

Nitrogen Sequestration and Groundwater Quality

Charles Shapiro and Bill Kranz, Haskell Agricultural Laboratory, UNL

Normally when we think of center pivots and agriculture, we think of plant production for income generation. Under some circumstances producers, Natural Resources Districts, and cities may need to consider nitrogen sequestration and nitrogen drainage as products of the agricultural system. While plant production is still important, nitrogen capture might be even more important in certain situations. When irrigation water is high in nitrates and the water is in a Wellhead Protection Area, removal and reuse of nitrogen may be a significant “agricultural product.”

This practice has not been proven and is still mostly a conceptual idea, but data are being collected and methodology is being developed to test the idea that nitrate-

rich areas can be remediated by irrigation practices that capture as much nitrogen as possible. This is contrary to the standard irrigation idea of supplementing rainfall with only as much irrigation water as is necessary to satisfy crop water needs. Because irrigation is supplemental and the quantity to be applied is unknown, not all the nitrogen in the irrigation water is used in the plant nitrogen budget. Nitrogen applied for the crop may become leachate if rainfall comes after an irrigation and there is drainage.

Compare this to the idea of using as much nitrate-rich irrigation water as possible with only as much supplemental nitrogen as needed to maintain crop production. When irrigating with extra nitrogen-rich water, any extra leaching does not

add nitrogen to the groundwater but returns it to the soil system.

This concept is being implemented on a small scale at a research site near Creighton, Nebraska. This site began development in 2002 when a grass/legume mix was planted under a center pivot that had been in a conventional corn/soybean rotation for many years. A small area was fenced out of the new irrigated, rotationally grazed area to allow direct comparison of the corn, soybeans, grass and alfalfa growth. The initial objective was to determine relative yields of these crops so that

the economic impact of making this switch from row crops to irrigated pasture could be evaluated.

As our research project continued, the idea of sequestering nitrogen became an important ob-

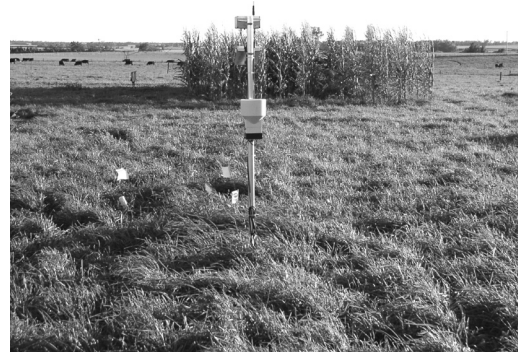
jective. Since 2004, rates of nitrogen have been applied to the corn and grass experimental areas and the irrigation quantities have been increased.

A rough nitrogen (N) balance can be calculated to determine if N is leaving the system or not. Not all the samples have been analyzed for the 2005 crop, but the 2004 data show some interesting information. For the most part, the addition of N increased nitrogen sequestration for the corn and grass. Total N in the corn and grass was similar, ranging from about 233 to 295 lbs N per acre. The increased N uptake for grass in 2004 was about 45 lbs when 175 lbs N were applied. In 2004, irrigation was not scheduled for maximum utilization of water

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Research plots are yielding data that indicate using high-nitrate irrigation on grass results in net removal of nitrogen.



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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

We hear much discussion today about quantity, security and cost of our energy supply. This subject is currently more sensitive primarily because of the gyrating prices we pay for gasoline, diesel and natural gas. In fact, the editors of *Successful Farming* magazine and *Agriculture On-line* declared the top agriculture story of 2005 to be the high cost of energy and fertilizer, which uses a large amount of natural gas in its manufacturing.

It is known that the world's supply of fossil fuels is limited, and with our society becoming more energy dependent, this subject is of both immediate and lasting concern. Therefore, it is incumbent upon us to begin taking a harder look at other sources of energy and especially renewable energy sources. Based on comments heard at Farm Bill forums across the country, Agriculture Secretary Johanns has stated that an energy strategy will be developed to take on the concerns relating to energy costs.

Grasses such as corn, sugarcane and sorghum are already playing a significant role in the production of ethanol, which is used primarily for blending with gasoline. Beginning this year (2006), almost three percent of the fuels used by Americans will be clean-burning renewable domestic fuels such as ethanol. This initiates the first phase of EPA's Renewable Fuels Standard Program authorized by the Energy Policy Act of 2005. This congressional act was designed to double the use of fuels produced by U.S. crops by 2012.

There are research studies underway that indicate some native species of grasses such as Switchgrass (*Panicum virgatum*) may be even more efficient and productive in the production of the carbohydrate substrate than either corn or sorghum. Ethyl alcohol (ethanol) is a product of carbohydrate conversion to alcohol. The amount of carbohydrate produced per unit of land area and the efficiency in converting it to ethyl alcohol will determine the ethanol produced per unit of land area.

Since switchgrass is a perennial plant and does not need to be replanted each year, there are also economic gains that are not present in annual plants such as corn. Further, the entire switchgrass plant is used in the conversion to alcohol as opposed to just the ear of corn currently being converted. CGS Associate, Dr. Ken Vogel with the USDA Agricultural Research Service, has been exploring use of switchgrass, a native Nebraska grass, as a source for biofuels (see "It's a grass, grass, grass for biofuel" at ard.unl.edu/rn/0900/grass.html).

There may be other species of grasses that are higher producers of carbohydrates under certain environmental conditions, but much additional research needs to be done to evaluate plants and their management practices, the conversion process and blending percentages as we look ahead. For example, there are several agricultural management practices that can be used to conserve energy such as grazing forages rather than harvesting, storing and feeding the hay. It seems abundantly clear that we need to place greater emphasis on developing and using renewable energy sources and on doing a better job of conserving and using our energy efficiently.

M. A. Massengale

Maximize pre-emergence success in turf

by Roch Gaussoin, Department of Agronomy and Horticulture, UNL

Your choice for pre-emergence weed control depends on factors such as efficacy, cost, availability and application equipment. You should also select a pre-emergence herbicide for its performance based on the environmental effects of the previous season, particularly weather conditions. Also, it is vital to understand proper application and how this will benefit you throughout the season.

The application of a pre-emergence herbicide is the most desirable method of weed control for several reasons. First, homeowners or sports spectators will never see weeds emerge. Also, a pre-emergence treatment keeps weeds from becoming established and robbing the turf of water and nutrients.

During drought conditions, using pre-emergence products becomes even more relevant. Procedures for applying pre-emergence herbicides are fairly simple and are explicitly described on the pesticide label. Always check the label for recommended rates, sensitive turf species and other considerations, which may alter herbicide performance. You must understand how pre-emergence herbicides work to apply them for maximum success.

When a pre-emergence herbicide is applied to the turf and properly watered in, the chemical moves down through the turf where it comes in contact with the soil. The herbicide is tightly bound to the soil particles in the upper soil surface where the weed seeds germinate. As they germinate, they contact the herbicide-treated soil and the chemical inhibits the growth of the shoots or roots, eventually killing the susceptible weed. The success of the application depends on applying the chemical prior to germination. Also, conditions must favor weed seed germination.

The soil herbicide concentration is the critical factor in the amount and length of control possible from pre-emergence herbicides. Once the herbicide has been applied, a variety of processes take place that eventually reduce the herbicide concentration. When herbicide concentrations drop below a critical level, you must reapply the herbicide to maintain control.

This is why some pre-emergence herbicides require a second application. Information about residual activity can be found on the label, which will also indicate how soon after application re-seeding can occur.

For example, depending on application rate, some products such as Team have relatively short post-application reseeding restrictions (6-8 weeks), others (i.e., Pendulum, Dimension) are intermediate (9-12 weeks), and Barricade has the longest post-application restrictions for reseeding (16 weeks).

Apply water soon

Depending on product and formulation, irrigation or rainfall after application may be necessary. For some products, if the herbicide isn't watered within 72 hours, the chemical is exposed to light, which can increase degradation. The longer the delay in applying water, the greater the potential loss of herbicide.

Drought conditions can affect residual activity. An interesting observation in 2002 was seen in irrigated vs. non-irrigated turf areas in eastern Nebraska. In September, soil chemical analyses of five pre-emergence-treated areas from the previous spring indicated that non-irrigated areas had substantially higher levels of the applied herbicide than irrigated areas. In two instances, the herbicide levels were high enough to slow establishment in the reseeded areas. The application of pre-emergence herbicides on non-irrigated areas may possibly require a change in "normal" application procedures. In non-irrigated areas, a turf manager might consider the use of lower-use rates, shorter residual products and/or not applying a second application if the drought would persist into the summer months.

Another example of weather effects is the occurrence of an unusually dry and hot spring, which could delay weed seed germination. If mid- to late-summer rain occurs, a flush of grass weed seed germination may be seen after the herbicide has degraded below control levels. Be aware of the weather and understand what effect it can have on pre-emergence performance. It can help you time reapplications or an unseasonably late application.

Watch the temperature

Some weeds are more easily controlled if the pre-emergence is applied at the appropriate soil temperature. For example, crabgrass is best controlled when soil temperatures are sustained above 50°F, while goosegrass and foxtail require 60°F or greater for germination.

Stressed turf (from traffic, disease and insects, drought, etc.) normally loses density and is less competitive against opportunistic weeds. In subsequent years, the turf could have more weeds because of the increased weed seed production from the previous year. Once again, pre-emergence products are the logical choice.

Also, decreased turf density may cause the soil temperature to rise faster this spring, and you may need to apply pre-emergence products earlier. Greater weed pressure may also require higher-use rates, split applications or post-emergence applications.

With the upcoming season, does one pre-emergence product have a benefit over another? Base your choice of what pre-emergence herbicide to use on sound, unbiased data. Base your decision on:

- 1) consistent performance from year to year; for example, in testing over the last 10 years in Nebraska, Pendulum, Dimension and Barricade have provided consistent and reliable performance, and
- 2) performance under weather and/or management conditions anticipated at your location. Also, consult with distributor and manufacturer representatives.

When pre-emergence application results are less than desired, an application of a post-emergence herbicide may

be necessary. Selective post-emergence products that target the same species as most pre-emergence products include the arsenicals, such as MSMA, Acclaim Extra (fenoxa-prop-ethyl) and Drive (quinclorac). Drive has performed favorably in University of Nebraska trials and also has excellent activity on white clover. Acclaim Extra has also performed well but should not be used on drought-stressed annual grasses because efficacy is severely impaired. The arsenicals can be injurious to

cool-season grasses including tall fescue and Kentucky bluegrass when temperatures are elevated.

Use the data in the table accompanying this article as a generalized guide for product choices. Consult and follow the product label for additional important information. For the latest and greatest information on weed management for not only turf, but all major Nebraska crops, go to ianrpubs.unl.edu/weeds/ec05-130.pdf.

Selected herbicides and their efficacy in Nebraska testing

Common name	Trade name(a)	Activity	Annual grass control(b)			
			Crabgrass	Goosegrass	Foxtail	<i>P. annua</i>
Benefin	Balan	Pre	G-E	F	G	G
Bensulide	Betasan	Pre	G-E	P	P	E
Siduron(c)	Tupersan	Pre	G	UK	P	UK
Oxadiazon	Ronstar	Pre	G-E	E	F	G
Oryzalin	Surflan	Pre	E	E	E	G
Pendimethalin	numerous	Pre	E	E	E	G
Dithiopyr	Dimension	Pre/Post	E	G	G	G
Arsenicals	numerous	Post	G	UK	G	UK
Fenoxaprop	Acclaim	Post	E	E	E	UK
Quinclorac	Drive	Post	E	G	G	UK

Common name	Trade name(a)	Activity	Annual broadleaf control			
			Oxalis	Spurge	Henbit	Chickweed
Benefin	Balan	Pre	UK	F	UK	UK
Bensulide	Betasan	Pre	UK	UK	G	UK
Siduron(c)	Tupersan	Pre	UK	UK	UK	UK
Oxadiazon	Ronstar	Pre	G	UK	UK	UK
Oryzalin	Surflan	Pre	UK	G	E	E
Pendimethalin	numerous	Pre	UK	G	E	E
Dithiopyr	Dimension	Pre/Post	G	G	G	
Arsenicals	numerous	Post	UK	UK	UK	UK
Fenoxaprop	Acclaim	Post	UK	UK	UK	UK
Quinclorac	Drive	Post	E	UK	E	E

(a) Trade names are mentioned to provide specific information. Mention of a product does not constitute a guarantee or endorsement by the Nebraska Agricultural Experiment Station.

(b) E=Excellent, G=Good, F=Fair, P=Poor, UK=Unknown or not tested in University of Nebraska trials

(c) Only pre-emergence herbicide registered for newly seeded cool-season turf

Nitrogen Sequestration and Groundwater Quality (continued from page 1)

nitrate, but as a supplement to rainfall. About 5.8 in of irrigation were applied, with a nitrate-N concentration of 33 ppm. That calculates to 43 lbs of N applied with the irrigation water. With corn, about 30% of the N was in the non-grain parts and was not removed from the plots, so that for corn, only the grain N can be credited toward removal.

Soil samples taken in the spring of 2005 show that the high amount of N applied to the continuous corn left more N (87 lbs N in top 48 inches) in the soil than where no N was applied to continuous corn (34 lbs N in 48 inches). The high N rate on the grass plots was similar to the N levels in the zero-N corn (43 lbs N in 48 inches). While not significant, there was a trend for the grass without fertilizer N (13 lbs N in 48 inches) to have reduced nitrates in the soil. When these additions and subtractions of N were summed, there was a net loss (removed

in the plants) of 90, 177, and 19 lbs N per acre for the zero-N corn, zero-N grass, and 175 lbs N grass, respectively. For the 175 lbs N per acre corn there was a net increase of 163 lbs N per acre, some which might be lost below the root zone and could end up in the groundwater.

The nitrogen balance presented here is not complete, as it does not include losses to the atmosphere or nitrogen changes in the soil. However, it illustrates that using high-nitrate irrigation on grass results in net removal of nitrogen. At this site, significant nitrogen was mineralized from the organic matter, but there is potential to increase irrigation rates with high-nitrate water and increase nitrogen sequestration in the grass crop. Additional work is continuing at the site to balance water application, crop growth and nitrogen sequestration.

Losing Grasslands and Natural Areas to Development

by Richard Sutton, Department of Agronomy and Horticulture, UNL

Last September I was privileged to lead a tour of managed natural areas in and around Lincoln as a part of the national annual Natural Areas Conference. Several hundred natural area managers from all over North America converged on Lincoln to share their knowledge and experience. Our local tour included sites at Pioneers Park Nature Center and its adjacent prairie, Lincoln/Lancaster County's Wilderness Park Sand Prairie and Saltillo Savanna restoration, Lincoln Parks and Recreation, Lower Platte South Natural Resource District and The Nature Conservancy's rare and endangered saline wetlands, and Nine-Mile Prairie. While the primary focus of the tour was the natural areas, a secondary focus dealt with the human responsibility for managing them in the face of urban development.

Those on the tour could strongly relate to the problems that face our local natural areas because they, too, faced them in some form in each of their own home locales. As one manager put it, "Economic development usually means physical development leading to either creeping or drastic land use change with all the planned and unplanned effects of plant and soil loss, increased impervious surfaces, redirection of runoff, and impacts on wildlife and even the scenery."

Grasses and grassland ecosystems are the dominant feature of our Great Plains region, so grasslands were a component of all the natural areas the tour visited. They are suited to our local variable temperatures, drought and intensive grazing. So, one would think that the local grassland communities, if simply protected, would be thriving. In some cases yes, but in many others, that was not the case.

Just as types of development differ, so do the types of loss being inflicted upon our local grasslands. In many instances the grassland communities have been totally supplanted with hard surfaces. Removing the natural ability of these plants and their roots to slow water and increase runoff percolation has led to areas of localized or general flooding in Lincoln's urbanized watersheds. It has been estimated that nationally, the impervious surfaces cover 43,000 square miles, or an area about the size of the state of Ohio.

While such removal is dramatic, much more insidious is the degradation of grassland areas and their loss of biodiversity. Invasive species such as leafy spurge can also gain a foothold in grasslands and smother them as surely as woody plants. A portion of the grass area in the buffalo exhibit at Pioneers Park has been under invasion by leafy spurge and has



Development threats don't always come from physically harming grasslands. Views like this from Nine-Mile Prairie will change with the addition of 115-foot-tall power line towers. Such adjacent aesthetic harm is difficult to gage, but certainly diminishes the meaning attached to virgin prairie and loosens our psychic connection to the landscape." Richard Sutton

declined in biodiversity. Even conversion from prairie to park or lawn reduces the number of species per square yard from many to only a few. Highly managed recreational lawns rarely intentionally include forbs or more than one species of grass.

The natural progression of plant succession also impacts grasslands. Where burning or routine removal of woody plants ceases, grasses often succumb to shading. The unique Sand Prairie in the northwest corner of Wilderness Park is slowly

being compromised by the influx of woody plants. As housing development occurs nearby, it is only a matter of time before management by burning will raise the concerns of neighbors. Meanwhile, at the Wilderness Park Saltillo Savanna restoration site, an area of old-field dominated by Siberian elm has been converted to an area of sapling oaks and ash now under-planted by bluestems, switchgrass and Indiangrass in an attempt to recreate a wood-

land/grass complex that may have existed before Euro-American settlement.

Professional, scientific management should protect and prolong the diversity and integrity of grasslands, but even there, adjacent management practices can also cause concern. For example, at about the same time that the Natural Areas Conference was convening, the Lincoln Electric System was finalizing plans for a combined 115 and 345 KV power transmission line bordering Nine-Mile Prairie. Even though the line would not be on the prairie proper, requirements that affect

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Richard Sutton

burning of the prairie and use of herbicides in the right-of-way line will have unknown impacts.

Herbicides and fertilizers can also leach or run off from lawns, parks and golf courses and have impacts miles from their source. Erosion and sediment control, while mandated by the federal, state and municipal agencies, still impacts acres of natural and man-made wetlands. An untold and unexamined result of mass grading and then individual site construction is the complete destruction of an integrated soil profile. Tough native bunch grasses struggle to grow or expand on such a compacted, depleted soil.

Perhaps the most difficult to pin down is the loss of meaning that accompanies adjacent development next to our dwindling prairies and expanding park space. Because grasses and grasslands are communities that occupy the ground plane, our experience of them is strongly affected by neighboring activities. The Saltillo Savanna has its views controlled by woodland, but Nine-Mile Prairie will soon be festooned with 115-foot mega towers that belie that prairie's sense of naturalness.

Grasslands are an integral part of most natural areas, but are just as vulnerable to direct and indirect development pressures. Proper management of grasslands, therefore, should take their unique structure, function and change into consideration as they are developed, modified or completely removed.

Editor's Note: Sutton is a registered landscape architect in Nebraska and has done landscape ecological research and planned natural areas. Nine-Mile Prairie, a focus of the above article, is so named because it is approximately nine miles northwest of downtown Lincoln. Details about the prairie can be found at snrs.unl.edu/wedin/nefieldsites/NineMile/nine_mile_prairie.htm.

New Prairie Grasses to Fatten Beef Cattle

Two new varieties of big bluestem prairie grass could boost beef cattle weight by as much as 50 pounds per head, according to Agricultural Research Service (ARS) and collaborating university scientists.

The beef weight gains come from grazing trials in eastern Nebraska that compared the new releases—named “Bonanza” and “Goldmine”—to the Pawnee and Kaw varieties. The latter two cultivars have been the leading big bluestems in the Central Plains and Midwest for more than 40 years, a reign stemming from their broad adaptability to the regions' diverse growing conditions.

Such adaptability is especially important on marginal cropland used for cow-calf operations where the animals draw nutrients from forage rather than grains, notes Ken Vogel, who leads ARS' Wheat, Sorghum and Forage Research Unit in Lincoln, Neb.

Pawnee and Kaw, however, were never specifically bred with forage quality in mind, according to Vogel, a supervisory plant geneticist. Goldmine and Bonanza offer the best of both worlds, combining adaptability with improved forage quality. Vogel began breeding the big bluestems in 1977, and recently field-tested them in collaboration with ARS Lincoln rangeland scientist Robert Mitchell and University of Nebraska-Lincoln

researchers Terry Klopfenstein (ruminant nutritionist) and Bruce Anderson (forage specialist).

In pasture trials from 2000 to 2002, cattle that grazed the new big bluestems gained 18 to 50 pounds more per acre than those that grazed Pawnee and Kaw. The researchers estimate these gains could mean net-profit increases of \$15 to more than \$35 per acre a year for beef producers. On marginal cropland, yearling steers that grazed pastures of Goldmine and Bonanza generated net profits of up to \$119 per acre. That's 2.4 times more profit than the producer would have earned from growing corn on the same land during the same years, according to the researchers' estimates.

Certified seed of Goldmine and Bonanza will become available in 2006.

Source: Nov. 18, 2005 USDA press release by Jan Suszkiw, online at www.ars.usda.gov/is/pr/2005/051108.htm.

Editor's Note: Vogel, Mitchell, Klopfenstein and Anderson are CGS Associates.

Nike Golf Camp in Lincoln This July

The second annual five-day Nike Junior Resident Golf Camp will be held in Lincoln July 17-21, 2006. Scott Holly, Coordinator of the UNL Professional Golf Management (PGM) program, is camp director. Helping with the camp will be PGM Director, Terry Riordan, Greg Johannesen, and Mike Schuchart and Jim White, who are PGA teaching pros at Wilderness Ridge Golf Club, the home course of the UNL PGM program. Girls and boys 14 to 18 years of age with some golfing ability are qualified to participate. Cost is \$745 for “resident” and \$645 for “extended day” (9:00 AM to 9:00 PM). For more information and to register, go to the PGM Web site (pgm.unl.edu) and click on the Nike Junior Golf Camp link. If you have questions, contact Holly at sholly2@unl.edu, 402-472-7467.



PGA teaching professional Mike Schuchart helped 2005 Nike Golf Camp participants improve their game.

CGS Associates

In October 2005 **Charles Francis** was named a fellow in the American Association for the Advancement of Science, the world's largest general scientific society and publisher of *Science* magazine, for his contributions to research and development of multiple cropping systems, on-farm research techniques, definitions of agro-ecology, and experiential learning methods.

At the Gamma Sigma Delta Annual Award and Initiation Banquet in October, **Ivan Rush** received the Extension Award in recognition of his 31 years of service as a beef specialist at the University of Nebraska Panhandle Research and Extension Center. His excellence in extension programming has been recognized by the Nebraska Beef Council, American Society of Animal Science Extension, and UNL Cooperative Extension.

Robert Shearman is the recipient of the 2006 United States Golf Association Green Section Award, which is given annually by a distinguished panel of experts in the turfgrass field and recognizes persons for contributions to golf through work with turfgrass. Those contributions include: As executive director of the National Turfgrass Evaluation Program (NTEP) from 1993-1998, he adopted a strategic long-term action plan for the program. He was instrumental in establishing the first cooperatively sponsored, on-site turfgrass evaluation program between the USGA, NTEP and the Golf Course Superintendents Association of America, which resulted in turfgrass managers nationwide having access to information about the best-suited grasses for their particular region. With a local, regional and national turfgrass perspective, he helped guide the USGA turfgrass research program. Shearman will be honored at the Golf Industry Show in Atlanta in February.

As **Al Steuter** concluded his 23-year career with The Nature Conservancy, he received that organization's Lifetime

Achievement Award, given to those who "demonstrate continued professional excellence, cooperation, support of colleagues, and commitment to Conservancy values." An authority on grazing and bison, Steuter started the bison program at the Conservancy's Niobrara Valley Preserve, which now has a permanent population of 500 animals on 20,000 acres. A Conservancy publication states that his contributions "have profoundly influenced our efforts in the conservation of native grasslands, the role of disturbance in grassland systems, and how our mission can be most effectively pursued in a landscape primarily owned by farmers and ranchers."

In December NU Vice President and Institute of Agriculture and Natural Resources Vice Chancellor John Owens presented three faculty members with an Omtvedt Innovation Award. One award went to **Don Wilhite**, who as director of the National Drought Mitigation Center, articulates the causes and effects of drought on people and governments in the United States and around the world as well as the importance of improved monitoring and preparedness to help reduce the damage caused by drought. Wilhite is one of the lead investigators on a new \$6.4 million USDA grant that will use cutting-edge technology to provide better information on current climate and soil moisture conditions at local levels, leading to the ability of farmers to make better decisions on what crops to plant, tillage, and fertilizer practices.

At the Nebraska Cooperative Extension Association's annual conference in late fall, **David Baltensberger** received the Distinguished Service award in the Specialists section. Also recognized at the conference for service to NCEA and Extension was Bruning State Bank, which received the Outstanding Service by a Group Award. **Frank Bruning** has served on the Center for Grassland Studies Citizens Advisory Council since its inception in 1995.

2006 Nebraska Grazing Conference to be Aug. 7-8



Kearney will again be the site of the sixth annual Nebraska Grazing Conference, to be held August 7-8, 2006. While the program is still in the planning stages, we can announce that Barry Dunn with the King Ranch Institute in Texas and Fred Provenza at Utah State University will make return appearances this year. Past participants will receive a brochure in the mail in June. Watch for details in the Spring 2006 issue of this newsletter and in other media outlets. Updates will also be posted at the conference Web site: www.grassland.unl.edu/grazeconf.htm.



Resources

2005 Guide to Weed Management in Nebraska. Faculty at seven universities had input into this highly detailed, 176-page publication, which is available online at ianrpubs.unl.edu/weeds/ec05-130.pdf.

The Nebraska Game and Parks Commission has some new wetland education products available free of charge. *Guide to Nebraska's Wetlands and their conservation needs* is a full-color, 59-page special publication that defines and describes Nebraska wetlands and discusses wetland functions, dynamics, classification, inventory and conservation efforts. *Trail Tales* is a quarterly publication sent to nearly every fourth-grade student in the state. The Spring 2006 issue is a special wetlands edition that describes Nebraska's wetlands, their functions and associated wildlife. Also included are several games and trading cards featuring some of Nebraska's wetland wildlife. The *Wetlands of Nebraska* video contains scenes from a variety of Nebraska wetlands, including their associated wildlife, and explores the values wetlands provide and the role they play in the lives of Nebraskans. The video is targeted to fourth- to sixth-grade students, but is appropriate for younger and older audiences as well. Learn more and order at www.ngpc.state.ne.us/wildlife/programs/wetlands/#video, or contact Ted LaGrange, 402-471-5436, ted.lagrange@ngpc.ne.gov.

Three good federal Web sites containing searchable databases with photos and information on grasses and forbs:

Federal Highway Administration
(plants are organized by color)
www.fhwa.dot.gov/modiv/green.htm

Plant Conservation Alliance
www.nps.gov/plants

USDA Plants Database
Plants.usda.gov



Info Tuft

Dr. Glenn Burton, internationally renowned agronomist who received his B.S. at the University of Nebraska, died November 22, 2005 at the age of 95. His work with pearl millet made major contributions to the green revolution in India and Africa and is thought to have saved millions from starvation. Among his many national awards, he was recognized in 2002 by the Turfgrass Producers International organization for his work in turfgrasses and as the driving force behind many improved forage and grain hybrids as well as grasses for hay and pasture.

Calendar

Contact CGS for more information on these upcoming events:

2006

- Mar. 17-19:** Combination Nebraska Partnership for All-Bird Conservation symposium and "Rivers and Wildlife Celebration," Kearney, NE, www.nebraska.audubon.org
- July 17-21:** Nike Junior Golf Camp, Lincoln, NE, pgm.unl.edu
- Aug. 7-8:** 2006 Nebraska Grazing Conference, Kearney, NE, www.grassland.unl.edu/grazeconf.htm
- Nov. 12-16** ASA-CSSA-SSSA International Meetings, Indianapolis, IN, www.agronomy.org/meetings.html
- Dec. 9-13:** 3rd National Conference on Grazing Lands, St Louis, MO

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