

## Managing the Meeting of the Cow and the Grass

by Pat Reece, Department of Agronomy and Horticulture, Panhandle Research and Extension Center, UNL, Scottsbluff

I arrived in Nebraska in the middle of the winter of 1978, one of the “real winters” of the last three decades. When the snow melted, I could see that most of the cattle were Hereford or Angus. Soon they became rainbow herds as the availability of different breeds increased and breed boasting became rampant. It became an era of “Bigger is Better” with little concern over the cost of “Bigger.” Bigger cows produced bigger calves, especially when calved unnaturally early in the calendar year. Bigger was better at the café and better with simple enterprise analyses that didn’t fully reflect the risks and costs of bigger for rangeland-only production environments. Many ranches now focus on fitting cow-calf enterprises to their production and market environment.

The 1980s also became an era of new grazing management concepts spawned on the premise that the carrying capacity of a ranch was directly related to the complexity or intensiveness of the grazing system. Concurrently, annual rainfall increased every year from 1980 to 1984. The worst drought in the-then-recorded history of western Nebraska was centered in 1985. It was a crushing experience, especially for those who had barely survived the economic crisis in agriculture with outrageously high costs of money and the peril of borrowing against inflated land values.

The previously delicate issue of bigger cows and calves consuming more grass became readily apparent in 1985, regardless of the grazing system. The impacts of lactation potential and mature cow weight on dry-matter intake are critical issues for determining

carrying capacity. With no change in the number of cows on the ranch, increases in cow and calf weights alone increased stocking rates more than 40% on many ranches during the 1980s.

After drought in the 1980s, we published “Drought Management on Range and Pastureland: A Handbook for Nebraska and South Dakota.” We emphasized that drought was a natural part of the range livestock production environment. Since 1999, drought has become the norm for much of the semi-arid rangeland in our region. In fact, 20-year long-term annual precipitation averages have declined by two or more inches because of the current prolonged drought in Wyoming, western Nebraska, and northeastern Colorado.

Since soil water is the most limiting variable for herbage production in this region, there has been

little or no margin of error for grazing management mistakes during the past nine years. Many would love to return to the era of periodic drought with periodic consecutive years of average or above-average precipitation to fully recover from the combined effects of drought and grazing stress.

During the 1930s, the western boundaries of shortgrass and mixed-grass prairies marched hundreds of miles eastward. The distinguished UNL professor of botany, Dr. J.E. Weaver, and his colleagues noted that much of the rangeland looked like abandoned farmland because annual weeds dominated the landscape. Wherever overgrazing has occurred, prior to and during our

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Three decades ago it was common to calve several months before green grass was available.

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Note: Opinions expressed in this newsletter are those of the authors and do not necessarily represent the policy of the Center for Grassland Studies, the Institute of Agriculture and Natural Resources or the University of Nebraska.

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## FROM THE DIRECTOR

Research is of ever increasing importance to grasslands and grassland agriculture. Numerous grassland researchers are retiring and many of them are not being replaced. Therefore, it is all the more important that their work be published, recorded and stored in our libraries for the benefit of current and future researchers who work on grasslands and related areas. As a result of this fact, libraries are becoming a more important component of the research agenda.

There are many libraries at colleges, universities, other public and governmental entities and with private individuals and organizations. However, there is one national library in the United States that collects and houses all research items relating to agriculture and that is the National Agricultural Library (NAL). The Library was established by the United States Congress in 1862 and was charged to be the primary agricultural information resource of the United States.

The National Agricultural Library is the world's largest and most accessible research library focused on agriculture and related subject matter areas. It is located in Beltsville, Maryland on property operated by the Agricultural Research Service of the United States Department of Agriculture (USDA). The Library was established by Congress specifically as a national library to serve the USDA, land-grant universities and other stakeholders. Currently, the NAL contains nearly four million items in total, carries subscriptions to some 16,000 periodicals, and has access to billions of pages of information and data dating from the 16<sup>th</sup> century to the present.

Essentially all of the research and educational information published on grasses and grasslands is catalogued and stored here. Those of us working with, interested in or associated with grasses and grasslands should help to see that this kind of information is collected and available in this Library. By having all such information located in one place and digitally formatted, it would be easy to find and retrieve.

The Library has most of its collections organized into eight information centers, and there is a need for more such centers, especially with emerging new areas of interest and importance such as renewable sources of energy, specialty crops, etc. The NAL cooperates and has extensive networks with other U.S. national libraries, land-grant university libraries and with libraries of international organizations and of other countries.

In recent years, the NAL has suffered from a lack of funding, as have many research and educational programs in agriculture and closely related areas. There is need for a significant increase in funding to maintain the current collection, to continue adding information and data as well as continuing to convert the information to a digital format so that it is accessible online from any place at any time to those around the world seeking research findings, data and documents on a wide range of information on agriculture, natural resources, food and nutrition and related areas.

*M. A. Massengale*



## A Prairie Green Roof

by Richard Sutton, Departments of Landscape Architecture and Agronomy and Horticulture, UNL

In the 1970s the idea of people pastures gained support. These places featured native grasses and forbs as the foundation for low-input recreational landscapes such as parks and golf courses. Now the idea of creating native plant communities and placing them over our heads on roofs is a next logical step. It is not such a new idea because many a soddy on the prairie had a buffalograss roof. Modern green roofs began in Europe with the use of high-tech roofing membranes, then starting in the 1990s, vegetation replaced shingles on many of Germany's roof tops. Some estimates now place the area of green roofs in German cities at 15% and growing.

Green roofs, just as "people pastures" do, improve and sustain the urban environment by controlling and cleansing storm runoff, reducing heat loads, improving aesthetics and providing wildlife habitat. New product advances have created sophisticated layered roof "sandwiches" of impermeable membranes, drainage cores, root barriers and growing media to support a topping of plants. Unlike the gravel or rock ballast that covers most flat commercial roofs, on extensive green roofs a 4- to 6-inch layer of specially formulated rooting media provides dampening of heat fluctuations, but must hold moisture for plants. The inorganic fraction is usually a carefully designed mixture of lightweight, porous materials graded from fine to coarse. These materials include heat-expanded clay (calcined clay), heat-expanded shale, perlite, pumice, sand and gravel, and even crushed clay tiles and brick. This inorganic mixture provides good internal drainage, low compaction, and moderate weight, and good root anchorage. Its ability to hold water is limited, as are its availabilities of micro- and macro-nutrients. The water-holding capacity and nutrients in the solution are embedded largely in the organic fraction. This fraction is usually supplied by processed compost or may be retained in portions of the inert green roof "sandwich." Compost also contains a biotic complement of micro-organisms essential in the breakdown of organic material and recycling of micro- and macro-nutrients.

The green roof growing environment, like that of our western Great Plains prairies, is windy and hot, thus it leads to high evapo-transpiration rates. In winter, plants may be subjected to many freezing and thawing cycles. The thin soil layer on extensive green roof systems presents a growing environment hostile to most plants because of temperature fluctuations and reduced water-holding capacity. In Europe and now in North America, green roof designers have over-relied upon sedums and other succulents for the growing layer. These plants have small root systems, making their succulent, above-ground vegetative parts not only photo-synthesizers, but also water storage vessels. Used in monocultures, these mostly exotic plants are subject to diseases and pests.

Native prairies located near the 100th Meridian offer a source of drought-, wind- and cold-resistant plants for green roofs, especially those with shallow, wide-spreading roots like those found in mid- and shortgrass prairies. While selecting mid- and short-



Atop the Pioneers Park Nature Center green roof, Kelsay Latshaw, a UCARE (Undergraduate Creative Activities and Research Experiences) worker and Landscape Architecture major, plants one of several treatment plots with native grasses and forbs.

grass prairie plants becomes a reasonable strategy to deal with shallow soil and the attending problems of seasonal temperature fluctuations, drought conditions, intense wind and sun, establishment and growth of these plants are also dependent on the water, nutrient and microbial balance that occurs in their root zone. The growing medium for green roofs is nearly sterile, and the type and composition of the microbial population in the compost fraction, if it exists, may not be suitable for optimum prairie plant growth. However, these conditions can be modified in the specification and installation of the growth medium.

The Pioneers Park Nature Center's Prairie Building is adding more space, one feature of which is a 900-square-foot covered entrance foyer and exhibit space. Because of its mission in teaching the public about our local environment, using native prairie plants instead of sedum was imperative. The roof of the foyer has been designed as a green roof, and may be the first modern, designed green roof for a public building in Nebraska. A cross-section reveals a sandwich consisting of the following layers from bottom to top: roof structure and decking, roof membrane, root barrier, water retention/protection mat, 1" drainage component, filter fabric, fall net, media and plants. The sandwich section is 5 1/4" thick, allowing the media component to be 3 1/2" deep. The planted area is buffered from the roof parapet on all sides by a 1' wide gravel vegetation-free zone. Along the north side of this slightly sloping roof are 5 scuppers, placed to allow excess water to drain from the roof into a drainage collection system and cistern. Rooflite, a proprietary growing media material consisting of 95% expanded shale and 5% screened compost, had two treatments applied to it. These treatments had to be carefully designed so as not to exceed the structural support of the green roof section.

The proposed research treatments intend to test the effects of using prairie soil microbial inoculants and mitigating drought impact during establishment by adding super-absorbent polymers. The survival and establishment of mid- and shortgrass prairie plants will be observed and noted for the next two to three years.

The mid- and shortgrass prairie plants selected for the roof's vegetated component are:

little bluestem, *Schizachyrium scoparium*  
 sideoats grama, *Bouteloua curtipendula*  
 blue grama, *Bouteloua gracilis*  
 hairy grama, *Bouteloua hirsuta*  
 prairie junegrass, *Koeleria macrantha*  
 Scribner's panicum, *Dicanthelium scribnerianum*  
 sun sedge, *Carex heliophila*  
 plains spiderwort, *Tradescantia bracteata*  
 Fendler aster, *Aster fendleri*  
 fringed sage, *Artemisia frigida*  
 plains primrose, *Calyophyllus serrulata*  
 prairie clover, *Dalea purpurea*

## Carbon Sequestration Pilot Project Wraps Up

Steve Chick, USDA - Natural Resources Conservation Service, Lincoln, NE

Nearly four years ago Nebraska NRCS entered into a contract with the Chicago Climate Exchange to establish the first-ever carbon trading market in the United States. The project's objectives were to develop, aggregate, verify, register and make available for sale carbon credits from U.S. producers in a voluntary rules-based market system. The project sought to reward farmers who captured and stored CO<sub>2</sub> emissions through sequestration in soils. The proposed pilot program area covered included Iowa, Kansas and Nebraska, with Nebraska NRCS being the administrator of the grant. The ultimate objective was to enroll 10,000 tons of carbon offsets within the project area. So how did we do?

A total of 335,000 acres have been enrolled in the program. Over the course of the four years, approximately 700,000 tons of carbon offsets have been issued to participants. More than 500 producers have been receiving annual payments for the carbon offsets in their contracts. The supplementary income generated from this program may have approached nearly \$3.3 million. The pilot project has now been expanded through a national Conservation Innovation Grant, resulting in about 20 states now offering carbon trading opportunities including statewide coverage in Nebraska. So, I believe it is safe to say that we have done very well with our pilot project.

## The Nature Conservancy Expands Its Scope

Aurora, NE – The Nature Conservancy has announced the formation of two new project offices within its Nebraska Chapter. As a result of several months of strategic planning, the Central Nebraska Project Office in Aurora has been divided. Chris Helzer will remain in Aurora and become the Program Director for the new Eastern Nebraska Project Office, and John Heaston will move to Cozad to be the Program Director for the Platte River Project Office.

The Eastern Nebraska Project Office will cover the eastern third of the state, including the Rainwater Basin, southeast Nebraska prairies, and the saline wetlands near Lincoln. The focus of the office's efforts will be to assess the viability of the biodiversity found in Nebraska's fragmented landscapes and design strategies to enhance and preserve that viability.

For the last ten years, Chris Helzer and other Conservancy staff have worked with a number of partners to develop, test and export land stewardship and restoration strategies along the Central Platte River. The new project office structure will allow the Conservancy to extend that work to other parts of the state. The Eastern Nebraska Project Office staff will become more active in existing conservation partnerships in eastern Nebraska (e.g., Saline Wetlands Conservation Partnership and the Tallgrass Prairie Partnership) and will look for opportunities to form new collaborations that focus on biodiversity conservation in fragmented grasslands.

“The new structure will allow the Conservancy to focus on the question of how to conserve biodiversity in grasslands that are small and isolated from each other,” stated Helzer. “We don't know how much the long-term survival of the plants and animals in those small prairies might be compromised by landscape fragmentation. We want to learn more about that through research, and use that research to design conservation strategies.”

John Heaston is now the Platte River Program Director. The office [located in Cozad] will have two primary responsibilities. It will direct the Conservancy's activities and strategies for the Platte River across Nebraska, and coordinate and support the Conservancy's conservation planning across the state.

This office will focus on developing effective partnerships on the river that balance the needs of community, economy and environment. Current efforts include working on enhancing grassland habitats along the river, reclamation and planning of mine sites and supporting the development of local working groups to address river issues like controlling invasive plants and access/trespass. The Platte Habitat Partnership is one such group. Future efforts will include developing programs and partnerships to promote sustainable water use for agriculture and municipal demands while balancing flow requirements for maintaining the character and function of the river.

Editor's Note: Above is from a March 2007 press release from The Nature Conservancy.



## Managing the Meeting of the Cow and the Grass (continued from page 1)

current prolonged drought, these images have returned to the landscape. Well-managed rangeland continues to be dominated by desirable, native species. The ability of ranchers who adapt and prosper under worst-case scenarios speaks volumes about the stewardship, dedication, and ingenuity of ranch families.

The past two decades of UNL research on rangeland plant-animal-environmental interactions have provided significant guidelines for sustaining healthy plant communities. At the beginning of our research effort at the Gudmundsen Sandhills Laboratory (GSL), we concluded that we needed to identify the timing of grazing and environmental conditions under which desirable co-dominant warm-season tallgrasses are most likely and least likely to be overgrazed by cattle. This information has been incorporated into simple decision-support tools like the Sandhills Defoliation Response Index System (SanDRIS), which minimizes susceptibility to drought and substantially reduces the risk of declines in range condition. Some fundamental components of SanDRIS include (1) warm-season tallgrasses are most likely to be overgrazed during their rapid-growth windows, (2) overgrazing of preferred species is unavoidable during rapid-growth windows, and (3) providing full growing-season deferment to pastures every three to four years is the best way to sustain high levels of plant vigor and range condition.

Overgrazing on Sandhills rangeland is controlled more by when pastures are grazed than by the length and frequency of grazing periods. Ranchers have control of two of the three variables that have the greatest collective influence over how warm-season tallgrasses respond to grazing. The primary controlling variables are (1) season of defoliation, (2) precipitation regime, and (3) end-of-season residual herbage. Justification and guidelines for using SanDRIS will be presented at the 2007 Nebraska Grazing Conference August 7th in Kearney, NE.

My involvement in major educational projects included directing the Nebraska Range Youth Camp for 10 years from 1979 to 1989, serving on the planning and teaching team for the biannual Nebraska Range Shortcourse, in even numbered years, from 1978 to 2006, and co-founding and teaching the Nebraska Ranch Practi-



Pat Reece and Jerry Volesky explain the sequence of rapid-growth windows for different plant species to the current class of Nebraska Ranch Practicum participants.

cum. Just as in selecting an appropriate grazing system, one kind of educational package does not fit all. Contrasting educational objectives are best accomplished with different content and format.

We began research at the Gudmundsen Sandhills Laboratory (GSL) in the early 1980s. Our ability to progressively design and conduct studies based on previous GSL research projects resulted in the development of multidisciplinary research teams that dramatically increased the relative value of the research for the range livestock industry. Eventually, the development of world-class teaching and research facilities and the results of extensive multidisciplinary projects provided the resources needed for the Nebraska Ranch Practicum ([www.panhandle.unl.edu/ranchpracticum](http://www.panhandle.unl.edu/ranchpracticum)), which we initiated in 1999. The educational concepts and format of the Practicum are unique to Extension education. We spent three years discussing and considering different prototypes for the Practicum. During the last nine sessions of the 8-day, 3-season Practicum, ranchers, advisory personnel, and students have learned how to use decision-support tools to optimize management of grass and cattle cycles. Participants have consistently ranked the Nebraska Ranch Practicum as an extraordinary educational investment.

The arctic winds and deep snow drifts during the winters of 1978 and 1979 and drought in the 1980s enhanced my understanding of ranching; however, they pale in comparison to the effects of the current prolonged drought on rangeland vegetation in western Nebraska and the adjoining states. As a new member of the UNL Range & Forage Management faculty in 1978, my learning curve was very steep for a number of years. The non-stop opportunities to learn from ranchers, advisory personnel, and our many research and Extension education team ventures have been wonderful. The past 30 years have been excellent preparation for the next phase of my career as the CEO for Prairie and Montane Enterprises, an LLC specializing in rangeland resources assessment and management advisory services in Colorado, Wyoming, and the semi-arid regions of Nebraska and South Dakota.

Editor's Note: Through September Dr. Reece may be contacted at 308-632-1242 or [preece@unl.edu](mailto:preece@unl.edu). After September 30, 2007, you can contact him at 308-641-0167 or [patreece@PrairieME.com](mailto:patreece@PrairieME.com).



Today many ranchers look for ways to fit cow-calf enterprises to their production and market environments.

## CGS Council Tours North Central Nebraska

On June 6, 2007, Center for Grassland Studies Citizens Advisory Council members, CGS Associates and guests participated in the CGS summer tour, which this year took place in north central Nebraska.

We began the day at the Ord Golf Club where manager and superintendent Rod Ostrander described some of the challenges and rewards of managing all aspects of a smaller, nine-hole municipal course. Our second stop, arranged by Keith Udell, was the Burwell High School, which is establishing and using turf-type tall fescue for its athletic fields. Mark Sortum, manager of the new Calamus Golf Course, arranged a nice lunch for us in the course's headquarters building where we heard from Korlyn Goff the interesting story of how the course was built and is maintained by local residents.

On our way to Shovel Dot Ranch, we made roadside stops along the Calamus Reservoir Wildlife Management Area and listened to Ben Rutten with Nebraska Game and Parks Commission (NGPC) talk about how these areas are managed. NGPC is using prescribed fire to control eastern red cedar encroachment on the area. Thanks to Ben (and his binoculars), we got to see a bald eagle in her nest (albeit from some distance), which was a first for some of us!

Homer Buell, a Citizens Advisory Council member, led the vehicle caravan through his ranch near Rose. Most of his comments (which were made before we left the lunch area because of the extremely windy conditions that day that made it difficult to hold papers and be heard) focused on ranch history, grazing management strategies, riparian vegetation management using grazing to benefit wildlife, and managing drought conditions on the ranch. Homer and NGPC wildlife biologist Bill Vodehnal discussed how a partnership agreement between the ranch, NGPC, US Fish and Wildlife Service, and the Sandhills Task Force helped to benefit the ranching operation and wildlife habitat. The Sandhills Task Force enters into cost-



Rod Ostrander discusses management of the Ord Golf Course.

share agreements with landowners with the goal of sustaining private, profitable ranching while benefitting habitat for wildlife. In the case of the Shovel Dot Ranch, additional fence and water development was provided to complete the grazing rotation of pastures while providing some wildlife habitat along the riparian zone.

The final tour stop was the 6,000-acre Barta Brothers Ranch, which is owned by the University of Nebraska Foundation and managed by the UNL Agricultural Research and Development Center. We gathered in the new education center (out of the wind!) to hear Dr. Walter Schacht describe some of the studies on vegetation and animal response to intensive grazing systems that he and others are conducting on the ranch with the help of undergraduate and graduate students. We then drove to a site where Dr. Dave Wedin talked about a grassland destabilization experiment that he and his colleagues and students are conducting as part



Tour participants were treated to the scene of this bald eagle with her young.



A tour participant takes a close look at the grass on an athletic field at Burwell High School.



of the large, multi-faceted Sandhills Biocomplexity Project funded by the National Science Foundation. The experiment attempts to answer several research questions: How do evapotranspiration, soil moisture, and drainage change as the state of the uplands changes from continuous grass cover to bare sand? How does the energy balance (e.g., albedo, net radiation, sensible, latent and soil heat fluxes) respond as uplands change from continuous grass to bare sand? Do the intact litter layer and soil structure that persist during severe short-term disturbance (loss of the plant canopy for one growing season) significantly modify the effects of bare sand on water and energy balance? Do they allow rapid recovery of grassland functioning? How are the dynamics of soil moisture and drainage from the rooting zone coupled to the dynamics of water in the vadose zone and the water table? More information on the Sandhills Biocomplexity Project project can be found online at [sandhills-biocomplexity.unl.edu/index.htm](http://sandhills-biocomplexity.unl.edu/index.htm).



Checking out the home place while touring Homer Buell's Shovel Dot Ranch.



Ecosystem ecologist Dave Wedin (fourth from left) describes the grassland destabilization experiment he and others are conducting at the Barta Brothers Ranch.

The tour car caravan makes a roadside stop to hear Ben Rutten talk about some of the management strategies used by the Nebraska Game and Parks Commission in the Calamus Reservoir Wildlife Management Area.



## Restored Wetlands Capture Missouri River Water Reducing Flooding

Lincoln, NE – Landowners who have recently restored wetlands along the Missouri River helped reduce flooding by capturing river water in the wetlands, according to Steve Chick, Natural Resources Conservation Service (NRCS) State Conservationist.

“Near Lake Waconda south of Plattsmouth, Neb., where about three feet of water covered two restored wetlands totaling more than 700 acres, NRCS estimated more than 600 million gallons of water were taken out of the river.

“Without wetlands providing relief to the river, water would have continued downstream, causing greater flood damage. During times of flooding these restored wetlands allow flood waters to spread out into the flood plain, thereby reducing the flood impacts downstream. By restoring the wetland corridor we are beginning to replicate what used to occur naturally. The wetlands hold this water, work as a filter, and then slowly return most of the water to the river,” Chick said.

Since 1992, more than 25,000 acres of wetlands near the river have been restored in Nebraska. About 10,000 of those acres have been restored since 2004 when NRCS and several partner agencies put monies aimed specifically to the Nebraska side of the Missouri River corridor through the Wetlands Reserve Enhancement Program (WREP).

Earlier this month [May] NRCS announced it has \$4.3 million dollars available to landowners interested in restoring wetlands along the Nebraska side of the Missouri River from Ponca to Rulo. These funds total a \$19.2 million commitment by USDA’s NRCS since 2004.

The Wetlands Reserve Enhancement Program differs from the standard Wetlands Reserve Program by the increased partner organizations’ involvement, targeting funds to a specific area, and the option for multiple landowners to link wetlands together to form wetland complexes, creating a wildlife and floodplain corridor.

The WREP is a voluntary program that provides technical and financial assistance to landowners or Tribes who restore and protect wetlands. Participants can choose from a 10-year restoration cost-share agreement; a 30-year conservation easement, or a permanent easement, which has been the most popular selection. Financial payments vary with the option selected. Technical assistance for restoring the wetland comes from NRCS and its partners. Landowners retain ownership and control non-developed recreational activities like hunting, fishing or other recreation uses.

In addition to the individual landowners and NRCS, partner organizations investing in this effort include: The Nature Conservancy, Nebraska Game and Parks Commission, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Parks Service, U.S. Environmental Protection Agency, the Lewis & Clark Natural Resources District (NRD), the Papio-Missouri River NRD, Lower Platter South NRD, Nemaha NRD, and Ducks Unlimited.

Editor’s Note: The above press release was issued by the Nebraska NRCS office May 11, 2007.

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