

The Next Generation of Buffalograss Cultivars

by Keenan Amundsen, Department of Agronomy and Horticulture, UNL

During the past 30 years, the University of Nebraska–Lincoln (UNL) has been developing improved turf-type buffalograss cultivars. This effort began through a collaborative research agreement formed in 1984 between the US Golf Association (USGA) and UNL. The motivation of the research agreement was to develop and evaluate alternative grass species that could benefit the golf industry while reducing management inputs and costs. Buffalograss is a native of the Great Plains that forms a dense sod, establishes quickly through stolons, has good color, and has exceptional drought, heat, and cold tolerance. Additionally, an acceptable buffalograss turf can be maintained with as little as two lbs nitrogen per growing season and one inch of water per month. These inputs are significantly less than those used to manage most other turf species.

Buffalograss cultivars developed at UNL are superior to common buffalograss for turfgrass quality, uniformity, production characteristics, and canopy density. While several advancements have been made, the buffalograss breeding program is still driven to develop newer and better cultivars to meet increasing demand. Breeding efforts have focused on improving seed yield, sod strength, functional turf traits, and stress tolerance. As an example, shade is an abiotic stress that impacts more than 20% of all managed turf. Since shade is a significant component of the landscape, shade tolerance is a must for future turfgrass cultivars. Buffalograss is generally regarded as being intolerant of shade.

During the summer of 2013, a shade study was established to evaluate the performance of 38 accessions when grown under a shade cloth that blocks 60% of natural light. The study included six named cultivars along with six shade-tolerant Kentucky bluegrass,

tall fescue, and fine fescue accessions. In total, 20 of the 38 buffalograss accessions were found to be shade tolerant (Figure 1). Similarly, traffic tolerance is important for most turfs since pedestrian and vehicle traffic are common, particularly on golf courses. Buffa-



Figure 1. Evaluation of buffalograss shade tolerance. The bottom left accession is tolerant of shade while the other accessions have poor shade tolerance.

lograss often suffers from poor traffic tolerance. In the summers of 2013 and 2014, weekly traffic was applied with a Brinkman Traffic Simulator to 104 advanced buffalograss accessions. Buffalograss performance was evaluated based on monthly turfgrass quality and percent green ground cover ratings. The study was conducted from mid-June through October in each year. In total, 11 accessions were identified that showed no visible damage symptoms following traffic throughout the duration of the study (Figure 2). Previously, the lack of shade and traffic tolerance limited buffalograss use. However, results from these studies suggest new sources of abiotic stress tolerance that will contribute to

the development of future cultivars.

It is fitting that in this 30th anniversary year of the breeding program's collaboration with the USGA, the release of the newest seeded buffalograss cultivar, Sundancer, was announced (Figure 3). Compared to other seeded cultivars that were evaluated at eight geographically distinct locations, Sundancer established faster, had darker green color, and had better canopy density. Once established, Sundancer outperformed the other entries for turfgrass quality, color, spring green-up, and canopy density. Sundancer is a broadly adapted seeded buffalograss and is an example of the advancements made in buffalograss cultivar development through strategic breeding efforts.

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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

Recently, we have seen and heard considerable information in the news about the use of cover crops. The dictionary defines cover crops as “crops planted between periods of regular crop production to prevent soil erosion and provide humus or nitrogen.” That seems like a narrow definition, considering all the uses of these crops.

While cover crops are not cash crops that are harvested for sale, they are valuable in many other ways. For instance, they provide useful forage for livestock at certain times during the year. These crops provide an excellent livestock pasture because they are actively growing young plants that are highly palatable and nutritious.

In addition, cover crops reduce wind and water erosion of soil, add organic matter, fix nitrogen, suppress or control weeds, feed soil microbes, conserve soil moisture, cool the soil, reduce nutrient pollution of streams, break up hardpans, improve water infiltration and provide wildlife habitat. Cover crops may also help control insects and diseases. Most of the aforementioned items contribute to improved soil and environmental health.

Many different types of grasses and legumes can be grown for cover crops, depending on the purpose for which they are intended, time of planting and the environment under which they are grown. Some of the more common crops that are used for this purpose are wheat, barley, oats, rye, triticale, pearl millet, sorghum, sudan grass, Hairy Vetch, rape, Austrian winter peas, cowpeas, turnips and radishes. These crops can be planted individually or as mixtures of grasses, legumes or a combination of both. When legumes are used either alone or in mixtures, they add nitrogen to the soil and provide a forage high in protein content.

Planting a cover crop can be done anytime of the year even if another crop is growing. Planting during the summer months would normally call for warm-season plants, whereas a fall planting favors cool-season plants. Extending the fall grazing season through the use of cover crops can be highly profitable for the livestock producer. If these crops are seeded into a small grain stubble, one should be able to graze through the fall and even extend into the winter, if the weather is favorable. Perhaps, one could expect to graze for 2.5 to 3 months most years in parts of Nebraska.

When considering planting a cover crop, one should first decide the primary purpose: forage for livestock, erosion control, improving soil and environmental health, providing wildlife habitat or any combination of the above. Cover crops provide many long-term benefits, but to be most effective, the primary goals for their use must first be established.

M. A. Massengale

New Switchgrass Variety Promises More Biofuel at Lower Cost

The release of a new type of switchgrass specifically designed for bioenergy generation has been announced by U.S. Department of Agriculture (USDA) researchers and their partners. Agricultural Research Service (ARS) scientists have spent decades working on different projects that contributed to the development of the cultivar “Liberty,” which can yield eight tons of biomass per acre.

ARS is USDA’s chief intramural scientific research agency, and this research contributes to the USDA priority of developing new bioenergy sources.

The release of the new cultivar is a significant milestone for ARS. It’s also a key accomplishment for CenUSA Bioenergy, a project funded by USDA’s National Institute of Food and Agriculture, which is tasked with developing perennial bioenergy production systems in the Midwest. An announcement about Liberty was published in the *Journal of Plant Registrations* in June.

ARS researchers who contributed to Liberty’s development include retired geneticist Ken Vogel, agronomist Rob Mitchell, molecular biologist Gautam Sarath, and geneticist Michael Casler. Mitchell and Sarath work at the ARS Grain, Forage and Bioenergy Research Unit in Lincoln, Nebraska, and Casler works at the U.S. Dairy Forage Research Center in Madison, Wisconsin.

Liberty contains traits from southern lowland switchgrass types that result in high yields, as well as traits from northern upland switchgrass types that support winter hardiness. In a 16-year breeding study, the new cultivar increased biomass production by as much as 43 percent compared to the parent lines.

Another plus with the new cultivar is that gains in yield were achieved without an increase in nitrogen fertilizer use, which helped lower expected production costs on the farm by approximately \$20 to \$30 per ton. With the increased yields, each acre of switchgrass could potentially be used to produce 75 to 160 more gallons of ethanol.

The development of Liberty followed several ARS investigations into the evolutionary patterns of switchgrass, which is a



Liberty, a new type of switchgrass developed by the Agricultural Research Service, can potentially yield as much as 75 to 160 more gallons of ethanol per acre than previously possible, a landmark breakthrough. Photo courtesy of Ben Fann, ARS.

native North American perennial with a highly complex genome. This work has resulted in the identification of eight regional gene pools with traits that could be useful in developing switchgrass varieties for different production environments.

Results from these studies have been published in *Genetica* and *Crop Science*.

Read more about this work in the August 2014 issue of USDA’s *Agricultural Research* magazine (www.ars.usda.gov/is/AR/archive/aug14/switchgrass0814.htm).

Source: USDA online news article written by Ann Perry, August 7, 2014 (www.ars.usda.gov/is/pr/2014/140807.htm).

Editor’s Note: Prior to retirement, Ken Vogel was an Associate of the Center for Grassland Studies and on the CGS Policy Advisory Committee. Rob Mitchell is a current CGS Associate.

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Figure 2. Buffalograss accessions evaluated for traffic tolerance.

In an effort by turfgrass managers to save resources and management costs, demand for buffalograss is on the rise because it can be maintained at an acceptable level with few management inputs. To satisfy this demand, the UNL buffalograss breeding



Figure 3. Sundancer growing at the John Seaton Anderson Turfgrass Research Facility near Mead, NE.

program is poised to develop the next generation of buffalograss cultivars that have better stress tolerance and turf performance characteristics.

Near Record Attendance at 2014 Nebraska Grazing Conference

We came very close to breaking the attendance record at the 14th Nebraska Grazing Conference held August 12-13, 2014 in Kearney. The final count of 251 total participants was just shy of the 254 in 2006. Can you hear a voice whispering: "If we keep having it, people will keep coming?" Based on comments from this year's evaluations, the conference continues to meet a need for grazing information and networking. Below are just a few of the written comments.

On the speakers...

Nate Garrett — water

"Presentation was good — great explanation of the process NRCS goes through."

Jay Norton — soil health

"Good overall framing of soil health theory and practical application."

Walter Schacht, Jerry Volesky — mob grazing research

"Good information on an issue/management program new to many ranchers."

Tyler Greer, Randy Holmquist — producers who use mob grazing

"Interesting experiences/knowledge. I enjoyed the opinions presented."

Larkin Powell, Steve Winter — wildlife and grazing

"Very interesting and different."

Bethany Johnston — new app for monitoring grasslands

"Appreciate the preview. I'm excited to try the GrassSnap app."

Julie Elliott, Nadine Bishop — managing during and after drought

"Great info; well presented and direct. Very beneficial for what producers are going through."

Curt Pate — stockmanship and stewardship (morning talk, afternoon demo)

"Fantastic — need this topic every year. [The talk] was very good — 45 min. went too fast; [the demo was] the best — do this demo stuff again."

Ben Bailey, Hadley Hill, Ryan Sexson — producers who use low-stress animal handling techniques

"Good panel with on-the-ground, real-world experiences; good points to keep in mind. 'Teaching' attitude; great set of young stockmen; new definition of 'cowboy.'"

Rob Mitchell — switchgrass research

"Interesting and informative; good presentation."

Frank & Henry Beel — management practices of 2013 Leopold Conservation Award winner

"Excellent video — I enjoyed this."



Every year the conference features the previous year's winner of the Leopold Conservation Award for Nebraska. The 2013 recipient was the Beel Family, represented by Frank (left) and Henry Beel, who showed an excellent video that highlighted the management practices on their ranch in Johnston and illustrated why they were chosen for this special recognition.



Following Curt Pate's talk on stockmanship, (from left) Ben Bailey of Lakeside, Hadley Hill of Wauneta and Ryan Sexson of Nenzel made up a panel of Nebraska producers who talked about how they incorporate low-stress animal handling techniques in their management.



Texas rancher, consultant and speaker Curt Pate gave a morning talk on stockmanship and stewardship fundamentals, followed in the afternoon by a demonstration of low-stress handling of horses and cattle at the Buffalo County Fairgrounds.



Extension Educator Bethany Johnston introduced the new GrassSnap mobile app for monitoring grasslands.



In the wildlife and grazing concurrent session, wildlife biologist Stephen Winter from Minnesota (left) reported on research on the response of wildlife to patch burn grazing, and UNL wildlife ecologist Larkin Powell discussed managing Sandhills rangelands in a way that helps increase populations of greater prairie-chickens.



With his extensive experience in agricultural leadership positions, Chuck Schroeder, founding executive director of the University of Nebraska Rural Futures Institute, provided targeted and insightful opening remarks.

On the program...

- ◆ “You always come up with a balanced program; it’s always the highlight of the year [for me]. Keep it up!”
- ◆ “Good mix of producer and academics.”
- ◆ “Like those first-hand accounts from producers – esp. what does and doesn’t work for them.”
- ◆ “Program content was great. Thank you for such a great program.”
- ◆ “Best conference available for ranchers. Keep up the good job.”
- ◆ “Good and diverse offering again this year.”
- ◆ “Good job on program lineup.”
- ◆ “[Program] was well balanced and very good. [Opening speaker] Chuck Schroeder really set it up.”
- ◆ “[Conference] provides variety from year to year.”
- ◆ “Very worthwhile; fun reminding me of what I should already know.”
- ◆ “Really enjoyed the stockmanship aspect.”
- ◆ “Very informative and very well run.”
- ◆ “Overall a very educational program.”



University of Wyoming soils specialist Jay Norton discussed the importance of proper management to maintain and enhance plant production and soil health in grazing lands.



After UNL scientists Jerry Volesky (from left) and Walter Schacht reported on their recent mob grazing research, producers who cooperated on the research, Randy Holmquist from Reliance, SD and Tyler Greer from Ainsworth, NE, shared their experiences with using mob grazing methods.



USDA-ARS scientist Rob Mitchell reported on research he and UNL colleagues have been conducting on the use of switchgrass for forage and bioenergy.



USDA-NRCS civil engineer Nate Garrett (from left) laid the groundwork for the session on water capture, transfer and storage. He was followed by Nebraska producers John Martin from Pleasanton and Roy Westover from Ashby who shared how they manage water in their operations.



USDA-NRCS employees have been pretty busy the past few years helping producers deal with drought. Addressing management issues during and after drought were Julie Elliott (left) from Colorado and Nadine Bishop from Nebraska.

Files from the 2012, 2013 and 2014 conference proceedings are online at the conference website, nebraskagrazingconference.unl.edu. Hard copy of some past conferences can be ordered from that site, which lists the speakers and topics for each year. Check with the CGS on which years are still in supply.

The 2015 conference will be back at the Kearney Ramada on August 11-12. If you have not attended previous conferences but would like to be on the mailing list to receive notice of the next conference, simply send your name and address to the CGS office.

Details of the 2015 program will be posted on the conference website as they become available early next year.

The Nebraska Grazing Conference has several sponsors including this year’s conference underwriters: Center for Grassland Studies, Nebraska Game and Parks Commission, Nebraska Grazing Lands Coalition, Farm Credit Services of America, and Merial.

Editor’s Note: Thanks to Troy Smith who contributed all photos except the one of Winter and Powell.

Center for Great Plains Studies Crafts Ecotourism Campaign

Nebraska attracts tourists with the Cornhuskers, the College World Series, Henry Doorly Zoo and Chimney Rock. It's perhaps not as well known for its rivers, native grasslands and its other ecological wonders.

The UNL Center for Great Plains Studies is launching a project with the goal to change that — and build Nebraska and the Great Plains into a premier destination for ecotourism.

Organizers, including center director Richard Edwards, have been pushing ecotourism in the Great Plains for years, first with the development of a website (visittheprairie.com) and ecotourism map (www.unl.edu/plains/ecotourism-sites). The effort focused on highlighting Nebraska state parks and conservatories and marked the center's first ecotourism marketing venture.

Now, the center is developing a promotional plan and consolidating a coalition of private partners around Nebraska to bring ecotourism to the forefront in the state.

"The idea behind all of this work (with private enterprise) is that you can build thriving communities, job opportunities and economic development, as well as promote conservation of natural resources with ecotourism," Edwards said.

For six months, center research assistant Kat Shiffler has been touring Nebraska, visiting privately held ecotourism spots and interviewing the owners to find out what's been offered, what's in the works, and the successes and obstacles they have encountered. When she completes her tour, Shiffler will provide a case study on many Nebraska eco-destinations and a summary of her findings.

Already, the center has identified a common need among all — more promotion.



As a first step, Shiffler, Edwards and Katie Nieland, the center's communications coordinator, developed an ecotourism seal and 12 images depicting the state's offerings. Each week beginning Sept. 30, in advance of the Center's November First Friday event, two posters will be released at visittheprairie.com.

The images were inspired by a 1930s series of National Parks posters produced by the Works Progress Administration. Like the original posters, the center's new materials denote serene images that invoke interest in a quiet, peaceful interaction with nature. The images are being developed into posters, postcards and other items and will be available for use by ecotourism sites.

"What we're showing is this isn't flyover country," Shiffler said. "There are actually many diverse opportunities of experiences you can have with nature."

Center officials also hope a new Great Plains Ecotourism Coalition can provide organizational resources to and unify the various players around Nebraska. While it is still in development, the coalition could connect the expertise of university faculty expertise with the ecotourism providers in rural parts of the state.

"We have a group of faculty members who are interested in helping us promote ecotourism, getting their students into the field and working with these private enterprises," Shiffler said.

Edwards said he is confident the pieces will be in place to make the Great Plains a major eco-destination.

Editor's Note: The above is excerpted from an article published by University Communications 9-28-2014.

Early Weaning: A Good Bet for Beef Producers in Drought-Stricken Areas

For decades, scientists at the Agricultural Research Service's Fort Keogh Livestock and Range Research Laboratory (LARRL) in Miles City, Montana, have studied management options that minimize the effects of severe drought on rangeland livestock production. Recently, LARRL animal scientists Richard Waterman, a rangeland nutritionist, and Thomas Geary, a reproductive physiologist, teamed with local ranchers and collaborators at Montana State University (MSU) and the American Simmental Association in Bozeman, Montana, to evaluate early weaning of beef calves and its impact on cow, heifer, and steer performance.

"When a calf is weaned early, all nutrients that normally go to milk production for the calf can be retained by the mother — helping to increase or sustain her body weight and condition," Waterman says. "And proper handling of early-weaned calves can result in greater weight gain than if they had remained with their mothers, especially during drought."

Tallying the Benefits

Scientists confirmed that weaning a calf earlier than normal potentially offers a beneficial production alternative for beef producers when forage is limited.

"With the calf removed, the cow needs less forage to address her needs, which is especially important during drought," Waterman says.

"Another issue with drought is the inability to grow enough summer and winter forage for cattle," says rancher and collaborator Dean Peterson, who volunteered his cow/calf herd in Judith Gap, Montana, for the project. "We used to run 500 cows, but now we run 400, because it's about maximizing the efficiency of the forage. We suffered an initial loss of income, but we're doing a better job at taking care of the land and cattle, and our operation is sustainable for the long term."

Research was conducted using calves from both Judith Gap and LARRL. Some calves were weaned early, at 80 days of age, while others were weaned at the more traditional age of 215 days. Cows that weaned a calf early weighed more and were in better body condition at the start of winter. Consequently, the amount of harvested feedstuffs required for cows to maintain satisfactory body weights and condition throughout winter was reduced.

"We learned a lot," Peterson says. "The research confirmed that early weaning is profitable. If you wean calves early, you have fewer problems and can better control the production environment."

“Early weaning during severe droughts will reduce economic losses that would occur when selling lightweight calves,” Waterman says. “In order to achieve an economic benefit, a 20-percent increase in reproductive performance in the cow herd would need to be realized, because early-weaned calves must go on feed much sooner.”

Outcomes of the research also demonstrated that early weaning increases the probability of heifers becoming pregnant on time in the following breeding season, Waterman says.

“The nice response was in body weight, especially with those 2-year-olds nursing for the first time,” he says. “It takes a cow 5 years to reach her mature body weight. When young cows have their calves removed early, the demands of lactation cease — allowing the cow to focus her resources on body condition and growth. If a cow goes into winter in better condition, maintains that condition, and calves with better condition the next year, she will be much more likely to remain in the herd until maturity.”

The objective is to preserve body condition of the cow at a time when forages are limited, says John Paterson, a former MSU animal science professor and Extension Service beef cattle specialist. “We don’t want cows to get thin or pull body condition down, because they’re lactating, which requires a lot of feed. The way you save that feed is to stop lactation by getting the calf weaned earlier.”

Steering in the Right Direction

Additional findings showed that early-weaned steers reached maturity sooner than traditionally weaned steers when weight gain, feedlot performance, and carcass traits were measured. Steers had a higher rate of growth between the time of early weaning and the time of normal weaning.

Early-weaned steers typically had poorer USDA yield grades, revealing the importance of identifying them before they enter the feedlot, Waterman says. While producers who market cattle using a quality grid will benefit from having a higher quality carcass going into market, research indicates that management of early-weaned calves can directly affect how they are graded at harvest.

“Carcasses of early-weaned steers may be too fat and receive less-desirable USDA yield grades compared to those of traditionally weaned calves of similar genetics and age when harvested together,” Waterman says. “If early-weaned steers are identified before entering the feedlot and harvested at an earlier age, producers have the opportunity to market them at more desirable yield grades with increased quality premiums for those carcasses.”

Partnering with the University of Illinois, scientists confirmed this strategy by using ultrasound to measure carcass characteristics. Early-weaned steers were then harvested at a younger age than traditionally weaned animals to maximize their carcass value.

“This research involved cattle that were on Montana ranches, so it was the real deal,” Paterson says. “When you wean earlier and get those cattle into the feedlot, the quality and yield are very nice. A lot of ranchers have figured that out, because it’s an economic issue as much as anything else.”

Peterson is among those ranchers. “We went far enough into the study to get the benefits on the other end,” he says. “We had better cattle with early weaning because it helped our quality too. And because we retained ownership of all our steers and heifers until slaughter, we were able to realize those premiums. We had better carcasses when we weaned earlier.” — By Sandra Avant, Agricultural Research Service Information Staff.

This research is part of Food Animal Production, an ARS national program (#101) described at www.nps.ars.usda.gov.

Editor’s Note: The above was excerpted from an article published in the August 2013 issue of *Agricultural Research* magazine. Read the entire article at www.ars.usda.gov/is/AR/archive/aug13/beef0813.htm.

Catch 2014 Grassland Studies Fall Seminars Live or on Video

By the time this newsletter is printed, we will be more than half-way through the 20th annual Grassland Studies Fall Seminar Series. You can still catch remaining presentations, and if you missed one or more of the earlier seminars, you can email grasslands@unl.edu to request the video of the desired seminar(s). This fall’s entire schedule is below.

The seminars are held 3:00-4:00 in the UNL East Campus Union. Refreshments are available prior to each seminar, compliments of the Frank and Margaret Leu Foundation Fund, which also supports the Leu Distinguished Lectureship each year.



Dr. David Bohnert, beef specialist from Oregon State University, was the 2014 Leu Distinguished Lecturer. Video of his and all other seminars in the series are available for viewing. Contact the CGS office for details.

Fall 2014 Seminars

- Sep. 8** – Bill Kreuser, Dept. of Agronomy and Horticulture, UNL, “Winter desiccation injury to turfgrass: Lessons learned from winter of 2014”
- Sep. 15** – Dirac Twidwell, Dept. of Agronomy and Horticulture, UNL, “Grassland to juniper woodland regime shift: Easier to prevent than reverse”
- Sep. 22** – Bruce Anderson, Dept. of Agronomy and Horticulture, UNL, “China’s roller-coaster forage history”
- Sep. 29** – Mary Drenowski, Dept. of Animal Science, UNL, “Considerations for designing supplemental programs for forage-fed growing cattle”
- Oct. 6*** – David Bohnert, Ruminant Nutritionist and Extension Beef Cattle Specialist at Oregon State University and Director of the Eastern Oregon Agriculture Research Center, Burns, OR, “Nutritional management: Strategies for efficient beef production in a rangeland environment”

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Catch 2014 Grassland Studies Fall Seminars Live or on Video *(continued from page 7)*

- Oct. 13** – Daren Redfearn, Dept. of Agronomy and Horticulture, UNL, “The truth and trade-offs of common grassland management strategies”
- Oct. 27** – Jay Parsons, Dept. of Agricultural Economics, UNL, “Accounting for variable production in decision making”
- Nov. 10** – Marty Schmer, USDA-Agricultural Research Service, “Comparing the bioenergy potential and greenhouse gas emissions of switchgrass and continuous corn”
- Nov. 17** – Richard Gray, Nebraska Dept. of Roads (retired), “It won’t grow in the bag”
- Nov. 24** – Eric Zach, Nebraska Game and Parks Commission, “2014 Farm Bill conservation programs: Will they keep grasslands green side up?”
- Dec. 1** – David Wedin, School of Natural Resources, and the sod house team, “A sod house autopsy: Insights into prairies and homesteading a century ago”
- Dec. 8** – TBA

*2014 Leu Distinguished Lecturer

CGS Associates

Chris Calkins received the Animal Industry Service Award at the July 2014 meeting of the American Society of Animal Science.

The Lincoln Center Kiwanis Club Award for Distinguished Service has recognized extraordinary service provided by individuals to their community, state and nation since 1922. The 2014 recipient is **Dayle Williamson**. His many accomplishments include serving Nebraska’s Soil and Water Conservation Agency for 42 years. As director of the agency for 30 years, he oversaw many important environmental protection and improvement activities including implementation of the law creating the Nebraska Natural Resources Districts. He also served in the U.S. Army and then the Nebraska Army National Guard for three decades, retiring with the rank of Brigadier General. Upon his retirement from state government, Senator Ben Nelson asked him to join his staff to work on agricultural and military issues, which he did for nearly 12 years. The Center for Grassland Studies has been one of the beneficiaries of Williamson’s vast knowledge and experience, as he has served on the Center’s Policy Advisory Committee since its inception in 1995.