Clay Soils

It is very fitting that Robert Blank worked out the sequence in soil environment change that resulted from medusahead invasion in the western Great Basin. Blank's graduate studies mentor was M. A. Fosberg at the University of Idaho, who first reported the association between clay soils and medusahead invasion. Blank determined that for the vast Columbia Basalt formation, that extends from northern California, northwestern Nevada, and southwestern Idaho to British Columbia, Canada, the soils where medusahead is found are often associated with the development of the Cascade volcanos to the west. On the Modoc Plateau in northeastern California, during the Tertiary period, extrusive volcanic flows periodically dammed water flows, which resulted in the formation of large lakes. Contemporaneous with the lake formation, volcanic ejecta from the rising Cascades contributed large volumes of tephra (ash and cinders) that rained into the lakes. Diagenesis or alternation of this lake-laid tephra formed 2 to 1 expanding lattice aluminosilicate clay minerals (group name of smectite). The type of smectite clays found on the Modoc Plateau possess high levels of shrink-swell and unusual water retentive properties.

Soils dominantly smectitic in composition, are referred to as self-churning Vertisols. These are soils that swallow themselves annually. When they dry the soils shrink until an extensive system of cracks is formed. Surface soil layers partially sluff into the deep cracks. Upon re-wetting the soils swell, burying the material entombed in the cracks or sometime ejecting it back on the soil surface. In contrast to normal soil development where horizonation is used as an interpretative tool, these soils continually erase their own history. Over thousands of years, the shrink-swell action of the clays has rafted underlying rock, from cobble to boulders in size, to the soil surface. **The resulting landscape is one of the most miserable to walk, drive or ride horseback across on the western range. At turn-out date in the spring, cows have the choice of standing on four rocks or sinking 10 inches deep in sticky clay.** By late summer, yawning cracks 4 to 10 inches wide stretch among the rocks. Some open to the bedrock 3 to 6 feet below. Sometimes the soils are sorted into huge, irregular polygons of rock almost entirely composed of rock with only clay films.

Rock sorting to the surface and rock polygon formation, precludes the tillage of medusahead sites for weed control and seedbed preparation. The infested sites usually cannot be seeded with a drill, even a heavy duty rangeland drill. Artificial seeding is limited to broadcasting on the soil surface with no possibility of obtaining seed coverage.

The clay textured soil surface among the rocks is a hostile environment for the establishment of perennial grass seedlings. The structure of these clays when dry is granular. As the seedbed surface dries in the spring the aggregated particles of clay are readily wind erodible. As the drying clays shrink, they pull away from the crown of perennial grass seedlings leaving the adventitious roots exposed and the seedling attached by the true or seminal root only. This process is aggravated by frost heaving during the winter. In the spring it is common to observe semi-circular patterns on the seedbed surface where the wind has whipped such precariously attached seedlings back and forth until they die. These seedlings are easily pulled from the ground by grazing animals.

Natural Communities

Robert Blank and James Trent searched for range sites similar to those invaded by medusahead to study how native plants became established on the clays. When considering medusahead invasion on volcanic landforms in the Great Basin, it is important to be aware that the seemingly flat basaltic tablelands appear very uniform, but actually support a multitude of micro-topoedaphic features and plant assemblages. One of the plant communities most frequently encountered and most extensive in area is characterized by Lahontan sagebrush/Sandberg bluegrass (Figure 1).

Figure 1. *Lahonton sagebrush/Sandburg bluegrass plant community. This site will become dominated by medusahead following repeated wildfires fueled by cheatgrass and medusahead herbage. Even though this is a fairly high condition site, it already contains scattered medusahead plants. The meter range pole is divided into decimeters.*

Blank and Trent found the soils of the Lahontan sagebrush communities were fascinating micro-environments of dust, developed physical, and microphytic crust. These sites were selected as parallel environmental potentials to adjacent degraded sites infested with medusahead. The shrubs grow on mounds rising above the clay soil. The mounds are composed largely of eolian dust, from the vast playa system left in the Great Basin by drying Pleistocene (pluvial) lakes. The shrubs trap the falling dust and coarse particles bouncing across the surface of the clays (a process known as saltation). The shrubs add leaf fall to the soil accumulations beneath their canopies. This supports an extensive microphytic community. The eolian veneer extends to the interspace and varies in depth from 0 to 10 inches. Shrub interspaces, which make up 50% of the area, are largely bare of vegetation except for Sandberg bluegrass plants growing on pedestals.

Common and scientific names of plant material.

Appar flax	*Linum lewisii*
Big sagebrush	*Artemisia tridentata*
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Cheatgrass	*Bromus tectorum*
Crested wheatgrass	*Agropyron desertorum*
Idaho fescue	*Festuca idahoensis*
Lahontan sagebrush	*Artemisia arbuscula* ssp.*longi caulis*
Medusahead	*Taeniatherum caput-medusae* spp. *asperum*
Palmer penstemon	*Penstemon palmeri*
Sandberg bluegrass	*Poa secunda* ssp. *secunda*
Sherman big bluegrass	*Poa ampla*
Squirreltail	*Elymus elymoides*
Tall wheatgrass	*Elytrigia elongata*

Obviously, the mounds with their relatively thick layers of eolian deposited soil, nutrient cycling from leaf and litter fall, and potential nitrogen fixation from the cryptogamic crust are a much more desirable location for plant growth than the bare Vertisol beds of clay. The interspaces between the shrubs were largely bare, but Robert Blank suggested they play an important part in making the Lahontan sagebrush community function. They developed vesicular crust that are so impermeable that they reduced water penetration to the clay beds and tended to channel deep moisture penetration to the mound areas. If the deep clays do not get wet they have reduced expansion and shrinkage. The mounds composed of coarser-textured material serve to dampen the surface effects of the expanding lattice clays.

Apparently, what has occurred in the process of degradation of these sites is that first cheatgrass invaded the former Lahontan sagebrush sites. Then the cheatgrass was replaced by medusahead. Recurring wildfires, carried by the dense accumulation of annual grass herbage, killed the non-sprouting shrubs. Once the shrubs were gone the eolian derived mounds eroded away and the entire system reverted to a clay-rock surface. This resulted in a drastic change in seedbed diversity and quality. Diversity of safesites for germination is greatly reduced because all of the multitude of varied litter and microphytic crust sites that formed in irregular halos on the shrub mounds were lost. The shrinking-swelling, frost heaving clays provided a very unstable and hostile environment for germination and seedling establishment.

Medusahead Germination On The Clay Seedbeds

If the smectite clay beds offer such a hostile seedbed how is medusahead so successful in colonizing the sites? The answer lies in the inherent potential of medusahead seeds to germinate and the rapid accumulation and slow decay of the litter of this grass. Medusahead seeds (technically more complex than a simple seed, a type of fruit known as a caryopsis) can germinate suspended in litter without the callus end of the seed in contact with a moisture supplying substrate. Not only can they do this once, but repeated germination from adventitious buds can occur if the initial root dries before seedling establishment is obtained.

Rod Bovey determined that medusahead herbage has a higher silica content than that of any other grass. Between not being preferred by herbivores and decaying slowly because of its silica content, medusahead communities develop a thick layer of litter. Litter is excellent for damping the extremes of bare seedbeds and bringing the potential of the seedbed within the germination requirements of plant seeds. In this case the effects of the litter goes even farther. Moisture events, or perhaps even diurnal fluctuations in relative humidity, cause clay particles to cling to the lower surface of the fine medusahead litter. This is close to the time honored recipe for manufacturing adobe bricks. In this case a flexible mat containing the seed reserves of the medusahead community is formed. Not only are the extremes of the seedbed environment mollified, the medusahead seedbank is kept free of the self-churning action of the clay soils. Miniature bridges span cracks and flex with the swelling and shrinking of the clay. Seeds that fall into the cracks are buried far deeper than they can emerge. Medusahead seeds germinate in the litter and drop incredibly strong juvenile roots to the clays. These juvenile roots are capable of transporting moisture back to the seedling.

This is such a favorable modification of a harsh seedbed it would seem reasonable that seeds of other plant species would find favorable sites for germination. They do, but the fierce competition from dense stands of medusahead effectively eliminate the seedlings of other species from establishing. **If you are going to establish seedlings of desirable species you must first reduce competition from the dense stands of medusahead.**

We have established several different species of native shrubs, including Lahontan sagebrush, on the clay beds by transplanting seedlings and providing first season weed control. Many of these transplants successfully established and even persisted through years of extreme drought. These plantings have been established for as long as 15 years and produce abundant crops of viable seeds as determined by field collection and laboratory testing. We have never observed natural successful establishment of shrub seedlings around these nursery plants.

Herbicidal Control Of Medusahead

There are several herbicides that give excellent control of medusahead. There has been little commercial activity in registering herbicides for this use because of lack of interest by ranchers and land management agencies conditioned by the cost of such treatments and environmental concerns. Control has not been the problem. **Getting perennial replacement species established to *biologically suppress* medusahead has been the problem.** If you are going to biologically suppress an annual grass you must establish a perennial grass. The lack of perennial grass seedling establishment is directly related to the harshness of the churning clay soils that form the seedbed.

Figure 2. *Wheatgrass seedlings growing from furrows where sand was applied to clay seedbed. Broadcast spreading a thin layer of sand consistently produces perennial grass seedling establishment. Placing the sand in furrows is not as consistent because the sand sometimes disappears down cracks in the clay beds.*

There are two basic systems for applying herbicides to control an annual grass. One is to create a herbicidal fallow by applying a soil active herbicide in the fall and waiting a year for the herbicide activity to dissipate before seeding. Fallow systems have the advantage of storing moisture and nitrates, but it results in the loss of the litter layer. This is not a problem on sandy to clay-loam textured soils found on most big sagebrush potential sites where cheatgrass is the annual being controlled, but in the case of these medusahead sites the churning clay is exposed. The second herbicidal control involves using a contact herbicide that is inactivated when it reaches the soil surface. The only applicable material for medusahead is glyphosate (Trade name Roundup). Another potential herbicide in this class is paraquat, but it does not kill medusahead under Intermountain environmental conditions. In Utah, the best control of medusahead that has led to perennial grass establishment, occurred when the periodicity and amount of fall rains induced excellent germination of medusahead before winter. After applications of glyphosate, wheatgrasses were seeded into the litter with a no-till drill

Seeding Attempts

The standard perennial grass that has been historically used for seeding in the precipitation zone where our research plots are located in northeastern California is crested wheatgrass. We started seeding crested wheatgrass at several locations on the clay soils in 1970. Establishment and subsequent growth have both been very disappointing. We tried many different

Figure 3. *Moderately successful perennial grass establishment on clay soils infested with medusahead. Medusahead competition was reduced with application of the herbicide glyphosate and the site broadcast seeded in the spring over the medusahead litter. Seedling establish - ment such as this only occurred once in the last 25 years.*

native and introduced species with continued out-right failure to sporadic, inconsistent sub-marginal success. The large seeded tall wheatgrass has given the most consistent, but always sub-marginal, results.

Physically Modifying The Seedbed

We worked our way, with no success, through a host of applied organic mulches in an attempt to improve the quality of seedbeds. We hit upon a highly effective inorganic mulch, sand. You normally do not think of a coarse sand as a desirable seedbed, but a 1 to 2 inch layer of sand applied across the clay results in excellent and consistent establishment of several different species of native perennial grasses (bluebunch wheatgrass, Idaho fescue, squirreltail) and forbs (Palmer penstemon and Appar flax) (Figure 2). Was the problem solved? Unfortunately, it has not been solved on a practical basis. Calculate the amount of sand that is required to cover an acre a couple inches deep. Except for limited applications in high value situation, the sand mulch is not economically feasible.

Figure 4. *Excellent stand of Sherman big bluegrass growing on site where medusahead was controlled with herbicides. Range pole divided into decimeters.*

Yearly Variation

During the prolonged struggle to find adapted plant material for seeding on the medusahead sites, we became well acquainted with variation in the amount and periodicity of precipitation received on the experimental sites. This included 3 years when it was too dry for medusahead to grow and reproduce (less than 5 inches of total precipitation annually). Average precipitation for our experimental site is about 12 inches. Years of seeding on these clay soil sites with average precipitation from 8 to 14 inches have resulted in failure. In 1996-1997 the site was blessed with just under 9 inches of precipitation during early and mid-winter. Unfortunately, it never rained after February first and the seedings were complete failures.

Mythical Wet Spring Materialize

The winter of 1997–1998 finally turned out to be the mythical wet winter with abundant warm spring rains. We obtained good stands of tall wheatgrass on both atrazine (1 lb per acre) and sulfometuron methyl (0.3 oz per acre) fallowed plots from fall seeding, and marginal, but consistent over a large area, stands with applications of 0.5 lb per acre of glyphosate followed the same day with spring seeding (Figure 3). The most successful stands were obtained with `Sherman' big bluegrass, a cultivar which we had not previously tried (Figure 4).

Sherman Big Bluegrass

The cultivar Sherman was developed from plant material first collected in eastern Oregon. Sandberg bluegrass is the most abundant perennial herbaceous species in the un-degraded Lahontan sagebrush communities. When medusahead dominates, Sandberg bluegrass is completely absent from the community. We noted this association many years ago and have repeatedly tried to establish local collections on the medusahead infested clay soils. We were never successful with these trials.

Is Sherman big bluegrass a potential break through in plant material for revegetation of medusahead sites? Or was the success with this native species a fluke associated with the exceptionally wet spring? **Repeated trials over time will provide the answer, but if we have to wait for reoccurrence of the exceptional warm wet spring of Great Basin mythology, the answer may have to wait for the next generation of researchers.**

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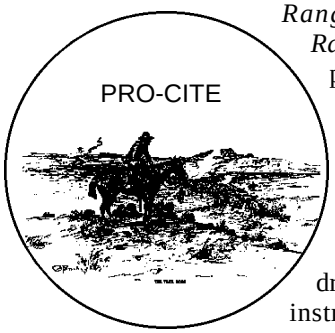
Psst, Do You Want Some Information on Rangeland Resources and Management?

Charles B. Rumburg (Society for Range Management) and Leigh Hunt (Australian Rangeland Society)

Ha, just try and find it! Volumes and volumes of information exist; the challenge is in plowing through all of these volumes to find the subject of interest—such as a specific plant, how to control a pest, the impacts of burning or hundreds of other subjects. Well, the solution to that problem has just gotten a whole lot easier. Members of the Society for Range Management (SRM) and the Australian Rangeland Society (ARS) now have access to the most comprehensive bibliographic database of rangeland resources and management that exists, thanks to a joint initiative between the two societies.

The database contains a read-only record of all of the articles that have been published in *Rangelands* and its predecessor *Rangeman's Journal,* the *Journal of Range Management (JRM), The Rangeland Journal* (TRJ) and its predecessor the *Australian Rangeland Journal* (ARJ). Furthermore, the database doesn't require an advanced degree in computer science to use. All that is required is a computer with a CD-ROM drive, the ability to follow simple instructions for installing the program and the basic skills of scrolling and double-clicking with a mouse in a windows 95/98 environment.



Each record in the database contains the names of the authors, article title, name of the journal, year, volume number, issue number, page numbers, abstract (where available) and key words (where available). All records can be quickly searched by author, title, Journal or keywords. A little practice will enable advanced techniques capable of full text searches for selected words in the above fields. Word searches in *Rangelands* are good only for authors and titles because abstracts do not exist; but the database is capable of pointing you to the exact location of that article that you have been wanting to review only you forgot which issue it was in.

The database is currently available as a read-only version from the Society for Range Management office. The database and the files for searching it are supplied on a CD-ROM disc which comes with instructions for installation and a small manual from ProCite with brief instructions for using the application. A small executable file may be installed on the computer's hard drive which permits the records to be searched directly from the CD-ROM disc if you choose.

There are currently 6953 records in the database which is complete through 1998. Of these 6953 records 72.8% are from *JRM*, 21.9% are from *Rangelands* and 5.3% are from *TRJ/ARJ*. This large number of records in one location makes this a great resource for anyone interested in rangeland resources and their management. Fortunately, the ProCite application enables users to search thousands of records in the blink of an eye.

The Journals: *JRM* was first published in 1949.and contained information on the society, gradually added information on resource management research. The Society decided to convert *JRM* to a peer-reviewed journal for scientific research. However, this created a need for a lay journal where managers and rangeland users could share ideas and personal experience relating to rangeland issues and resource management. This led to the publication of the *Rangeman's Journal* in 1974 which became *Rangelands* in 1979.

The *Australian Rangeland Journal* was first published in 1976 and became *The Rangeland Journal* in 1992. Although the journal is small in terms of the number of papers published each year, it accepts papers of scientific merit on a diverse range of issues associated with rangeland resources. Ecology, monitoring and management feature predominantly in published papers, but these address issues that are not restricted to grazing or pastoralism (ranching). This diversity is reflected in the special issues of the journal that have been published in recent years. Topics covered include wildlife and conservation in rangelands; contemporary values, goals, needs and expectations of rangeland users; grazing management; and water in the rangelands. In addition, papers are published concerning range rehabilitation, feral animals and their impact and management, native herbivore/domestic stock interaction, native grasses and range condition and monitoring. Papers are accepted from anywhere in the world and there is an increasing number of international papers being published.

The History of the Database: The concept of the database began in late 1992. However, at that time no digital files existed for any SRM publications (the first digital files were created in July 1994.). So a search began to discover if any SRM members had created a bibliographic database for their own use. The search was successful. John and Terri Walker, then at the U.S. Sheep Experiment Station in DuBois, Idaho, had created a database that included both *Rangelands* and *JRM*.

John agreed to transfer his database into the ProCite software and to make the bibliography available, through the SRM, to everyone who wanted a copy. Distribution of the database first began in 1994. About the same time the ARS contacted SRM about the possibility of including the information from their journal in the database. SRM agreed and a memorandum of understanding (MOU) was formally adopted by both organizations in 1997. The MOU specifies the responsibilities of the two societies in respect of the database. SRM has agreed to handle the production and development of the database while the ARS has agreed to provide its records for inclusion in the database, provide new records as they become available and promote the database within Australia and elsewhere through its publications. The MOU also acknowledges that each Society retains the rights to their published information.

By this time, John Walker was assuming new responsibilities with Texas A&M University and, because he and Terri no longer had time to work on the database, they turned all of their rights over to the SRM. For that contribution, the SRM owes John and Terri Walker a great debt of gratitude. One of us (CBR) wanted to see the database completed because of the tremendous value that it has for rangeland resource managers and scientists. Therefore, he volunteered, in 1997, to update the *JRM* records and add the records from the Australian literature. He continues to this day, adding abstracts to the *JRM* records (since the original database did not contain abstracts). He has recovered *JRM* abstracts from the 1980s [from word processing disks created by SRM on an unrelated project called Communications on Renewable Resources (CORR)]; from abstracts created by SRM members Linda L. Conde, Steven Warren, Don Michael Andrews and Brian V. Hulet of articles published in Volumes 6-10 and 12-17, 1953–1964 (Volume 11 was not found); and with scanning assistance from Bob Rich to recover missing abstracts.

On the Australian side, we are grateful to Gary Bastin of CSIRO in Alice Springs for his work in preparing the Australian records for the database. Most of the early paper titles and abstracts were not in electronic form so these required scanning, character correction and formatting before they could be imported into the database. Gary is also extracting 'key words' for papers where they do not exist (i.e. issues prior to volume 19, published in 1997) and has agreed to continue providing new records as they come to hand to ensure the database is up-to-date.

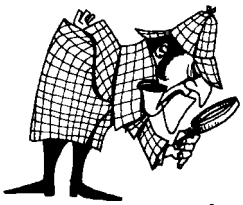
The Future: A bibliographic database is never complete. There is always new information being released that needs to be included. Adding value to the current database is possible by including abstracts and keywords where none exist (which we hope to have completed by the next release). We could seek agreements with other organizations to expand the database. We are particularly interested in information published by the Grassland Society of Southern Africa and have contacted them to learn of their interest in participating.

New and different ways of providing this information are also possible. SRM could, for example, make this database available on the World Wide Web, where anyone could search the database on-line. The important questions are what would be most valuable to managers and scientists in the field. and to others interested in information and rangeland resources. Finally, there is always, the bottom line - what are the costs and how will the financial resources be obtained to accomplish the desired end. However, we are convinced that these problems will be overcome and that this valuable SRM/ARS information resource will only become more valuable and more easily accessible.

The Australian Rangeland Society views this joint initiative with SRM as being of great importance to rangeland science and management through the sharing of ideas across international borders. We live in a global environment these days and many rangeland issues are common between different countries. However, the issues are often dealt with in different ways and we can all learn from each other in working towards optimum solutions for range resource issues. The joint database is one way of helping to share this information, and including other professional publications in the database will enhance its value.

Where can you get a copy?

Copies of the bibliography are available from the SRM, 445 Union Blvd., Suite 230, Lakewood, CO 80228, USA. The cost of the read-only CD-ROM is $125 (U.S.) for SRM and ARS members and $140 for non-members, with shipping charges of $4.00, $5,00 and $10.00 to US, Canada/Mexico, and all other countries, respectively.



Sneek a Peek at the upcoming issue of Journal of Range Management

Range Research in the Far Western United States: The First Generation

James A. Young

The first generation of range scientists established that grazing must be regulated, that productivity was declining and accelerated erosion was common. Establishing the capacity of the range to support grazing on a sustainable basis was required to prevent over utilization of the resource. A major accomplishment of this group was the concept that changes in the species composition provided an index of range condition. The history of the early range science development in the mountainous and intermountain portion of the West is summarized.

Achievements in Management and Utilization of Privately-Owned Rangelands

Clenton E. Owensby

Management and utilization of private rangelands have changed little in the past 40 years. Management strategies of the ranching enterprise must conform to rangeland productivity and be responsive to natural perturbation and economics. Some of the most significant recent research findings have been the reimposition of natural ecosystem processes such as fire which had been previously eliminated from the ecosystem. Research that improves the efficiencies of resource allocation and utilization will offer opportunity to improve management and utilization of privately owned rangelands but research infrastructure changes threaten applied research for rangelands.

Nutrient distribution among metabolic fractions in two *Atriplex* spp.

Muhammad Islam and Mark A. Adams

River saltbush and Old man saltbush are used and promoted as fodder species in saline areas.
Their nutritive value for stock and distribution of salts and nitrogen and phosphorus within metabolic pools in foliage are related but hitherto unstudied. In a study conducted near Perth, Australia, we quantified N and P fractions in foliage and related our results to climatic conditions and to traditional measures of nutritive value (e. g. total N). Total concentration and fractions of N and P were positively correlated with rainfall and negatively with temperature and likely nutritive value is less than requirements of many ruminants.

Reassessment of Revegetation Strategies for Kaho'olawe Island, Hawaii

Alan D. Ziegler, Steven D. Warren, J. Lyman Perry, and Thomas W. Giambelluca

Restoration of vegetation, especially native species, is a prerequisite for the future of the Hawaiian island Kaho'olawe. We reassessed earlier experimental plantings by the U.S. Army Construction Engineering Research Laboratories to determine changes in individual species coverage and overall species composition and to identify native and exotic species most capable of persisting on the barren, windswept areas of the island. Four species, buffelgrass, glycine, Natal redtop, and siratro appear resilient to the harsh conditions, but survival of native woody species was low without fertilization and protection. Future work should focus on further identification of appropriate species for island restoration.

Predictive Models for Grazing Distribution: A GIS Approach

Brent L. Brock and Clenton E. Owensby

Attempts to model grazing distribution and forage use patterns have met with various degrees of success. Field collected data from 2 years under 2 grazing systems were linked to associated geophysical properties of the pastures for input to models to predict grazing distribution and forage utilization. Differences in the success of the 2 models showed that grazing distribution and forage utilization operate at different scales and parameters. The use of GIS holds promise as a technique for developing useful predictive models for range management.

Achievements in Management and Utilization of Southern Grasslands

Carl S. Hoveland

Southern grasslands, developed from former eroded row crop land since the 1930's, are now a major beef cow-calf production area. The introduction of Kentucky 31 tall fescue, Pensacola bahiagrass, breeding of Coastal bermudagrass, and adequate lime and fertilizer were major factors in this development. Improved quality pastures for growing weaned calves has come from research accomplishments such as better winter annual grasses and clovers, no-till planting, grazing-tolerant alfalfa, and controlled grazing. Future developments will likely include perennial grasses and clovers with herbicide and pest resistant genes, and much better tolerance to drought and grazing.

Response of 2 Semiarid Grasslands to Cool-Season Prescribed Fire

Carleton S. White and Samuel R. Loftin

Fire is a management tool that may aid in restoring and maintaining grass cover in areas of the Southwestern United States where woody perennials have invaded the semiarid grasslands. A 2-year study evaluated the effects of cool-season prescribed fire in 2 semiarid grasslands on cover-type, potentially mineralizable N and soil erosion. After 2 growing seasons with a 6-month drought, the measured characteristics were the same on the control and burn plots. Prescribed fire for reducing the cover of woody perennials may not increase the risk of site degradation over that caused by drought and weather fluctuations.

Breed Stocking Rate Effects on Chihuahuan Desert Cattle Production

John A. Winder, Calvin C. Bailey, Milton G. Thomas,

The relative productivity of Beefmaster, Barzona, and Brangus cattle was evaluated on conservatively and moderately stocked pastures in the Chihuahuan Desert of south-central New Mexico. Data analyses suggest that the three breeds perform similarly and that the drought in 1994 lowered returns per ha compared to 1993 when precipitation was near average. However, conservative stocking may present less financial risk than moderate stocking when drought occurs. These results are consistent with other studies demonstrating that conservative stocking can give financial returns from cattle production equal to those from moderate stocking.

Sagebrush Ingestion by Lambs: Effects of Experience and Macronutrients

Elizabeth A. Burritt, Roger E. Banner and Frederick D.

Intake of sagebrush by sheep may be improved by exposing lambs to sagebrush early in life or by increasing the macronutrient content of the diet. A 2-part study investigated how experience early in life and the macronutrient content of the diet affected intake of mountain big sagebrush by lambs. Neither early experience, nor additional energy in the basal nor protein supplementation increased sagebrush consumption by lambs. Increasing the use of sagebrush by livestock beyond the level of toxin satiation is unlikely unless the toxic compounds in sagebrush can be rendered inactive.

Activated Charcoal Attenuates Bitterweed (*Hymenoxys odorata*) Toxicosis in Sheep

George W. Poage III, Cody B. Scott, Matthew G.

Bitterweed toxicosis causes substantial livestock losses each year in west central Taxes. We conducted a series of trials to determine if dosing or feeding activated charcoal would attenuate bitterweed toxicosis in freshly weaned lambs. Both dosing and feeding activated charcoal resulted in lambs consuming more bitterweed and apparently avoiding toxicosis. These results suggest that combing activated charcoal with a supplement may reduce the likelihood of bitterweed toxicosis.

Impact of Locoweed Poisoning on Grazing Steer Weight Gains

Michael H. Ralphs, David Graham, Glenn Duff, Bryan

Short-grass prairies are important summer grazing areas for stocker cattle, but many of these rangelands are infested with white locoweed. In a 2 year study, stocker steers were grazed on locoweed-infested short-grass prairie in northeast New Mexico. Steers grazing locoweed lost weight as they became intoxicated and did not resume weight gains for 50 days after they stopped eating locoweed. Seasonal weight gains were 21 to 30 kg less for locoed steers than control steers. Stocker cattle should not be placed on locoweed-infested rangelands until green grass is abundant and locoweed begins to mature.

Livestock Grazing Effects on Forage Quality of Elk Winter Range

Patrick E. Clark, William C. Krueger, Larry D.

The quality of native forages is commonly below maintenance levels for wintering elk. Late-spring livestock grazing was tested as a means for improving winter range forage quality. Winter levels of crude protein in bluebunch wheatgrass, Idaho fescue, and elk sedge and in vitro dry matter digestibility in bluebunch wheatgrass were enhanced by late-spring grazing. Late-spring livestock grazing can produce substantial forage quality improvement on native winter range, which will benefit the nutritional status of elk and other winter grazers.
those from moderate stocking.

Disk Chain Effects on Seeded Grass Establishment

H.T. Wiedemann and B.T. Cross

Preparing a seedbed and seeding rangeland littered with brush debris requires extensive land cleanup before conventional equipment can be used. We compared seeded grass densities on seedbeds prepared with 3 implements designed for use on log-littered sites. Disk chaining followed by smooth chaining increased grass densities by 100% (12.1 vs 6.0 plants/m) in clay loam soils and 42% (9.2 vs 6.4 plants/m) in sandy loam soil compared chaining alone. The disk-chain+chain implement offers a method to enhance seeded grass establishment on log-littered land without raking the debris.

Leafy Spurge Control with Glyphosate plus 2,4-D

Rodney Lym

The most common herbicide for leafy spurge control is picloram plus 2,4-D but this treatment cannot be applied in environmentally sensitive areas. A 3 year study evaluated leafy spurge control with glyphosate plus 2,4-D applied annually alone or rotated with other herbicides in the spring. Glyphosate plus 2,4-D combination provided similar control of leafy spurge to the standard picloram plus 2,4-D treatments at 30 to 65% less cost. The treatment has the potential to become a major component to a leafy spurge management program.

Understory Dynamics in Cut and Uncut Western Juniper Woodlands

Jon D. Bates, Richard F. Miller, and Tony S. Svejcar

The expansion of western juniper woodlands in sagebrush steppe has the potential to change the composition, structure, and productivity of understory vegetation. Understory cover, density, biomass, N status, and diversity were monitored on cut and uncut juniper woodlands for 2 growing seasons in southeastern Oregon. Understory response was highly significant by the second year with large increases in biomass and cover in cut plots. Dominance by juniper reduced understory species diversity and it may take several years for understory plants to respond to juniper removal, particularly during dry periods.

Seedbank Diversity in Grazing Lands of the Northeast United States

Benjamin F. Tracy and Matt A. Sanderson

Little information exists about biodiversity of pastures in the northeast United States. In 1997 and 1998 we quantified seed bank resources from 9 farms (36 pastures total) in New York, Pennsylvania and Vermont. We identified greenhouse grown seedling and found mostly annual and perennial forbs with few useful forage species for cattle except for bluegrass and white clover. We concluded that seed banks will not supply a diverse assemblage of forage plants for cattle, and that bluegrass and white clover may perpetuate their dominance in northeast pastures through recruitment of seed bank individuals.

Grazing System, Stocking Rate and Season on Soil Biological Quality

Manas R. Banerjee, David L. Burton and W.P.

Long-term sustainability of pasture management systems is dependent upon maintaining soil biological properties. A field study near Brandon, Manitoba evaluated the extent to which the microbiological and biochemical properties of soil can change with season and pasture management system, including their likely value as indicators of soil quality. The fluctuations were mainly independent of the small variations in soil organic matter content but were closely related to seasonal changes in soil water content. The trends suggest that light continuous grazing systems had the largest microbial biomass and nutrient mineralizing activity.

Adaptation of Tall-Grass Prairie Cultivars to West Louisiana

W. D. Pitman

Cultivars of the tall-grass species developed from Great Plains ecotypes are available, appear to have potential, but have not been evaluated on the Louisiana Coastal Plain. Selected cultivars of switchgrass, indiangrass, and big bluestem were evaluated for adaptation and response to clipping on an acid sandy loam soil at Rosepine, LA with and without longleaf pine overstory. The southern varieties Alamo switchgrass and Lometa indiangrass were adapted but not tolerant of repeated defoliation. These two varieties have potential for conservation uses, but they would be difficult to maintain under grazing or hay harvest.

Policy Prospects for Brush Control to Increase Off-site Water Yield

T.L. Thurow, A.P. Thurow and M.D. Garriga

This research analyzed ranchers' willingness to participate in a ranch-revenue neutral brush control cost-sharing program designed to enhance water yield. A survey assessed willingness to reduce brush cover to 3% in various brush cover classes. Sixty-six percent of respondents indicated a willingness to enroll some portion of their land; ranch size, source of ranch income, and whether or not expense limited past brush control efforts were the variables which best explained the probability and extent of participation. These results demonstrate ranchers would support a publicly-funded cost-sharing program that would promote private investment in brush control.

Regular Sustaining Members

as of November 12, 1999

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E.T. Bartlett
Donald J. Bedunah
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Joseph A. Wagner
John W. Walker
Gordon L. Watts
J.C. Whittekiend
George E. Wiggins
J. Ross Wight
Gary B. Will
Walter D. Willms
Nellie C. Wilson

Browsing the Literature

JEFF MOSLEY

This section reviews new publications available about the art and science of rangeland management. Personal copies of these publications can be obtained by contacting the respective publisher or senior author (addresses shown in parentheses). Suggestions are welcomed and encouraged for items to include in the future issues of *Rangelands.*

Animal Ecology

Bison performance and productivity on tallgrass prairie. E.G. Towne. 1999. Southwestern Naturalist 44:361-366. (Division of Biology, Ackert Hall, Kansas State Univ., Manhattan, KS 66506). Reports calving rates and weight gain data for unsupplemented bison on the Konza Prairie Research Natural Area in northeastern Kansas.

Native woodlands and birds of South Dakota: Past and present. M.A. Rumble, C.H. Sieg, D.W. Uresk, and J. Javersak. 1998. Rocky Mtn. Research Station Research Paper RP-8. (Rocky Mtn. Research Station, 324 25th St., Ogden, UT 84401). Over 80% of the bird species present today were also present 80-150 years ago.

Stallion harassment and the mating system of horses. W.L. Linklater, E.Z. Cameron, E.O. Minot, and K.J. Stafford. 1999. Animal Behaviour 58:295-306. (Massey Univ., Private Bag 11-222, Palmerston North, New Zealand). Feral horse mares in social subgroups with a single stallion had greater well-being than mares in multi-stallion subgroups.

Grazing Management

Effects of previous grazing nutrition and management on feedlot performance of cattle. J.S. Drouillard and G.L. Kuhl. 1999. Journal of Animal Science 77(Suppl. 2):136-146. (Dept. of Animal Science and Industry, Kansas State Univ., Manhattan, KS 66506). Reviews current knowledge and concludes that relatively little is known about relationships between management of grazing cattle and their subsequent feedlot performance and carcass traits.

Improvements

Biological-control herbivores may increase competitive ability of the noxious weed *Centaurea maculosa*. R.M. Callaway, T.H. DeLuca, and W.M. Belliveau. 1999. Ecology 80:1196-1201. (Division of Biological Sci., Univ. of Montana, Missoula, MT 59812). Idaho fescue plants grew less when a knapweed root moth attacked neighboring spotted knapweed plants.

Effect of *Galerucella* spp. on survival of purple loosestrife *(Lythrum salicaria)* roots and crowns. E.J.S. Katovich, R.L. Becker, and D.W. Ragsdale. 1999. Weed Science 47:360-365. (Dept. of Agronomy and Plant Genetics, Univ. of Minnesota, Saint Paul, MN 55108). Frequent clipping killed the majority of purple loosestrife plants, but defoliation by a biological control agent had little effect.

Fire effects on prairies and oak woodlands on Fort Lewis, Washington. R.K. Tveten and R.W. Fonda. 1999. Northwest Science 73:145-158. (R.W. Fonda, Dept. of Biology, Western Washington Univ., Bellingham, WA 98225). Prescribed fires at 3-5-year intervals have successfully controlled conifer encroachment and weed invasions in native prairie.

Integrated pest management to control reed canarygrass in seasonal wetlands of southwestern Washington. K.M. Kilbride and F.L. Paveglio. 1999. Wildlife Society Bulletin 27:292-297. (U.S. Fish & Wildlife Service, 9317 NE Hwy. 99, Suite D, Vancouver, WA 98665). A combination of disking and application of Rodeo herbicide effectively controlled reed canarygrass.

Post-fire seedling establishment in Florida sand pine scrub. M.E. Carrington. 1999. Journal of Vegetation Science 10:403-412. (SW Florida Research & Education Center, Univ. of Florida, Immokalee, FL 34142). Post-fire seedling density in sand pine scrub was much lower than in California chaparral.

Measurements/Sampling

Bias, precision, and accuracy of four measures of species richness. J.J. Hellman and G.W. Fowler. 1999. Ecological Applications 9:824-834. (Dept. of Biological Sci., Stanford Univ., Stanford, CA 94305). Compared the strengths and weaknesses of four ways to gauge biological diversity.

Plant/Animal Interactions

Effect of vertebrate grazing on plant and insect community structure. J.L. Rambo and S.H. Faeth. 1999. Conservation Biology 13:1047-1054. (Dept. of Biology, Box 871501, Arizona State Univ., Tempe, AZ 85287-1501). Elk, deer and cattle grazing increased plant species richness, even in a nutrient-poor, semi-arid grassland, but decreased insect abundance.

Effects of habitat on dickcissel abundance and nest success in Conservation Reserve Program fields in Kansas. J.P. Hughes, R.J. Robel, K.E. Kemp, and J.L. Zimmerman. 1999. Journal of Wildlife Management 63:523-529. (R.J. Robel, Division of Biology, Ackert Hall, Kansas State Univ., Manhattan, KS 66506). Nesting success increased with greater amounts of litter cover.

Polyphenols and agriculture: Beneficial effects of proanthocyanidins in forages. R.J. Aerts, T.N. Barry, and W.C. McNabb. 1999. Agriculture, Ecosystems & Environment 75:1-12. (T.N. Barry, Massey Univ., Private Bag 11222, Palmerston North, New Zealand). Moderate concentrations of condensed tannins in forage improve protein metabolism, reduce internal parasites, and reduce the risk of bloat in cattle and sheep.

Plant Ecology

Long-term landscape patterns of past fire events in a montane ponderosa pine forest of central Colorado. P.M. Brown, M.R. Kaufmann, and W.D. Shepperd. 1999. Landscape Ecology 14:513-532. (Rocky Mtn. Tree Ring Research, Inc., 2901 Moore Lane, Fort Collins, CO 80526). The historic fire regime was more variable than what generally has been found in previous studies.

Plant community responses to disturbance by mechanized military maneuvers. D.G. Milchunas, K.A. Schulz, and B. Robert. 1999. Journal of Environmental Quality 28:1533-1547. (Dept. of Rangeland Ecosystem Sci., Colorado State Univ., Fort Collins, CO 80523). Litter cover and shrub cover declined with increasing levels of vehicular maneuvering.

Virtual herbarium: A collection of digital plant images. T. Welch, C. Sparks, S. Strobel, and B. Sindelar. 1999. ($50; Montana Prairie Products HC 75, Box 11, Plevna, MT 59344). This CDROM is an interactive, visual collection of 141 grasses, forbs, and shrubs common to Montana's rangelands.

Reclamation

Effects of grazing exclusion and reseeding on a former uranium mill site in the Great Basin desert, Arizona. D.W. Lash, E.P. Glenn, W.J. Waugh, and D. J. Baumgartner. 1999. Arid Soil Research and Rehabilitation 13:253-264. (Dept. of Soil, Water & Environmental Sci., Univ. of Arizona, 2601 E. Airport Rd., Tucson, AZ 85706). Routine reseeding procedures may be effective for reclaiming mine sites in moister climates, but more intensive efforts are needed to revegetate desert sites.

Grassland legume establishment with imazethapyr and imazapic. D.D. Beran, R.A. Masters, and R.E. Gaussoin. 1999. Agronomy Journal 91:592-596. (R.A. Masters, Keim Hall, East Campus, Univ. of Nebraska, Lincoln, NE 68583). Preemergence application of these 2 herbicides can be used to reduce weeds and improve the establishment of certain legumes seeded on pastureland and rangeland.

Re-grassing farmland: A practical guide to selecting the right forage species. Z. Abouguendia. 1999. (Grazing and Pasture Technology Program, Box 4752, Regina, SK S4P 3Y4, Canada). This 38-page bulletin describes the recommended species, seeding methods, and management for pasture seedings in Saskatchewan.

Using geotextile fabric in livestock operations. S. Ruth, J. Overmoyer, D. Barker, and L.C. Brown. 1999. Land and Water (March/April Issue):42-46. (Dept. of Food, Agr. & Biological Engineering, 590 Woody Hayes Dr., Columbus, OH 43210). Geotextile fabric can reduce erosion from high-traffic areas used by livestock and farm equipment.

Socioeconomics

Developing resource-based social conflict models for assessing the utility of negotiation in conflict resolution. R.H. Germain and W. Floyd. 1999. Forest Science 45:394-406. (College of Environmental Sci. & Forestry, Syracuse Univ., Syracuse, NY 13210). Social conflict models were able to predict the types of natural resource conflict that were predisposed to resolution through negotiation.

Land degradation and the decline of ranching in the Sierra Nevada foothills, California. D. Smethurst. 1999. Land Degradation & Development 10:161-175. (Dept. of Geography, 501 McGone Hall, Univ. of California, Berkeley, CA 94720). Concludes that political and social bias has affected land use regulations, which ultimately has left rangelands less protected from residential development than forests.

Public involvement and dispute resolution courses in natural resource schools. W.J. Harmon, M.J. McKinney, and J.A. Burchfield. 1999. Journal of Forestry 97:17-23. (Montana Consensus Council, Room 219, State Capitol Bldg., Helena, MT 59620). Describes a model course in conflict resolution for university students in natural resource management.

Soils

Long-term ecosystem impacts of an introduced grass in the northern Great Plains. J.M. Christian and S.D. Wilson. 1999. Ecology 80:2397-2407. (Dept. of Biol., Univ. of Regina, Regina, SK, Canada S4S 0A2). Soils in crested wheatgrass fields had less nitrogen and carbon than soils under native prairie.

Soil characteristics in semiarid highlands of central Mexico as affected by mesquite trees (*Prosopis laevigat*a). J.T FriasHernandez et al. 1999. Arid Soil Research and Rehabilitation 13:305-312. (L. Dendooven, Dept. Biotechnology & Bioengineering, Inst. Politecn Nacl, Center Invest & Estudios Avanzados, Mexico City 0700, DF, Mexico). Soil microorganisms and nutrients were more abundant under the canopy of mesquite trees than in the surrounding areas.

Author is professor and extension range management specialist, Dept. of Animal and Range Sciences, Montana State Univ., Bozeman, MT 59717.

Letter to the Editor—Viewpoint

Nol Ward Article, "Ranchers Need Support For Sustainable Ranching: What Government Can Do a Rancher's Perspective" Volume 20, July 1999

I think this is an extremely important article and is reminiscent of many past articles on the government's retaining an intercity captive welfare constituency through the use of public laws and policy. While Mr. Ward states that he is recommending the program only for privately owned rangelands, the philosophy seems appropriate for public owned lands also, and as a minimum would at least have to be coordinated in many areas of the country. Ward's comment "less, down to a sustainable level, is better" rather than more is better" I think is very valid, however, it does not work because of political interference. Many agency personnel agree, however, are forced to back down when livestock operator's contact their congressional representatives. Also, agency's sometimes cater to their constituency in order to document workloads, meet targets, enhance budgets, empire building etc. Agency's usually indicate this game is needed to stabilize the industry.

Mr. Ward states "The program that I'm recommending will not require governmental restructuring of any kind since capable governmental personnel are readily available through each of these governmental agencies." I agree agencies have many capable personnel, however, restructuring will be necessary to get management to be accountable to the proper management of the grazing lands, rather than to the whims of congressional representatives and powerful lobbies. Management should be following the laws until congress is willing to change those laws. There is too much game playing with targets in order to relate to congressional inquiries and mandated accomplishments. An example of this is to have a target that so many operators sign up for a program within a certain timeframe, so consequently constraints are relaxed through new interpretations. I knew of one livestock operator who was trying to abolish his crop allotment so his Soil Bank land could be left in grazing management but his property tax would be moved back to grazing land rather than cropland. This was dryland, not irrigated lands. He was told this was not possible, even though it was Class V lands. I told him he must have misunderstood so he asked me to talk to the office manager. I talked to the office manager and was told he could not abolish his crop allotment, but he could transfer the crop allotment to a higher Capability Class land that he owned. This was a ploy to maintain the particular office workload, which then relates to maintaining budget, numbers of personnel, and personnel grade structure. There are other examples in component one of why I believe some restructuring will be required.

In component two, personnel will need some agency backing in determining eligibility of applicants. A definition of acceptable operations will be needed, will hobby ranches qualify? I knew one operator when asked to submit proof of his livestock ownership (somebody else's brand), brought in a bill of sale dated that same day, but had been grazing the livestock for three weeks. Because of this date discrepancy, he was asked for a canceled check, and when it was sent in to the office had a transaction date three weeks after livestock grazing began, and was three months after the dated grazing application. There are a variety of actions that someone is always willing to try. These things can be handled, but only if management is willing to stand up to scrutiny. I need to make the point that most operators are not trying to pull these kinds of shenanigans, but when they do, there should be consequences for their actions (in previous example, fraudulent application).

In component three, some of the land management agencies should additionally be meeting their mandates of the "Rangeland Improvement Act" as to type of inventory, however agencies generally are probably not meeting it currently. Capacity estimates are appropriate whether the land is private or public. Again, some operators disagree with agencies establishing capacity estimates on their private lands.

I believe that component four is very appropriate and is one of the better ways of stabilizing the livestock industry.

Component five is necessary, however, it is imbedded with many disasters along the way, ie, public land grazing fee studies of the past twenty plus years. I know of cases where one government agency was paying more per acre to rest private grazing lands in the growing season, than the operator was paying to graze government lands (a different agency) during the growing season.

Components six and seven are very appropriate.

I believe that there should be a contract requirement to have a ranching easement executed during and after the contract period to continue the grazing management. If the operator does not see the benefit in the program management period, he will never. If the operator wants out of the ranching easement anytime during the ten year contract, he can opt out by paying back the subsidy plus a minimal interest rate. In past programs, ie, Soil Bank, the land was required to be returned to cropping. There has been a continuous flow of programs, CAP, CRP etc. It would probably have been appropriate for the taxpayer to own the lands, as they have paid for it several times over.

If this is not done, we are attempting to keep them in a welfare state, same as the inner city welfare maintains a captive audience in past years.

Robert E. Wagner
5323 West Iliff Drive
Lakewood, CO 80227

Requiescat in Pace

John F. Reed passed away on 4 December 1997 in Durango, Colorado, where he and his wife Beatrice had lived since his retirement, in 1985, from the University of Wisconsin, Green Bay.

SRM had not received an obituary for Mr. Reed, a charter member of the Society, until recently.

John was born 18 November 1911 in Rockport, Main to Marshall and Linthel Reed. He received his AB degree in biology from Dartmouth College in 1993, and applied to Duke University graduate studies in forestry and botany, where he received his M.A. degree in 1935 and his Ph.D. degree a year later.

John married Mildred Stites, a fellow botany graduate student, in 1934.

Upon graduation, John received a faculty position in natural sciences at Amarillo Junior College, Amarillo, Texas. Two years later he accepted a position as instructor of biology at Baldwin Wallace College, Berea, Ohio. He advanced in rank to Associate Professor before moving to the University of Wyoming in 1946 where he served as an Assistant Professor, where he developed a strong program in ecology on the campus and managed the summer University of Wyoming Science Field Camp at 10,000 feet in the Medicine Bow Mountains.

After living in Africa from 1951 to 1952 he and his family moved to the University of New Hampshire in 1956 where Mr. Reed was Dean of the Graduate School, Special Assistant to the President, Dean of the College of Liberal Arts, Vice President, and Acting President in 1961–1962. From 1962 to 1970, he was President and Professor of Biology at Fort Lewis College, Durango, Colorado. He played a key role in moving the college from a two-year to a four-year institution and fostered its outreach to native Americans.

John's final academic years were spent at the University of Wisconsin, Green Bay, where he was Professor of Ecosystem Analysis and of Environmental Studies. It was during these years that he contributed so much to the Ecological Society and to biology in general on the national scene.

John was a consultant to the Council on Environmental Quality and the Federal Council on the role of ecology in the federal government; the U.S. Committee for Man and the Biosphere; member of the NAS-NRC committee on International Environmental Programs; member of the steering committee for the Man and Biosphere Program; and the Great Lakes Research Facility advisory council.

John received two Distinguished Service Awards from Fort Lewis College for his leadership, and received a Certificate of Appreciation from the Sea Grant Institute of the University of Wisconsin.

He is survived by his three sons: John, Robert, and James. Mildred preceded him in death in 1967.

Stanton Wallace, Charter member of SRM, passed away on September 6, 1999. He was born January 28, 1909 in Flagstaff, Arizona Territory, to William and Ethel Anderson Wallace.

He was reared on cattle ranches, mainly on the family homestead at Morman Lake, Arizona and in New Mexico along the Pecos River near Fort Summer, and southwest of Melrose on land which is now in the Hart Ranch portion of the New Mexico Boys' Ranch.

After graduating from Arizona State Teachers College, now Northern Arizona University, he taught school in Sedona and then did graduate work in forestry at Colorado A&M, now Colorado State University.

Mr. Wallace began his career in the U.S. Forest Service in Arizona as a summer fire lookout in 1926. Following his studies in Colorado, he supervised the Civilian Conservation Corps construction projects in 1935. The the next 25 years he worked at various assignments on the Coconino, Karibab, Tonto, Cibola and Gila national forests. The final 10 years of his career were in range and wildlife management for the Forest Service Region 3 office in Albuquerque. He retired in 1969.

Mr. Wallace was a member of numerous organizations, including the Tyrone Masonic Lodge No. 52, Tyrone Chapter No. 41, Order of the Eastern Star, Masonic Lodge of Research of New Mexico, CCC Alumni, National Association of Retired Federal Employees, American Association of Retired Persons, Valley Community Church, and the Camp Thunderbird board.

Stanton was preceded in death by his wife Margaret. He is survived by his two daughters, Margaret L. Wallace of Dallas and Joanne W. Stockert and husband, John of Tularosa; two sisters, two granddaughters, and three great-grandchildren.

1999 *Rangelands* Index

Board of Directors Meeting Highlights
1999 Summer Meeting
Highlights of the Joint Meeting of the
SRM Board of Directors and Advisory Council

The Society for Range Management Board of Directors 1999 Summer Meeting was held in the Executive Board Room of the University Park Holiday Inn, Ft. Collins, Colorado, August 13-14, 1999. President Kendall L. Johnson presided.

EVP Whittekiend reported that Matthew Wirt resigned from the Membership Services Manager position effective June 30. Helen Hall was promoted to this position and will be expanding her duties to include more responsibility in the areas of recruitment & retention, as well as management of the membership database & subscription program. Deen E. Boe began as SRM's Washington, DC Representative on April 1. He reported that activity has been brisk in negotiating the sale of the office building, and that there are currently two cash offers and the sale of the property is eminent. Whittekiend reports that the NRCS position is progressing well. An agreement has been signed with the NRCS Washington Office that outlines the responsibilities of both parties for a program of up to five years. The position description was completed, and a vacancy announcement was advertised nationwide for the period July 6 through July 30. A certificate of qualified applicants is being prepared and the selection process will hopefully be completed by the end of this month. The Board discussed the Endowment Fund's gift membership program and Whittekiend reported that there are still 74 Gift Memberships that have not been utilized by the Sections for the year 2000. Sections will be asked to distribute these memberships by 11/1/99 and return any unused to the Denver office for distribution by the Board.

Washington Rep Boe reported on the National Academy of Science's Committee on "Riparian Zones: Functions & Strategies for Management" still has 11 days remaining to recommend SRM members for committee membership. President Johnson will make recommendations for membership.

The Board approved becoming a national partner in Seeking Common Ground activity with Deen Boe as a member-at-large. The Board agreed to designate a candidate to represent SRM on the Invasive Species Council Advisory Committee; and to solicit a candidate to submit an abstract for a special session entitled, "NEPA after 30 Years: The Good, the Bad, and the Ugly," at the North American Wildlife & Natural Resources Conference.

The Board expressed there sincere appreciation to the Endowment Fund Board of Governors for their dedication and service to SRM's Endowment Fund.

Lamar Smith, chair of the Certification Task Group, reported the proposed initial fees for first year and grandfathering of current SRM & California consultants of $50/members and $125/non-members. Everyone who submits all materials will be screened and if accepted will not need to take examination. Second year fees will be $100/members and $200/non-members. Fees will cover the cost of program and will not be used as general operating funds. The task group recommended 16 CEU's per year was appropriate. Each course will be approved by SRM and may have different CEU's assigned. The courses could be offered by SRM Sections, extension agencies and at the SRM annual meetings (at least 16 hours at SRM meetings). The Task Group will draft letters to the SRM & California consultants announcing the programs, as well as to the Federal agencies. It was recommended that an orientation about the program at the Boise meeting would be valuable. We need to promote the program to SRM members through the Trail Boss News. The grace period for grandfathering will be one year from the time the program is initiated. The Board approved certification fees as recommended.

The EFBOG reported that the SRM Endowment Fund has now passed the $300,000 level and they are very proud of this accomplishment. They suggested that perhaps it was time to discuss the future direction to take for the fund. The EFBOG recommended selecting a specific purpose or project that the Boise Silent Auction proceeds will be directed to. The Board approved the Endowment Fund Board's recommendation to direct proceeds of the Boise Silent Auction to the SRM Rangelands Video Project.

The following Board rep assignments were made for upcoming Section meetings:

Arizona - Budd
New Mexico - McLain
California – Linebaugh
North Central – Whittekiend
Colorado – Budd/Whittekiend
Northern Great Plains – Sieg
Florida – Whittekiend
Oklahoma - Williams
Idaho – Johnson/Secrist/Whittekiend
Pacific Northwest – Johnson
Int'l Mountain – Budd
South Dakota – O'Rourke
Kansas – None
Southern - Williams
Nat'l. Capital - Boe
Texas – Williams
Nebraska – Secrist
Utah – O'Rourke
Nevada – McLain/Linebaugh
Wyoming – Budd/Whittekiend

The Board accepted the Award Committee's selections for Honor Awardees at the 2000 Annual Meeting, as well as wording changes in their handbook.

Advisory Council Meeting Highlights

The Board of Directors (BOD) for the Society for Range Management held a business meeting in Fort Collins, CO on August 13–14, 1999. In conjunction with that meeting, the Advisory Council (AC) met on August 13.

The AC discussed nearly a dozen subjects that have been raised by individual Sections or by the BOD. The subjects covered included: a draft resolution calling for the creation of an international member-at-large position on the Board of Directors; the Boise meeting; the Hawaii meeting; associate memberships; certification of rangeland managers; the Washington D.C. Representative; sale of the Denver office building; the NRCS position for certification/public affairs on loan to SRM; job requirements for federal range positions; the listing of the black-tailed prairie dog and the sage grouse as endangered species; the Invasive Species Executive Order; the creation of a National Academy of Sciences committee to develop a riparian area processes and functions evaluation process; the Range Video; and the Workshop on "Journey for Change" that the BOD held on August 11–12, 1999 in Fort Collins. The Advisory Council discussed all of these various issues. Some of the items were tabled until the Boise meeting and some subjects were brought up for information purposes.

The next planned meeting of the Advisory Council will be at the International Annual Meeting in Boise, Idaho in February 2000.

Highlights of the Joint Meeting of The SRM Board of Directors and Advisory Council

Advisory Council Chair-Elect Wayne Hanselka the joint meeting to order. The following recommendations were presented for the Board's consideration:

Recommendation #1. Standards in Federal Government Range Position Certification. A new policy implemented by the Office of Personnel Management has led to a reduction of quality candidates sent forward from OPM for Federal vacancies for GS 454 Series. The Advisory Council recommends that the Board address these concerns through Public Affairs and the Washington, DC representative.

Recommendation #2. Proposed Listing of Species on the Endangered Species List. The Advisory Council recommends that the Board, through the Executive Vice President and appropriate committees, provide detailed comments on all future proposed listing of endangered species (e.g., black-tailed prairie dog and sage grouse). Such comments should be based on best available science and experience. Comments should be submitted in a timely manner.

Recommendation #3. Rangeland Representation on Study Committee. The Advisory Council recommends that the Board use appropriate methods (perhaps the Washington Representative) with the National Academy of Science to ensure that rangelands be represented on the Riparian Zones: Functions and Strategies for Management Committee. Rangelands are 60% of the U.S. landmass and are not presently represented on the committee.

MOTION by McLain, second by O'Rourke to accept the recommendations as presented. Passed unanimously.

Statement of Ownership, Management, and Circulation
(Act. of August 12, 1970, Sec. 3685, Title 39, United States Code)

1. *Title of Publication*: Rangelands
2. *Date of Filing:* September 9, 1999
3. *Frequency of Issue*: Bimonthly
4. *Location of Office of Publication:* 444 Union Blvd., Suite 230, Lakewood, Colorado 80228
5. *Location of General Business Office:* Same
6. *Name and Address of:*
   Publisher: Society for Range Management, 444 Union Blvd., Suite 230, Lakewood, Colorado 80228
   Editor: Gary Frasier, 7820 Stag Hollow Road, Loveland, Colo. 80538
   Managing Editor: J. Craig Whitekiend, 444 Union Blvd., Suite 230, Lakewood, Colorado 80228
7. *Owner:* Society for Range Management, 1444 Union Blvd., Suite 230, Lakewood, Colorado 80228
8. *Known Bondholders, Mortgages, etc.:* Membership
9. *For Completion by Nonprofit Organizations Authorized to Mail at Special Rates:* The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes 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*	3,856	3,708
B. *Paid Circulation*		
1. *Dealers, counter sales*	0	0
2. *Mail subscriptions*	3,536	3,396
C. *Total paid circulation*	3,536	3.396
D. *Free distribution*	30	30
E. *Total distribution*	3,566	3,426
F. *Copies not distributed*	290	282
G. *Total*	3,856	3,708

I certify that the statements made by me above are correct and complete –*J. Craig Whitekiend,* Managing Editor.

A CHRISTMAS MEMORY

By Mrs. E. J. Dyksterhuis

It was 1934, a Christmas I shall always remember as an Iowa bride far from home for the first time and in the wilderness of the New Mexico mountains in a National Forest in a Federal Camp.

Dyk had graduated from Iowa State College (in forestry) in 1933 but jobs were scarce then so we couldn't get married as planned. Money, too, was scarce so my engagement ring was not a diamond but the beautiful Theta Xi Fraternity pin. Later that year he and a fraternity brother hitchhiked as far as Nova Scotia looking for work, to no avail. He did, however, make some interesting contacts.

In March 1934 Dyk was offered a job at Terrell's Aquatic Nurseries in Oshgosh, Wisconsin that would pay thirty dollars a month! We quickly got married and were soon on our way.

A few months later he received word from his forestry professor, Dr. McDonald, asking if he'd be interested in a job as a CCC crew foreman that was located in a camp on a National Forest near Silver City, New Mexico. The salary would be $152 a month, Federally paid! We joyfully jumped at the opportunity and went by Greyhound Bus all the way from Oshgosh to Silver City.

Three month later Dyk was asked to take on a 30-man NIRA crew that was to be stationed in another area of the forest. He accepted so we moved again. Our home was an Army tent and Dyk had an L. L. Bean Sleeping Bag which I shared with him until we could get me one of my own at a later date. This was to be a new life for me – living in the great outdoors often seeing no one but my husband for days on end.

But to Get to Christmas!!!

On Christmas Eve we were the only ones in camp. We walked around the area, followed some wild animal tracks, and finally back to camp thinking how lucky we were to have a job and to be together.

Christmas morning 1934 we awakened and walked out of the tent to a beautiful new world! This Iowa bride was spellbound by her gift of thousands of glittering "diamonds" shimmering in the newly fallen snow that covered all the trees and vegetation surrounding our camp.

Of my many wonderful Christmases none could ever obliterate the memory of that first one with Dyk when we were alone in the National Forest and Mother Nature presented me with so many "diamonds".

Marry Christmas to all of you!

Marge

Pennsylvania Dutch Bread

Mix together in bowl:
1 cup flour
2 eggs
1 cup milk
Dash salt

Melt 1/2 to 3/4 stick butter or margarine in 9 x 13 pan and pour batter on top. Bake at 400° for 1/2 hour.

A Bachelor Man's Thoughts on Holiday Happiness

Isn't funny how people value most the things that they don't, and often can't have.

The school wallflower would sell their soil to be popular. People living in poverty will spend their last penny on lottery tickets in hopes of hitting the big one. Men who married early in life often envy their single friends. Of course, there are exceptions to the rule. Many people, including me, are somewhere between content and supremely happy with their position in life. After all, there are two ways to be happy- you can get everything you want or want everything you've got. But everybody, I guess, has something that they want that just always seems to elude their grasp. For a lifelong and rapidly aging bachelor man, I guess my personal brass ring is a wife and family.

Now don't misunderstand. I have had friends married to the wrong person, and I know that would be a miserable existence. That's why I've only seriously thought about it once. And bachelorhood has some real selling points. You get to come and go when you like. You can pretty much leave things lay where you put them and expect them to be there when you look again. You have more time for hobbies. You can drink milk out of the carton. You don't have to spend money on decorative towels, wait for the bathroom, or worry about leaving the seat up. But I often think that somebody special to do things for and who care whether or not I was late for supper would be a good trade for all those indulgences. Throw in a kid or two to give piggyback rides or read stories to or help with their homework and I'd throw in some boot. For a lot of married guys, these events become commonplace, and they don't really appreciate how much that sort of thing is worth to a guy who doesn't see it very often.

It's worse, of course around Christmas. You can't spend time watching Christmas shows with kids. As awful as it is for most men to fight holiday crowds to buy Christmas presents – shoot, just to go shopping without the crowds – it's a little less so when trying to find the perfect present for somebody special that you think feels the same way. The greatest Christmas of my life was spent with somebody I felt that way about. You don't miss what you never had, but losing it sure leaves a hollow spot for a long time that's hard to fill. You see a family come to church together or at a holiday gathering and, no matter how hard you try not to think about it, you can't help but wish it were you.

I know to other people on intimate terms with the more burdensome aspects of wedded life this may seem like the overemotional whimpering of a naive dreamer. I don't mean to discount the mundane or burdensome parts of life with someone else. Some parts of it can be downright miserable from time to time. Many people are in unhappy relationships from which they need to release themselves. For them, single life would be an immense improvement. But in many cases, I think those who take a more jaded view do it because they tend to dwell on a few unpleasant aspects and ignore the multitude of small but positive things that give life its spice and turn an existence into an adventure. Like watching your kids get up on Christmas morning with that light shining in their eyes, or that smile that comes over your spouse's face when you do something unexpectedly right. Those are some of the things that can make life a whole lot more pleasant and interesting, if we let them.

So married people, this holiday season, and all year long, when you catch yourselves losing patience with your offspring or spouse, remember that life alone is everything it's cracked up to be. Show the people you care most about that you love them. It doesn't have to be anything big – a word of encouragement to your teenager, reading your four-year-old a story, leaving your spouse a note or a cup of coffee in bed in the morning to let them know you're thinking about them. Sometimes they remember the little things long after the expensive doodads that they got for presents are gone. Count your blessings and think about all the good things they do before you say something when you're upset that you may later regret.

Remember, one of the secrets of happiness is wanting what you've got.–SRM Member

RANGELANDS Reader Survey:

Over the years, various **Society for Range Management (SRM)** members and others have commented that the **SRM's *Rangelands*** publication does not meet their needs. One way or another, most of the responses for what you would like ***Rangelands*** to be gets back to the ***Rangelands*** Editor, SRM officers and staff, and the ***Rangelands*** Editorial Board.

Well, now is the time for you to put all of your comments/suggestions into written form.
The **SRM** Board of Directors are contemplating change(s) to the content and direction that ***Rangelands*** will take in the future. Rather than a small group providing input, this is your opportunity to help out in a direct way.

Please take the time to complete this survey and return it to the editor. **REMEMBER, now is the time to act - YOU SNOOZE, YOU LOSE! (if you do not complete this survey, then you give up the right to complain to the Editor in the future.)**

Survey results will be kept confidential. The ***Rangelands*** Editor will summarize the comments returned in a future issue.... (Please answer questions as completely as you can.)

1) Currently, authors are asked if funds are available to pay for articles published (page charges). Should these charges be:
   A: Kept the same
   B: Reduced to a lower amount
   C: Fees dropped altogether
   D: Kept the same, but allow the ***Rangelands*** Editor the option to waive fees.
   E: Other (describe):_____

2) For selected topics, should we pay authors to write articles (specific expertise; PRO vs. CON, Animal Waste, Biodiversity, etc.)?
   A: Yes
   B: No

3) For invited papers, who selects topics and/or authors?
   A: ***Rangelands*** Editor
   B: **SRM** Board of Directors
   C: **SRM** Executive Vice-President
   D: Others (Identify):_____

4) What changes to ***Rangelands*** would you recommend for a more user friendly publication? For:
   A. Students: _____
   B. Resource Managers: _____
   C. Agencies: _____
   D. Teachers: _____
   E. Researchers: _____
   F. Consultants: _____
   G. Others (List)_____

5) With the sheer diversity of the **SRM** membership, how can one publication be expected to serve an individual's needs? If you could change it, what would you do?

_____
_____
_____

6) What would you like to see in articles? Please explain.
   A: More technical: _____
   B: Less technical:_____
   C: Other:_____

7) Some members complain that articles in ***Rangelands*** are rejects from ***JRM*** as they often look similar. ***Rangelands*** has no specific author's handbook. The general rule is that the article must be easy to read. If you could change how articles look, what do you suggest?

_____
_____
_____

8) For authors, if ***Rangelands*** is changed significantly enough so that articles no longer "look like ***JRM***," are you willing to change to the new style of writing. If you are a researcher from a university, will the university system accept publication in a different format from what is presently used? Please explain.

_____
_____
_____

9) Do you like the regular departments in each issue (Summary of Articles in Next Issue of ***JRM***, Browsing the Literature, etc.)? Please explain.

_____
_____
_____

10) Should articles submitted for publication be reviewed for content (technical) only, style only (readability) or both?

_____
_____
_____

11) Presently, articles submitted for publication are reviewed by the ***Rangelands*** editor and someone from the ***Rangelands* e**ditorial board. The ***Rangelands*** editorial board is composed of SRM's own membership and is presently diverse in their backgrounds. Should this process be kept the same, or changed? Please explain.

_____
_____
_____

12) Should the scope of ***Rangelands*** be widened to better serve both the internal (SRM members) and external users? Please explain.

_____
_____
_____

13) Should ***Rangelands*** by changed to an all color publication? Please explain.

_____
_____
_____

14) How should ***Rangelands*** be funded?

A: A portion of **SRM** member dues.
B: Page charges to authors.
C: Combination of A & B
D: Other:_____

15) Other comments:_____

_____
_____
_____

Please return entire survey to: **Gary Frasier, Editor, 7820 Stag Hollow, Loveland, Colorado 80538**