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Center for Grassland Studies

E-mail: grassland@unl.edu
www.grassland.unl.edu

Phone: (402) 472-4101
Fax: (402) 472-4104

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Restoration of Salt Cedar Infestations

© Lani Malmberg, Ewe4ic Ecological Services

Salt cedar (*Tamarisk spp.*) is an aggressive, invasive weedy species that threatens our native ecosystems. Each adult tree takes about 300 gallons of water per day and exudes salt back into the soil, forever altering the site for all forms of life. A monoculture of salt cedar means loss of plant diversity and all the life that depends on it. Extra salt added to the soil renders it unable to support desirable plants and results in bare ground and erosion, and therefore, sedimentation into the water ways, which lowers water quality and reduces diversity of aquatic life. Water is a very valuable resource, especially during these desperate drought times, so we must work to keep it in the soil, and keep rivers fortified. The loss of soil, plant, aquatic, and animal life reduces productivity and lowers human ability to make a living on the land in that area. The entire system is out of balance, and cautious planning must precede restoration of the entire watershed.

Goats (1200 in all) helped Dennis Swayze with brush control (including salt cedar, sage brush, plum thickets and juniper trees) on his ranch at Freedom, OK.

We must be mindful of the situation's past, present, and future. How did the system get so stressed and what past management allowed salt cedar to become an infestation? The treatment applied now will affect the entire system for decades to come. What can we afford to do? What are the long-term monetary, ecological, and social costs? Long-term goals set for the land, soil, water, people, animals, plants, microbes, birds, fish, reptiles, and invertebrates should reflect a healthy, functioning, sustainable ecosystem.

We are lucky that we have several choices when addressing salt cedar infestations; however, effects of each treatment method should be extrapolated forward in time to model subsequent influences and true costs of our actions. Unfortunately, the true cost of a treatment is seldom calculated in our culture of instant gratification and quick visual determination of success. A short-term "fix" that addresses only symptoms may cost more in terms of human health than we are willing to pay later. As an analogy, the true cost of food in our country is not reflected in grocery store prices, but concealed deep within the frightening status and price of health care and mental health care of our population, i.e., obesity, diabetes, asthma, and depression.

Goals set for natural resources in an area will determine which plant species need to replace salt cedar for desired future productivity. Once that is identified, the site can be prepared for those species to be the best competitors.

Look past the obvious visual symptoms of the salt cedar trees. Begin by looking in the soil, where all change begins and where few people look first because they cannot see it. The soil supports all microbial life below and all plant life above the surface. Soil holds (or doesn't hold) the water and air needed to support these forms of life, i.e., there should be equal tonnage of earthworms below and cows above an acre of land. A productive grassland needs a properly balanced fungi:bacteria ratio in the soil and a balanced mix of forbs and herbs growing above. Bulldozing salt cedar trees is analogous to a severely dehydrated person paying for a surgical face lift. The short-term fix did not address the underlying problem of dehydration, and therefore, money was wasted; there was no long-term effect.

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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.

Note: Opinions expressed in this newsletter are those of the authors and do not necessarily represent the policy of the Center for Grassland Studies, the Institute of Agriculture and Natural Resources or the University of Nebraska.

Martin A. Massengale .....CGS Director
Pam Murray.....CGS Coordinator
Jan Shamburg..... CGS Secretary
Anne Moore ..... Newsletter Layout

From the Director

I attended the 3rd National Conference on Grazing Lands held in St. Louis, Missouri on December 10-13, 2006, officially representing the American Society of Agronomy. The theme of this year's conference was, "Grazing Lands, Gateway to Success," and it was structured as a forum with paper presentations, posters and exhibits for discussing the benefits of grazing. The primary purpose of the conference was to improve the awareness of the economic and environmental aspects of grazing lands. The conference is held every two years, and there were about 1200 people in attendance this year.

One of the significant changes that has occurred since the last conference has been the large increase in the availability of distiller's grain. This by-product of the ethanol industry has provided a large source of a new feedstock for livestock use. Other topics presented at the meeting and receiving considerable interest were grass-fed beef, grass-based dairying, organic production, converting from conventional crops to grass-based operations, extending the grazing season and the associated economics, multi-species grazing, compatibility of wildlife and grazing, invasive species, and sustainable rangelands and grasslands. Many of the presenters were also looking at niche marketing of their products.

This conference is sponsored by the National Grazing Lands Conservation Initiative (GLCI). The GLCI was formed in 1991 when a group of organizations representing agriculture, wildlife, conservation and scientific interests met together based on the belief that the resources of the Natural Resources Conservation Service (NRCS) intended for grazing lands had been or were being diverted to compliance and other activities referenced in the 1985 farm bill. Therefore, one of the primary activities of the National GLCI Steering Committee to date has been to see that funding for the GLCI is included in the federal farm bill. The legislation so far has assigned responsibility for GLCI to the NRCS for providing assistance to private landowners in cooperation with others.

Although primary responsibility is assigned to NRCS for the GLCI program, many other federal agencies are actively involved. In addition to NRCS personnel at the St. Louis meeting, representatives of the Agricultural Research Service, Cooperative State Research, Education and Extension Service, Bureau of Land Management, Forest Service and Fish and Wildlife Service were in attendance. Numerous State Agricultural Experiment Stations and Extension Services are actively involved in this effort as well.

GLCI also has another important responsibility, and that is to advocate and support increased research and education programs on grazing lands. New knowledge obtained through research is constantly needed to provide more effective grazing management systems. Likewise, educational programs are needed to provide information and high quality assistance to landowners on how best to manage their grazing lands for the intended purposes. With more of the U.S. corn crop being used to manufacture ethanol, grasslands, including cultivated forages, are likely to become more important as a feed source for the livestock industry. Therefore, the more research information that we have available for use in educational programs with livestock producers, the more effective and productive their grasslands will become.

M. A. Massengale

Patch-burn Grazing: Benefits for Both Wildlife Habitat and Livestock Performance

by Chris Helzer, Director of Science and Stewardship, The Nature Conservancy (Aurora, Nebraska) and Tim Tunnell, Grassland Manager, Platte Habitat Partnership (Wood River, Nebraska)

Introduction

Patch-burn grazing has been getting increasing attention as a land management system that benefits wildlife habitat and plant diversity without compromising livestock production. The system uses fire instead of cross-fences to shift livestock grazing around a pasture. Because portions of the pasture are "rested" each year while others are grazed more intensively, there is no need to move cows to a different pasture to build up fuel for the next year's fire. This appears to give patch-burn grazing tremendous potential as a tool to help combat eastern redcedar infestation on Nebraska rangelands.

The Nature Conservancy is collaborating with other scientists across the Midwest and Great Plains to evaluate the potential of patch-burn grazing as a tool for livestock production, habitat management, and biodiversity enhancement on both public and privately-owned grasslands. The Patch-Burn Grazing Working Group meets each fall to share data, potential funding sources, and ideas for increasing landscape heterogeneity through patch-burn grazing and other systems. The Working Group members represent Oklahoma State University, Iowa State University, Kansas State University, Missouri Department of Conservation, and The Nature Conservancy, among others.

Description

Patch-burn grazing is a system that encourages intensive grazing on a portion of a pasture each year while resting the remainder of the pasture. Each year, a portion of the pasture is burned (the burn "patch"), which attracts grazing cattle to the lush re-growth of grass following the fire. Cattle graze the burned portion of the pasture until a new portion is burned – usually the following year. In times of hot dry weather or cool wet weather, when grass growth slows, cattle will "spill over" into the previous year's burn and graze lightly until the current year's burn catches up again. The extent to which the cattle spill over into the previous year's burn is determined by stocking rate; they will spill over more under higher stocking rates, and less under lower stocking rates.

The location of the next burn is determined by the amount of fuel available for the fire. That fuel includes dead grass, either standing or lying on the ground. After the fire, cattle graze the burned patch for the entire season, essentially overgrazing that portion of the pasture. However, as soon as the next portion of the pasture is burned, the cattle will shift their grazing pressure to the new burn. Then, over the next several years (until the next burn), the recently-grazed area will rest and recover its vigor.

One of the unique features of patch-burn grazing is that cattle select their forage differently than in other grazing systems. In patch-burn grazing, the vast majority of the forage eaten by the cattle is grass, excluding many of the legumes and other forbs (broad-leaved plants) that are normally eaten. Patch-burn grazing ensures that cattle can have complete free choice of forages, because their movement is not restricted within the pasture, and if their first choice is not available in the burned patch, they can go outside that area to find what they want. This is a difference between patch-burn grazing and traditional rotational systems, where cattle are restricted to a portion of a pasture by fencing, and it helps cattle maximize the quality of their forage intake at all times.

Cattle grazing in the burned patch of a patch-burn grazing system being implemented along the Central Platte River near Wood River, NE.

Habitat Benefits of Patch-burn Grazing

The cycle of intense grazing pressure and long rest periods in patch-burn grazing creates excellent vegetation structure for a large variety of wildlife species. Recently-burned patches provide short vegetation because of the recent fire and the intense grazing. This short vegetation, particularly in the spring and early summer, provides excellent habitat for many grassland-breeding birds, as well as for migrating sandhill cranes and other wildlife species.

In the areas that were patch-burned during the previous year, grasses are slowly recovering their vigor. In the meantime, the forbs that were ungrazed during the previous year take advantage of the open spaces left by the weakened grasses. They increase their abundance by seed and rhizome. That reproduction is accompanied by other forbs, including some annual weeds, taking advantage of the open spaces between the temporarily-weakened grass. This weedy cover provides ideal (and unique) habitat for upland game birds like pheasants and quail. Young birds need the safety provided by the vertical cover (tall forbs), but can't move through dense grass near the ground. The thin grass and tall forbs in the year following the burn provides perfect brood-rearing habitat for these species. Many other wildlife species also benefit from the habitat and food quantities provided by the vegetation response to the fire and grazing.

In the remainder of the pasture, where little grazing has occurred for two or more years, the grasses and other plants grow tall and thick. This provides dense vegetation for wildlife habitat, including excellent nesting and wintering habitat for species such as pheasants and quail. It also provides adequate fuel for the next fire, and ensures that the fire will burn with sufficient intensity to kill trees such as eastern redcedars.

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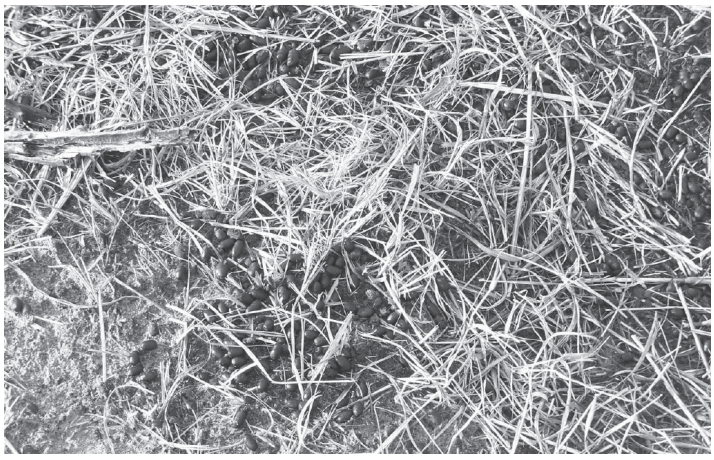
Restoration of Salt Cedar Infestations (continued from page 1)

Snack time!

An excellent remedy for watershed rehabilitation is to employ hoof action and herd effect of a large managed herd of livestock. Choosing an animal species that eats salt cedar preferentially is a brilliant way to begin. Goats are browsers, and management is made easier because goats eat salt cedar twelve months of the year. In addition to their natural diet preference, goats have unique behaviors that add value: tight herd behavior; they stand on their hind legs to reach up 8' onto the older trees; they climb trees; they crawl on their knees into a dense brush patch. Goats address several levels of treatment simultaneously, instead of administering one step at a time. Goats are the best treatment choice for fall and winter work – best bang for your buck, no pun intended.

A large managed goat herd eats the salt cedar trees and recycles them through the gut to deposit pure, organic fertilizer as it moves. The hoof action of the entire herd tramples the fertilizer into the soil. During fall and winter there is no foliage, so goats will strip the bark off bigger trees, and bite off the new growth, orange-colored "whips" that are the expansion of the infestation. Again, all these nutrients are reduced to organic fertilizer pellets trampled into the soil, releasing stored nutrients to feed the future desired plant species. Goats are self propelled, so this treatment is less affected by increasing fuel prices. It is interesting to note that goats generate body heat as they browse; the twigs, stems, and dead brush are broken up in the gut and the process releases heat energy. So goats fuel themselves with the salt cedar trees – 24-hour pumps. Cattle, by comparison, need carbohydrates and calories for heat.



Soil is augmented with organic matter from recycled weeds that have been laid down, trampled into the soil and mulched from hoof action.

When goats walk, their hooves hit the ground flat. A good Border collie can accelerate the goats to running, where hooves hit vertically, digging and aerating as they go. Changing herd speed has different effects on the soil surface. One-thousand goats have 4000 hooves to till, aerate, mulch, trample and work the soil, helping to negate the salt while building soil health for future desired plants. Goats get a drink during the day, and that water can be dumped strategically a pint at a time with a dab of nitrogen in it, effectively irrigating. The herd manager can plan where goats will stay the night, and their intestines are purged on that area, intensively building soil organic matter and adding nutrients. Body heat of the herd laying on a night set may influence soil surface temperature there.

Bulldozing salt cedar trees is analogous to a severely dehydrated person paying for a surgical face lift.

What can one expect with a goat treatment? Expansion of the salt cedar patch is halted immediately as goats eat the new whips. The first two years' results are happening below ground as soil is stabilized, salt is neutralized and trees are recycled to organic matter to feed soil microbes, releasing nutrients. Above-ground visual success is seen dramatically in year three and beyond.

Salt cedar management may include grazing, browsing, biocontrol insects, chemicals, and machinery, but care must be taken to address the entire living system and not just the visible salt cedar tree itself. A managed goat herd is working simultaneously on all parts of the environment, and restoration is all inclusive – restoring a healthy functioning, productive ecosystem where the insects, birds, reptiles, wildlife, livestock, soil microflora and fauna and diverse desired plant species maintain efficient water and mineral cycles, energy flow is high, and plant succession moves.

Nebraska supports many herds of goats that were not here ten years ago. Train the goats, teach the herders, and employ existing resources to address a billion-dollar problem threatening water supply to Nebraska and surrounding states.

Editor's Note: Lani Malmberg started Ewe4ic Ecological Services in 1997, which utilizes a goat herd for alternative weed management and land restoration and now provides service in 10 western states, including Nebraska. Lani comes from a working cattle ranch background and is well acquainted with land stewardship issues. Her education includes an Associate of Applied Science in environmental restoration, a B.S. in biology/botany and an M.S. in weed science. She is a published author and travels across the country giving presentations on new-age goat herding. She is also a guest professor in the agriculture department at Central Wyoming College. Lani can be contacted at: 768 Twin Creek Road, Lander, WY 82520, 970-219-0451, ewe4icbenz@aol.com.

Patch-burn Grazing: Benefits for Both Wildlife Habitat and Livestock Performance

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Plant Diversity Impacts

While the impacts on the plant community are still being tested, it appears that plant diversity increases through the patch-burn grazing system. Because grasses are the preferred forage for the cattle, forb abundance increases, adding to the overall diversity of the pasture. Preliminary data from Nebraska shows that native legume abundance increases during the first two years following a fire, and then is stable or slightly declines in the next year. Altering the season of fire can also impact the plant community, with late-spring fire suppressing cool-season grasses and early-spring or fall fires favoring cool-season grasses over warm-season grasses.

Livestock Performance

Oklahoma State University has done multiple comparisons of livestock performance between the patch-burn grazing system and other common livestock systems. Using stocker cattle, no differences in weight gains were found between patch-burn grazing and other systems. Cow-calf pairs are now being tested as well, and early results indicate no differences in performance between patch-burn grazed sites and other grazing systems. In addition, a stocking rate that is sustainable long-term on most common grazing systems can also be applied to patch-burn grazing, so there is no need to reduce cattle numbers when switching to patch-burn grazing.

When implementing patch-burn grazing on private lands, there are several important components that need to be included. First, establishing an appropriate stocking rate is critical. A moderate stocking rate should provide the animal distribution needed to both get the desired grazing impact on the burn patch and also provide adequate rest to build up fuel on the unburned areas. Second, water and mineral distribution should be set up as to not conflict with the desired grazing pattern. For example, if the burn patch is on the west end of the pasture, and the next year's planned burn is on the east end, it would be counterproductive to have the only available water and/or mineral located on the east end of the pasture. Finally, prescribed fire is an obvious necessary component of the system. While capacity to conduct burns on private lands is slowly growing, it is still uncommon to find private landowners willing or able to burn their property annually. This system requires consistent burns to meet both ecological and livestock performance objectives.

Summary

Patch-burn grazing is still an evolving practice. Experiments with season of fire and various fire return intervals are underway to help evaluate the potential for the system to help combat invasive species like smooth brome or Kentucky bluegrass dominance. The expansion of patch-burning into more geographic areas, especially into drier rangelands to the west and cooler areas to the north, will also be helpful in determining how the system works in those kinds of landscapes.

Multiple studies have shown that creating heterogeneity on grazed grasslands is beneficial for both livestock and the ecological health of the prairie. There are multiple ways to achieve that kind of heterogeneity. However, patch-burn grazing has shown several unique qualities (e.g., the increased forage selectivity by cattle and the vegetation structure found in the post-burn patch) that make it an intriguing system. As more private landowners and public land managers begin implementing patch-burn grazing, we'll find out much more about its practical value to Nebraska grasslands.

CGS Associates

Tiffany Heng-Moss was recognized by the USDA Higher Education Programs for the Food and Agricultural Sciences Excellence in College and University teaching. Heng-Moss was one of six regional honorees at the annual meeting of National Association of State Universities and Land-Grant Colleges in Houston in November.

At the annual ASA-CSSA-SSSA meetings in Indianapolis in November, **Roch Gaussoin** was named a Fellow of the Crop Science Society of America, the highest honor the society bestows. Gaussoin and CGS Associates **Robert Klein** and **Robert Wilson** were among the authors who received a certificate of merit for the publication, *2006 Nebraska Guide for Weed Management*.

Steve Rodie recently received a North American Colleges and Teachers of Agriculture Teacher Fellow Award at the NACTA Conference held in British Columbia, Canada.

At the annual meeting of the Nebraska Cooperative Extension Association in November, **Steve Melvin** received a Distinguished Service Award.

Tala Awada received a 2006 Institute of Agriculture and Natural Resources Dinsdale Family Faculty Award.

Soil Physical Characteristics of Aging Golf Greens

by Roch Gaussoin, Department of Agronomy and Horticulture, UNL

Summary

- Water infiltration decreases as a sand-based rootzone matures. The decrease is associated with a decrease in air-filled porosity and an increase in capillary porosity over time. The total porosity, however, remains relatively constant.
- The addition of soil to the rootzone does not increase the rate of decrease in infiltration.
- The decrease in infiltration may be attributable to placement and movement of fine sand particles from topdressing sand or accumulated organic matter.

Since 1997, a UNL research project funded by the United States Golf Association (USGA) has been focused on developing a better understanding of the agronomic characteristics of sand-based rootzones as they mature. While many research endeavors may be conducted for two or sometimes three years, it is rare when a research site is evaluated for more than five years. Thanks to the long-term funding commitment of the USGA – and in the initial five years, also the Environmental Institute for Golf – we have been able to evaluate the long-term microbial, chemical and physical characteristics of structured research greens ranging in age from one to eight years. In the previous issue of this newsletter, we described the chemical characteristics of aging golf greens. This article summarizes the soil physical characteristics. A more comprehensive article on this research, including literature cited, is available online at usgatero.msu.edu/v05/n14.pdf. Research on golf green microbial ecology is available at turf.lib.msu.edu/tero/v02/n03.pdf.

Experimental Set-up and Design

Research was conducted at the University of Nebraska John Seaton Anderson Turfgrass Research Facility near Mead, NE. Four experimental greens were constructed following USGA specifications in sequential years from 1997 to 2000. Treatments included two rootzones – 80:20 (v:v) sand and sphagnum peat and an 80:15:5 (v:v:v) sand, sphagnum peat, and soil (silty clay loam), and two establishment grow-in programs – accelerated and controlled. Establishment treatments were based on recommendations gathered by surveying golf course superintendents and a USGA agronomist with experience in establishing putting greens. The accelerated establishment treatment included high-nutrient inputs and was intended to speed, or decrease time for, turfgrass cover development and readiness for play. The controlled establishment treatment was based on agronomically sound turfgrass nutrition requirements. Plots were seeded with "Providence" creeping bentgrass (*Agrostis stolonifera* Huds.) at 1.5 lbs per 1000 ft^2. During the establishment year, the total amount of N, P, and K of the accelerated establishment treatment was two times and four times the amount of the controlled establishment treatment for pre-plant and post-plant, respectively.

All construction materials were tested by Hummel & Co, Inc. (Trumansburg, NY) and met USGA specifications for putting green construction. The first putting green was constructed in late summer of 1996. The rootzones were allowed to settle over the winter and seeded 30 May 1997. The same procedures were used for construction and seeding of greens in 1998, 1999, and 2000.

Following the establishment year, management practices applied to the putting greens did not differ and were maintained according to regional recommendations for golf course putting greens.

Water infiltration was obtained from single-ring infiltrometers in the field, and undisturbed soil cores were obtained from the plots and analyzed in the lab using physical property testing procedures.

Soil Physical Characterization Results

After the establishment year, rootzone treatment influenced soil physical properties while establishment treatments did not. Air-filled porosity (large pores), capillary porosity (small pores), total porosity (all pores), bulk density, and infiltration were significantly correlated with rootzone age for both rootzones. All soil physical properties demonstrated the same rate of change (slope) with age between the two rootzone treatments. Capillary porosity was correlated with rootzone age (increased as green aged), and increased 53% and 60% for the 80:20 and 80:15:5 rootzones, respectively. Air-filled porosity was negatively correlated (decreased as green aged) with rootzone age and decreased 28% and 34% for the 80:20 and 80:15:5 rootzones, respectively. Other researchers have reported similar results.

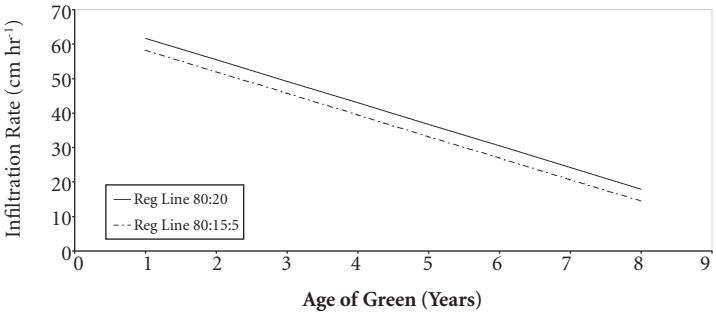
Infiltration was decreased as the greens matured. The infiltration declined 70% for the 80:20 rootzone, while the 80:15:5 rootzone declined 74%. The soil-amended rootzone, 80:15:5, initially had a lower infiltration than the 80:20 rootzone; however, both declined at the same rate.

Reductions in rootzone infiltration have been attributed to contamination from silt and clay, fine particle migration and organic matter layering. Our data indicate no increase in clay

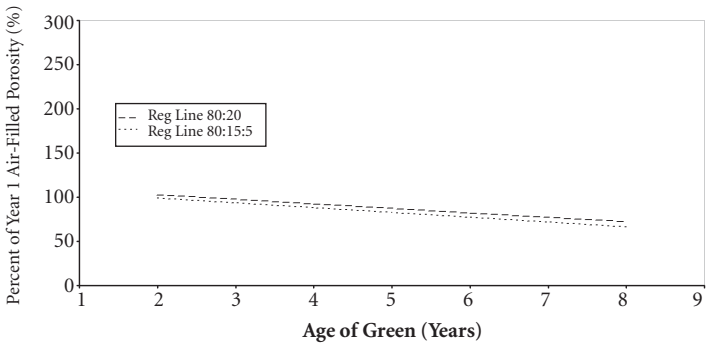
Table 1. Establishment year treatments on United States Golf Association (USGA) greens at John Seaton Anderson Turfgrass Research Facility near Mead, NE, USA, from 1997 to 2000.

	Establishment Treatment (ET)							
	Accelerated				Controlled			
Applications	N†	P	K	STEP‡	N	P	K	STEP
	lbs 1000 ft^2							
Pre-plant§	6	1.5	3.2	16	3	0.75	1.6	8
Post-plant¶	5	1.5	3	2.3	1.2	4.2	0.75	2.3
Total#	11	3	6.2	18.3	4.2	7.5	1.2	10.3

†Amounts are actual N, P and K.
‡Micronutrient fertilizer with analysis 12Mg-9S-0.5Cu-8Fe-3Mn-1Zn.
§Pre-plant was incorporated into upper 8 cm of the rootzone prior to seeding. Analyses for fertilizer sources applied were 0N-0P-0K (STEP), 16N-11P-10K, 15N-0P-24K, and 38N-0P-0K.
¶Post-plant fertilizers applied during the growing season.
#Total application amounts during the establishment year.



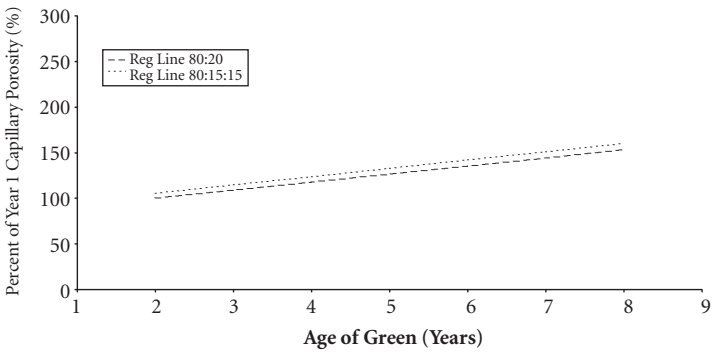
Regression lines of infiltration rate decline. Slopes were not significantly different between the regression lines at the 0.05 probability level. Rootzones were an 80:20 (v:v) sand, and spagnum peat mixture and an 80:15:5 (v:v) sand, and sphagnum peat, soil (Tomek silty clay loam) mixture.



Regression lines of the percent change of air-filled porosity compared to year 1 values of USGA specification putting green rootzones at Mead, NE. Rootzones mixtures were an 80:20 (v:v) sand, and sphagnum peat mixture and an 80:15:5 (v:v) sand, sphagnum peat, and soil (Tomek silty clay loam) mixture.

accumulation or clay migration. In addition, the soil-amended rootzone infiltration, while initially lower, did not decline at a faster rate than the rootzone without soil. In our study, the light frequent sand topdressing applications may explain the relatively slow decline in infiltration, as no layering was present in the rootzones. Surface organic matter accumulation has been reported to cause reduction in infiltration of putting green rootzones. In our study, a mat layer did develop with time, but data were not collected on the amount or rate of accumulation.

Rootzone samples taken in 2004 from below the visible mat layer had lower infiltration than the preconstruction infiltration values. The infiltration decline with age may have resulted from increased fine sand amounts and decreased coarse sand in the rootzone. The rootzone samples taken in 2004 had increased fine sand amounts in six of the eight rootzones, and decreased coarse sand in five of the eight rootzones sampled, compared to



Regression line of the percent change of capillary porosity compared to year 1 values of rootzones of USGA specification putting greens located at Mead, NE. Rootzones were an 80:20 (v:v) sand, and sphagnum peat mixture and an 80:15:5 (v:v) sand, sphagnum peat, and soil (Tomek silty clay loam) mixture. Rootzone material was not significantly different for percent change of year one capillary porosity (p=0.05).

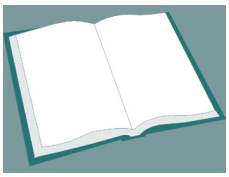
the preconstruction rootzones. These changes likely originated from the sand topdressing applications. The USGA recommends that topdressing sand meet rootzone particle size distribution. The topdressing sand used in our study met USGA specifications; however, it had a higher amount of fine sand (0.25 - 0.15 mm) particles, and less coarse sand (0.5 - 1.0 mm) than the sand used in the original rootzones. The fine sand particles may have been placed into the rootzone during core cultivation, especially during the first two years. The decline in rootzone infiltration may be attributed to the increased fine sand content of the rootzone. However, the decline in infiltration due to increased fine sand content does not completely explain the reduction of infiltration. Organic matter accumulation may account for the decrease, but this was not measured in this study.

Soil Physical Characterization Conclusions

After eight years, rootzone infiltration remained adequate for infiltration of regional irrigation and rainfall amounts. There was no apparent negative response from the addition of soil to the rootzone. The change in soil physical properties was, in part, the result of fine sand accumulation from topdressing sand. Fine sand accumulation from topdressing applications resulted in increased capillary porosity, decreased air-filled porosity and infiltration. Future studies of organic matter dynamics with time are needed, as their influence on soil physical properties are not well defined, or in some cases, are contradictory in the turfgrass literature. While this research investigated physical dynamics of sand rootzone as they age, minimal organic matter data were obtained.

Jim Gerrish to Speak at 2007 Nebraska Grazing Conference

While the planning committee is still working on the program for the 2007 Nebraska Grazing Conference, we can tell you that Jim Gerrish, formerly with the University of Missouri and now a grazing consultant located in Idaho, will be one of the key speakers. The conference will be held, as it has since its inception in 2001, at the Holiday Inn in Kearney. The dates are the same as the 2006 conference, August 7-8, which this year will be Tuesday-Wednesday. Details on the 2007 conference will be posted on the web site as they become available, www.grassland.unl.edu/grazeconf.htm. The next issue of this newsletter will also contain program details. Participants of any of the past six conferences will receive a copy of the brochure in June.



Resources

The National Grasslands: A Guide to America's Undiscovered Treasures. This new (2006) 154-page book by environmental historian Francis Moul is a guide to the American grasslands and the Grasslands National Park of Canada. It contains 28 color photos and 23 maps, and presents a history of the region that traces the establishment of the national grasslands as an important part of the New Deal's social revolution. Moul describes himself as an environmental historian – one who looks at how people have affected the land and how the land has affected people. Available from University of Nebraska Press, 1111 Lincoln Mall, Lincoln, NE 68588-0630, 1-800-755-1105, pressmail@unl.edu, unp.unl.edu.

Conducting a Prescribed Burn on Warm-season Grass CRP Sites. This October 2006 NebGuide is available online at www.ianrpubs.unl.edu/epublic/pages/publicationD.jsp?publicationId=642.

Analysis of the Economic Impacts on the Agricultural Sector of the Elimination of the Conservation Reserve Program. Approximately 34.7 million acres have been temporarily withdrawn from production through the Conservation Reserve Program. Most of the current CRP contracts are scheduled to expire between 2005 and 2011. As the contracts expire, producers have the choice of returning their acreage to major crop production or using it for some non-crop-production use. In September 2006 the Agricultural Policy Analysis Center at the University of Tennessee released a report that analyzes the economic impacts of a hypothetical elimination of the CRP on the agricultural sector. View the report at www.agpolicy.org/ppap/APAC-CRP-Report.pdf.

The Farmer's Decision. The 2005 book published by the Soil and Water Conservation Society is a resource for the decision making process that goes into balancing economic success with a healthy environment. The discussions represent an international view and are a blend of field and watershed scale observations and research. Learn more and order online at store.swcs.org.

Natural-Resource Amenities and Nebraska's Economy: Current Connections, Challenges, and Possibilities. In 2004 a group of individuals representing several state agencies, organizations and political leaders sought a better understanding of how natural resources contribute to Nebraska's economy. They formed a coalition that contracted with a consulting firm, which compiled and interpreted economic information about Nebraska from 100+ sources. The study examined the current status of, and potential for, natural-resource-related, amenity-driven economic growth in Nebraska. The report was released by the Nebraska Game and Parks Commission in October 2006, and is online at www.ngpc.state.ne.us/admin/niemereport.pdf. Many of the study's findings are similar to those reached by the Grassland Foundation in its report, *Economic Benefits of Grassland Protected Areas*, released in August 2005, www.grasslandfoundation.org/pdfs/GrasslandReport_Nov05.pdf.

The Conservation Security Program: An Assessment of Farmers' Experience with Program Implementation. This September 2006 report issued by the Center for Rural Affairs summarizes the viewpoints and problems in CSP implementation identified by farmers and ranchers who participated in the sign-up process in 2004, 2005 and 2006. Based on this information, Center for Rural Affairs staff developed a set of recommendations for USDA to improve the CSP implementation in future sign-ups. Online at cfra.org/pdf/CSP_Report_farmerperspective.pdf.

PGM Students Hit the 100 Mark

No, that's not a golf score; it is the number of Professional Golf Management students in the program as of January 2007. The eight students who transferred into the program for spring semester pushed the number to the century mark, which far exceeds original projections for this, the third year of the program. For more information on the PGA/PGM™ program, see pgm.unl.edu.

University of Nebraska Lincoln | CENTER FOR GRASSLAND STUDIES
222 Keim Hall
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