Conservation enthusiast; spokesperson and advocate would all be accurate depictions of John “Chip” Merrill’s involvement with conservation efforts over the last 50 years. But the title he seems to relish most is that of rancher – where he gets to practice what he has often preached.

Today, he and son John, Jr. operate the XXX Ranch, Inc., which variously has been a registered and commercial cow-calf, stocker and farming operation near Crowley, Texas. They represent the 4th and 5th generation of their family to ranch in Texas and range management is a big part of their history.

Over the last 41 years, the Merrills have utilized rotational grazing on their ranch, first with deferred-rotation and for 20 years with one herd intensive rotation units. Nearly a decade ago, they made the switch from a cow-calf operation to a seasonal stocker operation grazing the range from March through about June. In 2001, they produced 97 pounds/acre in 100 days with stockers on native range stocked at one steer per 2 acres with no inputs except salt and mineral. Those gains came in their fourth year of drought and grasshopper invasion. Merrill says the key to their success is always to stock according to forage available.

Off the ranch, Merrill has made numerous contributions to the range management profession as well. He is a past president (1981) and fellow of the Society for Range Management and has received the Frederick G. Renner award for contributions to the profession. He was the first recipient of the W.R. Chapline Land Stewardship Award from SRM. He served as president of the Texas SRM Section in 1974, and over the years has been involved in many of the SRM committees, as well as the SRM Endowment Fund Board of Governors.

Merrill was also a large part of the beginnings of the Rangeman’s Journal, now Rangelands. “Twenty five years ago, several of us discussed the fact that the Journal of Range Management is absolutely necessary, but did not meet the needs and interests of the majority of SRM membership. From that discussion, I then drafted a resolution to create the Rangeman’s Journal (now Rangelands), a separate and co-equal journal of the society that was technically sound, but written in laymen’s language, and we took it to the SRM board where it was passed. It’s also our best means of communicating with non-member professionals and the public.” Merrill believes Rangelands still serves that purpose, and he would like to see the magazine’s distribution extended.

Today, Merrill maintains his involvement with SRM, as well as, the Texas and Southwestern Cattle Raisers Association, the Natural Resources Foundation of Texas, the Botanical Research Institute of Texas, the Texas Wildlife Association, the Grazing Lands Conservation Initiative (GLCI) and many other conservation-minded programs. He is a past director of the National Cattlemen’s Association; was named Man of the Year in Service to Texas Agriculture by Progressive Farmer Magazine in 1995; and was inducted into the State Fair of Texas Heritage Hall of Honor in 1998.

From 1961 to 1996, while living on and operating his ranch, Merrill also directed the Ranch Management Program at Texas Christian University in Fort Worth. He says he’d “never taught anything
but Sunday school” prior to that. Evidently that didn’t matter, under his guidance the TCU Ranch Management Program became known and respected internationally.

**A Family Heritage**

Merrill’s introduction to conservation and land management came via his father Louis P. Merrill, who was one of the “founding fathers” of the Soil Conservation Service and served as the regional conservationist for Texas, Oklahoma, Arkansas and Louisiana for the first twenty years.

“I literally grew up with the Soil Conservation Service and those early people who approached conservation with a missionary zeal,” Merrill says. His father was charter member number four of the Soil Conservation Society of America (today known as SWCS), so to say he’s followed in his father’s footsteps is a bit of an understatement.

Merrill earned his degree from Texas A&M in range and forestry and worked for the Soil Conservation Service briefly before and after a stint with the U.S. Air Force. But he has spent most of his life ranching and teaching.

Asked what changes he’s noted in natural resource management issues over the last 25–30 years, Merrill says, “Most devastating is the shift from science-based professional management of private and public rangelands to misinformation, over-regulation and lack of qualified technical assistance for both. Environmental activists have damaged rangelands severely with lawsuits and mismanagement (wrong or lack of) from the court bench. Natural resources are constantly changing and require on-site management by competent land managers and adequate technical assistance to make needed and timely adjustments.”

Merrill’s advice to future rangeland managers is this: “Be prepared and updated as a lifelong learner to take advantage of science-based knowledge and practical experience to understand the capabilities and limitations of soil, water, plant, animal, human and economic resources; establish reasonable goals, evaluate alternatives, select the most appropriate, apply them judiciously and make timely adjustments as necessary. We must aggressively support wise, science-based rangeland management and oppose with equal vigor, that which is not.”

Today, as a producer representative on the GLCI national steering committee, Merrill is a strong advocate for providing technical grazing assistance to private landowners. “These lands are the breeding and growing ground for the country’s cattle and sheep; they constitute major watersheds, wildlife habitat, and are a source of recreation and open space amenities,” Merrill says.

He adds, “GLCI has become one of the strongest forces in support of conservation legislation...Funding for technical assistance is still inadequate. The next greatest danger is for NRCS to be program driven. It needs to be driven by conservation planning to be cost effective.”

Merrill likens his philosophy toward conservation assistance to a quote by President Lincoln: “The government should do for the people only that which needs to be done in the public interest that the people cannot do for themselves.” Says Merrill, “If we’d stayed with that in all things, we’d be much better off.”

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*Chip Merrill and his wife of over fifty years, Virginia, have three children and three grandchildren. All have been involved in the ranch over the years. “It’s a real team effort,” says Merrill.*

**Immigrant Forage Kochia (Kochia prostrata), a problem solving plant**

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**www.kochiaseed.com**

Immigrant Forage Kochia (Kochia prostrata), a problem solving plant

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Resource Roundup

Grazing
The Web

Get your grazing management questions answered at these top-notch web sites.

Rangeland research. Fencing ideas. Weed control. If you’ve got questions relating to these and other range and pasture topics, there’s plenty of information on the Internet. Problem is, finding that information can often be akin to locating a needle in a haystack.

The Society for Range Management has put a large effort into developing its web site in the past two years (www.rangelands.org), and it is a great starting point for general information or getting information on SRM events. The Web also hosts numerous other sites dedicated to natural resources. Here’s a listing of some of the cream of the crop:

Hay & Forage Grower magazine
(www.hayandforage.com) - This is a popular magazine produced six times a year. It primarily caters to alfalfa growers, but offers a good variety of forage-related information. Online, you can search the archives of back issues by specific topics and find links for up-to-date hay prices. The site is also updated regularly with forage news, research and coming events.

Forage System Research Center
(/aes.missouri.edu/fsrc/) - Universities are a wealth of information, especially for site-specific research by region of the country. For producers in the central and eastern part of the U.S., this site has a long list of publications in downloadable pdf format. The site is coordinated by the University of Missouri’s research center at Linneaus and offers some of the most practical information available.

Other universities with useful listings of forage research publications include:

Oklahoma Forage Extension Publications
www.agr.okstate.edu/forage/publications/forage-pubs.htm

University of Wisconsin Forages
www.uwex.edu/ces/crops/uwforage/uwforage.htm
Kansas Forage Web Site
www.oznet.ksu.edu/pr_forage/
Purdue Forage Information
www.agry.purdue.edu/ext/forages/
Mississippi State University
/www2.msstate.edu/~dlang/foragesms.html

Rangelands of the Western U.S. (//rangelandswest.org/index/html) – For livestock producers in the Dakotas, Nebraska, Kansas, Oklahoma, Texas and westward, this site is a gold mine. The site is a collaborative effort of land-grant universities in 17 western states. It includes detailed definitions and terminology about rangelands, articles about current rangeland policy issues, and an education page with several useful ideas.

Best of all, under “general resources” the comprehensive site includes forage related publications from the Extension service, links to each of the participating state land-grant universities, as well as links to forage experts by state.

Samuel Roberts Noble Foundation
(www.noble.org) – The Noble Foundation is a well-known authority on range and pasture research as well as beef production and ag economics topics. You’ll find all that information and more by clicking on the “ag division” box at the bottom of their home page. An added bonus on this site is the best plant image gallery on the Web. It includes color photos and detailed information on hundreds of range plants, forages and forbs.

Forage Information Systems
(/forages.orst.edu/default.cfm) – This site includes so much data, it’s easy to feel overwhelmed by the site at first. But, navigate through it, and it should yield the information you’re looking for. The site is maintained by Oregon State University, but includes information and links about hay, pasture and even silage from across the U.S.

My favorite feature is the site’s searchable database. This allows you to type in the name of specif-
ic forage or topic and it will pinpoint the information for you. Also, this is one of the only sites I’ve found with an in-depth list of vendors by category (seed, hay, fertilizer, fencing, etc.).

Outside of the standard university related sites, there are a few non-traditional sites with useful and unique information.

**Pasture Management**
(www.pasturemanagement.com)
This is a common sense, how-to-do-it Web site with good suggestions for managing land and people. The information is provided by Montana-based consultant Wayne Burelson who draws on real-life experiences. The useful site covers no nonsense topics like “7 principles to a healthy pasture” and “21 common mistakes to avoid when building a fence.”

**The Ranch**
(www.dowagro.com/theranch/) – Operated by DowAgroSciences this site includes the most comprehensive database of weeds and management strategies available for range and pasture settings. The pull-down menus allow you to select the weed you want information on, then shows a picture, offers a description about the plant and offers application rates for chemical control.

**Morgan’s Forage Site**
www.forage.com
Maintained by the Morgan Consulting Group, this site focuses on the economics of hay production, hay supplies and price trends.

**Allan Savory Center for Holistic Management**
www.holisticmanagement.org
For those interested in a sustainable management approach toward the entire ranch, this is your resource. A highlight of this site is the “library” which includes a lengthy list of articles about holistic management.

**Appropriate Technology Transfer for Rural Areas**
www.attra.org
This site provides fodder for “out of the box” thinkers. The information is geared toward sustainable farming practices, alternative crop and livestock enterprises and innovative marketing. If you are looking for new ideas, this is the place.

Lastly, there are several organizations dedicated to providing grazing management information to producers. While these sites don’t provide an abundance of content, they can be a useful resource to contact for more information about specific topics or to learn about upcoming educational workshops. They include:

- **Center for Grassland Studies**
  www.grassland.unl.edu
- **Grazing Lands Conservation Initiative**
  www.glci.org
- **Grazing Lands Technology Institute** (operated by the Natural Resources Conservation Service)
  www.ftw.nrcs.usda.gov/glti/homepage.html
- **American Forage and Grassland Council**
  www.afgc.org

Some final tips when surfing these and other sites:
1) Often the “research” or “publication” button on a sites homepage will take you to the most useful information.
2) Always check out a sites “links” button. Links can often take you exactly to the information you were seeking, or provide more detailed information specific to your region of the country.
3) Most sites include contact information for staff or experts in a certain field. If you can’t find the answers you are looking for, by all means call or e-mail these people.

Resource Roundup is compiled by Kindra Gordon. Contributions welcome at kindras@gordonresources.com

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**Erratum**

In the August issue of *Rangelands* on page 58 the following information was omitted.

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Sneek A Peek
At The Upcoming Issue Of
The Journal Of Range Management

Long-Term Effects of Burning *Festuca* and *Stipa-Agropyron* Grasslands

B. Pylypec and J.T. Romo

Understanding the dynamics of standing crop of plants after burning is necessary for developing strategies for conserving *Festuca* and *Stipa-Agropyron* dominated grasslands. The effects of spring burning on current year standing crop, litter and total standing crop were examined in central Saskatchewan over an 11-year period. Standing crop increased until about the 8th year after burning while litter reached a plateau at about 11 years. The frequencies of burning must be adjusted for management objectives and prevailing prairie conditions while striving to maintain a mosaic of burned and unburned patches.

Big Sacaton and Endophyte-Infected Arizona Fescue Germination Under Water Stress

Kaesha L. Neil, Ronald L. Tiller, and Stanley H. Faeth

Water availability in the germination stage of plants is crucial for seed germination and as a resource for developing seedlings. The effect of osmotic potential on total germination and time to germination for big sacaton and Neotyphodium-infected and uninfected Arizona fescue was investigated in a series of germination experiments. Big sacaton and Arizona fescue will germinate under a wide range of water stress, and endophyte infection in Arizona fescue seeds had no effect on germination. Future research should focus on seedling survival and establishment of varying osmotic potentials.

Nitrogen Effects on Seed Germination and Seedling Growth


Recent evidence associates the persistence of invasive annual plant species with fluctuations in different forms of mineral N in soils. Soil and hydroponic studies evaluated the influence of N form and availability on germination and seedling growth of 2 invasive annual grasses and 6 perennial grasses. Seed germination was not altered by mineral N form or availability but specific seedling traits were modified by distinct forms of mineral N. Reducing mineral N may impede growth of invasive annual grasses and improve the relative establishment of perennial grasses.

*Brassica elongata* ssp. *integrifolia* Seed Germination

James A. Young, Charlie D. Clements, and Robert Wilson

*Brassica elongata* ssp. *integrifolia* is a relatively new weed on rangelands in Nevada that is of concern because of the potential economic losses and ecological damage the species can produce. The germination characteristics were evaluated at a wide range of constant and alternation incubation temperatures to give some insight into the possible location that the plant might be adapted. The plant produces abundant seeds that germinate over a wide range of constant and alternating temperatures. These germination characteristics give the plant competitive advantages over native species on Great Basin rangelands.
Growth and Reproductive Responses of True Mountain Mahogany to Browsing

Deborah Turley, Bruce A. Roundy, and Scott C. Walker

Heavy browsing of big game may reduce growth of true mountain mahogany. We measured and diagrammed twigs on unbrowsed and browsed shrubs on the North Slope of the Uinta Mountains and above Nephi, Utah. Although annual and previous year’s twig growth was removed by heavy browsing on some sites and years, twigs regrew enough to compensate for this loss during wet years. Because such regrowth may be limited in dry years, browsing should be managed so that twigs and therefore shrubs either maintain or increase in size over time.

An Evaluation of the Federal Grazing Fee Formula


As the federal grazing fee formula was initiated in 1978 it was believed that adding the Beef Cattle Price Index (BCPI) and the Prices Paid Index (PPI) to the Forage Value Index (FVI) would improve formula tracking ability. We used regression techniques to test the performance of the fee formula. We found that the BCPI and PPI indices should not have been added to the formula and that adding these additional indices resulted in federal grazing fees falling below market value over time. The federal grazing fee formula should be modified if collecting market value for public land grazing is the goal.

Herbicide Effects on Vegetation Patterns in a Mesquite Savanna

Chandra B. Heaton, X. Ben Wu, and R. James Ansley

Many studies have examined the impact of mesquite control treatments on the cover and density of mesquite, but little work has been done on the impact of these treatments on the resulting spatial pattern. The long-term effects of above ground mortality and whole plant mortality herbicide treatments on woody and non-woody spatial patterns in a mesquite savanna in north Texas were examined in this study. Significant differences were found in percent cover and spatial patterns. Spatial patterns resulting from mesquite treatment can impact ecological processes and should be an important consideration in the design of long-term mesquite management practices.

True Mountain Mahogany Community and Shrub Size Responses to Browsing

Deborah Turley, Bruce A. Roundy, and Scott C. Walker

True mountain mahogany shrubs provide important forage for big game animals in the Intermountain area. We measured the effects of browsing by comparing vegetation and mountain mahogany size both inside and outside exclosures on the North Slope of the Uinta Mountains and above Nephi, Utah. Vegetation cover and numbers of plant species were similar inside and outside exclosures, but heavily-browsed shrubs were smaller than unbrowsed shrubs at some sites. Even though mahogany can replace growth lost to heavy browsing by regrowing during wet years, conservative management should limit use so that shrubs maintain or increase their size over time.

Soil Carbon, Nitrogen, and Phosphorus in Modified Rangeland Communities

Joann K. Whalen, Walter D. Willms, and Johan F. Dormaar

Rangelands cultivated for agricultural use may have a reduced capacity to store atmospheric CO₂. Selected characteristics of ungrazed, unfertilized rangeland soils under monocultures of annual agronomic crops, perennial introduced grasses and a perennial introduced legume were compared with native rangeland soils along a climatic gradient in the Northern Great Plains. Cultivation reduced the soil C and N content, and soils under alfalfa, orchardgrass and bromegrass production had more total C and N than soils under continuous wheat or wheat-fallow production. Establishing perennial plant communities can increase C and N storage in rangeland soils.

Recreationist Responses to Livestock Grazing in a New National Monument

Mark W. Brunson and Lael Gilbert

Public land managers seek to maintain society’s access to rangeland resources while protecting natural environments. Because this balancing act may be especially challenging in areas set aside for special protection, we surveyed visitors to Utah’s Grand Staircase-Escalante National Monument about their perceptions of livestock grazing and multiple-use management. While designation by itself did not appear to affect perceptions, opinions varied with recreation activity and demographic characteristics. Since monuments attract those who otherwise might not engage in rangeland recreation, designation may foster increased conflict between recreation and livestock grazing uses.
Carbon Isotope Discrimination and Yield in 14 Cool-Season Grasses

Douglas A. Johnson, Kay H. Asay, and Kevin B. Jensen

An understanding of how carbon isotope discrimination is affected by differential water application and its association with dry matter may be helpful in identifying the best cool-season grasses and breeding lines for forage improvement. A study in Utah evaluated the response of carbon isotope discrimination and dry matter yield to a water application gradient in 14 cool-season grasses. Reduction in carbon isotope discrimination and yield with reduced water was strongly linear and similar for all grasses. The study shows that breeding efforts to improve these 14 cool-season grasses should involve simultaneous selection for dry matter yield and carbon isotope discrimination.

Responses of Bahiagrass to Nitrogen and Defoliation

Masahiko Hirata and Wempio Pakiding

Bahiagrass is an important sod-forming, warm-season perennial of southern USA, Central and South America, and southwestern Japan. Tiller survival, lamina production, and changes in the mass of the stubble-stolon-root system were evaluated in Japan, under different frequencies of severe defoliation and nitrogen fertilizer rates. The survival ability of bahiagrass tillers, which was influenced only by defoliation frequency, did not differ among tiller age cohorts, indicating that all tillers are able to share energy and nutrients. Stolons are a key to defoliation tolerance being the main storage organ whereas the contribution of roots is minimal.

Germination of Seeds of Fremont Cottonwood

James A. Young and Charlie D. Clements

Lack of Fremont cottonwood seedling recruitment is of concern in many areas. We investigated the physiological amplitude for Fremont cottonwood seeds to germinate under a wide range of constant or alternating temperatures. In each of the 3 years that seed were collected, multiple temperature regimes supported 100% germination. This reinforces the need to understand the moisture relations of available seedbeds during the seed dispersal period to understand the limiting factors for seed germination.

Defoliation, Waterlogging, and Dung Influence Allocation Patterns in Deschampsia caespitosa

Evelyn H. Merrill and Patricia J.S. Colberg

Wet meadows are the most productive communities in the Northern Rocky Mountains but are sensitive to grazing by native ungulates and domestic livestock. The effects of simulated grazing and waterlogging on plant recovery was evaluated using tufted hairgrass. Extending flooding in combination with moderate rates of defoliation did not reduce aboveground biomass but aggravated root loss, caused shifts to shallower root distribution, and altered N concentration of aboveground biomass. Patterns were consistent with field studies showing that hairgrass remains abundant under temporary flooding conditions and moderate grazing levels but declines in unflooded uplands under heavy grazing.

Roller Chopping Effects on Tamaulipan Scrub Community Composition

Jason R. Schindler and Timothy E. Fulbright

Differential palatability may result in a shift in shrub community species composition toward dominance of less palatable shrubs. We tested the hypothesis that less palatable shrub species would be relatively denser and would have relatively greater canopy cover in roller-chopped shrub communities than in untreated communities 3 years after 2 roller chopping events and 9 years after 1 roller chopping event. There were no consistent trends in relative density or canopy cover differences or shrub species between treatments. We conclude that roller chopping and subsequent heavy browsing of palatable shrubs does not cause changes in shrub species composition.

Empowering Diversity: Envisioning Designing, and Developing Range Management Science

David L. Scarnecchia

The fragmented, weak identity of range science has been disadvantageous to the institutions and individuals associated with it. This paper involves analysis of a complex group of issues related to range science, the Journal of Range Management, and the Society for Range Management. The broad concept of range management science that it presents unifies elements of diverse specialized sciences, art, systems science, experiential science, and communication. Range management science establishes a philosophical environment of technical integration, social coherence, and precise language, where the scientific, institutional, informational and professional synergies can flourish.
Browsing the Literature

by 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 publishers or senior authors (addresses shown in parentheses). Suggestions are welcomed and encouraged for items to include in future issues of Browsing the Literature.

Animal Ecology


Potential gas development impacts on sage grouse nest initiation and movement. A.G. Lyon and S.H. Anderson. 2003. Wildlife Society Bulletin 31:486-491. (Cooperative Fish and Wildlife Research Unit, Univ. of Wyoming, Laramie, WY 82071). "Our results suggest that light traffic disturbance (1-12 vehicles/day) during the breeding season might reduce nest-initiation rates and increase distances moved from leks during nest-site selection."

Short-term bird response to harvesting switchgrass for biomass in Iowa. L.D. Murray and L.B. Best. 2003. Journal of Wildlife Management 67:611-621. (Dept. of Wildlife Ecology, Univ. of Wisconsin, Madison, WI 53706). Most species of grassland birds (16 of 18) were unaffected by the harvesting of switchgrass fields. Grasshopper sparrows were favored by harvesting, whereas more sedge wrens were found in nonharvested areas.


Wood thrush (Hylocichla mustelina) nesting ecology in relation to prescribed burning of mixed-oak forest in Ohio. V.L. Artman and J.F. Downhower. 2003. Auk 120:874-882. (Dept. of Biology, DePauw Univ., Greencastle, IN 46135). Prescribed burning is being increasingly used to restore and maintain oak-dominated forests in the eastern United States. Prescribed burning was found to have no effect on the reproductive success of Wood Thrushes.

Grazing Management

Linking herbivore experience, varied diets, and plant biochemical diversity. F.D. Provenza, J.J. Villalba, L.E. Dziba, S.B. Atwood, and R.E. Banner. 2003. Small Ruminant Research 49:257-274. Concludes that rotational grazing systems at low stock densities "may have trained generations of livestock to "eat the best and leave the rest" thus inadvertently accelerating a decline in biodiversity and an increase in the abundance of less desirable plant species."

Hydrology/Riparian


Differences in cottonwood growth between a losing and a gaining reach of an alluvial floodplain. M.J. Harner and J.A. Stanford. 2003. Ecology 84:1453-1458. (Dept. of Biology, Univ. of New Mexico, Albuquerque, NM 87131). Black cottonwood trees in western Montana grow faster in gaining reaches of an alluvial floodplain where there is more fine sediment and a higher water table.

Improvements


Effects of prescribed burning on herbaceous and woody vegetation in northern lowland meadows. A. Quinlan, M.R.T. Dale, and C.C. Gates. 2003. Restoration Ecology 11:343-350. (Dept. of Biology, Carleton Univ., Ottawa, ON K1S 5B6, Canada). Frequent spring burning to reduce shrub encroachment in sedge-grass meadows had only a small negative effect on willow cover, but favored sedges and rushes that were less palatable to bison.

Measures

Plant-Animal Interactions
The interacting effects of ungulates and fire on forest dynamics: An analysis using the model FORSPACE. K. Kramer, T.A. Groen, and S.E. van Wieren. 2003. Forest Ecology and Management 181:205-222. (Wageningen UR, Alterra, P.O. Box 47, NL-6700 AA Wageningen, Netherlands). Even at low ungulate densities, grazing is predicted to reduce the occurrence of both small and large-scale wildfires by reducing fuel loads and altering the vertical structure of the vegetation.

Plant Ecology


Reclamation/Restoration
Competition, seed limitation, disturbance, and reestablishment of California native annual forbs. E.W. Seabloom et al. 2003. Ecological Applications 13:575-592. (National Center for Ecological Analysis and Synthesis, 735 State St., Suite 300, Santa Barbara, CA 93101). Burning or mowing treatments did not affect abundance of native plants in a California grassland. Native annual forbs were strongly seed limited.


Soils
Do ungulates accelerate or decelerate nitrogen cycling? F.J. Singer and K.A. Schoenecker. 2003. Forest Ecology and Management 181:189-204. (Natural Resource Ecology Lab, Colorado State Univ., Fort Collins, CO 80523). In Yellowstone National Park (YNP) grasslands, ungulate grazing stimulates plant yield and soil nitrogen mineralization rates, but ungulate grazing in Rocky Mountain National Park (RMNP) grasslands does not. In willow and aspen vegetation types in RMNP, ungulate herbivory reduces plant yield and soil nitrogen mineralization rates. The higher ungulate densities in RMNP are believed responsible for these variable effects of herbivory on nutrient cycling.

Macroinvertebrates in North American tallgrass prairie soils: Effects of fire, mowing, and fertilization on density and biomass. M.A. Callaham, J.M. Blair, T.C. Todd, D.J. Kitchen, and M.R. Whiles. 2003. Soil Biology and Biochemistry 35:1079-1093. (Forestry Science Lab, 320 Green St., Athens, GA 30602). Introduced European earthworms were more abundant where fire and grazing were excluded from tallgrass prairie in Kansas.

Nitrogen dynamics in an annual grassland: Oak canopy, climate, and microbial population effects. D.J. Herman, L.J. Halverson, and M.K. Firestone. 2003. Ecological Applications 13:593-604. (Dept. of Environmental Science, Policy, and Management, 151 Hilgard Hall, Univ. of California, Berkeley, CA 94720). Nitrogen cycling was greater under oak tree canopies and greater in areas grazed by cattle than sites excluded from cattle.

Author is professor of range science and Extension range management specialist, Dept. of Animal and Range Sciences, Montana State Univ., Bozeman, Mont. 59717.