

# Center for Grassland Studies

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## Alkaline Wetlands of the North Platte River Valley

By Gerry Steinauer

Ecologist/Botanist, Nebraska Natural Heritage Program

The word alkali often brings to mind images of barren desert landscapes, but that is a misleading picture of North Platte River valley's alkaline wetlands and the abundance of life forms adapted to thrive in those salt-rich, seemingly inhospitable waters. Located just east of Chimney Rock, the nearly 500-acre Facus Springs wetland contains ephemeral and seasonally flooded alkaline pools, flats and grassy alkaline meadows. It is about to become the Nebraska Game and Parks Commission's second alkaline wetland in the North Platte River valley. The other is Kiowa Basin in western Scotts Bluff County.

Alkaline wetlands generally occur in arid and semi-arid regions where rainfall is inadequate to leach naturally occurring salts from valley basin soils, allowing them to accumulate. In Nebraska, alkaline wetlands are found primarily in the North Platte Valley west of Lake McConaughy and in a poorly drained region of the western Sandhills. In the North Platte Valley, alkaline wetlands form where groundwater levels are high and soil drainage is poor. At Kiowa, the alkaline basin abuts the south valley bluff. There a siltstone shelf, overlain by alluvium, lies approximately 10 feet below the soil surface. Groundwater seepage from uplands to the south flows atop the siltstone into the basin and is trapped. Over time, evaporation of the groundwater has concentrated the salts, primarily sodium carbonate and calcium carbonate, in the upper soil profile forming alkaline conditions. During dry periods, whitish salt crusts often form on the soil surface and the soil pH can top 9.

### Wetland Plants

Within the North Platte Valley's alkaline wetlands, the shallow pools where salts accumulate are the harshest growing environment for plants. There, plants must tolerate not only standing water in spring, but also dry and extremely alkaline soils in late summer. Stunted scattered plants of arrowgrass, an exceedingly salt-tolerant, grass-like forb, are frequently the sole inhabitants of highly alkaline depressions. Sea blite, alkali plantain, Nevada bulrush and inland saltgrass can survive in less alkaline depressions. Like most halophytes (plants adapted to grow on salty soils) these plants have the ability to accumulate higher concentrations of salts in their cell sap than salt concentrations in the soil water. By concentrating salts, these halophytes can draw soil water into their roots, since water generally flows from areas of low salt concentration to areas of higher salt concentrations.



Nebraska Game & Parks Commission

Bordering the alkaline pools and flats are more extensive, but less alkaline meadows dominated by alkali sacaton, foxtail barley, inland saltgrass, slender wheatgrass and plains bluegrass. Characteristic of many of the salt-tolerant forbs inhabiting the meadows, including spearscale, poverty weed and sea blite, are modest or inconspicuous flowers. Alkaline meadows lack the floral displays of Nebraska's more colorful prairies. Only a few of the alkaline meadow forbs can truly be called wildflowers. Among the showiest are hawk's beard, shooting star and prairie gentian. Several plants considered rare in Nebraska grow in the North Platte's



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## From the Director

**W**e are undergoing a stressful time in the beef cattle industry. Both feeder calf and fat cattle prices are low while grain prices are at near record levels. Also, the inventory of beef animals remains high.

With drought or near drought conditions occurring throughout the Great Plains and other grain growing regions, potential shortages could drive grain prices even higher. Such conditions would cause even greater stress on our beef cattle industry, possibly forcing some herd liquidation.

Ranchers are not the only ones to suffer when the cattle industry is experiencing stress. When cattle producers are having problems, it affects essentially every business in our communities across Nebraska. Rural communities are heavily dependent upon agriculture, and when times are tough, farmers and ranchers only purchase the necessities of life. Many of our Nebraska communities do not have non-farm industries to rely on for employment and to help offset this loss in purchasing power.

With the beef cattle industry producing the largest single source of farm income in Nebraska, this state is experiencing such stress. Therefore, the Center for Grassland Studies invited plant and animal scientists, agricultural economists, and extension specialists and educators from our faculty within the Institute of Agriculture and Natural Resources to review and determine how we might help ease part of the stress. The result was formation of the Plant/Animal Systems Project (group).

Project team members met on February 5, 1996 to discuss past research conducted in Nebraska and to determine if there are areas where we can potentially make a significant contribution toward improvement. The group decided that the first step should be to summarize the results of past Nebraska research to determine if there are voids where research needs to be done, or if existing but underutilized data are available that could be used to lower the cost of production. With financial support from the IANR Administration, we have hired Dr. John Ward, retired beef cattle specialist, to coordinate this effort. The target date for a report, complete with bibliography, is Fall 1996.

We at the University are a resource base for the state, its citizens, and their problems. Therefore, we must make every effort to explore ways that we can be helpful during this stress period for such a large part of our economy.

*M. A. Massengale*

The Center for Grassland Studies is a unit within the University of Nebraska-Lincoln Institute of Agriculture and Natural Resources. It receives guidance from a Policy Advisory Committee and a 50-member Citizens Advisory Council. This newsletter is published quarterly.

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## Hopper: Decision Support System for Rangeland Grasshopper Management

By Anthony Joern

School of Biological Sciences, UNL



Grasshopper problems periodically arise in the 770 million acres of rangeland in western U.S. The major concern, of course, is forage availability to grazing animals. While past management responses were based on simple estimates of economic thresholds at 8 grasshoppers per square yard to trigger control operations, this value is no longer considered valid as a decision standard for grasshopper control. Rather, the economic threshold and risk of damage varies among locations and over time, and this dynamic view of the problem must be incorporated into decision making. Current and future Grasshopper IPM planning must incorporate new views of the problem in order to develop appropriate control strategies.

In an effort to assist pest managers with making decisions about rangeland grasshopper control, USDA/ARS and USDA/ Animal Plant Health and Inspection Service (APHIS) scientists at the ARS Rangeland Insect Laboratory in Bozeman, MT have developed a computer decision support package called Hopper, version 4.0. This expert system package provides assistance to ranchers and decision makers for designing innovative control programs. Hopper combines advances in computer technology with the most complete biological knowledge base and economic analyses assembled for rangeland grasshoppers. The program is generally user friendly although it does require specific input that is not generally available to the public and an appropriate appreciation for the types of dynamic responses embedded in the software for proper use.

Hopper links weather data, rangeland type (geographical), grass composition, grasshopper composition and density, a ranch economic model and control options. In doing so, Hopper asks for specific data about your site. It then evaluates factors that are critical in the treatment decision making process but often too time consuming for field personnel to consider. Hopper provides a benefit/cost ratio (BC) that depends on both the biology and economic impacts of your decision. BC depends on many factors that change over time and location.

The BC ratio is based on costs incurred in a single year's operation and does not account for multi-year effects

such as the effect of reduced egg deposit on next year's population density. The economic analysis evaluates the value of forage for livestock consumption in a single season and does not include multi-year benefits. For example, maintenance of a brood herd and long-term survivability and profitability of the operation may accept a one-year loss over a ten-year cycle of nine profitable years. Hopper can calculate a multi-year BC, compounded from the single-year BC. Hopper does not account for environmental costs or benefits, value of beneficial species, or other non-forage related values.

Two versions of the program have been developed: Hopper for the expert user, and Hopper LITE for infrequent users. Each version assumes a moderate level of sophistication on the part of the user, especially in interpreting the results when developing appropriate control options. However, Hopper is more complex and flexible and thus less user friendly than is Hopper LITE. Both use the same analyses and produce the same output from identical input, but Hopper can be better tailored for specific conditions. (See Resources to obtain.)

### Controlled Burning in Rangeland Management

Spring is the time when some fancies turn to love, but James Stubbendieck's fancy turns to fire. Stubbendieck, a UNL professor of range ecology, uses a plot of native prairie grasses just outside of the CGS offices to teach his students about controlled burning. This process clears dead matter that may be choking existing plant life, removes weeds, and makes grasses more succulent and nutritious for grazers. One of its biggest benefits is control of eastern red cedar trees, a serious problem for ranchers in central and southeastern Nebraska. Prescribed burning kills over 90 percent of the trees, and is cheaper than mechanical or chemical methods.

The growth in use of prescribed burning is the primary reason the Nebraska Legislature passed a law in 1994 that requires permit seekers to submit a burning plan for approval by the local fire chief.



Agronomy graduate student Daniel Beran was awarded the 1996-97 Arthur William Sampson Fellowship. Sampson is considered the "Father of Range Management."

## Grazing Times

The following column by Jim Gerrish appeared in the premiere issue of the *The Forage Leader*, Spring 1996. Gerrish is with the Forage Systems Research Center at the University of Missouri.

\* \* \*

In this first column, I thought we might discuss several ways in which sound grazing management can help lower cost of production. In the light of current beef prices this is especially timely and because over half of the producer talks I have given this winter have dealt with the same subject, it makes it very easy to meet the publication deadline.

**#1: Grow more leaves on every acre.** Remember that grazing management is the business of converting solar energy to a salable product in a cost effective manner. Green leaves are basically the only tool we have for making that conversion. The more acres on the farm and the more square feet on every acre that we keep growing green leaves, the greater the productivity of the farm. Using the optimal stocking rate and adjusting it when needed is the tool we use in set stocking to maintain appropriate leaf area. If sward height and condition can be held at optimal levels, animal production will respond positively. In rotational grazing systems, planning the proper rest period to allow leaf growth to reach the target level and then efficiently grazing it off will keep most of the farm growing green leaves.

**#2: Harvest more forage per acre.** One of the quickest ways to lower production costs in a grazing system is to produce more pounds of beef per acre. This spreads overhead costs such as land, fence, and water development and operating costs such as fertility and overseeding across more production units. Controlling grazing on a timely basis can increase the number of grazing days per acre. On an annual basis, we have recorded seasonal utilization rates between 80 and 90% when grazing periods were 1 to 2 days. Rotating pastures every 3 to 4 days can yield 75% seasonal utilization rates. More traditional grazing programs typically harvest less than 50% of the annual production. Harvesting more of the forage already growing on your farm is usually a more cost effective option for producing more beef than trying to grow more forage.

**#3: Graze more legumes.** Legumes have a multi-fold benefit in grazing situations. In the Midwest, legumes such as red clover, alfalfa, and birdsfoot trefoil maintain a higher daily growth rate during the summer than do cool season grasses. Thus, legumes supply greater availability of quality forage during the summer months than do cool season

grasses. Nitrogen fixation by the legumes can eliminate the need for nitrogen fertilization in many cases. Research by Bill Templeton and Tim Taylor in Kentucky during the 1960s and 70s showed that a tall fescue-red clover mixture would yield as much forage as fescue receiving up to 200 lb N/acre. If you are purchasing large quantities of N fertilizer, switching to a legume based pasture system could provide a big payback. If you rely on relatively inexpensive poultry litter or other confinement animal waste for nitrogen, legumes may be a less attractive option.

**#4: Extend the grazing season.** Research from Missouri, Iowa, and Ohio all indicate that daily feed costs are 50 to 70 cents lower per beef cow when the cow is grazing compared to feeding hay. A well planned grazing program can provide stockpiled pasture well into winter across much of the upper South and lower Midwest. Even in more northern areas, stockpiled pasture can still be grazed with several inches of snow on the ground. Carefully budgeting stockpiled feed can extend the grazing season much deeper into winter. In research at the Forage Systems Research Center we compared 14, 7, and 3-day forage allocation strips on stockpiled tall fescue. Strip grazing on a 3-day frequency yielded over 40% more grazing days per acre than allocating a 14-day forage supply and produced the same level of animal gain.

*Editor's Note:* Reprinted with permission of the American Forage and Grassland Council, publisher of *The Forage Leader* which is distributed to AFGC members. For more information about the publication, call 1-800-944-2342.

## Weaver Small Grants Program

The Nebraska Chapter of The Nature Conservancy will provide four \$400 grants in support of graduate student research that enhances our understanding of Great Plains species or ecosystems and their conservation. High priority topics include: distribution of threatened species or critical habitats in the Central Platte Valley; grassland and wetland ecology and restoration; Great Plains migratory bird conservation and management; riparian woodland ecology and management; geographic information systems for conservation planning; studies of interdependence among species.

The RFP has been sent to 80 scientists and institutions in the Great Plains region that have graduate students in ecology, biology, and natural resources. You can obtain a copy by contacting the CGS office. Proposals are due October 1, 1996.

## Alkaline Wetlands *(continued from page 1)*

alkaline meadows, including slender plantain, silverweed, eastern cleomella, thelopody and sea milkwort. In part they are rare because the alkaline and saline soils to which they are adapted are limited.

The North Platte Valley's alkaline wetlands are now uncommon, and remaining in native vegetation are those too wet or too alkaline to ever have been plowed. They survive as hay meadows or pastures. Most of the valley's grazed alkaline wetlands have been chronically overgrazed. Consequently, highly palatable species such as alkali sacaton and slender wheatgrass have been replaced by less palatable and less desirable species such as inland saltgrass, foxtail barley, plains bluegrass and weedy forbs. Haying, which uniformly defoliates all plants, is usually less detrimental to alkaline meadow vegetation than season-long grazing. Hayed meadows usually have a higher diversity and abundance of palatable native plants than grazed meadows.

## Wetland Birds

Since 1969, Richard Rosche, an amateur ornithologist from Chadron, has recorded about 70 species of birds using the North Platte Valley's alkaline wetlands. As might be expected, shorebirds, wading birds, waterfowl and other birds whose life cycles are tied to wetlands dominate Rosche's list. Kiowa's wetlands are especially attractive to waterbirds because they offer a diverse mixture of habitats—shallow alkaline pools with open shorelines, seasonally flooded alkaline meadows, deeper freshwater marshes and seeps that maintain some open water even in the coldest weather. In recent years, Kiowa basin has been heavily used by migrating and wintering waterfowl including up to 30,000 wintering mallards and 10,000 wintering Canada geese.

Rosche has observed 20 species of shorebirds on alkaline wetlands. In late summer and early fall, hundreds of migrating shorebirds, including large numbers of Baird's sandpipers and lesser yellowlegs, can be found feeding and resting in the shallow waters at Facus Springs and Kiowa Basin. The swarms of brine flies and other invertebrates in the shallow alkaline waters and soil of the sparsely vegetated basins and flats make the wetlands exceptionally rich foraging areas for shorebirds. In recent years, American avocets and Wilson's phalaropes have nested at Facus Springs.

Often cursed by farmers and ranchers for their unproductive soils, home to an array of salt-tolerant plants and vital habitat for migratory and breeding waterbirds, the alkaline wetlands of the North Platte Valley are among Nebraska's most unusual and least understood natural systems.

## The 1996 Farm Bill

*by Dayle Williamson*

Nebraska Natural Resources Commission

Final action was taken on the new farm bill on April 4 when President Clinton signed into law the Federal Agricultural Improvement Act of 1996 (PL 104-127). There are a couple of major differences from past farm bills. First, the law will be in effect for a seven-year period rather than the normal five-year period. And second, it decouples federal payments from production. Crop subsidy payments will be made on a declining basis over seven years and then will cease. Farmers can make their own choice of crops to be planted without limitations.

In a recent telephone conference, Secretary Glickman described the new farm bill as a "mixed bag." He said the conservation section was excellent, probably the strongest environmental legislation passed during the Clinton Administration. He went on to express his disappointment with the payment provisions on crops and the possible need for a future safety net.

There is a new Environmental Quality Incentives Program (EQIP). This program consolidates the functions of four existing conservation programs into one and focuses assistance on locally identified conservation priority areas or areas where agricultural improvements will help meet water quality goals.

The popular Wetlands Reserve Program and Conservation Reserve Program are extended through 2002. Current Swampbuster and wetlands provisions from the 1985 and 1990 farm bills were modified to provide farmers with more flexibility to meet wetland conservation and compliance requirements.

Conservation Compliance was changed to direct USDA employees who are providing on-site technical assistance to notify landowners if they observe potential compliance problems. Landowners will have up to one year to take corrective action. County Committees are authorized to provide relief in cases of economic hardship.

There is also a new Conservation of Private Grazing Land initiative. This will offer landowners technical, educational and related assistance on the nation's 642 million acres of private grazing lands.

The membership of the state technical committees was also broadened. It is anticipated these groups will play a much more prominent role in the future.

*Editor's Note:* Thanks to the good work of members of the Nebraska congressional delegation, a provision of the farm bill was struck before final approval that would have prohibited producers from receiving contract payments on acres on which alfalfa and other forages are produced.

## Info Tufts



Research shows that there are 22 times more bird nests on CRP fields than on row crop fields.



The Wildlife Society has issued a position statement on livestock grazing on federal rangelands in the western U.S. Contact the CGS for a copy.



Nebraska's Sandhills is one of the largest grass stabilized dune regions in the world, comprising about 12.5 million acres and containing over 2,000 natural lakes.



The work of Glenn Burton, a native of Nebraska and a University of Nebraska alumnus, was featured in the March/April 1996 issue of *Golf Journal*. His accomplishments include development and release of several bermudagrasses for turf, bermudagrasses and bahiagrasses for hay and pasture, sudangrass and napiergrasses for forage, pearl millets for forage, and pearl millet inbred lines for forage and grain hybrids.



*Correction:* An Info Tuft in the Winter 1996 CGS Newsletter stated grazing could save \$50-\$60/day/cow compared to feeding hay. If only that were true! As you can probably guess, a dot was inadvertently omitted. The figure is \$.50-.60/day/cow, and comes from a seminar given last fall by Jim Gerish from the University of Missouri.

### Nebraska Range Shortcourse

Chadron State College is the site for the 19th annual Nebraska Range Shortcourse, June 17-21, 1996. Sixteen instructors from academia, USDA, and production agriculture will work with "students" in lecture and field settings. The course includes quizzes and a final exam, and can be taken for credit through the University of Nebraska Division of Continuing Studies or Chadron State College.

The course is designed to provide individuals who have a background in range management, natural resources, or agriculture an opportunity to increase their knowledge of the underlying principles of range management, and efficient, sustainable use of range for livestock and as a natural resource. Major topic areas are: The Range Resources; Ecology; Management and Public Land; Grazing and Livestock; and Fitting Livestock to the Production Environment.

Any adult with a background in range or plant sciences (either through practical or formal education) is eligible. Space is limited, so register early! Registration fee of \$110 covers all materials and transportation for field trips (additional tuition fees apply if taking the course for credit). Deadline is May 17.

For more information or a copy of the brochure, contact Dr. Lowell Moser, Agronomy Dept., UNL, PO Box 830915, Lincoln, NE 68583-0915, 402-472-1558, e-mail: [agri101@unlvm.unl.edu](mailto:agri101@unlvm.unl.edu).

"You go out and talk to cattlemen in western Nebraska. You won't find better stewards of the land anywhere." Paul W. Johnson, Chief, USDA-NRCS, in an interview with Susan Seacrest of The Groundwater Foundation (*The Aquifer*, Dec. 1995)

### CGS Fall 1996 Seminar Series

The Center for Grassland Studies will again sponsor an interdisciplinary seminar during the fall semester of 1996. A broad range of topics will be covered including soils, climate, wildlife, forage, range, livestock and grazing management, turfgrasses, and grasslands around the world.

The seminar will be presented by invited speakers from off-campus, UNL faculty, and seniors/graduate students taking the course for credit. To receive one unit of credit, students must register for either a seminar or special problem course within an academic department, and then participate in this seminar for their course requirements.

The seminar will be offered on Mondays in the East Campus Union from noon-1:00. A few selected presentations will be held on Monday evenings. For more information, contact the CGS office.

### New Museum Director Is Grass Researcher

Dr. James Estes became the director of the University of Nebraska State Museum on February 1. Among the areas of research on which he has focused in his career are plant and insect biology, the biology of chromosomes and the grasses of North America. He is currently working on a grass flora using expert systems.

One of his primary goals is to computerize the data holdings of the museum. "Because of its exceptional scientific holdings and its highly professional staff, UNL is in a position to assume national leadership in computerization of museum collections," Estes said.

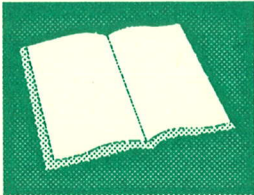
## CGS Associate News

**Ken Vogel** has a commentary on energy production from forages in the March-April issue of the *Journal of Soil and Water Conservation*. Contact the CGS office for a copy.

**Kathleen Keeler** wrote the introductory article in the summer 1995 issue of the *Great Plains Quarterly*, which features articles on grasslands (see Resources).

**Bruce Anderson** and **Ken Moore** are two of the organizers of the Native Warm Season Grass Conference & Expo to be held in Des Moines, IA September 12-13, 1996. They will also be co-editors of the proceedings, which will be published by the CGS.

## Resources



*Great Plains Quarterly*. \$20/yr individual, \$25/yr institution. Seeks readership among scholars and interested laypersons. Contains feature articles and book reviews dealing with scientific and artistic

aspects of the Great Plains. Center for Great Plains Studies, U. of Nebraska-Lincoln, PO Box 880313, Lincoln, NE 68588-0313, 402-472-6058, e-mail: [gpq@unlinfo.unl.edu](mailto:gpq@unlinfo.unl.edu)

*Innovative Systems for Utilization of Forge, Grassland, and Rangeland Resources*, W.F. Wedin and J. Presto Jones, ed. Proceedings of the September 1993 workshop held in Airlie, VA. Thanks to a grant from Land O'Lakes, Inc., this publication is available at no charge. Contact Walter Wedin, U. of Minnesota, 612-624-3284, e-mail: [wedin001@maroon.tc.umn.edu](mailto:wedin001@maroon.tc.umn.edu)

*CRP Land Use Guide*. Members of Cooperative Extension, state and federal employees as well as producers and industry people in Nebraska teamed up to publish this 57-page guide. Limited copies were printed and distributed in February 1996. While it is not for sale, a copy can be viewed in the CGS and selected Extension offices.

*Managed Grazing*. \$30. Set of 5 videos: Introduction (12:32); Managing Pasture Plants (14:36); Animal Management (16:33); Fencing and Watering (16:45); Year Around Resource Management (21:10). Iowa State U., Animal Science Dept., 109 Kildee Hall, Ames, IA 50011-3150, 515-294-2240.



*Hopper* (see related article). Will run on an IBM compatible computer with 640kb of memory (80386 or greater CPU is recommended) and a DOS version 3.1 or greater. A hard drive with at least 3.5mb of disk space is

required. Potential users may download Hopper via FTP from: [RIL.USDA.MONTANA.EDU](ftp://RIL.USDA.MONTANA.EDU) and via Internet at: <http://www.usda.montana.edu>. A copy of the documentation will be included in an upcoming Grasshopper IPM User Handbook (USDA, APHIS Technical Bulletin No. 1809). A single free copy will be available on a first-come, first-served basis by contacting: USDA-APHIS/PPQ, Stephen A. Knight, Unit 134, 4700 River Road, Riverdale, MD 20737, 301-734-8247.

We've done some rearranging and added new "other sites" to the Center for Grassland Studies new World Wide Web page, and will add more links as we learn of new sites that are of potential interest to our readers:

<http://ianrwww.unl.edu/cgs/index/htm>

The UNL Center for Sustainable Agricultural Systems has a new Web home page, and since the same people who designed the CGS home page designed this one, you may notice some similarities:

<http://ianrwww.unl.edu/csas/index/htm>

You can get a summary of the new farm bill as well as fact sheets broken down by categories such as Conservation on the Web:

<http://www.usda.gov/farmbill/index.htm>

## Calendar

Contact the CGS for more information on these upcoming events:

- June 10-14** Society of Wetland Scientists annual meeting, Kansas City, MO  
**June 13-16** American Forage and Grassland Council Annual Conference, Vancouver, British Columbia  
**June 16-20** North American Alfalfa Improvement Conference, Oklahoma City, OK  
**June 17-21** Nebraska Range Shortcourse, Chadron, NE  
**June 19** Turfgrass Field Day, Ithaca, NE  
**June 26-27** Grazing Retreat in Center, NE  
**July 7-10** Soil and Water Conservation Society Annual Conference, Keystone Resort, CO  
**July 10-11** Grazing Retreat in O'Neill, NE  
**July 11-15** Society for Range Management summer conference, San Antonio, TX  
**July 14-17** American Dairy Science Association Annual Conference, Corvallis, OR  
**July 17-18** Grazing Retreat in Hartington, NE  
**July 23-26** American Society of Animal Science Annual Meeting, Rapid City, SD  
**July 26** Brush Creek Ranch Seminar and Field Day, Atkinson, NE  
**Aug. 19-20/21-22** Integrated Resource Management Conference, North Platte/O'Neill, NE  
**Aug. 20-24** 7th International Grouse Symposium, Fort Collins, CO  
**Sep. 7** Festival of Color (features many native plants and grasses), Ithaca, NE  
**Sep. 12-13** Native Warm Season Grass Conference and Expo, Des Moines, IA  
**Sep. 14** Festival of Color (features many native plants and grasses), Ithaca, NE  
**Sep. 16-17** 34th Grass Breeders Work Planning Conference, Griffin, GA  
**Oct. 1-6** 3rd Annual Conference of the Wildlife Society, Cincinnati, OH  
**Oct. 21-24** New Zealand Grassland Association, Oamaru, North Otago, NZ  
**Nov. 3-8** American Society of Agronomy Annual Meeting, Indianapolis, IN  
**Dec. 8-11** 58th Midwest Fish and Wildlife Conference, Omaha, NE  
**Dec. 9-10** National Alfalfa Symposium, San Diego, CA

*If you have articles, events, resources, or other items you would like to submit for inclusion in future issues of this newsletter, please contact the editor, Pam Murray, at the CGS office.*



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