Spring 1998

Center for Grassland Studies Newsletter, Spring 1998, Volume 4, No. 2

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From the Director

As winter slowly passes into the background and spring approaches, we all look forward to being outside and the greening of the landscape. After the drab colors that we often experience in the winter, the greening of the grass brings a renewing of life--a promise for the future. How do we nurture and protect that future?

Often we do not know or think about the amount of previous work that has occurred in years past which makes our lawns, parks, golf courses and other grassland areas of today so beautiful and our lives so enjoyable. Years of research and testing have produced today's superior grasses and their specific management practices for each individual use. That kind of work must continue in the future by both public and private organizations for protecting and improving our grasslands and turf areas.

The people of Nebraska are fortunate that the University has developed an outstanding Turfgrass Science Team working on these very problems for our state. For example, with the current emphasis being placed on natural resources and environmental concerns, they are now giving special emphasis to developing grasses and management practices that are more environmentally friendly. Such grasses require less water, pesticides, fertilizer and mowing. With the expertise and capabilities of our scientists, I have no doubt that they will make even greater contributions on these projects in the future than they have in the past.

This is an exceptionally talented interdisciplinary team composed of horticulturists, entomologists, plant breeders, plant pathologists, irrigation engineers, soil scientists and landscape specialists. It is one of the top turfgrass teams in our country and, indeed, an area of excellence. Nebraska's foresight and leadership enabled us to have this many outstanding people working on turf and ornamental grasses.

The important contributions that members of our faculty in the Institute of Agriculture and Natural Resources (IANR) make outside of production agriculture are often times not understood. These scientists use the same biological principles in working with turf and landscape grasses as other scientists do in working with cultivated agricultural crops, but their contributions are not as easy to measure in economic terms.

The next time you enjoy a beautiful turf area or landscape grass, remember all the effort others have put into that grass for your pleasure and enjoyment. The motto of our Turfgrass Science Team--*The Good Life Needs Good Turf*--really is a truism.

Developing Integrated Weed Management Strategies to Improve Leafy Spurge-infested Grasslands

by Robert Masters, USDA Agricultural Research Service and Agronomy Department, UNL

The productivity of Great Plains grasslands have been substantially reduced by past management that enabled the establishment of invasive exotic weeds and displacement of native species. Many grasslands are comprised of degraded plant communities with reduced native species diversity and are producing at less than 50% of their potential. According to a 1992 National Resources Inventory conducted by the USDA-Natural Resources Conservation Service, there are over 70 million acres of degraded grassland in the Northern Great Plains in serious need of weed management, site stabilization, and reclamation.

The focus of grassland management should be to improve degraded grassland communities in a manner that makes them less vulnerable to invasion by exotic weeds and to spread of undesirable native species. In many instances grasslands have deteriorated to the point that desirable species are either not present or in such low abundance that grassland recovery will be unacceptably slow without direct intervention. A generalized model describes grassland degradation and improvement processes (Figure 1). Site-specific management systems comprised of multiple, complementary technologies or tools applied in appropriate sequences to optimize improvement of degraded grassland need to be developed. Such management systems can improve grassland quality and decrease negative impacts of undesirable exotic and native species.

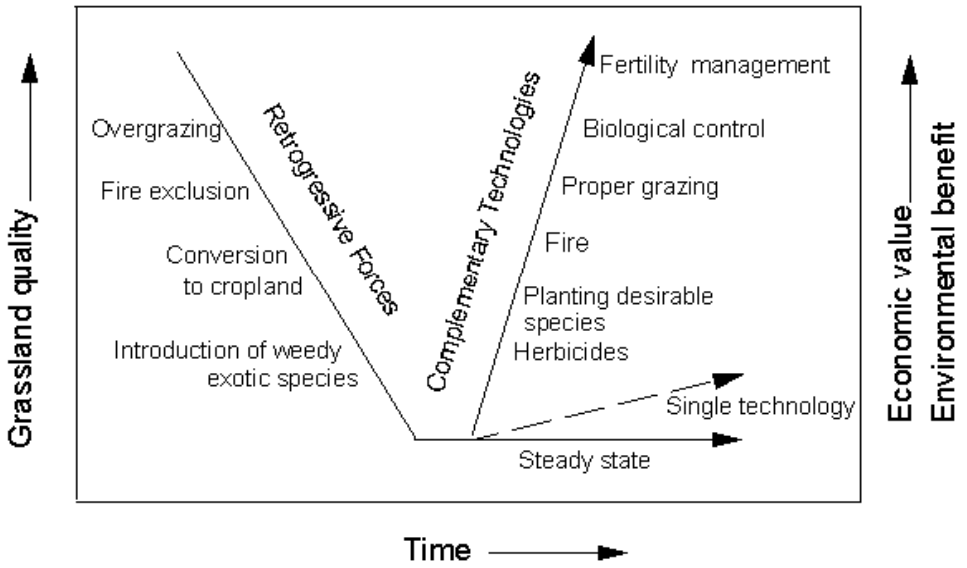

Figure 1. Proposed improvement model for Great Plains grasslands. Degradation leads to steady state condition of low productivity. Reliance on a single technology results in slow grassland recovery rate. Implementation of integrated weed management strategies accelerates

development of high quality grasslands.

The herbicides Plateau® and Roundup® have been determined to be important components of integrated weed management strategies being developed to improve Great Plains grasslands. In Nebraska, these herbicides have been used to (1) improve establishment of native warm-season grasses and legumes, (2) revegetate leafy spurge-infested grasslands with desirable perennial forages, and (3) control leafy spurge.

Leafy spurge is a serious threat to the productivity and biological diversity of Great Plains grasslands. Leafy spurge was introduced from Eurasia into the northern Great Plains and prairie provinces of Canada in the late 1800s. Leafy spurge is estimated to infest more than 2.5 million acres in North America. This invasive weed reduces grassland quality by interfering with desirable native species, reducing livestock carrying capacity, and lowering wildlife habitat quality. The aggressive nature of leafy spurge is related to its ability to reproduce from seed and adventitious shoot buds on the roots and the lack of natural enemies in North America. Seed dispersal mechanisms, high seed yields and viability, and rapid seedling growth and development enable new infestations to quickly establish.

Biological and chemical control methods have been the focus of leafy spurge management programs. Biological control agents used against leafy spurge include goats, sheep, and insects. Insects including the spurge hawkmoth, flea beetles, longhorn beetle, and gall midge have been approved for leafy spurge biological control programs in North America. It is too early to fully assess the impact of insect biocontrol agents since most have been released within the past seven years.

Leafy spurge control with herbicides is variable. Effective long-term control of small infestations of leafy spurge is possible with Tordon® applied at 1 gallon per acre. The high cost of this treatment limits its use to small infestations. Application of 2,4-D (2 quarts per acre) or 2,4-D (1 quart per acre) combined with Tordon (1 quart per acre) provides short-term control of leafy spurge and reduces seed production. These herbicides selectively control broadleaf plants including desirable native legumes and forbs. Plateau is a herbicide that has recently been shown to provide effective control of leafy spurge, while not controlling desirable legumes growing in leafy spurge stands.

Traditional rangeland weed management research has emphasized development and improvement of biological or chemical weed control methods. There is growing recognition that the search for any single measure to control leafy spurge may be misdirected. The presence and spread of leafy spurge is often a symptom of underlying management problems that must be corrected before sustained progress can be made toward controlling the weed and improving grassland productivity. Past management practices have often caused undesirable shifts in species composition and hastened leafy spurge establishment and expansion.

A study was undertaken to evaluate a strategy to improve leafy spurge-infested grassland sites near Ansley and Tilden, Nebraska. This grassland improvement strategy consisted of the combined application of herbicides, fire, and planting mixtures of native grasses and legumes. Plateau (12 oz per acre) and Roundup (48 oz per acre) were applied in October 1995. These two herbicides were selected because they are very complementary in their activity. Roundup controls cool-season grasses that are actively growing at the time of application, but provides no residual weed control. Plateau provides residual control of leafy spurge and annual weeds. Plateau is also tolerated by a number of warm-season grasses and legumes. In April 1996, the sites were burned to remove dead plant residue and the grass and legume mixtures were planted into the herbicide-suppressed sod without tillage. Leafy spurge density and yield of the vegetation including the planted grasses and legumes were measured in August 1997.

Treatment with the combination of Plateau and Roundup and planting the mixture of desirable forage grasses and legumes decreased leafy spurge abundance and dramatically increased forage yield on the leafy spurge-

infested research sites (Figures 2 and 3). Leafy spurge density and yield were reduced by 60% at Ansley and 95% at Tilden where the Plateau and Roundup treatment was applied compared to where no herbicide was applied. Application of the combined herbicides increased forage yield of the planted grasses from 0 to 3,700 lbs per acre at Ansley and 560 to 2,800 lbs per acre at Tilden. Moreover, total vegetation yield (yield of planted species and other remnant vegetation) increased from 2,200 to 5,700 lbs per acre at Ansley and 1,300 to 3,400 lbs per acre at Tilden where the Plateau and Roundup were applied together.

This study clearly demonstrates that the productivity of leafy spurge-infested grassland in Nebraska can be increased using herbicides, fire, and planting native grass and legume mixtures. The outcome of this multi-pronged approach is consistent with the desired goal of integrated grassland weed management strategies, which is to not only control undesirable plants, but more importantly, to reclaim the productive potential of degraded grassland sites by reintroducing desirable native plant mixtures. Once the desirable species are established, it is essential for land managers to use practices that shift the competitive advantage to desirable species and away from undesirable exotic and native species. Ultimately, the management systems developed must be reliable, efficient, and cost-effective, which is possible if multiple tools are used in appropriate combinations.

Note: Plateau is currently registered for use on roadsides and right-of-ways and not on rangeland and pastures. The research from which these findings were obtained was supported in part by the USDA-Agricultural Research Service, U.S. Environmental Protection Agency, Nebraska Department of Agriculture, and the Arthur Sampson Pasture Management Endowment Fund from the University of Nebraska Foundation.

Editor's Note: The Nebraska Leafy Spurge Annual Conference and Tour will be held at Chadron, Nebraska August 12-13, 1998.

Biological Control of Weedy Exotic Thistles and Its Ecological Side Effects in the Sandhills: Testing and Policy Implications

by Svata Louda, School of Biological Sciences, UNL

This is the second of a two-part series. The previous article (Winter 1998) discussed research Dr. Louda and her students conducted in the Nebraska Sandhills on the unintended effects of introduced biocontrol agents for exotic weeds on nontarget native plant species.ed.

Several striking features of the data should contribute to the rethinking of release criteria. First, this weevil should never have been approved for release. Its diet was not specialized enough. Pre-release studies showed that it accepted plants in the genus *Cirsium*, the group containing North American native thistles, a quarter of which are already declining. Our evidence argues that the immediacy and magnitude of a weed problem should not be considered sufficient justification for a rush to release an exotic species into the U.S. Mistakes need to be prevented since it is virtually impossible, and economically prohibitive if possible, to exterminate a well-established organism. When we discovered we had made a mistake with broadscale use of DDT, for example, we stopped using it, and its related chemicals, and invented alternatives. However, once a

biocontrol insect or disease is established, there is no way to stop or recall it. Second, the most devastating attack of the weevil to date is on Platte thistle, a species that flowers very early (May-early June) in the growing season, like Musk thistle. This is just when the female weevils are trying to find flowerheads on host plants for their young. However, no early-flowering native thistles were tested before release in the U.S. Thus, the case argues that more ecological criteria need to be incorporated into pre-release studies, for example, in choosing the species that need to be tested as potential hosts prior to release. Present procedures to evaluate potential use of alternative hosts is haphazard, with feeding tests on a few, arbitrarily selected natives more or less related to the target weed, and fewer, if any, field trials. The field test usually entails interplanting a native species with the target weed, usually at very high densities. It is not surprising that the weevil primarily uses its usual host when it occurs in abundance. The real question is, what does that insect do when the native is all that is available, such as in the Sandhills? Devising good tests to answer these questions unequivocally is hard, but we ought to insist on it, given the problems that can emerge if a mistake is made. And, more questions need to be asked about the kinds of consequences that could occur if the agent moves over onto related native or horticultural plants. Spillover effects onto horticultural plants, which have already occurred, for example, onto relatives of Klamath weed, seem less drastic than effects on the native grassland species. Protecting or replacing damaged decorative plants will protect the economics of the industry. Native plants are harder to replace.

Third, testing in the U.S. usually proceeds in parallel with field tests in the site of origin, under external pressure to find fast, cheap solutions to pasture and range weeds. Unfortunately, fast and cheap can lead to unanticipated problems later on, such as those shown by our study. These problems can be even more costly for the producers with weed problems. Once an organism gains a foothold, the remedy may be worse than the problem, and there is little that can be done to reverse the situation. Funding to test more species is needed. More patience in developing a knowledge base could have prevented the introduction of the weevil and the problems that it is now creating.

Fourth, the geographic range over which the weevil is clearly documented as increasing on its newly adapted native thistles is huge, comprising much of the short and midgrass rangelands in the upper Great Plains. This observation leads to at least two suggestions for improvement of present biocontrol practices. For one, more climatically restricted species instead of broadly tolerant exotic species like the weevil should be considered. Currently, the search for biocontrol agents includes a preference for a single species that can be effective throughout the entire range of the weed in its new home. The corollary of such tolerance is adaptability, lending to an increased probability of persistence under trying circumstances, such as a lack of the preferred host plant weed in the harsh environment of a continental sand dune ecosystem. An alternative, safer strategy might be to select several, more closely targeted plant-feeders, those restricted to specific environmental conditions under which the weed is really a problem, reducing the chances of a widely distributed problem. And two, restrictions on internal transport of agents, requiring public input into the decision to release in a new state or region, could contribute to slowing or confining problems as they arose. Presently, once an organism is cleared for release within the U.S., often under short-sighted political pressures on the USDA, it can be released in most states without further review. Thus, there is no provision for geographic variation in ecosystems and potential consequences if nontarget effects arise.

Fifth, our results suggest that the time required to evaluate potential problems may be much longer than currently expected. The weevil was introduced in 1969-72. However, in spite of being sold and shipped into the Sandhills early, it did not show up on the natives at our study sites until 1993, 20 years after introduction and more than 10 years after we started studying the system. This means that quantifying insect feeding in the lab or field for a few years may not be adequate. Better tests need to be designed to evaluate such host range expansion potential over time and under the stress. What happens when an alternate, though not preferred, host is the only one available, over some longer period of time?

In summary, we will continue our studies, by documenting the extent to which the host range expansion has occurred throughout the range of Platte thistle. And, we will continue to record both levels of insect

occurrence and damage to natives as well as the change in numbers of plants. One new study planned will analyze the interaction between the weevil and the golden picture-winged fly to better understand why the numbers of the fly dropped. Another will compare weevils from the native plant to those that use Musk thistle to determine whether there have been any adaptations associated with the host range expansion. However, enough information is now available to challenge "business as usual" for biological control. Our data should be viewed not as an excuse to rely on chemicals but to improve the process of selection of biological control agents, to provide sustained reduction in weed densities without undesirable side effects.

Cows in the Stream: A Sustainable Practice?

by Charles Francis, Department of Agronomy, UNL

For years we have been advocating fencing livestock out of streams, with the goal of recovering vegetation, habitat, and water quality. Federal programs have supported buffer strips, and other incentives are available to introduce this environmentally friendly practice. But now we are asking if this is really the best route to stream recovery, and whether one solution fits all streams?

NRCS technical specialist Larry Gates and farmers Ralph Lantz and Dan French have studied this question on their streams in Minnesota, and have come up with some surprising conclusions. They knew that the natural ecology of southeast Minnesota included a wide diversity of plant and animal species, and that periodic disturbance was a natural phenomenon in this region. Drought and floods, fire, and intense grazing by buffalo at infrequent intervals were among the events that disturbed stream courses as well as surrounding prairie. Could this information be used to help develop a management strategy to help streams recover and to improve water quality?

In a badly degraded stream area, livestock were kept out of the stream corridors on both farms by fencing, but the farmers allowed short and intensive periods of grazing in a carefully controlled pattern. The stream areas were subdivided according to the native vegetation, and different grazing patterns used in each. In the area surrounded by prairie, the cows were used up to seven times to graze for a 3-4 day period. In other areas with potential for hardwood growth, they were allowed in only twice. Still other areas had complete exclusion for up to two years, and then the grazing was allowed for short times. Lantz and French concluded that management had to be tailored to the natural topography and vegetation of an area -- one size did not fit all!

Gates introduced a biological monitoring scheme in which farmers learned to distinguish among nine different species of toads and frogs from their vocal expressions; this was used to provide one biological indicator of diversity, and to measure change over time in the stream ecosystem. They also did bird and fish counts in the riparian areas. The team concluded that pursuing three goals was important: economic viability, environmentally friendly strategies, and quality of life for the farm family. The farmers are encouraged by their participation in a small group of interested graziers, with regular meetings and field tours to share ideas and practices. They were highly complementary of the NRCS input, "A practical set of practices and measurements that are not often found in a government bureaucracy," according to Ralph Lantz.

The Oct/Nov 1997 issue of *The Land Stewardship Letter*, published by The Land Stewardship Project, carried a good article on this topic titled "The *Stream* Team." Contact information for The LSP is: 2200 4th St., White Bear Lake, MN 55110, 612-653-0618, http://www.misa.umn.edu/lsphp.html.

Editor's Note: At an April seminar on campus, Jon Kusler with the Association of State Wetland Managers said Missouri has about 1,000 stream teams involving 33,000 people.

Prairie Restoration Is Theme of CGS Fall Seminar Series

The Center for Grassland Studies will again offer its seminar series this Fall on Mondays, 3:30-4:30 at the East Campus Union. Presenters will focus on the theme of prairie restoration and will include on-campus faculty, people from the public and private sectors who work with prairie restoration issues, and graduate students taking the course for credit.

Students wishing to receive one hour of credit should sign up for independent study in the academic department of their choice. Undergraduate students will be expected to write a summary of each seminar and submit it to the course instructor, Dr. Martin Massengale. Graduate students will be expected to present a seminar (topic to be approved by the course instructor). If students desire two hours of credit, they will need to discuss this with the instructor.

All seminars are free and open to the public. For more information, or to be added to the seminar mailing list, contact the Center for Grassland Studies, 222 Keim Hall, UNL, Lincoln, NE 68583-0953, 402-472-4101, cgls001@unlvm.unl.edu. When available, the list of speakers and topics will be on the CGS Web page: http://www.grassland.unl.edu/

Conference Highlights Nebraska Loess Hills

The theme of the 16th North American Prairie Conference is *The Central Nebraska Loess Hills Prairie*. It will be held July 26-30, 1998 in Kearney, Nebraska. Five major types of prairie lie within a radius of 100 miles of Kearney. Opportunities to experience this biological diversity will include a field trip day, with potential trips to upland prairie sites, sandhills, lowland tallgrass sites, wet prairie meadows, prairie restorations, and southern mixed-grass sites. Field trips are sponsored by the Prairie Plains Resource Institute, The Nature Conservancy, The National Audubon Society, The Platte River Whooping Crane Trust, and the Biology Department at the University of Nebraska at Kearney (UNK). Proposed conference prairie-related topics include botany, ecology, entomology, physiology, zoology, soils, wetlands, history, restoration, education, sampling/monitoring, computer models, photography, and poetry, as well as fire and prairie ecosystems, cultural and literary perspectives, landscaping, and paleoecology of the prairie.

Registration is $110, which includes a book on the Central Nebraska Loess Hills written by UNK faculty as well as the conference proceedings. For more information, contact Dr. Paul Twigg, Biology Department, UNK, Kearney, Nebraska 68849-1140, twiggp@platte.unk.edu.

Attention CGS Associates: Showcase Your Work

One of the goals of the Center for Grassland Studies is to share the good work of the CGS Associates with colleagues and others interested in grassland issues. A primary method of doing so is through this newsletter, which is sent to a large national mailing list as well as being on the CGS Web page. We strive for a balance of articles in our focus areas of range land/pasture/forage systems, turf /landscape grasses, and wildlife/wetlands /natural habitats. If you have a topic you think might be of interest to our readers, please contact the newsletter editor, Pam Murray, 402-472-4101, csas001@unlvm.unl.edu.

Info Tufts

- In Nebraska 98% of the land is in private ownership.

- In February the government said it would spend $23.9 million over the next two years on the new Wildlife Habitat Incentives Program to help land owners plant native grasses, restore stream banks, and do other work to improve wildlife habitat. Focus will be on habitats of salmon, bald eagles, black bears, elk, turkeys and fish. USDA estimates about 170,000 acres of land would receive improvements with this year's funding and 114,000 acres in fiscal 1999.

- The Nebraska Chapter of The Nature Conservancy has opened its sixth office in Lincoln; other offices are in Omaha, Ainsworth, Aurora, North Platte, and at the Niobrara Valley Preserve. For a copy of their new brochure, contact The Nature Conservancy, 1722 St. Mary's Ave. #403, Omaha, NE 68102, 402-342-0282.

- The Nature Conservancy's 840-acre Graves Ranch in the Nebraska Sandhills harbors the world's largest known population of the federally endangered plant, blowout penstemon.

- Nebraska received $4,069,000 EQIP funds for FY98; that is $1.2 million less than last fiscal year.

- At a weed management conference on April 8, Interior Secretary Bruce Babbitt said invasive weeds are infesting 100 million acres of land a year, and are causing the extinction of native plants and animals. Farmers and ranchers have been spending $5 billion a year to control them.

In April, World Conservation Union scientists said at least one out of every eight plant species worldwide is threatened with extinction.

CGS Associate News

Lowell Moser received the Student Foundation/Builders Award for Outstanding Advising.

Prestigious kudos for teaching excellence were recently awarded to **Dennis Brink, Terry Klopfenstein, Dennis McCallister,** and **Walter Schacht**.

At this year's annual meeting of the Nebraska Sustainable Agriculture Society, **Terry Gompert** received the NSAS Sustainable Agriculture Research and Education Award. Last year's recipient was **Charles Francis**.

In recognition of his leadership with the annual Festival of Color event and his service with the TV program, *Backyard Farmer*, **Don Steinegger** received the UNL Distinguished Educational Service Award at the April Honors Convocation.

Bruce Anderson, Terry Gompert, Steve Melvin and **Bob Stritzke** received the 1998 Nebraska Cooperative Extension Excellence in Team Programming Award for their program, "New Tools for Pasture Production."

Resources

Paddock Shift: Changing Views on Grassland Farming. $25.95 + $3 s&h. Allan Nation discusses the historical, business, philosophical and technical aspects of management-intensive grazing. Stockman Grass Farmer, PO Box 2300, Ridgeland, MS 39158-2300, 1-800-748-9808.

American Farmland Trust has a new Web page dedicated to grass-based farming systems:

http://www.grassfarmer.com

The USDA-NRCS has just revised its National Range and Pasture Handbook (last revision was 1976); the CGS reference center has a copy. The Grazing Lands Technology Institute has several publications that would be of interest to many of our newsletter readers. Check out the GLTI Web page:

http://www.ncg.nrcs.usda.gov/glti/homepage.html

Introduction to Management Intensive Grazing Systems. Collection of teaching materials on sustainable and profitable grazing systems (includes slide sets with scripts, overhead masters, and handouts for producers) on various aspects of grazing systems. Can be purchased separately (range $15-35 each) or as complete set for $250. For more information, contact Henry Bartholomew, Southern Ohio Grazing Coordinator, OSU Extension, 150 N. Homer Ave., Logan, OH 43138, 740-385-3222, bartholomew.2@osu.edu.

This Spring the CGS was a cosponsor of the Water Resources Seminars, the theme for which was "Interrelationship of Water, Native Grassland and Wetlands." Videos of the presentations are available by contacting IANR Communications & Information Technology, 402-472-3035. A list of speakers and topics is available from the CGS office, and also on the following Web page:

http://www.grassland.unl.edu/SEMWAT98.htm

Want to learn more about Nebraska's Wetlands? Check out the UNL Water Center/Environmental Programs Web page on this topic:

http://www.ianr.unl.edu/ianr/waterctr/wetlands.html

Calendar

Contact the CGS office for more information on these upcoming events:

1998

May 27-29: Specialty Conference on Rangeland Management and Water Resources, Reno, NV

June 3-5 and 24-26 and July 8-10: Management Intensive Grazing Workshops in Center, Hartington and Pierce, NE

June 15-19 and 22-26: Nature Day Camp: Summer Orientation about Rivers, Buffalo County, NE (for 3rd-6th graders)

June 22-24: ATTRA workshop on integrated beef-forage systems, Spring Hill, TN

July 5-9: Soil and Water Conservation annual conference, *Balancing Resource Issues: Land, Water, People,* San Diego, CA

July 6-10 and 13-17: Nature Day Camp: Summer Orientation about Rivers, Hamilton County, NE (for 3rd-6th graders)

July 13-16: Society for Conservation Biology 1998 meeting, Sydney, Australia

July 23-27: Society for Range Management summer meeting, Crested Butte, CO

July 26-30: 16th North American Prairie Conference, *The Central Nebraska Loess Hills Prairie*, Kearney, Nebraska

July 27-30: American Society of Animal Science annual meeting, Denver, CO

Aug. 3: Turf Field Day, Ithaca, NE

Aug. 12-13: Nebraska Leafy Spurge Annual Conference and Tour, Chadron, NE

Sep. 12: Festival of Color, displays of colorful water conserving flowers, children's activities and landscaping demonstrations, Ithaca, NE

Sep. 28-Oct. 2: Monocots II and 3rd International Symposium on Grass Systematics and Evolution, Sydney, Australia

(e-mail: karen@rbgsyd.gov.au)

Oct. 18-22: ASA, CSSA, SSSA annual meetings, Baltimore, MD

1999

Feb. 21-26: Society for Range Management/American Forage and Grassland Council joint meeting, Omaha, NE

Apr. 11-16: International Symposium on Nutrition of Herbivores, San Antonio, TX

Jul. 19-23: VI International Rangeland Congress, *People & Rangelands: Building the Future*, Townsville, Australia

(http://irc.web.unsw.edu.au)

Congratulations to Landscapes Unlimited, Inc. for being recognized by their customers, architects and green superintendents as Builder of the Year for 1997 (and 1992, 1993, 1995). Bill Kubly, President of LUI, is a member of the CGS Citizens Advisory Council. Bill is also the current President of the Golf Course Builders Association of America, which celebrated its 25th anniversary last August.

Mail

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