

Center for Grassland Studies

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Subirrigated Meadow Management Practices

by Jerry Volesky, West Central Research and Extension Center, UNL

Introduction

Subirrigated meadows are an integral part of Nebraska Sandhills and river valley ranching operations – occupying nearly 10% of the 12 million acres of the Sandhills. Subirrigated meadows in the Sandhills typically occupy broad, flat valleys between rangeland located on elevated dune formations. River valley subirrigated meadows occur in locations where river or stream channel development has created a relatively flat flood plain.

The principal environmental factor that differentiates meadow vegetation types from others is the subirrigated nature of the meadow sites. Soil water is within rooting depth of the vegetation during most of the growing season. Within a meadow, plant community types form variable patterns of distribution influenced primarily by depth to water table or degree of soil wetness. Common cool-season species found in meadows include smooth brome grass, redtop bent, timothy, slender wheatgrass, quackgrass, Kentucky bluegrass, Canada wildrye, reedgrasses, and numerous species of sedges, rushes, and spikerushes. Sedge and rush plant types will dominate wetter meadow sites. Common warm-season grasses include big bluestem, prairie cordgrass, indiagrass, and switchgrass. Warm-season grasses tend to occur in lesser amounts in meadows that have been hayed each summer or in those where drainage and reseeding of cool-season species have taken place. Soil water salinity or alkalinity is another factor that influences plant species composition in subirrigated meadows. Species associated with saline subirrigated sites include inland saltgrass, prairie cordgrass, foxtail barley, alkali sacaton, and several species of sedges and rushes.

Prescribed burning is a practice that can be used to manipulate species composition of meadows. The re-

sponse is similar to that of tallgrass prairie where a prescribed burn in the spring will favor warm-season species and reduce cool-season species.

Haying

Haying is the primary use of the subirrigated meadow resource, with yields ranging from 1 to 3 tons per acre. Haying will typically begin in late June to early July on the drier, upper bench areas of the meadows. Normally, the depth to the water table increases and soil conditions become drier throughout July and into August. This permits hay harvest to extend across most areas of a meadow.

Date of harvest will have a significant effect on both yield and quality of the forage. Peak hay yield will normally occur from mid-July to early August. Hay harvested in June when the vegetation is at a younger stage of growth will consistently be higher in quality than that cut



Yearling steers grazing subirrigated meadow at the Gudmundsen Sandhills Laboratory.

(continued on page 4)



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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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FROM THE DIRECTOR

Many of us frequently discuss and report on our attendance at professional and scientific meetings in other states or countries, but it is infrequent for us to have a national or international meeting in our own state of Nebraska. There are several such meetings scheduled in 1999. Notable among those will be the Society for Range Management and the American Forage and Grassland Council meetings in Omaha on February 21-26. This is the first time these two organizations have met together even though they have many commonalities. An excellent program has been planned and there will be some part of the program of value to everyone interested in grasslands. A symposium on "Great Plains Grasslands at the Millennium" with an array of interesting speakers has been scheduled for February 25 and 26. This symposium is co-sponsored by the U.S. Forest Service, the UNL Center for Great Plains Studies, and the UNL Center for Grassland Studies. Our Center is also co-sponsoring one of the sessions of the Alternative Grassland Enterprises symposium on February 22, which has more of a local application.

In September the Center was fortunate to host Dr. Bill Laycock as the first speaker of the Leu Distinguished Lecture series. Dr. Laycock, who recently retired as head of the Department of Rangeland Ecology and Watershed Management at the University of Wyoming, spoke on the subject, "True Grassland Restoration—Is it Possible?" Dr. Laycock also visited with faculty, students and staff at both Lincoln and North Platte. His visit was made possible by an endowment from the Leu Foundation of North Platte. The late Frank Leu, who lived in Nashville, Tennessee, was chairman of the Foundation. This is another example where private funding has made a significant contribution to the University's programs. Many additional opportunities exist for further support and enhancement of programs handled through the Center for Grassland Studies.

One additional item that deserves comment at this time is the severity of disease problems on turf in 1998. Weather conditions were such throughout the summer that diseases did not develop to the extent of causing major problems until late summer and early fall. When symptoms did appear, they were severe and caused rapid deterioration of the turf. Grey leaf spot, a disease of ryegrass primarily, was especially troublesome this year; most observers had never seen a problem with this disease previously in Nebraska. Fortunately, our turfgrass scientists were able to work with turf managers in identifying the problems and determining the options available to them for managing the same. Let's hope that scientists can develop either resistant varieties or more effective treatments to control such outbreaks in the future.

M. A. Massengale

Wildlife Habitat Incentive Program

by Craig Derickson and Gerald Jasmer
USDA, Natural Resources Conservation Service

The 1996 Farm Bill created several new conservation programs that USDA agencies administer. One that is drawing a lot of interest from Nebraska land users is the Wildlife Habitat Incentive Program (WHIP). WHIP is administered by the Natural Resources Conservation Service (NRCS). For the purposes of this program, the term "wildlife" means: birds, fishes, reptiles, amphibians, invertebrates, and mammals, along with all other non-domesticated animals. The term "wildlife habitat" means: the aquatic and terrestrial environments required for wildlife to complete their life cycles, including air, food, cover, water, and spatial requirements.

WHIP in Nebraska is receiving assistance from a wildlife subcommittee of the State Technical Committee that the NRCS State Conservationist chairs. State Technical Committees were first established in USDA by the 1992 Farm Bill as a way to expand the level of participation of various natural resource and agricultural groups in the administration of USDA conservation programs. The wildlife subcommittee made recommendations to NRCS in the establishment of habitat priorities and criteria to be used in evaluation of individual applications.

The objectives of WHIP are to:

- Implement parts of the eligible participant's conservation plan that create and enhance wildlife habitat. This will make up the wildlife habitat development plan (WHDP).
- Enter into WHIP agreements to provide financial assistance in the form of cost-share payments to enhance habitat on eligible land for:
 - Upland wildlife.
 - Wetland wildlife.
 - Threatened and endangered species.
 - Fisheries.
 - Other types of wildlife.
- Provide program participants informational and educational support regarding wildlife habitat needs.
- Foster a positive public attitude toward wildlife, wildlife habitat, and land stewardship.

In Nebraska, the WHIP program will place emphasis on:

- Wildlife and fisheries habitats of state significance.
- Habitats of fish and wildlife species experiencing declining or significantly reduced populations including rare, threatened, and endangered species.
- Practices beneficial to fish and wildlife that may not otherwise be funded.

Nebraska received a 1998 fiscal year allocation of \$604,000 for WHIP to be used for the development of long-term (five to ten years) contracts with landowners. The conservation plans are developed with the landowners by NRCS or other wildlife agency personnel.

NRCS received 111 applications for more than \$850,000 from Nebraska landowners, and approved 73 wildlife contracts in 31 counties totaling nearly \$590,000. The wildlife practices in these 73 contracts will provide the following benefits:

- Convert 387 acres to native grasslands.
- Restore or improve 1,542 acres of threatened and endangered species habitat.
- Establish wildlife cover on 44 center-pivot corners.
- Allow access for environmental, educational, or research purposes on 78% of the approved applications.
- Contribute to the restoration of rare natural plant communities on 71% of the approved applications.
- Improve habitat on nearly 30,000 acres.

Individuals interested in additional information on WHIP can contact local NRCS and USDA Service Center offices, or call Jerry Jasmer or Craig Derickson at the Nebraska NRCS State Office at 402-437-5300.

Plan Now to Attend SRM/AFGC Joint Meeting

Many Center for Grassland Studies Associates and Advisory Council members, as well as the CGS Director, are involved in planning and implementation of the joint Society for Range Management (SRM) and the American Forage Grassland Council (AFGC) meeting in Omaha, Nebraska, February 21-26, 1999. The CGS is also co-sponsoring some of the symposia. The CGS Director is helping plan the "Great Plains Grasslands at the Millennium" symposium. One session of another symposium organized by CGS Advisory Council member Wyatt Fraas titled "Management Alternatives in Eastern Nebraska" will have seven Nebraska farmers discussing topics such as grazing alfalfa, managing CRP for grazing, EQIP assistance for pasture development, direct marketing of grass-fed lamb/beef/poultry, hogs on alfalfa, dairy grazing, grazing standing corn, and bison management and tourism.

For details on the meeting, contact Jim O'Rourke, Chadron State College, 61 Country Club Road, Chadron, NE 69337, 308-432-6274, jorourke@csc1.csc.edu.

Meadows (continued from page 1)

at later dates, but yield will be sacrificed. With early cutting dates, there is also a correspondingly longer period for regrowth. This regrowth can be grazed in the fall and winter, or a second hay harvest can take place in late August to early September. The regrowth hay from the second harvest is also of high quality. The total yield from an early harvest (June) and a second regrowth harvest will generally equal that from a single mid-summer hay harvest.

Fertilization

Applications of commercial fertilizer can provide a quick response to increase production from subirrigated meadows. Production increases can often be realized a short time after application. This provides an opportunity to manipulate vegetation to meet short-term needs. Nitrogen (N) and phosphorus (P) have been shown to produce a forage yield response, implying that they may be deficient in subirrigated meadow soils. Sulfur (S) has also produced a positive response in forage yield in many fertilizer trials. Soil tests are recommended in all situations to accurately determine fertilizer needs.

Studies conducted at the University of Nebraska Gudmundsen Sandhills Laboratory (GSL) have evaluated subirrigated meadow vegetation response to fertilization with N, P, and S at different rates in April before new growth began. On a subirrigated site dominated by grasses, average dry matter yields were increased by the application of N, P, and S when applied alone or in combination (Table 1). All yield responses to the different fertilizers were additive and not a result of interaction effects. Average dry matter yields increased by 890, 630, and 370 lb/acre for each 40 lb increment of N from 0 to 120 lb/acre. Phosphorus at 40 lb/acre increased average

dry matter yields by 830 lb/acre when averaged over all N levels. Sulfur applied at 20 lb/acre increased average dry matter yields by 670 lb/acre when averaged over all N rates.

The impact of fertilization on forage quality, crude protein (CP) and in vitro dry matter digestibility (IVDMD) was minimal (Table 1). The application of P₂O₅ and S did not influence CP, but N fertilization caused a small reduction in CP associated with the first increment of N fertilizer (0 vs. 40 lb/acre). It was hypothesized that the stimulation of growth caused by N fertilization reduced the leaf-to-stem ratio due to taller and more stem growth on the fertilized plots. This reduced the CP percentages since leaves are higher in protein than stems.

In general, recommended rates of fertilizer application for subirrigated meadows range from 60 to 90 lb/acre of N, 20 to 40 lb/acre of P, and 15 to 25 lb/acre of S. Rates used in special applications, such as after a May grazing period or after an early hay harvest, should be adjusted based on the portion of the growing season that has passed and management goals. The economic optimum level of fertilization depends on three factors: the response of dry matter production to the fertilizer, cost of the fertilizer, and value of the forage.

Introducing New Plant Species or Varieties

Grasses

The establishment of new grass species into subirrigated meadows assumes that replacing the existing vegetation or adding additional species to the existing composition will result in improvements in meadow production and/or forage quality. Several grasses, including redtop bent, Kentucky bluegrass, and smooth brome-grass for example, are present in many meadows from natural encroachment or actual seeding. The results of

Table 1. Dry matter production, crude protein (CP) and in vitro dry matter digestibility (IVDMD) of forage from a subirrigated site when fertilized with nitrogen (N), phosphate (P₂O₅), and sulfur (S).

Fertilizer treatment	Total yield	Incremental yield increase	CP	IVDMD
----- lb/acre -----			----- % -----	
<u>Nitrogen (N)</u>				
0	4500	---	8.8	54.9
40	5390	890	8.2	54.4
80	6020	630	8.1	53.5
120	6390	370	8.3	52.1
<u>Phosphate (P₂O₅)</u>				
40	5090	590	8.8	54.9
<u>Sulfur (S)</u>				
20	5010	510	8.8	54.9

these introductions can be mixed with both positive and negative aspects. Creeping foxtail, reed canarygrass, timothy, and meadow brome are four, more desirable cool-season grass species that have been successfully established in some subirrigated meadows.

Legumes

The seeding of legumes into subirrigated meadows has been a common practice for many years. Competition from existing vegetation and adaptation to a subirrigated meadow environment are the two primary factors that have limited their potential. Red, white, and alsike clover are three introduced species that are adapted and are recognized as desirable components of meadow vegetation.

Trials at GSL during the 1980s evaluated different legumes and varieties to determine adaptability to subirrigated meadow conditions. Only three legumes, red clover, alfalfa, and birdsfoot trefoil showed sufficient establishment, persistence, growth, and vigor. Birdsfoot trefoil showed a wider range of adaptation to soil water conditions than either alfalfa or red clover. The zone of adaptation for alfalfa was on the drier, higher elevation segment of the meadow, whereas red clover persisted well on the lower, wetter segment. The wide, intermediate wetness zone between these extremes appeared best suited for birdsfoot trefoil, extending well into the zones of adaptation for either alfalfa or red clover.

Establishing Grasses and Legumes

Grass and legume establishment into subirrigated meadow vegetation can be difficult. Full seedbed preparation with tillage will be the most successful approach, but is expensive and may not be physically possible on many subirrigated meadow sites. Sod-seeding grasses and legumes after existing vegetation has been suppressed with glyphosate or paraquat herbicides has been successful. One option to reduce competition for newly seeded legumes is flash grazing.

The cost and convenience of broadcast seeding of legumes make it an attractive approach. In a trial comparing broadcast versus drill seeding, density of birdsfoot trefoil seedlings and composition of birdsfoot trefoil in the hay was about two times greater for drilling versus broadcast seeding. This suggests a need for higher rates if broadcast seeding is used. It is also critical that proper haying, grazing, and/or fertilizer management occur for long-term maintenance or to realize an increase of the seeded legumes.

Grazing

Grazing of subirrigated meadows during the late fall or winter when the ground is frozen is a relatively common

practice. Recently, there has been more interest in grazing during other times of the year. Grazing meadows during the spring or fall is similar to other complementary grazing strategies that use seeded cool-season grass pasture at those times of year. Research at GSL has shown that a strategy which included grazing meadows with cows nursing calves during May rather than feeding hay increased calf weaning weight and reduced feed costs. A strategy that featured grazing of meadows during both winter and May with hay fed only during the calving season resulted in the greatest net return per calf. The practice of extending grazing earlier into the spring and/or later into the fall is attractive because of the extent to which production costs associated with producing and feeding hay can be lowered. Livestock gains while grazing subirrigated meadows during the growing season can be relatively high. In one trial, yearling steers gained an average of 2.4 lb/day while continuously grazing meadows from May through August.

Meadow vegetation response to grazing has not been closely studied, but similar to other vegetation types, it is likely that the primary grazing management factors of stocking rate, season of grazing, and grazing system would affect plant vigor, production, and species composition of the meadow. With poor grazing management, it is possible that grazing tolerant species will increase in abundance. Some legumes, particularly white clover, have been observed to increase under grazing. This is thought to occur because grazing will reduce the grass canopy and overall competitiveness of the grasses. White clover is a low-growing, stoloniferous species and will readily fill in vacant spaces. Although white clover will fix nitrogen, its forage productivity is relatively low.

Many times, using a combination of several different meadow management practices or strategies will result in a more efficient and optimal use of that resource. This is particularly true when one or several of the other meadow management practices are combined with grazing. The common practice of summer haying followed by grazing of the regrowth during the late fall or winter will typically result in the equivalent removal of 5 to 6 AUM/acre (hay + grazing) from the meadow. In one trial, a combination of practices that included May grazing followed by fertilization, haying in late August, grazing of windrows and regrowth by calves from November through January, and grazing of windrows and regrowth by cows in February provided the equivalent of 7.5 AUM/acre of forage.

Editor's Note: Contact the CGS for a version of this paper that contains scientific references.

The Effect of Planting Date on Turfgrass Seed Production in the High Plains

by Rebecca Harms, Turfgrass Project Coordinator, UNL

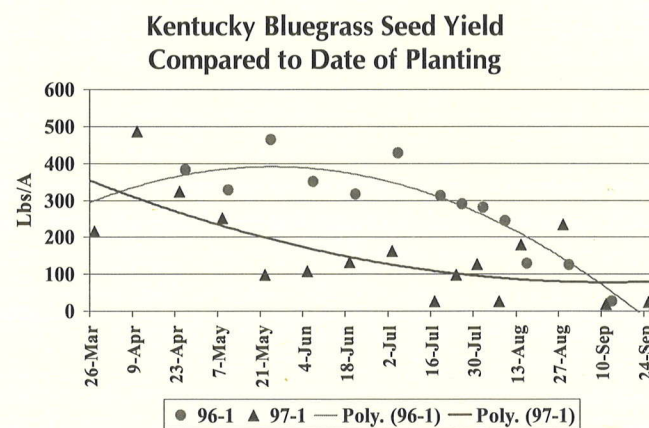
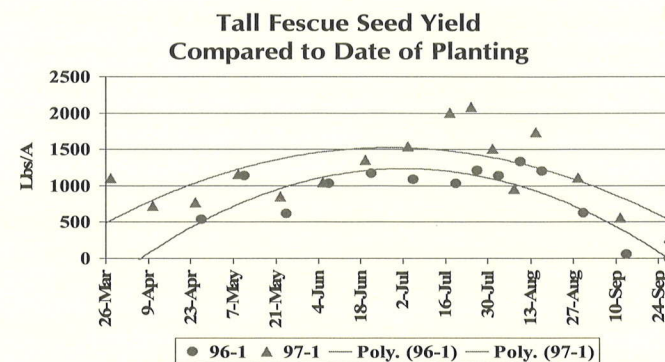
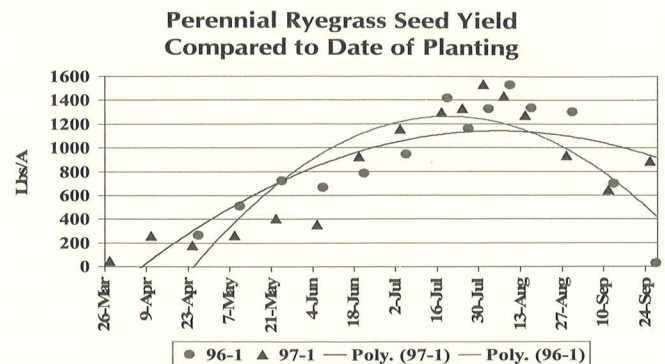
Research is being conducted at the Panhandle Research and Extension Center to determine proper dates of planting for three species of turfgrass for seed production that seed companies are interested in growing in this area. These grasses are Kentucky bluegrass (*Poa pratensis*), tall fescue (*Festuca arundinacea*) and perennial ryegrass (*Lolium perenne* L.).

Our study began by planting these three species on 14 dates in 1996 and 16 dates in 1997 from March 27 to September 27. These plots were planted by hand on 12" row spacing. The plot sizes were four square feet. The seeding rates were 4 lb/A for Kentucky bluegrass and 6 lb/A for tall fescue and perennial ryegrass. These plots were also fertilized at planting with 40 lbs of P_2O_5 and 40 lbs of N in the form of ammonium nitrate. They were watered lightly every day until emergence. Once seedlings have emerged and are well established, weed control methods need to be put into action. On the 1997 study *Tupersan* was applied after establishment. *Prowl* was applied post harvest to the 1996 study and again in the spring on both studies. In these studies, because the planted area is relatively small, our main force of weed control is by hand. The harvested plot size was two square feet taken from the middle of the plot. These were harvested by hand using gardening shears, dried and then threshed using a small plot thresher. After the plots had been harvested and burned, *Prowl* was then applied to control weeds before they emerged. After burn more fertilizer is applied: 30 lbs each of N and P. In October a higher rate of fertilizer will be applied: 120 lbs of N and 5 lbs of Fe. The plots will be watered once a week until first freeze and then will be watered during warm spells in the winter.

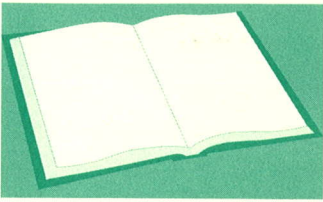
We have now collected two years of data from our first planting in 1996, and we also have one year of data from our 1997 dates of planting. Preliminary studies suggest that highest yields of Kentucky bluegrass (510 kg/ha) occur when planted from mid-May to late June, tall fescue (1490 kg/ha) from July to Aug 15, and perennial ryegrass (1480 kg/ha) from late July through August. In this study the early dates of planting for tall fescue and perennial ryegrass had extensive vegetative growth, and the residue the following spring posed a management problem.

The graphs depict the growth curve of each species of grass for the 1996 and 1997 planting seasons. These yields are based on this year's harvest.

Source: Reprinted with permission from *The High Plains Grass Seed Association*, September 1998.



Editor's Notes: The Panhandle Research and Extension Center in Scottsbluff will host a Grass Seed Production meeting to discuss research results and future research plans on December 17, 1998. There will be representatives from UNL and the Grass Seed Industry to aid in the discussion. Want to know more about the newly formed High Plains Grass Seed Association? Contact CGS Associate David Baltensperger, 308-632-1261, dbaltensperger@unl.edu.



Resources

Forage Systems Update. Free. Jim Gerrish is the editor of this quarterly newsletter that provides practical information on forage

production and grazing systems. Forage Systems Research Center, 21262 Genoa Road, Linneus, MO 64653, 660-895-5121, agnhenry@mail.missouri.edu.

Bison Ecology and Management in North America. \$30. Compilation of articles written on the research and findings presented at a June 1997 bison symposium in Bozeman, MT. Categories include ecology, management perspectives, genetics, physiology, paleontology, history, and disease. Extension Wildlife Program, 221 Linfeld Hall, Montana State U., Bozeman, MT 59717 (checks payable to MSU Extension Wildlife).

Great Plains Journals. The UNL Center for Great Plains Studies sponsors two multidisciplinary journals to stimulate research and creative scholarship on plains topics. The *Great Plains Quarterly* contains articles on history, literature, and culture of the Great Plains and seeks a readership among both scholars and the interested general public. *Great Plains Research* is a biannual multidisciplinary international journal containing original scholarly papers in the natural and social sciences dealing with issues of the Plains environment. The Spring 1998 issue focuses on freshwater functions and values of prairie wetlands. To subscribe to either journal, contact the Center for Great Plains Studies, 1213 Oldfather Hall PO Box 880314, Lincoln, NE 68588-0314, 402-472-3082, cgps@unlinfo.unl.edu, <http://www.unl.edu/plains/gpr.htm>.

The Northern Great Plains national forest and grassland planning group has summarized information on current resource conditions and uses in a document called *Analysis of the Management Situation*. Key findings were described in the July 1998 issue of *Revision Reporter*, a newsletter published by the USDA Forest Service. For a copy, contact: USDA-FS, 125 N. Main St., Chadron, NE 69337, or check out the Web site: <http://www.fs.fed.us/ngp/>.

Glossary of Ecosystem Terms. Extension Circular (EC 98-787) that describes Nebraska's ecosystems in general, and portions of the Platte River ecosystem in particular. To order, contact your local Cooperative Extension office, or Tom Franti, 402-472-9872, tfranti@unl.edu.

Pasture Management Guide for Livestock Producers. \$10 + \$4.25 s&h. Excellent general guide that provides basic pasture and livestock management information and serves as an introduction to rotational and management intensive grazing practices. Full of helpful color photos. Extension Distribution Center, 119 Printing and Publications Bldg., Iowa State University, Ames, IA 50011-3171, 515-294-5247, pubdist@exnet.iastate.edu.

In the previous newsletter issue you read about the Ashfall Fossil Beds. Here is the Web site: <http://www-museum.unl.edu/research/vertpaleo/afbindex.html>.

Roots of Stewardship. Free. NRCS video features 14 Nebraska ranchers discussing grazing lands management. It was developed at the request of the Nebraska Grazing Lands Coalition to help promote stewardship. Call 1-888-LANDCARE to order.

Beef Home Study Courses Begin Fifth Year

The NU *Beef Basics* home study courses will again be offered across Nebraska this year. These courses are designed to assist beef producers and farm and ranch managers in making management decisions for improving profitability. Registration deadline for all courses is November 13, and the fee is \$55 per course.



Beef Basics I will offer lessons on cow nutrition, ration formulations, and forage analysis. Discussion of forage crops and alfalfa production leads to information on grazing strategies and management. A lesson on feed ration economics will also be included.

Beef Basics II will include lessons on anatomy and physiology, replacement heifer development, reducing calving difficulty and calf losses, and calving management. The session covering basic genetics will explore the combination of genetics and environment. Another lesson investigates crossbreeding programs and breed selection that will allow producers to tailor a crossbreeding program to fit their operation. Breeding management, herd health management, and managing the herd to fit producer resources rounds out the course.

Beef Basics III will be offered in a similar 11-lesson course and will focus on management strategies, nutritional considerations, ration formulation, implant programs and health programs for the growing calf. Other lessons will emphasize the importance of all phases of weaning management, wintering systems and summer grazing management.

Beef Basics IV discusses goal setting, personnel and family issues, financial and production records, as well as business plans and record keeping systems.

Over 4000 producers from 40 states have participated in Beef Basics courses. Last year's producers estimated that they would save over \$16 per cow using the management and production ideas presented in the home study courses.

For more information, contact Bud Stolzenburg, 800-657-2188, cnty2664@unlvm.unl.edu, or see <http://www.ianr.unl.edu/beefbasics/index.htm> (where you can enroll electronically).

The courses are co-sponsored by the University of Nebraska Cooperative Extension and the Institute of Agriculture and Natural Resources.

Info Tufts



Little bluestem (*Andropogon scoparius*) is the Nebraska state grass.



In October Intel Corp. co-founder Gordon Moore and his wife, Betty, announced a gift of \$35 million to sponsor an "early warning system" for imminent threats to global biological diversity. Moore said the gift was to spur action as plant and animal species vanish into extinction faster than ever. The Moores' bequest will fund the new Center for Applied Biodiversity Science at Conservation International, a non-profit environmental group in Washington D.C.



In remarks to the League of Conservation Voters on October 7, 1998, President Clinton announced new rules to help protect the nation's threatened and dwindling wetlands. From now on, the federal government will require a full environmental review, with full public participation, of all projects in critical wetland areas, particularly flood plains.



Ever wonder what caused the influx of East Coast Europeans into the Great Plains after the Civil War? CGS Associate Jim Stubbendieck tells us there were six main factors: elimination of bison (the War Department paid hunters so much per head in a successful effort to wipe out this animal so essential to Native Americans); railroads; many people with little to do following the Civil War; cowboys began to round up wild cattle in Texas and established the cattle trails to the north; Homestead Act; and the invention of barbed wire. Many people were forced out of the Great Plains when ranches failed due to severe blizzards in the late 1880s.

Congratulations!

Congratulations to three CGS Citizens Advisory Council members: Kenneth Frasier and Sid Salzman each received one of the 1998 Master Conservationist Awards, presented annually by The Omaha World Herald since 1983. Frank Bruning, president and chairman of Bruning State Bank, and his wife, Mary, were honored for outstanding service to agriculture by the Nebraska Bankers Association.

Calendar

Contact CGS for more information on these upcoming events:

1999

- Jan. 7: Nebraska Forage and Grassland Council annual meeting, Lincoln, NE
- Jan. 7-8: MINK Forage/Livestock Group meeting, Kansas City, MO
- Jan. 11-13: Nebraska Turfgrass Conference, Omaha, NE
- Jan. 19-21: 1999 Farm Bill Conference - State of North America's Private Land, Chicago, IL
- Feb. 21-26: Society for Range Management/American Forage and Grassland Council joint meeting, Omaha, NE (<http://srm.org/meetings.html>)
- 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>)
- Aug. 15-20: International Congress on Ecosystem Health - Managing for Ecosystem Health, Sacramento, CA (<http://www.vetmed.ucdavis.edu/centers/iseh/ecosystemhealth.html>)

If you have articles, events, resources, CGS Associate News, 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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