Center for Grassland Studies

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Alternative Cow-Calf Management Systems in the Current Production Environment: An Update on Nebraska Research

by Jason Warner and Terry Klopfenstein, Department of Animal Science, UNL

In a previous Center for Grassland Studies article (Summer 2012), we discussed implementing alternative cow-calf management programs utilizing crop residues and ethanol co-products as a system to maintain beef production in an era of declining forage supplies. While cow-calf producers are enjoying record profitability, and drought conditions in most areas have recently improved, the challenges regarding the availability of traditional forages have changed little during the past few years. Although the U.S. beef cow inventory increased about 2% from 2014 to 2015, the cow-calf sector has generally been in a contraction phase the past four decades. Reasons why the U.S. beef cowherd has been liquidated are numerous, but the lack of available land for grazing or hay production is a primary cause. Corn prices have fluctuated in recent years, but the demand-driven price increase for grain has increased annual corn production partially at the expense of traditional forage acres (pasture, range, hay land). This is especially true throughout the Midwest and Northern Great Plains. Thus, fewer acres of pasture/rangeland coupled with increased demand from producers have resulted in the steady increase in pasture rental and purchase prices in Nebraska and surrounding states. Alternative systems designed to increase stocking rates and minimize the land base needed for cow-calf production may be worth evaluating. Our objective with this report is to provide a review and update on current research at UNL in this area.

Cow-calf pairs grazing cornstalk residue at the Agricultural Research and Development Center near Mead, NE.

Two feedstuffs that have become more abundant from increased corn production are distillers grains and crop residues. These feeds can be mixed together because the nutritional composition and physical characteristics complement each other. Because co-products are excellent sources of energy, protein and phosphorus, low-quality fibrous roughages can be incorporated instead of higher-quality forages such as alfalfa. Crop residues contain fiber, providing a rumen-fill effect which can reduce grazed forage intake, and wet or modified distillers grains work effectively because the moisture conditions the diet and encourages intake of low-quality forages. Feeding co-products and low-quality forages to replace a portion of the grazed forage intake (allowing for an increase in stocking rate) is one potential alternative to acquiring additional grazing acres.

In research at the Gudmundsen Sandhills Laboratory (2010 Nebraska Beef Cattle Report, p. 19), cows with spring-born calves were assigned to one of three treatments including: 1) stocked at the recommended stocking rate (0.6 AUM/acre) with no supplementation; 2) double stocked (1.2 AUM/acre) and supplemented with 14.6 lbs/pair/d (50% of estimated DMI) of a distillers grains/forage mixture; and 3) double stocked (1.2 AUM/acre) with no supplementation. The supplement was 55% grass hay and 45% wet distillers grains (DM basis). Pairs grazed upland Sandhills range during the summer growing season, and those pairs double stocked and supplemented received the feed at 50% of their daily intake. Pairs that were double stocked and supplemented had greater cow and calf gains than pairs either stocked at the recommended level or double stocked without supplementation. Grazed forage intake was not different across treatments, and each lb of the distillers and hay mixture only replaced 0.22 lbs of grazed forage.

Different mixtures of wet distillers grains and wheat straw were evaluated in the same study the following year. Wheat straw was utilized to provide additional fiber, and therefore fill, as compared to the grass hay the previous year. Wheat straw was

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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 Citizens Advisory Council.

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

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From the Director

Our society faces many challenges today, but some of the most important ones are ways to produce sufficient food for our growing population while protecting the environment, preserving species diversity and further developing rural areas. Management of these topics for the benefit of our society involves tradeoffs, especially as they pertain to agricultural production practices and other important land uses.

As scientists, we are prone to study and analyze individual parts of a system rather than looking at the entire system and determining how all the components fit and function together as one unit. However, evidence indicates that the trend is now changing in research and extension programs to a more holistic approach through increased multidisciplinary and team efforts. Many factors are driving change in our grassland systems today, and some are more prominent than others. Among the subjects causing change are economics, farm and energy policies, climatic change, zoning and social concerns.

Farming with grass can be viewed as a more inclusive practice since it provides benefits to the environment, financial rewards for commodity producers, and meets social interests. To most individuals, grassland agriculture is viewed as being environmentally friendly. Grasslands and livestock have been part of agriculture for thousands of years, and we have begun to realize the symbiotic relationship and the important role they play in our food chain and in feeding our increasing population. Ruminant animals have the unique capability of turning grasses and other forages into high quality protein food for humans, where those products would not normally contribute to the food system otherwise. Approximately half of the world's land surface area is covered by grasslands, and they provide a large percentage of the nutrients for ruminant animals that convert these plants into human food.

Grasslands overall are increasingly expected to provide many positive outcomes beyond the traditional production of food, feed and fiber. Some of the non-marketable benefits that come with grasslands are reduction of wind and water erosion of soil, serving as filter strips that slow down and/or reduce fertilizer and herbicide movement into streams, improvement of water quality, increase carbon sequestration and storage in the soil, mitigation of greenhouse gases, and providing wildlife habitat and recreational areas. The Conservation Reserve Program (CRP), administered by the Natural Resources Conservation Service of the U.S. Department of Agriculture, has had a significant and positive influence on establishing, stabilizing and improving American grasslands.

Much of the United States farm policy focuses on row crop production, yet over half of the agricultural land is in grasses and grasslands, and the receipts from animal agriculture are greater than those from crop sales. Grasslands and cattle production are dependent on each other, and we need to treat them collectively as an integral component of the food production system. Also, worldwide research investment for grassland agriculture has lagged well behind the research invested in commodity crops. Even so, significant progress has been made in the improvement of grasses and in management of grasslands for forage production, conservation of soils and other multiple uses. Vast grassland areas in the United States, and especially in the Great Plains region, have and are providing numerous positive ecosystem services.

M. A. Massengale

Alternative Cow-Calf Management Systems *(continued from page 1)*

mixed with wet distillers grains at three different levels including 50:50, 40:60, and 30:70 wet distillers:wheat straw (DM basis). Treatments included: 1) the recommended stocking rate (0.6 AUM/acre) with no supplementation; 2) supplemented with a 50:50 wet distillers:straw mixture; 3) supplemented with a 40:60 wet distillers:straw mixture; and 4) supplemented with a 30:70 wet distillers:straw mixture. All supplemented pairs were double stocked (1.2 AUM/acre) and fed 12.6 lbs/pair/d (50% of estimated DMI) during the summer. Cow ADG was greatest for pairs supplemented with the 50:50 wet distillers:straw mixture, and all supplemented groups had greater cow ADG compared to those at the recommended stocking rate. Calf performance was not different among treatments. Grazed forage intake was reduced for all supplemented groups compared to nonsupplemented pairs. Cattle fed the 30:70 wet distillers:wheat straw mixture had the lowest grazed forage intake, suggesting the added fiber limited intake. Supplementation of this feed nearly replaced grazed forage intake on a 1:1 basis, suggesting low-quality forages are necessary for realizing successful grazed forage replacement.

Supplementing to replace forage intake on smooth bromegrass pastures was studied recently at the Agricultural Research and Development Center near Mead, NE (2012 Nebraska Beef Cattle Report, p. 53). Nonpregnant, nonlactating cows were assigned to one of two treatments: 1) stocked at the recommended stocking rate (1.8 ac/cow) with no supplementation; or 2) double stocked (0.9 ac/cow) with supplementation (50% of estimated DMI) to replace grazed forage intake. Supplementation consisted of a 35% synergy (40% wet corn gluten feed and 60% modified distillers grains) and 65% wheat straw mixture (DM basis). Supplementation of the synergy:wheat straw mixture reduced smooth brome intake by approximately 48%. Therefore, a mixture of 30% distillers grains and 70% roughage nearly replaced grazed forage intake on a 1:1 basis, similar to the results observed in year 2 with pairs on Sandhills range.

A similar three-year trial (2015 Nebraska Beef Cattle Report, p. 14) was conducted using cows with spring-born calves at side grazing smooth bromegrass pastures. Pairs were assigned to either a traditional stocking rate without supplementation or double stocked with supplementation. The supplement was designed to replace approximately 50% of grazed forage intake (DM basis). A mixture of 30:70 modified distillers grains:cornstalks (DM basis) was fed. While cow performance was not different, weaning weight tended to be greater for calves from supplemented pairs. The supplement reduced grazed forage intake by 37%, or every lb of supplement replaced about 0.94 lbs of grazed intake.

These data indicate mixtures of low-quality forages and co-products can be supplemented to cattle to replace grazed forage intake, but likely with more success on smooth bromegrass in eastern Nebraska than on upland range in the Sandhills. Replacement of approximately half of the daily forage intake would allow for stocking rate to be doubled. However, it is critical that pastures are not overgrazed and range condition is not negatively impacted. Clearly, the cost of the supplement and delivery to the cowherd must be less than the grass it is replacing.

Another alternative to reduce the land base needed for cow-calf production would be total or partial intensive management (confinement). Data from our research group suggest that wet distillers grains and cornstalks or wheat straw can be used in limit-fed diets for both nongestating (2009 Nebraska Beef Cattle Report, p. 11) and pregnant (2012 Nebraska Beef Cattle Report, p. 13) cows. Recent data (2015 Nebraska Beef Cattle Report, p. 16) demonstrate adequate cow and calf performance and pregnancy rates can be obtained when summer-calving pairs are limit-fed high-energy diets throughout the breeding season and until 205 day weaning. While maintaining a cowherd in year-round total intensive management may be feasible in instances of low feed prices, incorporating fall/winter cornstalk grazing as part of the system appears more logical and economical (2015 Nebraska Beef Cattle Report, p. 19). We are currently evaluating a partial-intensive management system that utilizes summer drylot feeding with winter cornstalk grazing, and preliminary data suggest cow-calf performance may be adequate while the length of the cornstalk grazing period will be variable. This type of system may be practical for Nebraska producers with limited forage for summer grazing, but have access to co-products and cornstalk residue.

Editor's Notes: Warner is a graduate student and Klopfenstein is professor emeritus in the Department of Animal Science. The Beef Reports referenced in this article are available online at beef.unl.edu/reports.

What the Walls Tell Us

by John Carter, Nebraska State Historical Society

In the spring of 2012 a derelict sod house became the focus of an interdisciplinary team from the Nebraska State Historical Society, the University of Nebraska, Homestead National Monument, and the Custer County Historical Society. Though this roofless and overgrown structure was well beyond preservation, its walls held a trove of information about sod construction, life in a sod house, and the very soil itself, the stuff from which the sod came.

The story begins with Larry and Karla Estes, whose ranch sits in the northeastern corner of Custer County. Earlier their place was owned by H. Eugene and Berna Hunter Chrisman, who began construction of the house in 1902 and completed it in 1903.

Over the course of 110 years the house had been well used. The sods for the new house were cut and laid by Eugene with the help of the hired men. When finished, the dwelling was considered the headquarters for Chrisman's operations, which he called Edom Ranch.

The house was occupied through the early 1940s and then later used as a chicken coop. Over the years the roof disintegrated and the walls slowly eroded. The structure was an eyesore sitting in plain view of the Estes' home, so Larry and Karla decided it had to go. A friend suggested that the ruin might still possess some historical value, and contacted archaeologists at the Nebraska State Historical Society.

The archeologists did a survey of the property, and then shared what they found with me and my colleague, architectural historian David Murphy. Clearly there was nothing to save, but there was a lot to learn.

Murphy and I have a deep interest in sod houses, not only as structures but as a part of the environment. Clearly these are structures that are both *on* the land and *of* the land.

I had earlier talked with Chuck Butterfield, a range management specialist at Chadron State College, about what we might find in the sod itself. Clearly we could profile the flora that made up the sod, but we could also look at the dirt itself to see what stories it had to tell. Butterfield suggested that we might want to take a sample of the sod and bring it into the lab for analysis. His idea of a sample proved daunting. He wanted to cut out a four-by-eight-foot section of a wall, sandwich it between two pieces of sturdy plywood, and transport the whole thing to a lab for analysis.

Before this project could go much further, Dr. Butterfield took a new job in Wyoming, leaving us without a scientist. That is when I met Dave Wedin, an ecosystem specialist in the School of Natural Resources at the University of Nebraska. Dr. Wedin arranged for a place to store the sample and gathered other specialists to help with analysis. The University's Center for Grassland Studies provided funds for an undergraduate intern, Nicole Taylor, to work on the project.

So now the only problem was to harvest a big slab of sod and get it to Lincoln. That task was well out of my bailiwick but not, as it turns out, the folks in Custer County. Larry and the Custer County Historical Society gathered some eager volunteers who cut the sod loose with a hay saw, wrapped it in stretch wrap, bolted it between two pieces of rugged plywood, and gently laid it on a palate. They made it look easy. That chunk of sod weighed more than a ton!

Kevin "Kooch" Dauel of Ansley, a representative of Vermeer High Plains, provided a truck and trailer and set off for Lincoln. There the folks at Vermeer provided a warehouse while space at the University was made ready. They then hauled it to East Campus, where skillful University staff gently unloaded it. Now it was time to take a look at what we had.

University of Nebraska anthropologist LuAnn Wandschneider joined the team. Dr. Wandschneider had been studying sod houses and settlement, and brought with her not only her experience and research skills, but a handful of graduate students as well.

Blake Bell, a historian with Homestead National Monument, rounded out the lineup.

View of the Chrisman-Estes sod house slab being researched at UNL. Each sod brick was numbered and samples passed out to the various scholars to take back to their respective labs for analysis.

Century-old roots washed from sod samples. Roots were suspended in water, scanned, and analyzed digitally for size and length.

The team met regularly to slowly and methodically take the wall apart, brick by brick, from bottom to top. Each brick was numbered and samples passed out to the various scholars to take back to their respective labs for analysis.

David Murphy kept track of how the sod bricks were laid up, and from that produced a three dimensional drawing of the wall, showing its structure in detail. This revealed a complicated pattern that made for a durable wall, one that lasted more than a century.

He also weighed the bricks and found that the typical brick weighed about 44 pounds. Take that times the hundreds and hundreds of bricks in the structure and you get a pretty good idea of how much backbreaking work was needed to build it.

Dr. Wandschneider and her intern, Nicole, looked at what was in the sod and there found what you might expect: corn cobs stuffed to fill holes, scraps of newspaper, nails, and the like. Nicole used a screen to wash over a thousand pounds of soil from the sod. She found a bit of ceramic, but not ceramics made by Euro Americans, but rather by the Pawnee, probably between 2000BCE and 900CE. What we didn't expect was a bullet. She sent photographs of it to Dr. Douglas Scott, a forensic archaeologist. From the land and groove marks, Dr. Scott determined that the bullet was fired by either a Henry rifle or a .44-40 Winchester rifle. The knurling in the cannelure came into use around 1875, continuing into the early 1900s. Thus, the bullet was fired sometime between 1875 and the early 1900s. Because the bullet is not deformed, it likely never found its intended target.

From Dr. Wedin we learned that the sod house soil is derived from wind-blown silt, specifically Peoria Loess deposited between 25,000 and 14,000 years ago. Analyses of sod soil samples indicate homogenous texture averaging 58 percent silt, 29 percent sand, and 13 percent clay. This is consistent with soil maps for the site (NRCS Soil Survey) that show Hobbs silt loam soils in the flatter and more productive sites within a half mile of the house.

Wedin and Nicole were also able to wash roots out of the sod blocks, digitize, and analyze them. The average root mass in the 100+ year-old sod samples was 700 g/m2. This is comparable to estimates made in the mid-1900s by famous Nebraska ecologist John Weaver. He estimated that big bluestem-dominated prairie on loess soils would contain 660 g/m2 of roots in a layer as thick as our sod. Think about that – there are as many roots in the 100-year-old sod blocks as you would find in the top four inches of a living, intact prairie. That means that either the sod house builders picked locations that had higher than average roots and some have decomposed; or, there has been essentially no decomposition of roots in the sod blocks after a century! These dense fine roots gave the sod integrity in the native prairie, and still give the sod blocks integrity a century later.

The team continues to work with the sod to see what more can be found. Importantly, a substantial amount of the sod has been set aside, archived so that future scholars, with techniques more advanced that those now available, can do their own analysis. This project is a great example of what can happen when government agencies work together. We all learn more about this incredible state, both the place and its people.

Source: Reprinted with permission from April/May 2015 *Nebraska Cattleman* magazine. It was edited by David Wedin for the purpose of this newsletter.

Shaw Family Receives 2015 Leopold Conservation Award

Nestled in the heart of Nebraska's Rainwater Basin is Shaw Family Farms, a fifth generation row-crop and cattle ranch owned and managed by Steve and Vicki Shaw and their son and daughter-in-law Brian and Julie Shaw. The Shaw's belief is that they have been successful "not just because of hard work, but also because of the land ethic passed down from the first generation."

The Rainwater Basin is 99% privately owned and primarily cultivated for row-crop production. For most landowners in this area, the opportunity for land expansion is remote. This led the Shaws to partner with the Nebraska Game and Parks Commission and the U.S. Fish and Wildlife Service, so they could graze public lands. These relationships taught the Shaws about the benefits of wildlife management, and in turn, they had the opportunity to teach their partners about farm management. Steve and Brian are keen to share experiences about working with public land managers and how those relationships can benefit landowners and the environment.

As the Shaws began grazing public lands, they saw opportunity in integrating wetlands and grasslands into their farm, and decided to purchase a restored wetland and grassland tract. Although the USFWS holds an easement on the property, the Shaws can freely graze the tract while also providing an invaluable migration path for the estimated 8.6 million waterfowl and 300,000 shorebirds that rely on the landscape.

The success of grazing wetlands led them to restore wetlands and transition parts of their land to irrigated grassland. To maximize production potential they developed pivot irrigation systems and planted diverse mixes of grass and forb species that provide a reliable source of forage. They have also diversified their herds so that they can graze wetlands and grasslands at different times depending on the dietary needs of each herd.

The Shaws also developed a comprehensive nutrient

'Tis the Time for Tours

Late spring/early summer is a great time for touring activities involving grasslands… or so we thought. On May 19, 2015, several Center for Grassland Studies Citizens Advisory Council members as well as Center Associates gathered for a tour in south central Nebraska. Mother Nature must have been too busy to notice that the first day of spring was just around the corner, because it was cold, wet and windy. But that didn't deter many who simply donned their warm coats, boots, gloves and rain gear to join us for a very informative day.

We started in the clubhouse at Awarii Dunes, just south of Kearney, where we heard from its golf course superintendent, Brent Racer, about the development of this relatively new club and some of the course management issues he has been dealing with. He was followed by UNL turf specialist, Bill Kreuser, who has worked with Racer on some of those course problems. Then it was onto the golf carts for a short (due to the weather) tour of the greens.

The next stop was the Hinz Tract of land about four miles southwest of Minden. Andy Bishop with the U.S. Fish and Wildlife Service and Tim Horst with Ducks Unlimited discussed this area that is managed by the Rainwater Basin Joint Venture partnership for the mutually beneficial goals of wildlife habitat and livestock grazing. The site remains in private ownership, and the grazing on this working ranch promotes the desired habitat for priority species including whooping cranes.

Over lunch at the Minden Country Club, Richard Beechner (Beech) provided a brief history of the club's golf course and how it is managed. Then, since we were thwarted in our attempts to visit the Choquette ranch, as the rain had made access to the ranch difficult, owner Jim Choquette talked during lunch about how he manages his 2,000 acres. Over the years he has worked to improve soil health and restore the grasslands that support his Angus and Angus-cross herd in a rotational grazing system.

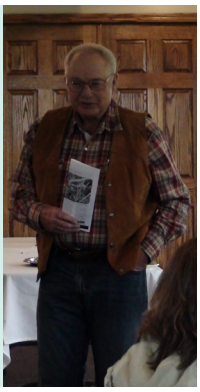
With full stomachs and warmed-up bodies, we headed back outdoors for a stop at the Sacramento-Wilcox Wildlife Management Area just west of Wilcox. Bob Meduna and Gerry Steinauer with the Nebraska Game and Parks Commission explained the development of "Sac" and how its water, trees, shrubs and grasses are managed to provide a wealth of cover diversity for a wide variety of birds.

The final stop of the day was the Funk Waterfowl Production Area, the largest WPA within the Rainwater Basin. What we observed was from our vehicles as we made our way to the headquarters where Mike Assenmacher and Damon Taylor with the U.S. Fish and Wildlife Service described the management objectives and methods for this area, which is known nationally for its abundance of birds during the spring migration and the occasional occurrence of whooping cranes. In the relative warmth and dryness of the HQ building, they explained how the wetland, which extends about three miles in length, is dissected by roads and dikes, forming smaller management units. Three separate pumping stations deliver water to seven different units. Several years ago the process began of restoring the upland to a high diversity grassland ecosystem with up to 120 species of plants being seeded. As restoration progresses on one area, another portion of the upland is tilled under and prepared for restoration. By 2013, all of the upland areas being cropped were reseeded to high diversity seed mixes. Spring prescribed burning, summer grazing of the wetland, and spring and fall pumping are the common management actions done each year.

Awarii Dunes Golf Course Superintendent, Brent Racer (left), showed the tour group some of the management issues he has had to address during this wetter-than-normal Nebraska spring.

Andy Bishop (left), Coordinator of the Rainwater Basin Joint Venture, and Tim Horst (right) with Ducks Unlimited, described some of the management strategies employed on the Hinz Tract within the Rainwater Basin Wetland Complex that has led to improved wildlife habitat and increased forage resources for livestock grazing.

With the aid of a large map on top of a pick-up, Mike Assenmacher and Damon Taylor with the U.S. Fish and Wildlife Service described the management methods, results to date and future objectives of the Funk Waterfowl Production Area.



Road conditions to Jim Choquette's ranch prevented us from touring his place, so he talked to the group at lunch about how he has changed management methods over the decades to improve soil quality and increase grass diversity.

After returning from the cold and wet field at the Sacramento-Wilcox Wildlife Management Area, the group listened to and asked questions of Gerry Steinauer (left) and Bob Meduna (right) with the Nebraska Game and Parks Commission as Center for Grassland Studies Director, Martin Massengale, moderated the discussion.

August 1 is Pre-registration Deadline for Nebraska Grazing Conference

The deadline is fast approaching to pre-register for the 15th annual Nebraska Grazing Conference to be held in Kearney on Aug. 11-12. To receive the pre-registration rate of $80 for the two days (including lunches and banquet), registrations must be completed online (or check postmarked by) Aug. 1. Otherwise, the walk-in fee of $95 applies. One-day registrations and student rates are available.

See details of the upcoming event and register at the conference website, nebraskagrazingconference.unl.edu. Contact the Center for Grassland Studies with questions.

In addition to listening to great speakers, participants of the annual Nebraska Grazing Conference always enjoy browsing the exhibit area to visit with vendors and learn about products, services and organizations related to the grazing industry.

Tuesday, August 11

9:00	Registration opens (refreshments in exhibit area)
10:00	Opening remarks, Greg Ibach, Director, Nebraska Department of Agriculture
10:30	Poisonous native range plants, Richard Knight, Tucson, AZ (formerly with Colorado State U.)
11:30	Management practices of 2014 Leopold Conservation Award winner: Pelster Family, Duane Pelster, Ericson, NE
12:00	Lunch
1:00	Influencing livestock grazing distribution, Mitch Stephenson, UNL, Scottsbluff, NE
1:45	Ecosystem benefits from fire and future consequences of not burning, Dirac Twidwell, UNL, Lincoln, NE
2:30	Break (refreshments in exhibit area)
3:00	Grassland response to prescribed burns, Russ Bloom, Scotia, NE, Michael Clarke, Berwyn, NE and Scott Stout, Curtis, NE
4:00	Into the future: Wyoming grazing from a startup perspective, Sage Askin, Riverton, WY
5:00	Social in exhibit area
6:30	Banquet with speaker, R.P. Smith, Broken Bow, NE

Wednesday, August 12

8:00	Registration opens (refreshments in exhibit area)
8:30	Incorporating annual forages into crop-forage-livestock systems, Daren Redfearn, UNL, Lincoln, NE
9:15	Controlling risk in grazing-based production systems, Jay Parsons, UNL, Lincoln, NE
10:00	Break (refreshments in exhibit area)
10:30	Using annual forage/cover crops, Nancy Peterson, Gordon, NE & Jerry Glaser, Spalding, NE
11:15	Livestock poisoning associated with cultivated crops, Richard Knight, Tucson, AZ (formerly with Colorado State U.)
12:00	Lunch
12:45	Prescribed fire effects and benefits for cattle, Derek Scasta, University of Wyoming, Laramie, WY
1:30	Reducing fly populations on pastured cattle, David Boxler, UNL, North Platte, NE
2:15	Closing comments and adjourn

Shaw Family Receives 2015 Leopold Conservation Award *(continued from page 5)*

management plan that includes conservation plans for 2,200 crop acres, establishment of grassland filter strips, pest management and conservation tillage. The farming and irrigation management practices the Shaws have implemented have allowed them to improve soil quality, decrease irrigation inputs, improve management of manure, and reduce fertilizer and soil additives.

"Steve, Brian, and their families are hard workers, honest, humble, always willing to give back, continually learning, and desirous of being good stewards of the land" wrote Jenny Rees, UNL Extension Educator, in her nomination letter. "They are very humble and lead by example through their character."

Source: Reprinted with permission from http://leopoldconservationaward.org/participating-states/nebraska/

Shaw Family Farms received the Nebraska 2015 Leopold Conservation Award. Pictured are Steve (left) and Brian Shaw.

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Scholar Co-authors Science Study Quantifying Ecosystem Loss

A University of Nebraska–Lincoln rangeland ecologist is among the co-authors of a study published in *Science* that has quantified land use change and the reduction of ecosystem and cropland productivity stemming from large-scale expansion of oil and gas development.

Dirac Twidwell, an assistant professor in UNL's Department of Agronomy and Horticulture, is among the authors of the paper, which was published April 23 in the journal.

The research concludes that oil and hydraulic fracturing operations have contributed to significant vegetation loss across broad swaths of central North America. The increasing footprint of such development in the Great Plains, researchers said, also signals what is likely to occur in other regions of the world.

"Land use is changing in the Great Plains, and there is considerable momentum for further conversion of our nation's rangelands to support energy demand," Twidwell said. "Whether we are talking about advances in oil and gas development, wind or biofuels, we should be aware of our growing energy footprint and how it might influence some of our last remaining iconic rangeland ecosystems, like the Nebraska Sandhills."

The research team, led by Brady Allred of the University of Montana, examined all of central North America, from the southern coast of Texas to northern Alberta. By looking at developments on a continental scale, the team found impacts and degradation that were not apparent when focusing more locally. They also noted how their analysis could be incorporated into land use planning and policy to avoid compromising future ecosystem integrity.

The study estimated that from 2000 to 2012, oil and gas development removed large amounts of rangeland vegetation, culminating at a rate-per-year equivalent to more than half of the annual grazing available on U.S. public lands. Vegetation removed from this development on croplands is equivalent to 120.2 million bushels of wheat, about 13 percent of all wheat exported by the United States in 2013.

In addition, the researchers said, nearly half of drilled wells are in extreme or high water stress regions. High-volume hydraulic fracturing uses two to 13 million gallons of water per well, which intensifies competition for water among agriculture, aquatic ecosystems and municipalities.

"This research adds to increasing calls for a better understanding, and awareness of, the potential trade-offs of regional-scale energy growth to other needs in a global society, like environmental and food security," said Twidwell. "Rangeland ecology students have a real opportunity to step into the workforce, work with the energy industry, and provide leadership in landscape planning and restoration."

The authors assessed the lost ecosystem resources by analyzing high-resolution satellite measurements of vegetation growth.

In addition to Allred and Twidwell, co-authors include W. Kolby Smith from the Institute on the Environment at the University of Minnesota; Julia Haggerty from Montana State University; Steve Running and Dave Naugle from the University of Montana; and Samuel Fuhlendorf from Oklahoma State University.

Source: Article by Haley Steinkuhler, Institute of Agriculture and Natural Resources, appeared in UNL Today, 4/23/2015, http://news.unl.edu/newsrooms/unltoday/article/scholar-co-authors-science-study-quantifying-ecosystem-loss/