Proceedings
of the 2012 Nebraska
Grazing Conference

August 14-15
Holiday Inn
Kearney, Nebraska

Program

Tuesday

Moderator: Kristen Eggerling,
Martell, NE

9:00 Registration (browse exhibit area, refreshments)

10:00 Welcome and announcements

10:10 **Opening remarks**, Brent Plugge, University of Nebraska-Lincoln, Kearney, NE

10:30 **Managing for ecosystem services and livestock production: Are there tradeoffs?** Justin Derner, USDA-ARS High Plains Grasslands Research Station, Cheyenne, WY

11:10 **Managing for biodiversity and livestock: Fire and grazing**, Sandy Smart, South Dakota State University, Brookings, SD

11:50 Lunch

12:45 **Management practices of 2011 Leopold Conservation Award winner**, Beau Mathewson, Potter, NE

1:15 **Federal and state endangered species on ranches: Cost-share programs**, Mike George, USFWS-Ecological Services, Grand Island, NE

2:00 Break

2:30 Concurrent sessions:
A) **Winter grazing** – Terry Klopfenstein, UNL, Lincoln; Nancy Peterson, Gordon; Al Svajgr, Cozad
B) **Decision making using monitoring** – Chad Buell, Bassett; Rod Christen, Steinauer; Bill Vodehnal, Nebraska Game and Parks Commission, Bassett

4:00 Reconvene

4:15 **Training livestock to eat weeds**, Kathy Voth, Livestock for Landscapes, LLC, Loveland, CO

5:30 Social with cash bar

6:15 Banquet speaker: Walter Schacht, UNL, Lincoln, **Grazers of Namibia, Southern Africa**

7:30 **Weed training workshop**, Kathy Voth

9:00 Adjourn

Wednesday

Moderator: Ron Bolze
Nebraska Grazing Lands Coalition

8:00 Coffee available in exhibit area

8:30 **Managing drought risk on the ranch: Introduction & climate outlook**, Cody Knutson, NDMC, UNL, Lincoln

9:00 **Step by step drought planning**, Pat Reece, Prairie & Montane Enterprises, Gering

9:30 **Livestock/feeding considerations in drought risk management**, Rick Rasby, UNL, Lincoln

10:00 Break

10:30 **Financial considerations in drought risk management**, Matt Stockton, UNL, North Platte

11:00 **RMA options: Pasture, rangeland and forage insurance**, Amy Roeder, USDA-Risk Management Agency, Humboldt, KS

11:30 **Producer reality check: Lessons learned in drought planning for established and beginning ranchers**, Ted Alexander, Sun City, KS

12:00 Lunch

1:00 **Evaluating grazing system options**, Harry Merrihew, Ashby; Lynn Myers, Lewellen; John Ravenscroft, Nenzel

2:30 Wrap-up, evaluations and adjourn

We hope to see you again next year,

August 13-14, 2013

nebraskagrazingconference.unl.edu

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Edited by Pam Murray, Coordinator, Center for Grassland Studies,
Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

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Writing a Drought Plan: Producer Reality Check

Ted Alexander, Sun City, KS

These next years will be very difficult for us in agriculture.

Economical

Financial

Environmental

As the climate shift continues, the tactical application of the strategic plan will enable the agricultural producer to adapt.

A drought plan is a strategic plan for adapting to climate shift as it is occurring.

Tactical application of the plan for either a drought or wildfire is the same.

- Drought -- forage doesn't grow because of lack of rain.
- Wildfire -- burns the forage.
- If both happen at the same time -- perfect storm!

Having a strategic plan will enable the producer to adjust the operation to lessen the negative financial and economic impacts.

A strategic plan will benefit the ecosystem goods and services that the producer provides:

- Water quality
- Water quantity
- Air quality
- Succession to the next generation of the family operation
- Economic benefit to the communities

Monitoring by the Numbers

Chad Buell, Shovel Dot Ranch, Bassett, NE

What is the biggest resource most of us have on our farms and ranches? The answer for most of us is our land. To be profitable and sustainable, we have to manage it well. Monitoring is a big part of managing the land. Before I go into how we monitor, here is a little information about our ranch.

Shovel Dot Ranch is located 35 miles south of Bassett, Nebraska. We have a cow-calf, backgrounding and yearling operation, along with hay and crop production. Our heifers start calving at the beginning of April and our cows start April 20th. We usually wean in early October and graze our calves on meadow regrowth until November 1st. We then background our calves along with some purchased steer calves until they go back to grass in early May. They are then sold off grass weighing 900 to 950 pounds. Our cows are grazed on winter range with a protein supplement until April 1st. Then they are hayed until they go back on grass also in early May.

We keep a lot of records for our cattle, but perhaps nothing is more important to the continued health of our business than the monitoring practices we use for our pastures, and then using the information we have gathered to make the necessary changes.

In the early years, monitoring was accomplished visually; assessments were made to promote the philosophy of harvesting forages in a way that promoted long-term sustainability, and then adjustments were made accordingly. In those early years, no records were kept.

Monitoring practices became more exact and effective with the introduction of record keeping several decades ago. In the 1980s, with guidance from U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) representatives, Shovel Dot Ranch instituted picture sites and began recording usage on an animal unit months (AUM) basis.

Range management practices also improved greatly in the 1980s when family members attended Holistic Resource Management (HRM) schools, worked with grazing consultants, and joined the Society for Range Management, all of which increased my family's knowledge and understanding of forage management and monitoring.

Through those years many advancement in forage production were incorporated, but in the early 1990s we made a change that turned out to have a long-term positive effect on our operation: the incorporation of a computer-based information-gathering system. At the time, we were looking for a better way to determine what effect we were having on the land with our grazing practices.

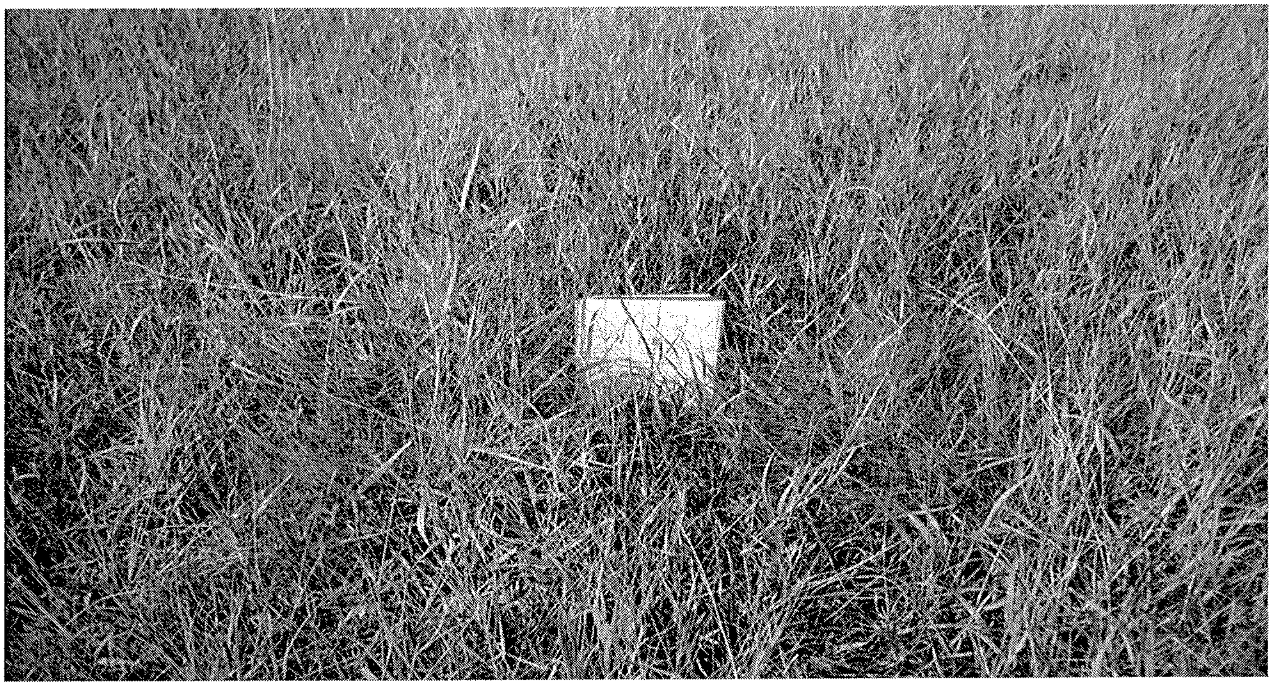
With the help of Dr. Terry DeGroff, a veterinarian and management information systems expert, we began using a DOS computer program developed at Texas A&M University called The Grazing Manager (TGM) to orchestrate grazing plans. Data on pasture sizes, carrying capacity using demand days, forage growth curves, rainfall, etc., were entered, as well as data about the various cattle groups such as numbers, weight, stage of lactation, etc. Using analysis from these data, a grazing plan was developed. During the first three years, the pasture input numbers, carrying capacity and growth curves were adjusted to the point that we felt we had those critical inputs correct. Since then, we have not changed that information, knowing that changes in grass that could be harvested, either up or down, were due to our forage harvesting techniques. This was and is a good way to monitor what effect our grazing management strategies are having. Since then, TGM was updated to a windows program, and then updated again by a company in Iowa, the latest version of which came out in 2008.

Along with the long-term monitoring of pasture conditions, we also use TGM for our grazing planning and record keeping on a yearly basis. We set up a grazing plan in the winter. Then as we go through our pasture rotations, we observe what the grass is actually doing versus what the program says we should have. Expected growth curves are plotted versus actual use for each pasture. We can also change the growth curves for the grass if we are seeing a good or poor growing year. Then we can change the plan for the rest of the year to project if there is a need for more forage or reducing herd size so that available forage can be stretched out. Having the information we gather through monitoring put into a format that is easy to work with helps us make changes early when those changes can have the most effect.

This year I changed the growth curve in TGM to fit the dry conditions. Then I changed the original plan using different scenarios. I could see what would happen with the grass if we sold yearlings early, weaned early, or reduced herd size. Because of what we learned from this information, we sold all our yearlings by early August, we are going to wean in early September instead of early October, and we plan to sell our older cows. We will also be sending cows to cornstalks, and we have been locking in feed needs.

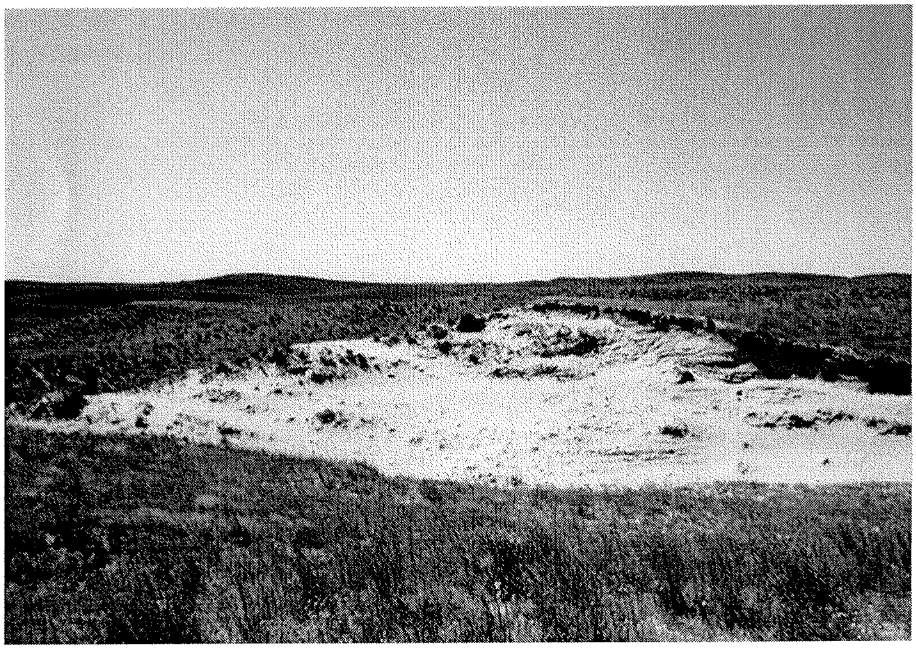
In the last couple of years, we added to our monitoring system by working with the NRCS in its Conservation Stewardship Program. One part of this program focuses on monitoring. We set up picture points in pastures to monitor plant composition along with plant height, density, etc., over time in order to measure the effect of grazing practices. We took GPS coordinates for these sites so we will be able to return to these exact sites year after year.

The following are site pictures taken in September 2011.



These are examples of site pictures taken in 1991 versus the same site in 2011.

1991



2011

1991

2011

These pictures show what our grazing practices have done for us over the last 20 years. We have made changes in grazing time, the amount of rest pastures are given, and the intensity of our pasture rotations. We are always trying new things. Last year with one of our rotations we started grazing each pasture one time during the growing season in hopes that the rest would be beneficial to the grass and that the pastures grazed early in the rotation would work well for winter grazing. The information we have gathered along the way and that we continue to gather has let us know what effect each change has had. The practices and management system we are using now put the information in a format that allows us to make decisions in a timely fashion. Together these have been invaluable to our grazing and conservation practices.

Our ranch has always looked to continually improve on what we do. How we monitor is no exception. TGM is a great tool for us, but as new technology is developed, we will always look to see if there is a better way. In the end, the key is to monitor so that you can measure how you are affecting your grasslands, not just eyeballing them, and them make the necessary changes.

Decision Making Using Monitoring

Rod Christen, Steinauer, NE

Ten Key Points of Monitoring

1) Invasives
   a. Clearing
   b. Spraying

2) Timing/Plant Growth Stage
   a. Solar panel (credit to Jim Gerrish)
   b. Don't graze immature plants (credit to Greg Judy)

3) Growing Season Grazing – Using Monitoring to Manipulate Desired Production & Timing
   a. Early Spring
   b. Summer
   c. Fall

4) Dormant Grazing
   a. Easier to manage grass (credit to Jim Gerrish)
   b. Feeding areas
   c. Animal impact

5) Hay Production
   a. Monitoring for best usage depending on weather
   b. Winter graze on regrowth with hay supplement

6) Deferred Grazing
   a. Rest & rebuild root system
   b. Fuel to burn

7) Controlled Burn
   a. Cedar tree control
   b. If Sericea Lespedeza Present Follow-up With Chemical Control

8) Calving Acres
   a. Allow enough cover for calving
   b. Emergency grazing area

9) CSP – NRCS
   a. Photo Point – discussion of required monitoring

10) Wildlife/Hunting
    a. Family recreation
    b. Alternative source of income

Conclusion – My Traditional Baseline for Grazing in southeast Nebraska:
    a. On average, figure 4½-5 acres per cow/calf pair for 5½-6 months
    b. On average, prairie hay production is 1-3 bales/acre (averaging 1600# bales)
    c. Discussion of make-up of herd

Managing for Ecosystem Services and Livestock Production: Are There Tradeoffs?

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Introduction

Most all grazing lands have traditionally been managed to provide food and fiber through management practices to achieve sustainable forage and livestock production (Dunn et al. 2010). Yet, society is desiring that these lands also be managed for multiple ecosystem services (defined as provisioning, regulating, cultural and supporting services, Millennium Ecosystem Assessment 2003; Havstad et al. 2007; Toombs et al. 2010), although valuation remains problematic (Farber et al. 2002; Swinton et al. 2007; review by Gomez-Baggethun et al. 2010). Determining tradeoffs associated with changing management from principally a forage and livestock production-centric basis to blending of production and conservation outcomes remains an open frontier (Figure 1). Compounding the uncertainty with determination of tradeoffs is the reality that provision of multiple ecosystem services from grazing lands involves applying management practices on often complex landscapes (Boyd and Svejcar 2009).

Achieving both livestock production and provision of ecosystem services is difficult to balance (Figure 2) when equal weight is given to all possible ecosystem services as there is a need to increase livestock production to feed an ever-expanding world population along with societal desires to provide a diverse suite of ecosystem services (wildlife habitat, greenhouse gas mitigation, lifestyle, water quality and quantity, soil health, carbon sequestration and storage, Havstad et al. 2007). Fundamental to this discussion is the stark reality that livestock production is driven by a developed economic market system whereas markets have yet to emerge for ecosystem services, and therefore the benefits of providing these services have yet to be monetized. Moreover, livestock managers realize that there are possible current economic costs to them by using livestock as ecosystem engineers (Derner et al. 2009) to provide ecosystem services through potential lower livestock weight gains (Figure 3), but that these costs may be lessened or even overcome through the valuation of ecosystem services (Figure 4). Without incentives that compensate for this lost income, or developed markets for ecosystem services on which decisions could be made to modify management to emphasize additional outcomes that have economic rewards, this issue will remain problematic for land managers.

Here, I will address managing grazing lands for multiple ecosystem services within the context of livestock production goals. I will discuss the tradeoffs associated between beef production and 1) provision of habitat for wildlife (e.g., grassland birds and black-tailed prairie dogs (*Cynomys ludovicianus*)), and 2) greenhouse gas mitigation.

Tradeoffs between livestock production and provision of habitat for wildlife

Restoring historic disturbance regimes to enhance habitat for grassland birds and other declining wildlife (Thompson et al. 2008; Augustine 2011) may conflict with livestock production goals. Unlike the widespread use of fire to manage mesic grazing lands (Fuhlendorf and Engle 2004; Govender et al. 2006), fire use is controversial in semiarid grazing lands. For example, prescribed fires can create suitable habitat for the grassland bird Mountain Plover (*Charadrius montanus*), a species of concern in the western Great Plains (Augustine 2011; Augustine and Derner 2012); yet a tradeoff may exist for livestock production if prescribed burning results in lowered livestock gains in these semiarid grazing lands. Recent studies in shortgrass steppe have demonstrated that prescribed burns can be used to manage wildlife habitat without negatively affecting forage availability to cattle (Augustine and Milchunas 2009; Augustine et al. 2010) or livestock weight gains (Derner and Augustine, unpublished data). Implementation of these prescribed burns, however, should occur following average or above-average precipitation years when sufficient fuel loads are present and fire can effectively reduce vegetation structure to desired low levels. In addition, prescribed fires should only be conducted on < 50% of a pasture as an insurance policy to provide residual forage the following spring in case dry conditions reduce forage growth (Augustine and Derner 2012). An important tradeoff for producers and land managers regarding prescribed fire is the cost of implementing burns. Programs to transfer fire management knowledge and capacity from mesic to semiarid grazing lands could assist in reducing such costs.

Like fire, burrowing rodents were historic components of most semiarid grazing lands worldwide, but have experienced population declines or eradication due to conflicts with livestock production. Sustaining the role of black-tailed prairie dogs in grazing lands of the Great Plains may be central to conserving habitat for associated wildlife species because their effects are more stable in space and time than are the effects of fires. There is only scant scientific information, however, pertaining to a question of primary concern to livestock producers: to what extent are livestock weight gains affected by the presence and abundance of prairie dogs? The lack of such information has fundamental economic consequences for land managers with grazing lands containing prairie dogs. Prairie dogs may potentially reduce carrying capacity of livestock by (1) consuming forage, (2) clipping plants to increase visibility and enhance predator detection, (3) building soil mounds around their burrow entrances, and (4) changing plant species composition (Detling 2006).

Cattle gained less weight in pastures of semiarid grazing lands with prairie dogs, but the reduction in weight gains was proportionately less than the increase in area colonized by prairie dogs (Derner et al. 2006). For example, relative to pastures without prairie dogs, livestock weight gains decreased by 6% with 20% of the pasture colonized by prairie dogs, and by 14% with 60% of the pasture impacted by prairie dogs (Derner et al. 2006). The 20% level of colonization by prairie dogs reduced the estimated value of livestock weight gain by \$15/steer, whereas the 60% colonization level of prairie dogs reduced the value of livestock weight gain by \$38/steer (Derner et al. 2006). Greater impacts of prairie dogs on livestock weight gains are expected in more productive grazing lands compared to semiarid grazing lands, as prairie dogs graze vegetation to approximately the same height in semiarid and more mesic grazing lands (Guenther and Detling 2003). The development of economic incentives or markets to compensate for livestock production losses associated with prairie dogs may be one means to advance mountain plover habitat conservation on privately owned grazing lands.

Where grazing lands are predominantly managed for livestock production, there is often an economic incentive to use livestock grazing, rather than historic disturbances such as prescribed fire or black tailed prairie dogs, to manage for ecosystem services such as wildlife habitat. For example, livestock could potentially be used as ecosystem engineers (Derner et al. 2009) rather than prescribed fires to create suitable habitat for Mountain Plover, but what are the tradeoffs associated with livestock weight gain? Heavy cattle grazing at twice the recommended stocking rate during spring (March–May) or summer (May–October) for six years did not substitute for prescribed fire or prairie dog grazing in terms of effects on vegetation structure and Mountain Plover habitat (Augustine and Derner 2012). Livestock weight gains with the very heavy cattle grazing were substantially lower on a per head basis compared to those with the traditional grazing practice of moderate stocking (Derner and Augustine, unpublished data). Livestock gains, when expressed on a per acre basis, however, were higher, except in drought years (Derner and Augustine, unpublished data). Thus, both prescribed burning and black-tailed prairie dog grazing appear to be important and complementary means to manage for Mountain Plover breeding habitat in semiarid grazing lands, whereas grazing by livestock alone does not create suitable habitat (Augustine and Derner 2012).

Tradeoffs between livestock production and greenhouse gas mitigation

Grazing lands are increasingly looked upon to serve as cost-effective sinks for mitigating climate variability given their contribution to sequester atmospheric carbon dioxide (CO_2) as soil organic carbon with low to moderate stocking rates (Derner and Schuman 2007). Carbon sequestration also contributes to changes in soil physical, chemical, and biological properties that affect key soil functions, such as nutrient cycling (Janzen 2005).

Though data are limited, inclusive greenhouse gas inventories of grazing management systems provide useful insights regarding potential tradeoffs between mitigation benefits and livestock production. Liebig et al. (2010) evaluated two grazing management systems on grazing lands for their effect on factors contributing to net global warming potential in central North Dakota. The management systems, differing by stocking rate, possessed similar net global warming potential based on assessments of soil organic carbon change, soil-atmosphere methane (CH_4) and nitrous oxide (N_2O) flux, and ruminant CH_4 emissions. However, because of greater beef production on an area basis within the heavily grazed system, greenhouse gas mitigation benefits per unit of livestock weight gain were reduced by over five times compared to a moderately grazed management system. Such results suggest greenhouse gas mitigation by grazing lands will be more effective at lower stocking rates, but at a cost of lower beef production per unit land area.

Conclusions

Grazing lands have traditionally been managed for sustainable forage and livestock production. Tradeoffs exist with managing grazing lands for additional ecosystem services such as wildlife habitat (e.g., grassland birds and black-tailed prairie dogs) and greenhouse gases in the Great Plains of North America (Figure 3). Progress toward reducing economic tradeoffs between livestock production and provision of ecosystem services in grazing lands will require

1) society to acknowledge that there are added costs of managing for multiple ecosystem goods and services, and there is limited capacity of ranching enterprises to financially support these public goals, which are chiefly non-revenue generating, and 2) development of markets for ecosystem services. The latter is needed to assist in the transition from a primary focus of forage and livestock production to a larger portfolio of blended conservation and production goals for ranching enterprises to accomplish "win-win" outcomes (Figure 4).

Literature Cited

Augustine, D.J. 2011. Habitat selection by mountain plovers in shortgrass steppe. *Journal of Wildlife Management* 75(4):721-728.

Augustine, D.J., and J.D. Derner. 2012. Disturbance regimes and mountain plover habitat in shortgrass steppe: large herbivore grazing does not substitute for prairie dog grazing or fire: *Journal of Wildlife Management* 76(4):721-728.

Augustine, D.J., and D.G. Milchunas. 2009. Vegetation responses to prescribed burning of grazed shortgrass steppe. *Rangeland Ecology and Management* 62:89-97.

Augustine, D. J., J. D. Derner, and D. G. Milchunas. 2010. Prescribed fire, grazing, and herbaceous plant production in shortgrass steppe. *Rangeland Ecology and Management* 63:317-323.

Boyd, C.S. and T.J. Svejcar. 2009. Managing complex problems in rangeland ecosystems. *Rangeland Ecology and Management* 62:491-499.

Derner, J.D., and G.E. Schuman. 2007. Carbon sequestration and rangelands: A synthesis of land management and precipitation effects. *Journal of Soil and Water Conservation* 62(2):77-85.

Derner, J.D., J.K. Detling, and M.F. Antolin. 2006. Are livestock gains affected by blacktailed prairie dogs? *Frontiers in Ecology and the Environment* 4:459-464.

Derner, J.D., W.K. Lauenroth, P. Stapp, and D.J. Augustine. 2009. Livestock as ecosystem engineers for grassland bird habitat in the western Great Plains of North America. *Rangeland Ecology and Management* 62:111-118.

Detling J.K. 2006. Do prairie dogs compete with livestock? *In*: J.L. Hoogland (ED.). Conservation of the black-tailed prairie dog. Island Press, Washington, D.C. pp. 65-88.

Dunn, B.H., A.J. Smart, R.N. Gates, P.S. Johnson, M.K. Beutler, M.A. Diersen and L.L. Janssen. 2010. Long-term production and profitability from grazing cattle in the Northern Mixed Grass Prairie. *Rangeland Ecology and Management* 63:233-242.

Farber, S.C., R. Costanza, and M.A. Wilson. 2002. Economic and ecological concepts for valuing ecosystem services. *Ecological Economics* 41:375-392.

Fuhlendorf, S. D., and D. M. Engle. 2004. Application of the fire–grazing interaction to restore a shifting mosaic on tallgrass prairie. *Journal of Applied Ecology* 41:604-614.

Gomez-Baggethun, E., R. de Groot, P.L. Lomas and C. Montes. 2010. The history of ecosystem services in economic theory and practice: from early notions to markets and payment schemes. *Ecological Economics* 69:1209-1218.

Govender, N., W. S. W. Trollope, and B. W. Van Wilgen. 2006. The effect of fire season, fire frequency, rainfall and management on fire intensity in savanna vegetation in South Africa. *Journal of Applied Ecology* 43:748-758.

Guenther, D.A., and J.K. Detling. 2003. Observations of cattle use of prairie dog towns. *Journal of Range Management 56*:410-417.

Havstad, K.M., D.P.C. Peters, R. Skaggs, J. Brown, B. Bestelmeyer, E. Frederickson, J. Herrick, and J. Wright. 2007. Ecological services to and from rangelands of the United States. *Ecological Economics* 64:261-268.

Janzen, H.H. 2005. Soil carbon: A measure of ecosystem response in a changing world? *Canadian Journal of Soil Science* 85:467-480.

Liebig, M.A., J.R. Gross, S.L. Kronberg, R.L. Phillips, and J.D. Hanson. 2010. Grazing management contributions to net global warming potential: A long-term evaluation in the Northern Great Plains. *Journal of Environmental Quality* 39:799-809.

Millennium Ecosystem Assessment. 2003. Ecosystems and Human Well-being, A Framework for Assessment. Island Press.

Swinton, S.M., F. Lupi, G.P. Robertson, and S.K. Hamilton. 2007. Ecosystem services and agriculture: cultivating agricultural ecosystems for diverse benefits. *Ecological Economics* 64:245-252.

Thompson, C.M., D.J. Augustine, and D.M. Mayers. 2008. Swift fox response to prescribed fire in shortgrass steppe. *Western North American Naturalist* 68:251-256.

Toombs, T.P., J.D. Derner, D.J. Augustine, B. Krueger, and S. Gallaher. 2010. Managing for biodiversity and livestock. *Rangelands* 32(3):10-15.

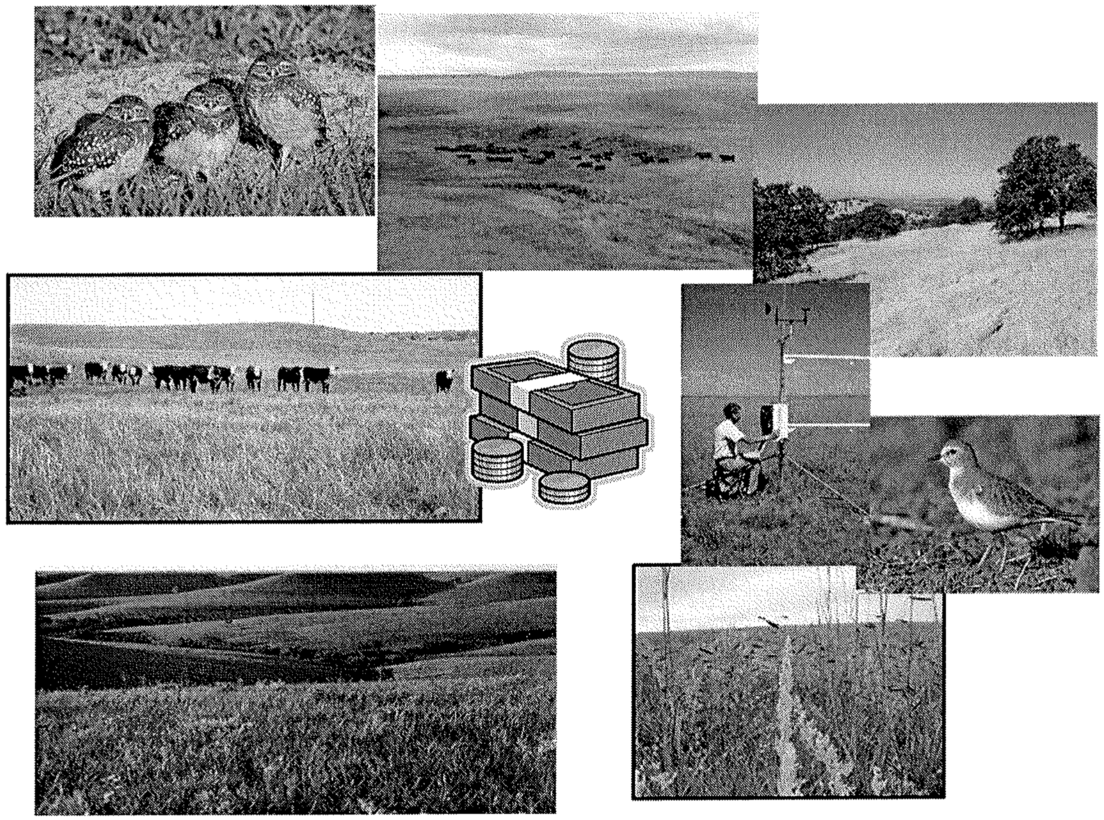


Figure 1. Blending of production and conservation outcomes on grazing lands (from Derner et al. *in review*)

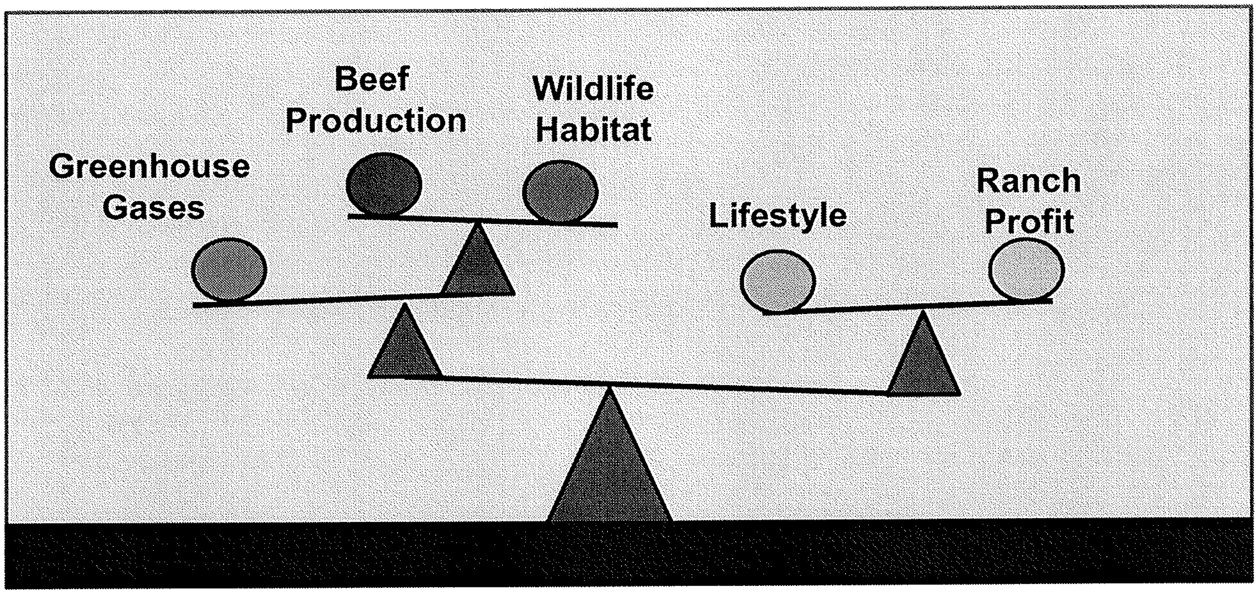


Figure 2. Balancing of ecosystem services and production goals when each is given equal weighting (from Derner et al. *in prep*)

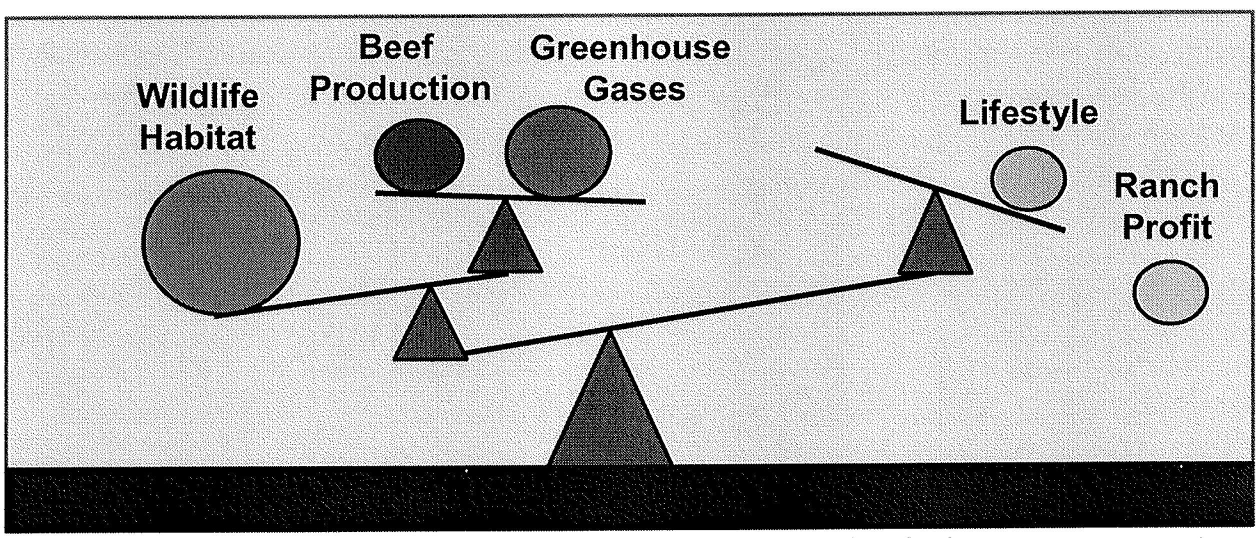


Figure 3. Benefits to one ecosystem service may result in tradeoffs of other ecosystem services and production goals (from Derner et al. *in prep*)

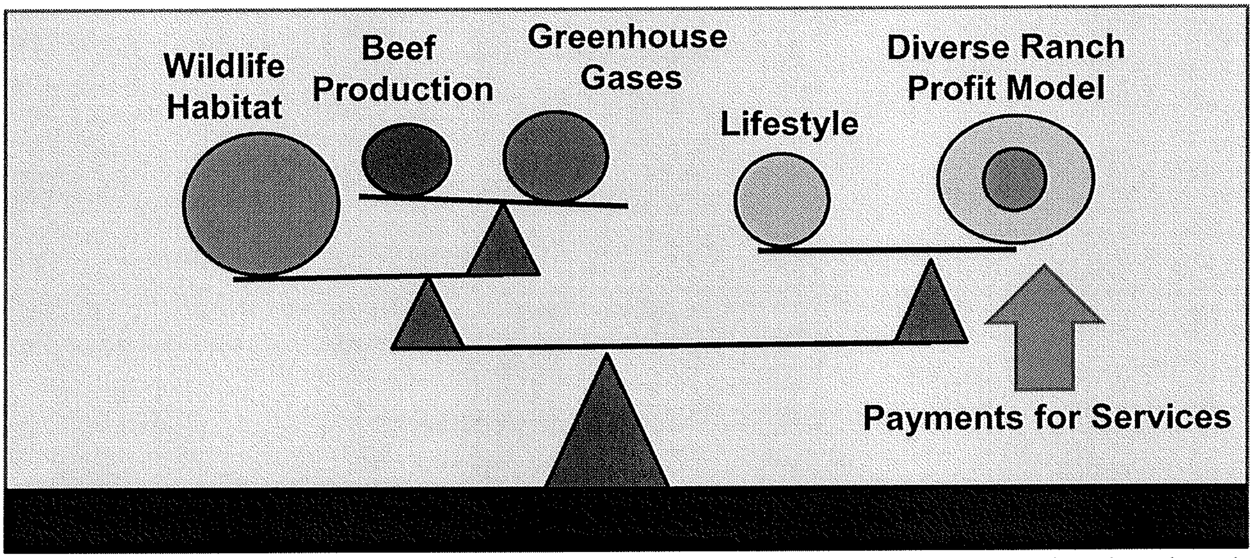


Figure 4. Payments for ecosystem services may balance the tradeoffs associated with reduced beef production (from Derner et al. *in prep*)

Endangered Species on Ranches

Nebraska Grazing Conference
August 14 – 15, 2012

Nature

There is a delight in the hard life of the open.

There are no words that can tell the hidden spirit of the wilderness that can reveal its mystery, its melancholy and its charm.

The Nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased and not impaired in value.

Conservation means development as much as it means protection.

Theodore Roosevelt

USFWS Mission Statement

Our mission, working with others, to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people

Endangered Species Act

- Became law in 1973
- 1,231 species are listed as endangered or threatened in United States
- Administered by the USFWS and the NMFS

Sections of the ESA

- Section 4: Listing, critical habitat, and recovery plans
- Section 5: Land acquisition
- Section 6: Assistance to States and Territories
- **Section 7: *Interagency Cooperation***
- Section 8: International Cooperation
- **Section 9: *Prohibited Acts***
- Section 10: Exceptions
- **Section 11: *Penalties and Enforcement***

Section 7(a)(1)

All Federal agencies shall use their authorities in the furtherance of the purposes of this Act by carrying out programs for the conservation of endangered and threatened species.

Section 7(a)(2)

Each Federal agency must, in consultation with the Service, ensure that any action funded, authorized, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat.

Definitions

- "Jeopardize the continued existence of" means to engage in an action that is reasonably expected to reduce appreciably the likelihood of survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution.
- "Destruction or adverse modification" appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species.

The Consultation Process

- Federal agency considers the effects of its action on listed species
  - Contacts the Service for a list of endangered and threatened species and their critical habitats
  - May contact the Service for additional technical assistance
  - Makes an "effects" determination

Consultation Process

- No Effect = no communication necessary between Federal action agency and FWS
- Not likely to adversely affect = informal consultation
- Beneficial effect = informal consultation
- Likely to adversely affect = formal consultation

Outcomes of Formal Consultation

Purpose: to determine if jeopardy and/or adverse modification are likely

- **No Jeopardy or Adverse Modification**
  - Issues an incidental "take" statement that estimates the number of individuals of animal species likely to be killed, harmed, or injured
  - Includes required measures to decrease impact on listed animals
- **Jeopardy or Adverse Modification**
  - Gives Reasonable and Prudent Alternatives to the action
  - Can be appealed to the Endangered Species Act Committee

Section 9

- Prohibits "take" of listed animals.
- "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Harm and Harass

- ***Harm*** includes significant habitat modification or degradation that results in death or injury to listed wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.
- ***Harass*** is defined as intentional or negligent actions that create the likelihood of injury to listed wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering.

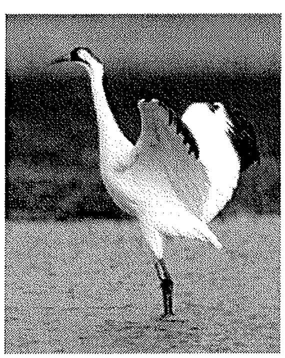
Plant Prohibitions

- Section 9 prohibitions for plants:
  - remove and reduce to possession from areas under Federal jurisdiction;
  - maliciously damage or destroy on any such lands;
  - remove, cut, dig up, or damage or destroy on any other area in knowing violation of any law or regulation of any state or in the course of any violation of a state criminal trespass law.

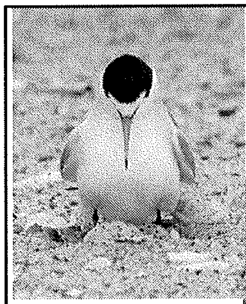
Section 11: Penalties

- Civil
  - $25,000 for a knowing violation, either threatened or endangered
- Criminal
  - Individual: $100,000 for endangered, $25,000 for threatened
  - Organization: $200,000 per organization, $25,000 for threatened
  - Up to 1 year imprisonment
  - Forfeiture of property

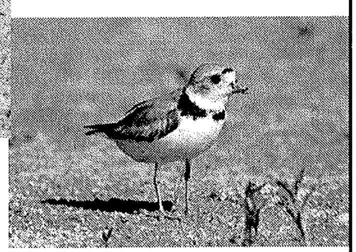
Species in grazing country



Whooping crane

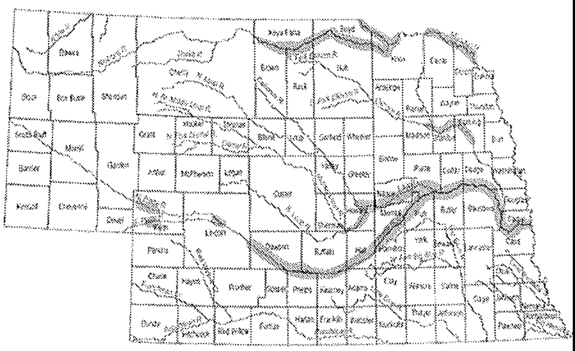


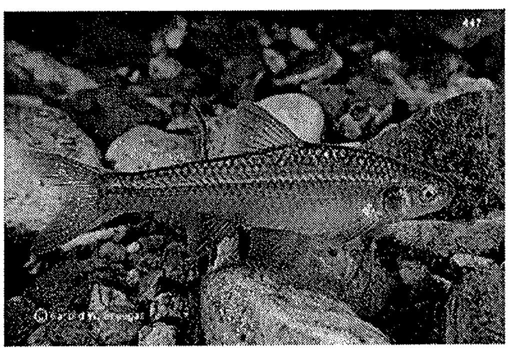
Interior least tern



Piping plover

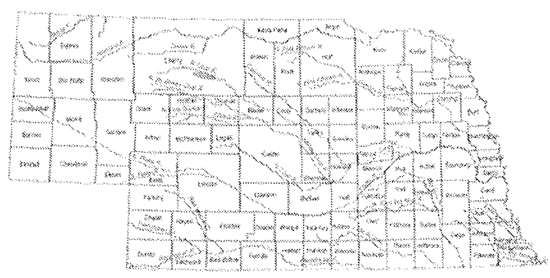
Estimated Current Range of Piping Plover (*Charadrius melodus*)
and Interior Least Tern (*Sternula antillarum athalassos*)

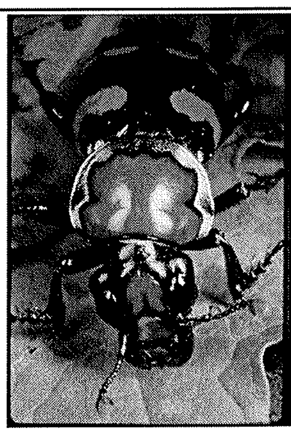




Topeka shiner

Estimated Current Range of
Topeka Shiner (*Notropis topeka*)



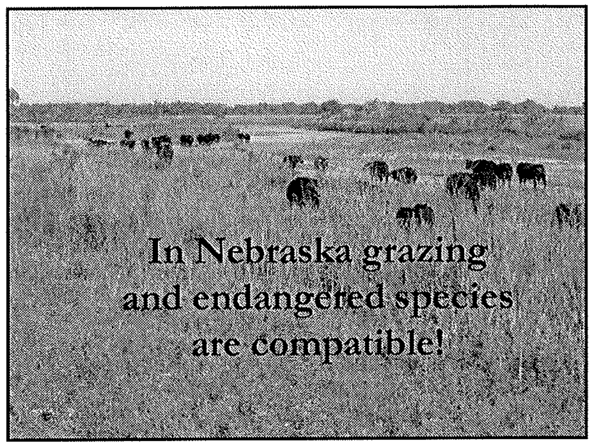


American burying beetle

Estimated Current Range of
American Burying Beetle (*Nicrophorus americanus*)

Blowout penstemon

Western prairie fringed orchid



Typical Habitat Restoration Projects

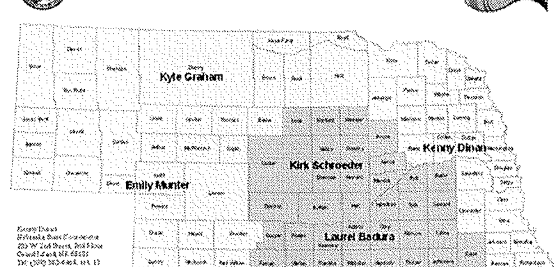
- **Removal and management of woody vegetation and invasive species (e.g., phragmites, tamarisk, purple loosestrife, eastern red cedar, russian olive)**
- **Restoration of riverine backwaters, sloughs and wetlands**
- **Restoration of riverine roosting and nesting habitats**
- **Rehabilitation of wet meadow and grassland habitats**
- **Livestock water development**

The key to the success of the restoration and maintenance efforts are the partnerships that have been developed with private landowners and other groups, agencies, and organizations.

- Landowners
- Nebraska Game and Parks Commission
- Platte River Whooping Crane Trust
- Nebraska Environmental Trust
- National Audubon Society
- The Nature Conservancy
- Ducks Unlimited
- Natural Resources Conservation Service
- National Fish and Wildlife Foundation
- Prairie Plains Resource Institute
- Platte River Habitat Partnership
- Natural Resource Districts
- Weed Management Associations
- Great Plains GIS Partnership
- Nebraska Natural Legacy
- Platte River Recovery and Implementation Program
- U.S. Fish and Wildlife Service
- Sandhills Task Force
- Pheasants Forever
- Wild Turkey Federation

Whom Do I Contact?

Nebraska Partners for Fish and Wildlife Program



Thank You!

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USFWS Grand Island, NE

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Winter Grazing

Terry Klopfenstein, Kari Gillespie
Department of Animal Science, University of Nebraska-Lincoln

In Nebraska, most of our calves are born in the spring and weaned in the fall. In order to get the calves to grass the following spring, it is obviously necessary to feed them through the winter (not rocket science). There are about as many ways to winter calves as there are producers. However, we will limit our discussion to three basic systems. The first is drylotting calves by feeding harvested feeds. The second is grazing native range with appropriate supplements. The third uses corn residue for grazing along with appropriate supplements. The same principles hold for cows as well.

Drylotting provides unlimited opportunities for use of feedstuffs. This would include hays, silages, harvested crop residues, protein sources and ethanol byproducts. Diets can be developed that will provide any target rate of gain. Producers are in control by feeding proportions and amounts necessary for the targeted gains and can least cost the diet based upon ingredient prices. Drylotting minimizes weather effects and cattle transportation costs. The downside of drylotting is cost of harvested feeds and cost of yardage.

Grazing winter range is as old as cattle production in the Sandhills. Range grass quality is low in the winter. While it may maintain a gestating cow, it will not give acceptable calf gains without protein and energy supplements. Availability and cost of supplements delivered to the ranch are critically important. Cattle do the harvesting and there is no maintenance (cost) of a drylot.

Cornstalk grazing offers excellent opportunities for wintering calves. The ethanol industry's use of corn and the subsequent increase in corn price has resulted in pasture being plowed up for corn production. While this reduces grazing and haying availability, the corn residue is a large supply of alternative forage.

We will produce about 10.3 million acres of corn this year in Nebraska, producing over 40 million tons of residue. If all of our cows and 1.0 million calves grazed corn residue, plus it was used as the roughage source for all of the feedlot cattle in the state, we would only use 2.8 million of the 40 million available tons of corn residue. Thus, we won't soon run out of corn residue.

Calves or cows grazing cornstalks eat primarily the husk, leaf and residual corn. Corn produces 15 to 16 lb of husk and leaf per bushel of corn grain produced. UNL research measurements suggest about 50% harvest efficiency by the cattle. Therefore, the cattle will consume about 8 lb of dry matter for each bushel (15.5% moisture) corn. At a 200 bu yield, that is 1,600 lb of leaf and husk consumed, which is equivalent to 2.35 AUM.

We estimate that 0.5% of corn ears remain in the field post-harvest; this may be higher in some situations. Using 0.5% of corn ears left, that amount of grain would increase diet digestibility by about 2.5 percentage units (example 50% to 52.5%). The husk is above 60% digestible and very palatable, and of course the grain is essentially all consumed. Stocking rate has a large impact on diet quality. The greater the grazing pressure, the more leaf that is consumed, and the leaf is much less digestible than corn ears (≈ 45%). For example, at a lower stocking rate and with only six of the eight potential pounds of husk and leaf being consumed and all of the grain being consumed, the digestibility of the diet will be 52%. If all 8 lbs are consumed (an additional 2 lb leaf), then the overall diet digestibility would be only 50%.

The obvious advantage to stalk grazing is the low cost of this grazed forage. Disadvantages are weather risk, potential transportation expense, lack of water and fencing. Unfortunately, the stalks may also not be near the backgrounding enterprise. Before we discuss these three options further, we want to discuss the effect of rate of winter gain on system economics.

All of these backgrounding options work well when ethanol byproducts are used as the supplement. The byproducts are excellent energy sources and provide good protein and phosphorus for calves (or cows) in addition to the energy. The energy value of distillers grains is about 130% that of corn, and for gluten feed at least 120% that of corn, in these forage-based feeding systems. Distillers grains are currently priced at about the price of corn grain, so they are quite economical considering the feeding value.

Figures 1 and 2 show the gain responses to levels of Sweet Bran or DDGS from calves grazing cornstalks. Similar gains were made by calves grazing winter range and supplemented with DDGS (Table 1). In this case, comparisons were made to drylot with hay and winter range each supplemented with a corn and soybean meal supplement.

Backgrounding systems can utilize readily available, inexpensive forages. By nutritionally restricting animals to varying degrees, available feed resources can achieve various calf gains to create yearlings for summer grazing, target different marketing windows, and create a year-round beef supply. Historically, backgrounding systems have centered on utilizing compensatory growth to minimize winter input costs, but then attain increased summer grazing gains during a period of higher nutrient intake. This philosophy may not have considered the benefits of a high supplementation level when cattle are retained through the finishing system, or when ethanol byproducts are available as a supplement. With the advent of readily available ethanol byproducts, it may be profitable to supplement growing cattle at a higher level than was previously believed. In addition, corn prices have risen considerably in recent years, thus changing previous economic analyses and potentially increasing the value of backgrounding programs. The objective of our study was to compare the economics of winter supplementation levels in a forage-based backgrounding system, using distillers grains as a winter supplement.

Five different studies, completed from 1987 through 2011, examined a high (HI) and low (LOW) winter supplementation level within a forage-based backgrounding system, and subsequent feedlot performance. Four studies utilized long yearling steers, and one study used spayed heifers. Cattle were first backgrounded on corn residue with varying supplementation levels, grazed throughout the summer, and then entered the feedlot for finishing.

In each study, animals were assigned randomly to treatment. Initial weights and weights between system phases were an average of two consecutive days' weight. Final weights were calculated from hot carcass weights adjusted to a 62% dressing percentage on steer studies, and to a 63% dressing percentage on the spayed heifer study. Data from four of five studies were adjusted to an equal fat thickness. Within studies, treatment groups had identical implant procedures and finishing diets.

Average performance values of the five studies were calculated and current economic assumptions (as of April, 2012) were applied to the two treatments to compare supplementation level profitability (Table 2). Initial feeder calf cost was $170/cwt for a 500-pound medium-framed British based calf. Grazing costs were $0.31/day while on cornstalks and $0.80/day for summer pasture. In this scenario, modified distillers grains (MDGS) was the winter supplement fed at two lb/head daily for the low supplementation level and five lb/head daily for the high supplementation level, on a DM basis. Winter supplement, MDGS, was assigned a cost of $0.12/lb DM fed. Finishing costs were assumed to be $0.13/lb of diet DM and yardage was assessed at $0.45/day. Sale price was set at $120/cwt on a live weight basis.

Cattle developed on a higher nutrition plane during the winter backgrounding phase had 0.20 lb greater ADG during the finishing phase and required 5 fewer days on feed to reach their equal fat finish point (Table 3). Total DMI was 20 lb less, resulting in $2.50/head lower total feed cost. In addition, the performance advantage of cattle supplemented at a high level was maintained through the system, resulting in an additional 85 lb of final wt, which provided $102.96 of additional revenue over the low level supplemented cattle. Total profitability in this scenario resulted in a $9.48 loss when backgrounding cattle at a 2 lb/head/day MDGS supplement level, and a $46.53 profit when backgrounding cattle at a 5 lb/head/day supplementation level (Table 3). These data show that 1.41 lb/day winter gain is better than .49 lb/day, when viewing entire system profitability. It does not show that 1.41 lb/day is optimal, however.

We did some simple economics on the three wintering systems (Table 4). We assumed 1.4 lb/day gain for all the calves. Cost of gain was just $0.73/lb for calves on stalks while it was $1.14 to 1.26 for drylotting. Range was intermediate. Of course, the economics depend upon our assumptions. New baled stalks may be $115/ton this year because of drought compared to the $80/ton from the past few years, which includes grinding and shrink. Baling is expensive, so it is unlikely stalks will be less expensive in the future. Baled wheat straw would be similar to corn stalks in quality. Yardage adds to the cost of drylotting.

Range cost is difficult to predict. We assumed equal yardage and distillers grains cost for range and stalk grazing. We also assumed winter range is half the cost of summer range. If it could be used at higher value for summer grazing, then half may not be enough to charge. If we expect grass lease rates to increase, this makes range less competitive.

Does this mean stalk grazing offers the greatest opportunity? Probably it does. Remember we will be using less than 10% of all the corn residue, so supply certainly exceeds demand. Will stalk grazing leases increase? Likely. How much? That answer we don't know.

Numerous studies have been done at the University of Nebraska over the years to determine the effect of grazing crop residue on grain yields in the subsequent years. In 1996 a grazing trial was started on a linear move irrigation field in a corn-soybean rotation looking at the time of the year that crop residue is grazed and its effect on subsequent yield. This 100-acre field is divided into two sections with half of the field in corn and half in soybeans every year. Each year they switch sides so the soybean yields reflect the direct impact of the grazing of corn residue and the corn yields are a year removed from the grazing treatment. Grazing has been initiated at two different times: fall/winter grazing and spring grazing. The fall/winter grazing typically is from November until February and is the time that most cattle are on crop residue. The field is typically frozen, and mud and compaction due to cattle in the field are at a minimum. Spring grazing in this field is typically from February through mid-April. This was designed to be the worst possible situation for grazing crop residue, as the soil is thawing and spring rains will cause the fields to be muddy and the amount of compaction and trampling should be at its highest. To increase the possibility of trampling and compaction, starting in 2000, calves have been stocked at 2.5 times the normal level (3 hd/3 ac). The three treatments -- fall/winter grazed, spring grazed, and ungrazed -- have been maintained in the same area since 1996.

Fall/winter grazing of corn residue on the linear move irrigation field showed a significant ($P = 0.001$) increase in soybean grain yields of 2 bu/ac due to grazing the year before. Corn residue grazing had no statistical effect ($P = 0.1808$) on corn yields, but there was a numerical increase of about 3 bu/ac for the fall/winter grazed treatments (Table 5).

Corn yields the second year of the spring grazing show no significant difference ($P = 0.1808$) but a 1.2 bu/ac numerical increase in yield on the grazed treatment. Soybean yields, planted the year following grazing of the corn residue, show a significant increase in grain yield ($P = 0.0010$) with a numerical increase of 1 bu/ac.

Irrigated corn grain yields in either a continuous corn or a corn-soybean rotation show no effect of grazing on grain yields, and soybeans planted the year following corn residue grazing show a significant increase in yields due to grazing treatment. Timing of grazing, fall grazed or spring grazed, seems to have little effect on grain yields. Since the treatments in the linear move irrigation field have been maintained over an extended period of time, any detrimental effects from grazing would have been picked up. With the statistical increase in yields of soybeans, especially in the spring grazing treatment, cattle grazing corn residue actually help the grain yields by working some of the nutrients and residue into the ground and removing some of the excess residue so the ground can warm up faster. In an article by Wilhelm et al. (2004, Agronomy J., 96:1), the authors suggest that the removal of 20-30% of the corn residue will have little effect on the structure and fertility of the soil, and leaving 70-80% of the residue will provide enough organic matter to add carbon back into the soil and maintain the integrity of the soil structure.

We find that the average digestibility of residue consumed is no more than 55%, meaning that the cattle utilize less than 55% of the organic matter and the remaining 45% of the organic matter is returned to the soil surface where it can be reincorporated into the soil, supplying organic matter for the soil microbes. Cattle remove less than 20% of residue unless the corn residue is overgrazed. This is an economical practice for wintering calves as well as cows.

Table 1. Weight and Average Daily Gain of Steers Fed a Corn/Soybean Based Supplement in a Dry Lot (CON) or While Grazing Native Winter Range or Fed Dried Distillers Grains While Grazing Range 6 Days Per Week

	Treatment[2]		
	Drylot	Corn/SBM	DDG
Initial BW, lb	468	468	470
Final BW, lb[3]	562	570	558
ADG, lb/day	1.51	1.65	1.42

[1]Stalker et al. (2006).
[2]Drylot-grass hay plus 4.2 lb supplement, Corn/SBM 6 lb/day on range and DDG 4.2 lb/day.
[3]Adjusted 4% for fill.

Table 2. Performance summary of five winter supplementation trials at two supplementation levels

	Low[1]	High[2]
Winter phase		
Initial BW, lb	500	500
Days	143	143
ADG, lb/d	0.49	1.41
Summer phase		
Days	135	135
ADG	1.46	1.09
Finishing phase		
DOF	112	107
ADG, lb/d	4.15	4.35
DMI, lb/d	28.2	29.2
Final BW, lb	1240	1325

[1]Low = cattle supplemented during the winter phase for a low daily gain
[2]High = cattle supplemented during the winter phase for a high daily gain

Table 3. Profitability analysis of high and low winter supplementation levels

	Low[1]	High[2]
Initial purchase cost, $/hd	850.34	850.34
Winter phase		
Cornstalk grazing cost, $/hd	45.76	45.76
MDGS cost, $/hd	34.32	85.80
Summer phase		
Grazing cost, $/hd	107.68	107.68
Finishing phase		
Finisher diet cost, $/hd	408.72	406.22
Feedyard yardage, $/hd	50.18	48.15
Total revenue, $/hd	1487.52	1590.48
Profit, $/hd	-9.48	46.53

[1]Low = cattle supplemented during the winter phase for a low daily gain with 2 lb MDGS/head daily

[2]High = cattle supplemented during the winter phase for a high daily gain with 5 lb MDGS/head daily

Table 4. Winter Costs[1]

Expenses	Drylot[2]	Range[3]	Stalks
Forage $/d	.58 (.40)	.36	.12
DG $/d[4]	.84	.70	.70
Yardage $/d	.35	.20	.20
Total $/d	1.77 (1.59)	1.26	1.02
$/lb gain	1.26 (1.14)	.90	.73

[1]Estimated 1.4 lb/day gain.

[2]10 lb baled stalks, 6 lb distillers grains (dry matter); stalks @$115/ton ground or $80/ton ( ).

[3]Range at $33/AUM × .5, to equal half of summer cost.

[4]Priced equal to corn @ $6.50/bu ($.14/lb dry matter).

Table 5: Grain Yields

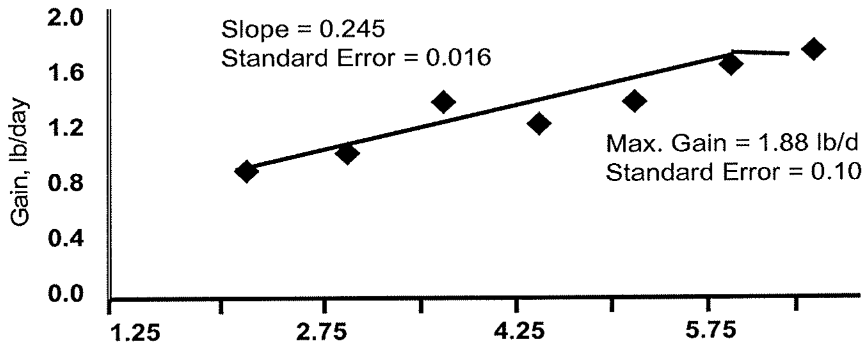
Years of Study[1]	Cropping System[2]	Crop	Grazed Yield	Ungrazed Yield	SEM	P value
93-95	Irrigated Continous Corn[3]	Corn	185.33	181.67	27.3272	0.5766
96-11	Fall Grazed Corn-Soybean[4]	Soybeans	62.4	60.4	2.1056	0.001
96-11	Fall Grazed Corn-Soybean[4]	Corn	208.9	205.8	7.8359	0.1808
96-11	Spring Grazed Corn-Soybean[4]	Soybeans	61.7	60.4	2.0156	0.001
96-11	Spring Grazed Corn-Soybean[4]	Corn	207.2	205.8	7.8359	0.1808

[1] Starting and ending year that the study was conducted

[2] Type of cropping system that the field was managed in.

[3] Was maintained in a continuous corn system

[4] Fields are from linear move irrigation field and maintained in corn followed by soybean rotation for 14 years.



Daily gain of steers supplemented with wet corn gluten feed on cornstalks (Jordon et al., 2001a).

Figure 1.

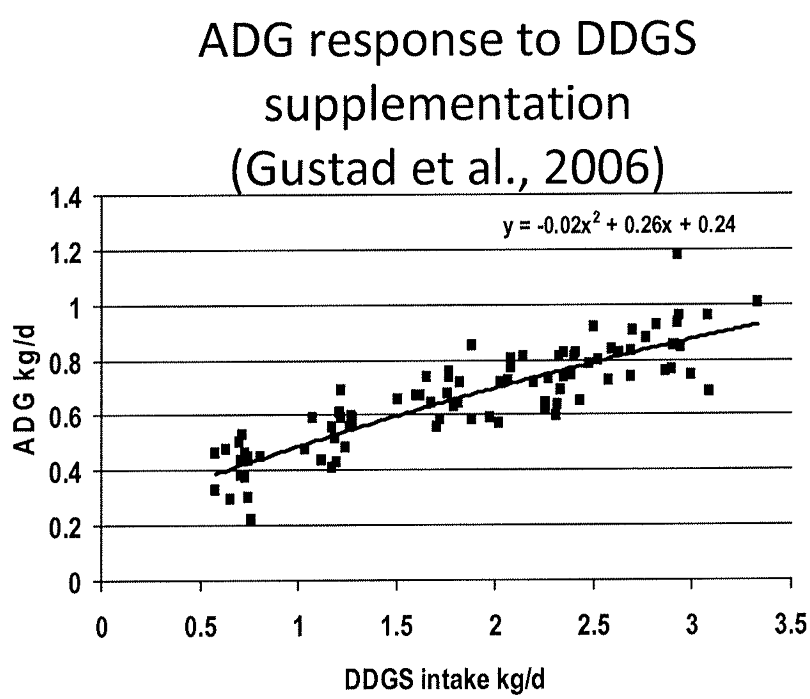


Figure 2.

Managing Drought Risk on the Ranch: Introduction and Climate Outlook

Dr. Cody Knutson, National Drought Mitigation Center, 618 Hardin Hall, University of Nebraska-Lincoln, Lincoln, NE 68583-0996, cknutson1@unl.edu, (402) 472-6718

Abstract

Drought is a recurring threat to the financial and natural resources health of ranch operations in Nebraska, and the drought of 2012 is no exception. According to the U.S. Drought Monitor (http://droughtmonitor.unl.edu), as of July 17, 2012, nearly 86% of Nebraska was experiencing drought conditions ranging from moderate to extreme severity. Studies have shown that drought losses associated with such events can be significantly minimized through ranchers' efforts to prepare for drought.

Therefore, staff members of the National Drought Mitigation Center at the University of Nebraska-Lincoln (UNL) have been working with a group of ranchers and advisors from across the Great Plains and other collaborators from UNL and South Dakota State University to better understand the effects of drought on ranching operations and strategies that can be implemented to reduce drought losses. This work has been funded by the USDA Risk Management Agency. A primary outcome of the project has been the creation of an online resource called *Managing Drought Risk on the Ranch* (http://www.drought.unl.edu/ranchplan). This website offers guidance on actions that can be taken before, during, and after drought to better prepare for, respond to, and recover from drought conditions. In addition, it provides a step-by-step methodology on how to integrate these strategies into a drought plan tailored for an individual operation.

Specifically, the drought planning portion of the website describes a series of actions to consider when developing a drought plan, such as:

- Identifying drought planning partners and establishing communication;
- Identifying the ranch vision and objectives;
- Inventorying ranch resources;
- Understanding drought risks and benefits;
- Defining and monitoring drought;
- Identifying critical dates for making decisions;
- Identifying strategies to be implemented before, during, and after drought; and
- Monitoring and evaluating the drought plan.

The expectation of this work is that creating a clear and usable planning methodology, along with relevant supporting information, will lead to increased drought planning among ranchers that will help to lessen the drought vulnerability of their operations and the grasslands that support them.

2011 Leopold Award

Rodney, Arlene, Randy, Gina, Beau and Kahla Mathewson
RGM Corporation

Background

- Between Sidney and Potter, NE.
- Started by Rod and Arlene Mathewson.
- RGM Incorporated in 1976 when Randy returned from college.
- Beau returned in 2005 after graduating from UW.
- Transition from lease to ownership/generational.
- We put together our ranch through purchases over time. Much of what we have bought needed years of rehabilitation.
- 2011 we switched from cow/calf, replacement heifer and bull development to yearling operation.

Quick Facts

- 4200-4600 feet in elevation
- All types of soils: clay, sand, shallow limy, silty 15-17" of precipitation annually
- Cool-season dominated range
- Sedges, wheatgrasses, needlegrasses are key species
- Available AUM/ac. range from 0.40 to 0.70
- Mix of CRP, farmland, and rangeland in area

Conservation and Stewardship

- Continue to make things better for all users
- Leave things better than you found them
- Does not happen overnight; takes vision, patience, and determination
- Cooperation with agencies is key
- Works with natural processes
- Is an inherent part of a good grazing system
- Is sound business

Key Operational Concepts

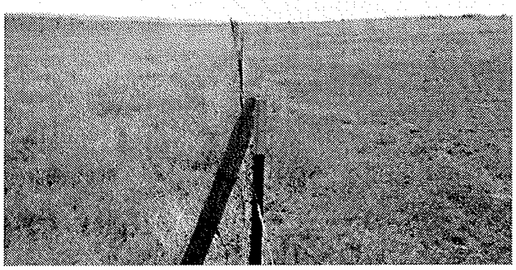
- Rotational grazing
- Fencing, pipelines, watering facilities
- Education and outreach; agency cooperation
- Technology
- Monitoring
- Invasive species management
- Land improvement and remediation

Rotational Grazing

- Higher stocking density for shorter duration
- We rotate on three- and four-year rotations
- Five grazing units, each with five sections
- Graze from May 5 to September 10
- Never in a pasture more than twice in three years, nor for more than 45 days (usually 30)
- Erosion is eliminated, past abuse is reversed
- Was not possible when we rented, and before pipeline, water, and fencing improvements
- Diversity increases exponentially, as does cover
- Seeing is believing!

Seeing is Believing: Fence line Comparison May 15, 2012 Photo

Rotational system **Season long grazing**



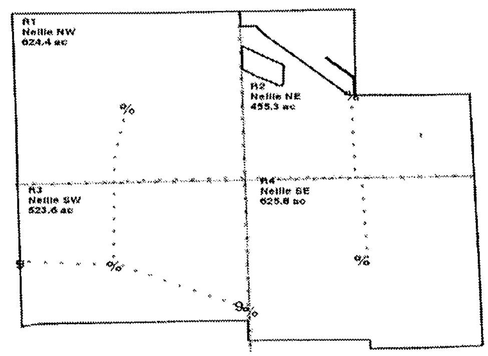
Rotational Grazing

- Impossible without adequate, well-positioned water
- Never graze the same pasture at the same time of year two years in a row
- Utilize forage most efficiently; ~ 30% increase in stocking rate WHILE using less forage
- Diversity greatly increases as does ground cover
- Allows flexibility within set parameters
- Manage for benefit of land -- Always
- Matches cattle to forage resources
- (Small) Con: the same is true for weeds; must monitor every pasture multiple times every year
- Long-term investment, labor and capital intensive

Rotational Grazing Continued

- Requires NRCS, clear objectives and planning
- Requires ownership or long-term lease or progressive owner
- Improvements for rotational grazing allow any type of livestock to be grazed at any time of year
- Scalability
- Rest time is key
- Creates habitat for all inhabitants of the ecosystem -- from microorganisms, to insects and birds, to cattle and large ungulates
- Economically AND environmentally superior

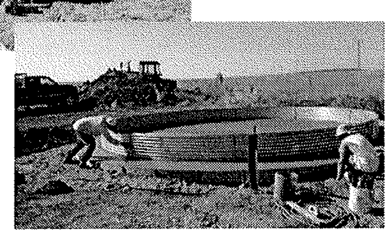
Fencing + Water = Grazing System



Water

- We construct 25' bottomless tanks
- Match well capacity with stocking expectations and storage capacity
- Move away from windmills to submersible and pipeline
- Smaller tire tanks can be used in pasture edges
- Water sources should be no more than ½ mile apart

Water is THE key!



Drought

- Drought conditions are mitigated by dependable (i.e., electric), well-spaced water and a planned grazing system
- Drought impacts a herd for years
- Grazing mismanagement is magnified with drought
- Look at best/average/worst case scenarios before start of grazing season
- Dynamic of "Subsidizing" a cattle herd with harvested feed and grain has dramatically changed since 2002
- Drought impacts can be mitigated with deep culling and lower stocking rate expectations
- Decreasing stocking rate and resting pastures longer during drought has dramatic positive effects when normal conditions return

You Are a Teacher

- Use your land and management practices to show others how grazing is sustainable; rangeland plants evolved with grazing.
- Every student is critical.
- We work with the Rocky Mountain Bird Observatory, and Extension and other agencies for field days and research lands. People SEE how proper grazing and subsequent improvements benefits the environment.
- Private enterprise is the key to stewardship.

Education

- Education can be as little as talking to your neighbor on a plane. People want to know where their food comes from.
- Be cool. Politely listen and then use your science-based knowledge of our industry to educate.
- If people know our narrative, it is that much harder for outside, special interest groups to push their radical anti-ag agendas through via ballot measure.
- Pride, heritage, and stewardship are the values to which we adhere.

Education, Outreach and Cooperation

- Your education is also important.
- Seminars and continuing education help you do what is best for your land and circumstances.
- Many of the practices we use were learned from other producers through successes and failures. Extension research is one of the most valuable resources we have.
- Never stop learning!

Technology

- Record keeping, Information gathering, Information synthesis
- Technology is used to gather and organize information
- Never before has technology been more cost effective or easier to use
- Communication and information gathering technology
- Indispensible management tool

GPS

- GPS technology allows us to catalog, manage, and monitor key areas, points of interest, and invasive species locations
- Not impossible without GPS, but very burdensome
- Enhances long-term memory
- Aids in visualization and prioritization of projects
- Very affordable and easily utilizable
- Infinite possibilities

Record Keeping

- Records are made much more usable and customizable with database programs.
- Abstract data become actionable.
- Performance records and grazing records are absolutely essential.
- Customize database with photos, links to NOAA data, whatever you can imagine.
- UNL and other extension services can help you get started.
- Keep photos, waypoints organized.
- Keep relevant data that helps make you more efficient.

Future of Technology

- More integrated
- Increasingly better and cheaper
- Tool for demonstrating "value" of ranch
- Shorter learning curve
- Drones

Invasive Species Management

- Invasive species are not a problem on native range; problem areas are usually less than 400 sq. ft, and can be as little as a single plant
- Disturbed areas, wet areas, seeded areas and farmland/pasture interface are locations where weeds can thrive
- Canada Thistle, Scotch Thistle, Field Bindweed, Curly Dock, Lupine, and Mullein
- Constantly vigilant
- GPS technology is invaluable to ISM

Weeds

- Spring, mid-summer and fall seek and destroy campaigns
- Simple Equipment: Pickup Mounted 200 Gal. Sprayer and ATV with 50 Gal tanks, boom, GPS
- Our objective is eradication
- Most all of the original patches have been eradicated, but new plants emerge in drainages
- Educate neighbors about noxious weeds
- Chemical selection is important; weed species AND surrounding species must be considered
- Keep records with GPS of spot treatments, photos, etc. and continue to monitor

Land Enhancement

- 25K+ trees and shrubs planted
- Returning farmland to native grass and forbs
- Creates habitat and diversity
- Cost-share programs
- NRCS and NRD are instrumental
- Lasting legacy
- Climax communities are the ultimate objective
- Prescribed burns are an effective tool

Thank You

- Responsible grazing is the cornerstone of our environmentalism.
- Use technology to suit your needs.
- Tell your story.
- Strive for ecological climax communities.
- Ranchers are environmentalists.
- Contact info:
- Beau Mathewson: beaum756@gmail.com
- Randy Mathewson: rgm@prairieweb.com

EVALUATING GRAZING SYSTEM OPTIONS
Partnership between Harry & Jerry Merrihew
Cedar Hill Ranch & Lazy Bones Ranch

Harry Merrihew, Asby, NE

1. Harry has son, Rocky; ½ of ranch approx. 6250 acres. Jerry has part-time help and has about the same acres, making the total ranch about 12,500 acres.

2. There are about 1100 acres of meadow ground, with the balance of the acres being pasture.

3. The cow herd consists of a Hereford base with about 95 registered cows and 425 commercial cows.

4. About 20 pastures with 27 windmills and 6 submersible pumps.

5. All cows calve in the spring, then carried over as yearlings.

6. 100 head of replacement heifers are calved in March; cows calve in April and May.

7. Yearling steers are sold on video in August and delivered in the first week of October.

8. The yearling heifers are trimmed for size in the spring; approximately 50 that are too small to breed are sold, leaving about 200 that are bred. One-half of these we keep for replacement and the rest are sold.

9. From the registered herd we sell a few bulls and replace our bull battery with 8 to 10 new bulls for our own use.

10. Buy outside bulls for registered herd. Have tried artificial insemination with little success.

Cows to Swede pasture in December for 3 months
About 12,500 acres in total ranch
Curt and Dad got soil award in the 50's
Bob and I got soil award around 1976
Changed a lot of pastures in 75 and what changes
I am from the old school before computers.
Knew what would work for our ranch
Cow calf, yearling operations, well balanced
Cross-fenced several pastures
Put in a few new wells
Planted a lot of trees, maybe could use a few more for shelterbelts
About 1100 acres of meadow ground, high ground, low ground
What we use for salt troughs and why they are good
Mineral program, how we mix it with salt; we use iodine
How the ranch was put together
No pivots--about neighbors' pivots
Raise our own bulls--except for herd bulls, and where we get them
Service our own windmills and how
No sick calves
Vaccine program
When we calve and why
When we sell yearling steers and yearling heifers
Bred heifers--need a better program
Rope for sick calves occasionally
Contract hay for neighbors
Help neighbors with preconditioning and branding, moving cattle
Use low birth weight, black bulls on heifers
It all works great if it rains a little more than normal
Run about 490 to 530 head of cows at the top--depends on moisture

Rotation Scheme

I will start with the month of December as around the 10th of December the cows are moved to a pasture that is about one-half hill for grazing and the other one-half is meadow. The ground is usually frozen by then, so the cows can't hurt the ground by walking on it. The meadow has after-growth after the haying, which was done in June or July. With less than three-quarter section of ground, the cattle are able to stay there for 3 months, until the first of March when the frost is starting to disappear. They are moved to another location at this time. It depends on the grass in the next location as to which pasture we use. When we feed the cows from these winter and spring locations, we make it a point to try not to feed the processed bales in the same spot. We feel that this is why we don't have to treat for scours or hardly any sick calves.

The calves are weaned from their mothers around the first of November and weaned next to the cows behind a woven wire fence for 3 days. At this time cows are moved to a meadow 1 mile away to graze on after-growth.

The calves stay at this location for most of the winter where they will receive protein and hay until the following spring when they will be moved to pasture. The steers will be moved to about 1340 acres of pasture in May. The 2 pastures that we use for this are divided at about 2/5 to 3/5. The pastures will be altered going into one of the pastures for about 3 weeks and then moved to the other one... staying in this pasture until about August 1st and weighed out around October 1st.

The bred heifers are moved around to fresh pasture in the fall and then on to another meadow with after-growth. Hay and protein are provided. They are brought in close to the buildings for calving about March 8th. The heifers are sorted for size, with about 50 taken off and sold. The remaining 200 are summered on 2 pastures that are also rotated from year to year.

The late calving that we do lets us calve in the open. Our calving lot is about 160 acres. The cows are moved to one of two fresh pastures as soon as they calve: one about 680 acres and the other about 150 acres. They stay in these pastures until branding time, then the pastures rest until next year.

The purebloods are kept separate from the rest of the herd as they run on after-growth from the meadows and are also fed protein and hay. They also have pastures that we rotate from year to year.

Most of the summer pastures don't get grazed until the middle of June, and then we rotate to the other pastures around August 1st. These are rotated on a yearly basis so that the pastures that we summer will rest about a whole year before going back into them. Sometimes the cattle will go back into the pastures that we used the first part of the grazing season -- usually after the first fall frost, as we feel that pastures can't be damaged much after frost.

The 3 pastures that are used for the bulls are allowed to rest for about 3 to 4 months during the summer growing season.

EVALUATING GRAZING SYSTEM OPTIONS
Tippetts-Myers Ranch

Lynn Myers, Lewellen, NE

Three considerations when building a systems level ranch plan are:

1) Drought Plan

2) Grazing Plan

3) Transition Plan

These three are different and separate subject areas, but all they are intertwined... you can't build one without the others when you use a GPS to guide your operation or ranch.

Your GPS consists of:
- Goals... our goals.
- Philosophy... property ability, personal ability.
- System... your grazing and operation plan.

Grazing system must fit you and your resources. It must be flexible and adaptable to whatever situation occurs during the year, but yet be sustainable over the long haul and optimize what you and your resources can produce.

Our grazing system is built with a drought plan in place.

Plan A: Trigger dates of June 4 to July 4. It provides us the flexibility to destock beginning June 4. These populations receive consideration when destocking in Plan A:
- Fall cows
- Fall calves and yearlings
- Dry cows

Plan B: Trigger date of mid-July. These populations receive consideration when destocking in Plan B:
Early wean old cows and poor genetic cows and those with defects (eyes, udders, etc.)
Custom grazed cows and heifers removed from ranch

Plan C: Trigger dates of late August-September. This population receives consideration for destocking in Plan C:
- Wean rest of calves early. We normally deliver calves October 15-20 rotated through winter just like summer move every 30 days.

Considerations you must look at to achieve sustainability in all areas:

- Pregnancy rate
- Length of breeding season
- Performance and rate of gain
- Time of year calving and breeding
- Basic marketing plan and target dates
- What you can stand labor wise
- Cost and need of infrastructure
- Do you want to maximize or optimize in one area of your operation? How does that affect the other areas?

When you consider these questions, you have a framework to build your whole ranch plan. That plan should include a way to monitor.

One tool we use to monitor/develop our grazing system is SanDRIS. SanDRIS helps us optimize year-to-year changes in pasture-use sequences that minimize the effects of grazing and drought stress. This tool is based on the three variables that have the greatest collective effect on warm-season tallgrass response to grazing on Sandhills prairies: (1) season of defoliation, (2) timing and quantity of precipitation, and (3) quantity and distribution of residual herbage at the end of the growing season.

You can't know where you are going if you don't know where you've been and where you are at.

Here is our plan...

All grazing pastures, whether leased or owned, in deferred rotation. Generally no longer than 30 days in pasture during growing season; deferred every third year for full growing season. Meadow grounds are rotated on owned ground in a two-year program. The very lowest or heart ground is hayed every year. The high ground part of each meadow is hayed one-half one year while the other half rests, then reversed the next year. Meadows are usually lightly grazed sometime during the winter. In drought, they may be used more heavily, but not beyond 50% of the grass is taken off. The meadows are in the maps that show black, which indicate our home place and Marie's. These also show the pastures on these units that are primarily for winter use and rotated using the 30-day rule; not varied in use sequence since it is a non-growing use period.

Normally we leave more than 50% of grass in pasture in the good years. This becomes our reserve for use in drought when we go to 50% use.

Our cows are split into two bunches. Herd A is young cows that are first- and second-calvers. Herd B is older cows that are third-calvers and up. Rotation is shown on separate maps. Herd C is a custom grazed herd of cows. These we can destock with 30 days' notice. This is part of the flexibility plan to give us more for our own cows, if needed.

The Hines map is the same program as Herd C. These are custom grazed yearling heifers that we can destock with 30 days' notice.

We graze our own replacement heifers on the Thornton pasture.

We also have fall grazing on Crescent Lake Wildlife Refuge to supplement our grass.

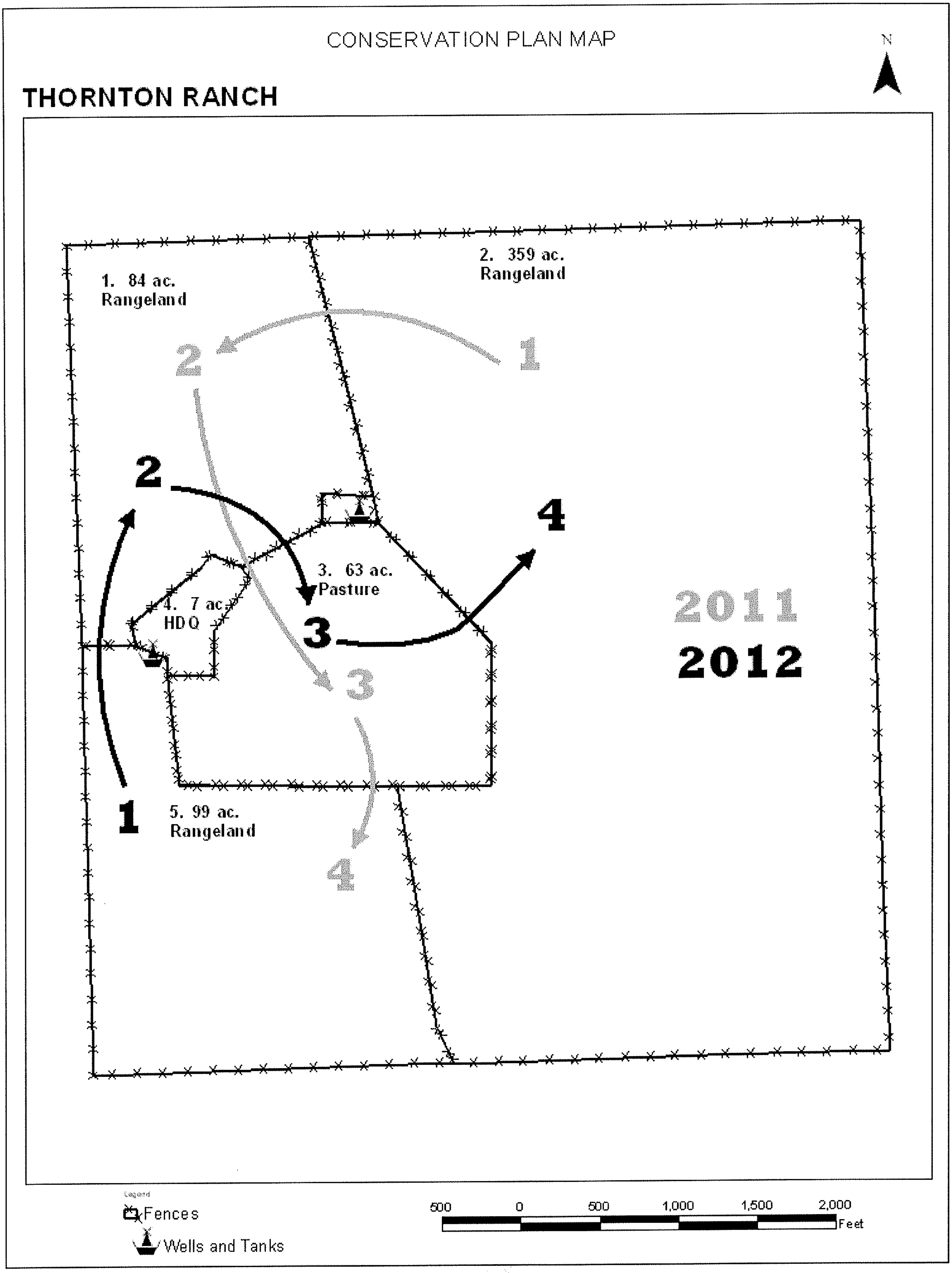
Each year we monitor our pastures with GPS photo point in September using Sandris and then enter the data in our grazing records.

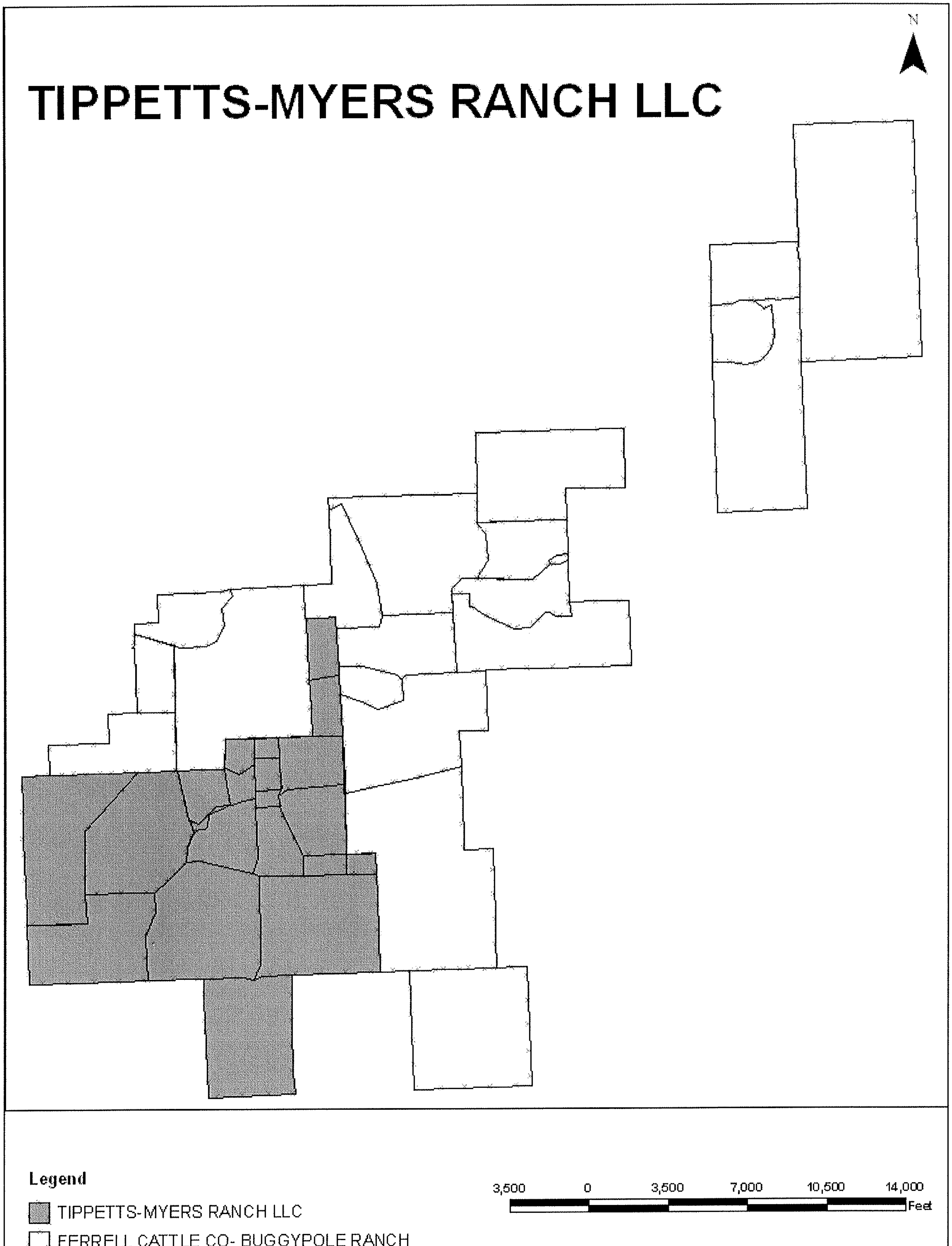
Transition to the next generation is a consideration in all areas of management. It plays into the long-term sustainability of the ranch. A lot of work, communication, and compromise will be vital to its success.

The Myers Families:
Lynn and Marlene
Creston and Family
Carissa and Family

CONSERVATION PLAN MAP

THORNTON RANCH

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TIPPETTS-MYERS RANCH LLC
Legend
TIPPETTS-MYERS RANCH LLC
FERRELL CATTLE CO- BUGGYPOLE RANCH
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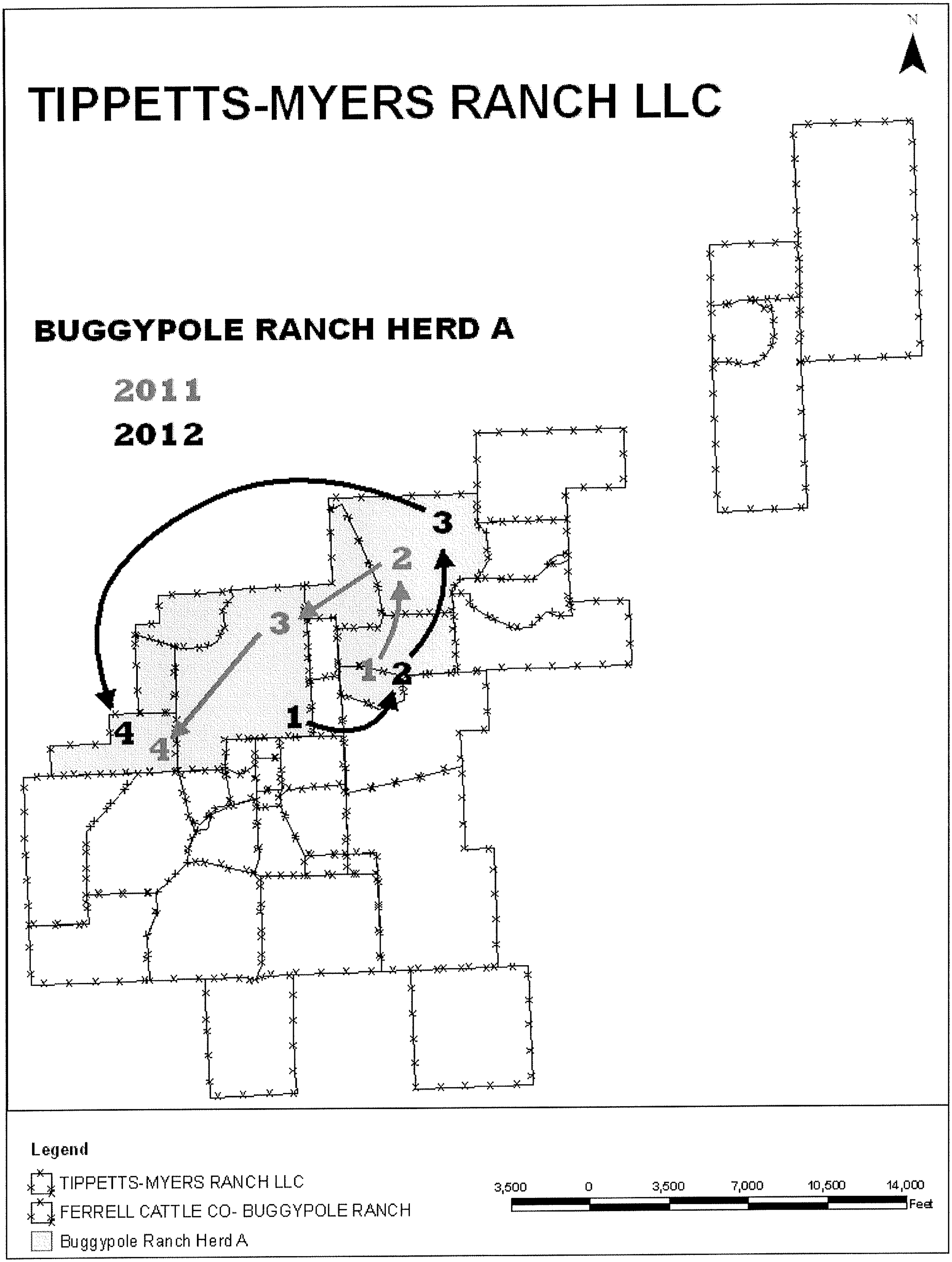
Feet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BUGGYPOLE RANCH HERD A
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TIPPETTS-MYERS RANCH LLC
FERRELL CATTLE CO- BUGGYPOLE RANCH
Buggypole Ranch Herd A
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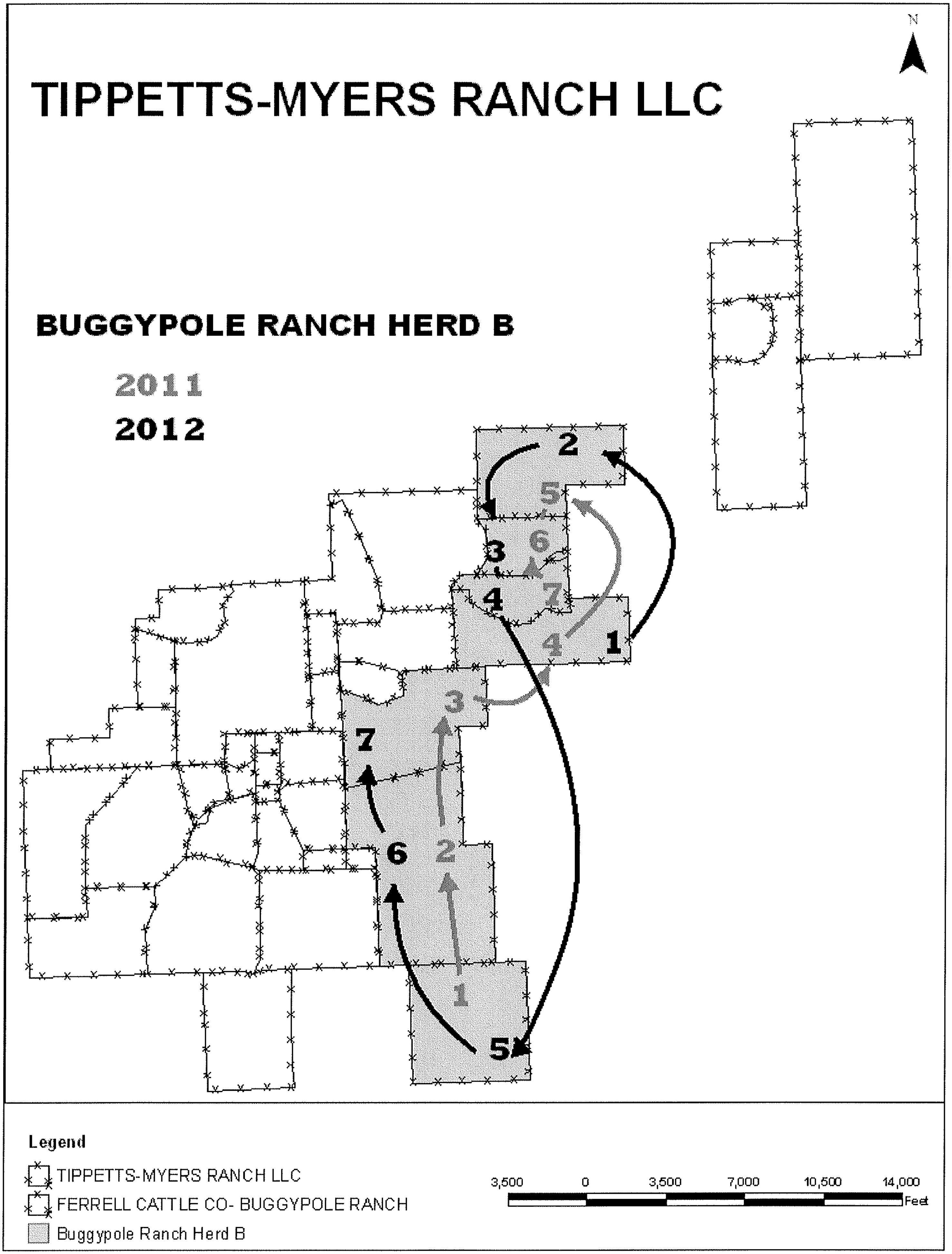
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TIPPETTS-MYERS RANCH LLC
BUGGYPOLE RANCH HERD B
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FERRELL CATTLE CO- BUGGYPOLE RANCH
Buggypole Ranch Herd B
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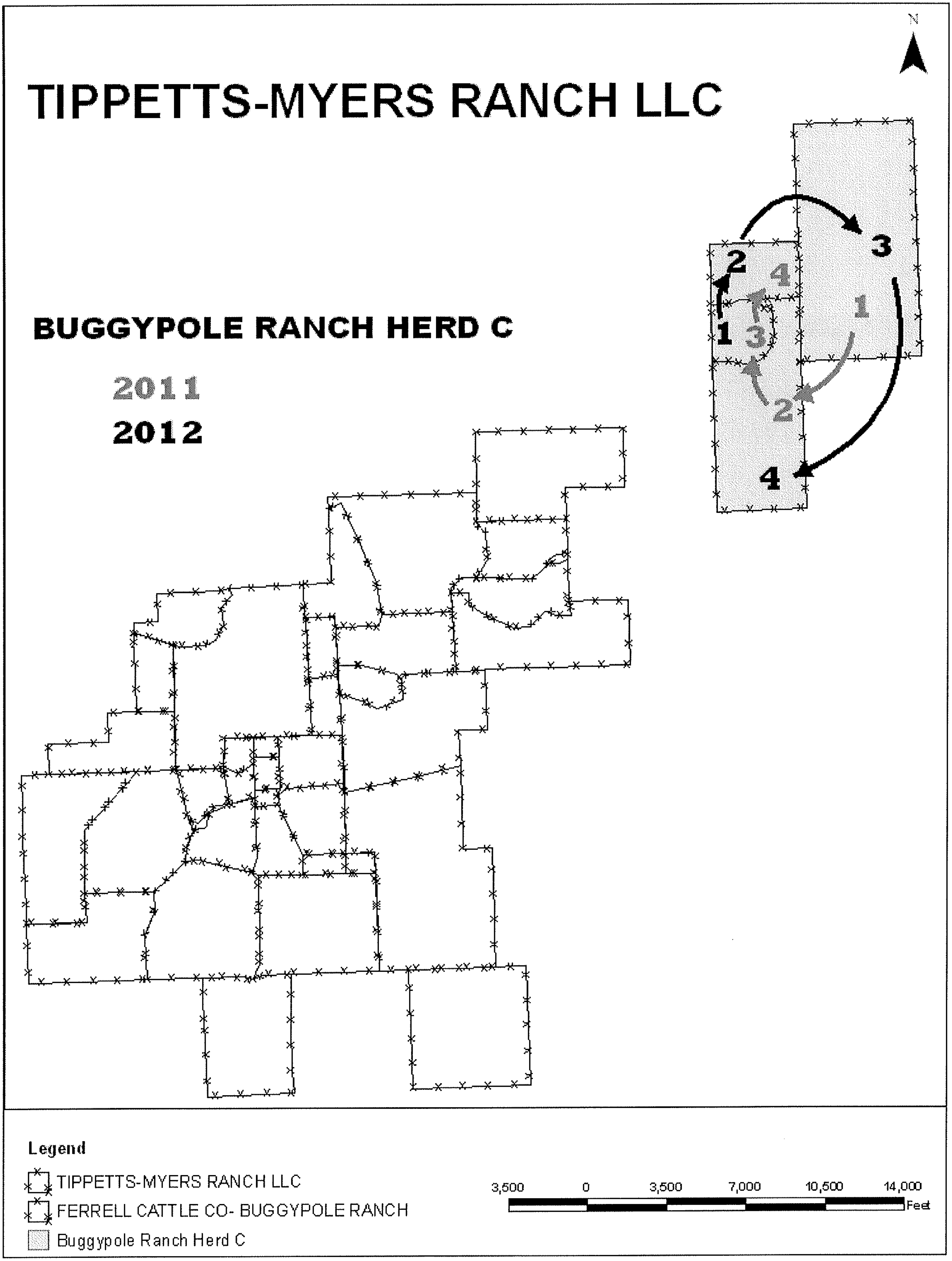
TIPPETTS-MYERS RANCH LLC
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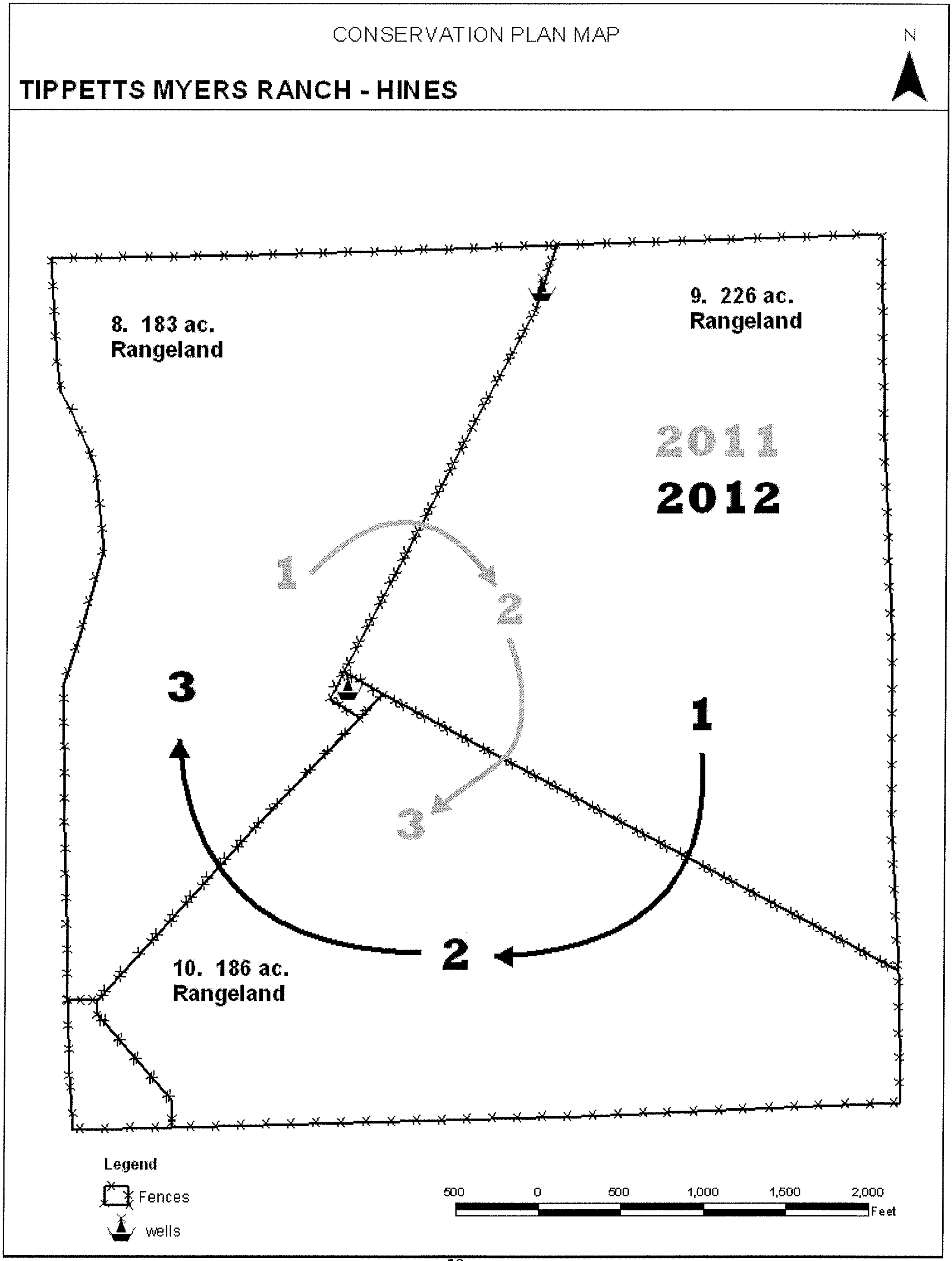
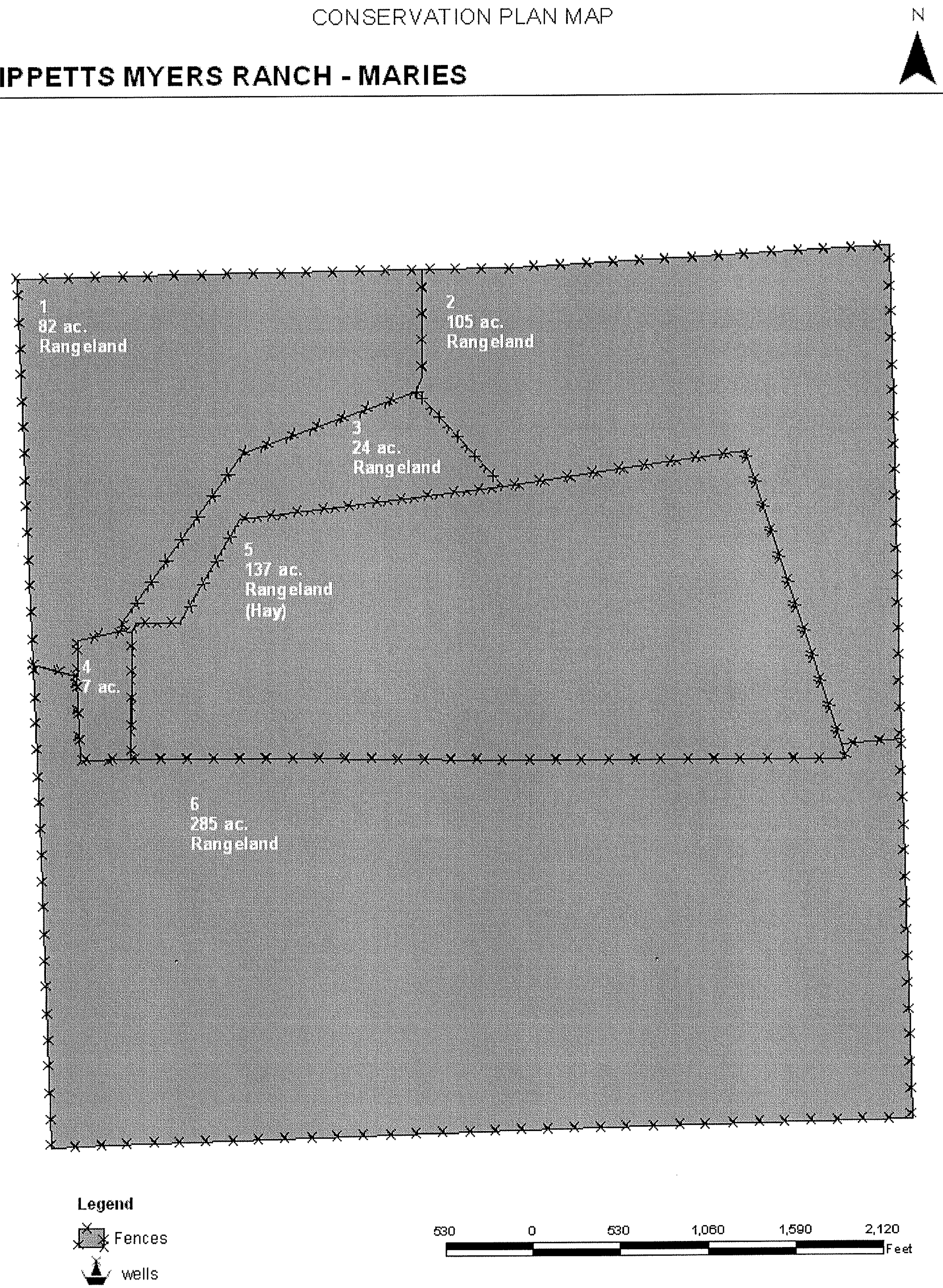

CONSERVATION PLAN MAP
N
TIPPETTS MYERS RANCH - HINES
8. 183 ac.
Rangeland
9. 226 ac.
Rangeland
2011
2012
1
2
3
3
1
2
10. 186 ac.
Rangeland
Legend
Fences
wells
500
0
500
1,000
1,500
2,000
Feet

CONSERVATION PLAN MAP

TIPPETTS MYERS RANCH - MARIES



Swathe Grazing
Plum Thicket Farms

Nancy Peterson, DVM, Gordon, NE

Plum Thicket is a family owned and operated LLC consisting of Rex and Nancy Peterson, our son, Patrick, and his wife, Krista, who is in veterinary school.

Our mission is to produce high quality cattle, forage, and grain with management practices that foster the best stewardship of our land, our livestock, our soil, and our human resources.

Resources

340 cows
560 acres of farm ground under irrigation
1740 acres dry land farm ground
2200 acres of deeded pasture (no wet meadows)
4,421 acres of leased pasture
3 family members
1 summer intern

The single biggest driver of business decisions is stewardship.

Why swathe graze?

Forage crops play a vital role in a no-till crop rotation and are soil builders.
Uses much less fuel.
Requires significantly less labor.
The only nutrient that leaves the field walks off as beef.
Distributes manure evenly across the field.
In the long term, will improve organic matter and soil health.

What are the down sides?

In a drought year, may have issues with nitrate levels.
Hard to know how much hay is there.
Hard to get a good representative feed sample.
A truly severe storm could block access to feed.
You feel like a foolish grasshopper when all your neighbors are being busy ants.

How do we address these problems?

Always test for nitrate level a few days after swathing so that if it is too high, you can bale it and blend it with other feeds.
Raise swather to its highest setting, leaving maximum stubble height.

Estimate production by using the same hoop we use for pasture production.

Clip at same stubble height as swather.

Take a minimum of 10 samples across field.

Dry, and weigh in grams, averaging weights of samples.

Multiply by 50 to get pounds per acre.

Sample at least 10 swathes, taking sub-samples from middle of swathe.

If you have a better idea, **speak up!!**

Keep a baled hay reserve to get you through a bad storm.

One option is to bale a few windrows, leave the bales in place and fence them off (bale grazing does a wonderful thing to the soil).

The hay in the windrows will still be good when the snow melts.

What do we plant? (God doesn't plant a monoculture, so we don't either.)

15 pounds conventional soybeans (3.7 RM or higher)
5 pounds BMR sorghum
5 pounds millet
1 pound sunflowers
1 pound sweet clover
1 pound turnips (only if planting it later in the season)
1 pound radishes

When do we swathe it?

As soon as the first sorghum heads begin to emerge from the sheath.
Sorghum makes up the biggest part of the tonnage, so we look to it for the optimum balance between quality and quantity.

How does swathe grazing perform?

The cow herd has winter grazed swathes since 2005.

Swathe grazing allows us a 10 to 11 month grazing season.

The snow has never interfered with their ability to find the swathes

Year		acres	# head	AU	days	AUM	AUM/acre
2005	cows	261	350	1.29	48	722.4	2.77
2007	cows	169	229	1.29	55	541.59	3.20
2008*	cows	169	235	1.29	10	101.05	0.60
2008*	cows	84	235	1.29	7	70.74	0.84
2009	cows	84	210	1.29	26	234.78	2.80
2009	cows	60	210	1.29	12	108.36	1.81
2010	steer calves	70	140	0.55	55	141.17	2.02
2011	weaned calves	11.7	282	0.43	11	44.46	3.80
2011**	steer calves	70	150	0.5	25	62.50	0.89
2011**	heifer calves	70	127	0.58	45	110.49	1.58
2011	steer calves	80	150	0.67	108	361.80	4.52
2012	bred heifers	70	106	0.95	72	241.68	3.45
2012***	cows	70	201	1.29	5	43.22	0.62
2012	cows	70	201	1.29	15	129.65	1.85

* In 2008, we planted a cover crop after we harvested the wheat and turned cows on it mid winter. Cover crop was a mixture of BMR sorghum, soybeans and clover

** In 2011 we had an 18" snow cover and couldn't see how much feed was left, so we moved the steers early and went back with heifer calves later to clean up.

How do calves perform on swathes?

Year	**ADG**
2010	1.69
2011	1.96

2012 data

	date	Age (days)	weight	ADG
weaning wt	10/10/2011	155	436.5	
background in wt	12/10/2011	216	573	1.9
midwinter wt	2/17/2012	285	723	2.3
Background out wt	3/30/2012	326	834	2.8

How were the steer calves supplemented?

Steer ration
3.7 pounds light test weight milo
3.8 pounds DDG
Supplement containing Rumensin (80 mg/day), some urea for DIP and trace minerals

Utilizing NRC's predicted intake, the steers were fed to gain around 1.8 pounds ADG. Between December and late February, the steers gained 2.3 pounds ADG.

Between Feb 17 and Mar 30th gained 2.8 ADG.

Why did the steers out-perform the projection?

The steers were either eating more hay than NRC predicted

or

The hay was a better quality than the feed sample showed.

The sample could not measure the regrowth.

The sample probably missed the turnips and radishes.

Probably a bit of both.

What is the cost per acre of raising a summer annual cocktail?

Spring burn-down herbicide	$ 6.74
Fertilizer	$29.08
Seed	$25.00
Planting cost	$18.00
Swathing	$14.00
Total:	**$92.82/acre**

How does swath grazing compare to traditional feeding programs?

Average AUM/acre over 7 years is 2.98 AUM/acre

Cost per AUM	$31/AUM
1290 pound cow	$24.00/month or $0.80/day

Compare it to feeding 30 pounds of $65/ton hay, which costs $0.975/day.

Labor of feeding the cows is not included in this calculation.

What was the cost of gain in back-grounding the 2011 born steers?

Steer ration

3.7 pounds light test weight milo* valued $3.33/bu ($.06/#)	$0.22
3.8 pounds DDG valued at $220/ton ($0.11/#)	$0.42
1/3 pound Supplement valued at $540/ton ($0.27/#)	$0.09
($92.82 x 80 acres) / (150 calves x 108 days)	$0.46
Total:	**$1.19**

*I sold corn @ $5.95/bu. Milo is usually worth 80% of corn.
I discounted it by another 30%, because I couldn't sell it, to come up with $3.33/bushel.

At 2.3 ADG cost of gain was $0.52.
At 2.8 ADG cost of gain was $0.425.

Management Considerations for the Beef Cow Herd in Drought Conditions

Rick Rasby
Beef Specialist, University of Nebraska

Introduction

Drought has occurred somewhere in Nebraska for as long as I can remember. This year it seems to be more wide-spread than in the past. The challenge for cow/calf producers is to implement a plan in a timely fashion so that the grazed resource is not compromised. In some areas of Nebraska, because the soils are fragile, mismanagement one year may require a number of years to reestablish more normal productivity. A management strategy may be to depopulate/destock. Producers have taken many years to develop genetic combinations that fit their environment and resources, and now they may have to cull some of those genetics. Not having a drought management plan means that you are hoping for the best and likely will not make management decisions on a timely basis, and this may be costly to the cattle enterprise.

Drought Management Plans

Keep the plan flexible. If there is some moisture received and relocation is part of the drought management plan, maybe you don't have to relocate the whole herd. If weather conditions do change, total implementation of the drought plan may not be needed. In Nebraska, it is important to identify when (dates) to begin implementation of the drought plan. In the Sandhills of Nebraska, if we get "w" inches of rain by "x" date, then "y" amount of forage will be produced and generate enough forage for "z" AUMs. Ask your university pasture/forage specialist or person at NRCS for that information. An example, if we don't get a certain amount of moisture by May, we are probably looking at reduced forage production in our pastures, at least in the Sandhills of Nebraska. In the drought management plan, include options of relocation and depopulation.

If you don't have a drought plan, you typically wait too long to react. For instance, this year is a little bit different in regard to cull cow prices. They are pretty good, but not as good as last year. It wasn't that long ago when cull cows sold for $.28/lb and now they are in the $0.70 to $0.80 per pound range. Have in the drought management plan the date to begin to depopulate, if it comes to that management strategy, prior to the time everyone else is sending cull cows to market. As more cows enter the market and are sold, price will decrease.

A primary objective for the cow/calf enterprise is to stay profitable during a drought. This is usually a challenge as harvested forages are in low supply, causing the cost of these forages to be expensive. In addition, fuel cost to get forages transported adds cost to the forages, especially if the forages need to be hauled any distance.

Some of the soils that we manage are fairly fragile, especially when you think about soils similar to those in the Sandhills of Nebraska that are sand. These pastures cannot be overgrazed because of the number of years it takes to get them back to be productive after over-grazing.

Strategies to Reduce Grazing Needs: Depopulating/Destocking Strategies

Depopulating/destocking and relocating all or part of the herd will reduce the need for pasture. Before considering relocation, there are management strategies that could reduce the need for pasture enough that cows would not need to be relocated.

Early weaning

Early weaning does impact forage availability. The 2000 NRC model indicates when comparing a non-lactating cow vs. a lactating cow, there is about a 4.6-5.9 lb savings in dry matter intake between them. That would be about a 1200 lb cow eating 2% of her body weight. Forage intake of a 250 to 300 lb calf is about 5.3 lb per day. If the two forage saving numbers are added, it's about 10 lb of dry matter per head per day. So for each 2.5 days the calf is weaned, there is about enough grass savings for one more day of grazing for a 1,200 lb cow.

Calves can be weaned at 45 to 90 days of age. The older the calves are, the more likely the feeding accommodations better fit the calf. Feed bunks and water sources need to be at a height that small calves can access the water and feed. Diets will need to include high quality feed. Feed straw and corn stalks don't fit in these diets.

To free up enough pasture, the whole calf crop may not need to be early weaned. If that is the case, consider early weaning calves from females raising their first calf, old cows, cows that were identified at calving as being culled after weaning their calf.

Consider retaining early weaned calves for some time after weaning to generate enough money to pay for the cow costs. Light weight calves sell at a higher price ($/lb), but usually the light weight calf doesn't generate enough total dollars to pay for the annual cow costs. In addition, early weaned calves are very efficient at converting feed to gain and if retained into the feedlot, if grown for a short period of time (two weeks) and then fed a high-starch diet, a high proportion grade USDA average choice or better.

Consider creep feeding the calves before early weaning. This management practice will get the calves used to eating a ration out of a feeder. Using creep feeding in this manner is bunk breaking the calves. This will help reduce morbidity and mortality of early weaned calves if they are drylotted.

Cow Culling Strategies

This is a challenge for most producers, especially in drought conditions. Depopulation means that you are going to decrease cow herd numbers to get though the drought. Producers have likely spent a lot of years building the genetics in the herd to fit their environment. Producers need to inventory the cow herd. Pregnancy check cows early in drought years, and develop a marketing plan for the non-pregnant females. Wait until about 40 days after the end of the breeding season to preg-check. Waiting 40 days after the breeding season to preg-check will be long enough to not possibly abort any late-bred females. Any feeds that are purchased need to be fed to productive cows. Keep only pregnant cows or cow/calf pairs. If cows need to be culled, this is where records are handy.

Cull female list:

- Non-pregnant females
- Bad teats, udders, eyes, feet and legs
- Old cows
- Cows with poor disposition
- Poor performing cows
    - Cows that consistently wean calves in the bottom ¼ or 1/3 of the herd every year over a two- to three-year period
        - If they are in the bottom for two to three years in a row, they are probably telling you something; the genetics don't quite fit the environment that you are asking them to perform in.

Using individual cow records in drought conditions comes in handy. It's difficult to cull on production in a commercial cow-calf operation. Once you cull open cows, those with bad udders, bad teats, feet and legs, or poor disposition, you don't have a lot of room to cull on the quality of calf that the cow raises. Drought is a situation to cull cows on performance. Again, if depopulation is a management strategy, make the decision prior to the time that everyone else culls cows so you don't have to market when there is a high supply of cull cows entering the market, causing a depression in price.

Cow/calf – Yearling Operations

Cow/calf – yearling operations have a "built-in" drought management plan. In these operations, when drought occurs, the yearlings can either be sold or retained into the feedlot to reduce the need for pasture. This may free up enough grass to have all cows remain at location and early weaning and cull strategies may not need to be implemented.

Relocating Cows to Reduce Pasture Needs

Relocation may include all or part of your herd. If there are guidelines based on moisture received by a certain time of the year as it relates to forage production in pastures, use this information to help make relocations decisions. Using this information will give a pretty good idea if it is necessary to relocate all or part of the herd. Relocation would include securing pastures elsewhere, securing/building pen space on your location (make sure the pasture used as a sacrifice pasture can be easily renovated), or securing pen space in a feedlot (in the summer time, the numbers in the feedlot go down and there may be an opportunity to bring cows into a feedlot).

Relocation of Cows to Pasture Within or Out of State

When relocating the cow herd to another location within the same state or another state, producers need to go through a checklist:

- Who is responsible for checking on the cattle?
- Who is responsible for checking on the water?
- Who is responsible for checking the mineral/salt?
- Who is responsible for checking and repairing fence?
- Who is responsible for doctoring sick cattle?
- If cattle are transported across state lines, are there any restrictions or health information needed before they can be transported?

Have a biosecurity plan for cattle that leave your location, especially if part of the herd is relocated and part of the herd remains on your location. Consult with your veterinarian to develop this plan. The diseases that were once regional now appear to be more wide-spread. When cattle are relocated, are they going to be co-mingled with another group of cattle? If you relocate part of your herd, when they are brought back to the ranch, can they be quarantined from the rest of the herd for some period of time from a biosecurity standpoint to make sure they are free of disease?

Relocating Cows to a Feedlot

Feedlots may be an option to relocate cows during a drought for spring and summer. Before relating to a feedlot, cow-calf producers need to know:

- Diet that will be fed and cost.
- When and how often they will receive and when they need to pay their feed bill.
- What other costs will they be charged?
    - What is yardage?
- Who determines health treatment?
- Biosecurity – will there be other cows fed with their cows? How will your cows be separated from their feeder cattle?

It is a challenge for feedlot managers not to try to "fatten" the cows. Cows fed in a drylot need to be fed to achieve or maintain a body condition score of 5 (1= very thin; 9 = obese).

Conducting a breeding season in a drylot can be a real challenge. Try to get the breeding accomplished before the cows relocate to the feedlot. If this is not possible, AI may be an option. If AI is used, there will still need to be a natural service component, as not all cows will conceive to AI. Corner off a portion of the pen with an electric fence to allow calves to walk under the fence and to an area where they can get away from the breeding activity and not get hurt.

Relocating Cows to a Sacrifice Area at Your Location

Cows could be drylotted at the owner's location. A pasture could be sacrificed as a drylot for the cows. If the sacrifice area is a pasture, make sure it can be easily renovated. Sometimes summer annuals are planted as a feed source, and this field would be a logical place to temporarily drylot some cows, as it would be easily renovated. Feed cows to a body condition score of 5.

Conducting a breeding season in a drylot can be a real challenge. Try to get the breeding accomplished before the cows relocate to the feedlot. If this is not possible, AI may be an option. If AI is used, there will still need to be a natural service component, as not all cows will conceive to AI. Corner off a portion of the pen with an electric fence to allow calves to walk under the fence and to an area where they can get away from the breeding activity and not get hurt.

Rations for Drylotted Beef Cow in Drought Conditions

Because forages are usually limited and expensive during drought, consider limit feeding the cows when they are drylotted. Limit feeding means that cows are fed a ration daily but the ration quality is such that a full-feed of the ration doesn't have to be fed to meet their nutrient requirements. As an example, a 1,200 lb cow being fed a ration that is average quality will consume 2-2.2% of her body weight daily on a dry matter basis. For ease of calculation, if she eats 2% of her body weight daily, that's 24 pounds of feed daily on a 100% dry matter basis. In a limit-fed ration, the density of the nutrients may mean that we can feed only 17 to 18 pounds of the ration on a dry matter basis to meet her nutrient needs. Forage cannot be totally eliminated from the diet. Data suggest that at least 0.5% of a cow's body weight on a dry matter basis be forage to maintain rumen health. If a cow weighed 1,200 lb, then the minimum amount of forage on a dry matter basis would be 6 lb/hd/da dry matter basis. If the forage is 90% dry matter, 7 lb/hd/da (6l b/hd/da divided by 0.90 = 6.67) of this forage needs to be in the diet.

The forages in these rations are needed to reduce rumen function problems, maintain rumen integrity, and keep the rumen healthy. Lactating cows with high milk ability will need more grain compared to cows that give less milk. Distillers grains and distillers grains mixed with forage combinations can be used in limit-fed diets. Limit-fed diets that include distillers grains and forage are in the 2009 (pg 11) and 2012 (pg 13) Nebraska Beef Report.

If you feed a limit-fed diet, some considerations are:

- The machinery to deliver it.
- If you set yourself up at your place, leave plenty of bunk space -- about 24-36" per head.
- Be consistent with the amount of feed delivered daily. If the rations calls for 12 lb/hd/da of corn, that doesn't mean that you feed 6 lb one day and 12 lb the next. Be consistent in regard to the amount and energy source you deliver.
- If a supplement is needed, include an ionophore, which is helpful for acidosis and increases feed efficiency.
- Do not finely grind the forage or grain. Long-stem hay will slow down rate of passage and limit-fed cows will feel fuller for a longer period of time.
- Consider sorting young cows from older cows.

Limit-fed diets are hard to balance for nutrients using low quality forages and grains such as corn without adding a protein supplement. Limit-fed diets with low quality forages are easy to balance using grain byproducts like distillers grains.

Cows being fed a limit-fed diet will act hungry and gaunt for the first week. For that first week, consider splitting the total ration in half and feeding cows twice daily. Thereafter, feed once daily. The limit-fed diet is designed to meet nutrient requirements without the cows consuming all that they eat in a day. Usually after about a week to 10 days cows adapt to this feeding regiment. If it takes longer for them to adapt, put a bale of straw in the pen. Feed salt and mineral free choice. Cow-calf producers aren't used to including calcium in the diet. When feeding high grain diets or distillers grains, some calcium will need to be added to the diet.

Feeds for cow rations would include CRP hay, straw, corn stalks, corn, silage (droughted corn would work), byproducts (distillers, gluten, wheat mids, soy huls) and milo. Do not finely grind the grains; this may cause them to be digested too rapidly in the rumen and cause acidosis or founder.

Feeding/Forage Options for Drought-damaged Corn Fields

Corn that has been affected by drought can be used as a feed for cattle. Before harvesting for something other than the grain, check with your crop insurance person to determine what needs to be considered to make sure that the field can be put up as a forage crop and still receive any insurance that is possible. The drought-damaged corn plant will likely contain nitrates. Data indicates that the nitrates reside in the bottom 6 to 8 inches of the stalk. Use management strategies to reduce cattle losses due to high nitrates in feed.

Silage

A drought-damaged corn field can be salvaged as corn silage. Harvesting the drought-damaged corn field as silage will reduce nitrates by 30 to 60%. To reduce the nitrates through the ensiling process, allow the silage to go through the 21-day fermentation process before opening the bunker to feed. Ideal moisture content of the silage for packing into a bunker is 65% (35% dry matter), with a range of 62 to 68% moisture. This is critical when making silage. If the silage is too wet, there will be excessive seeping and spoilage, and proper fermentation will not occur. If the silage is too dry, it will be difficult to pack and create the anaerobic (with oxygen) conditions necessary for the fermentation process.

It is difficult to determine when to chop a drought-damaged corn field for silage. The green chop may be as high as 80% moisture, which is too wet to pack into a bunker. At this moisture content, let it continue to dry in the field or windrow the field, and let it wilt in the field until the desired moisture content is achieved for chopping and packing into the bunker.

To determine the moisture of the standing crop, select some stalks and cut them at the same height that the chopper will be set. Cut the stalks into small pieces (about 1 inch) using a cleaver or heavy knife, mix the sample and then analyze the sample for dry matter using the microwave. Take a sample from some of the chopped material, weigh the sample then dry it down in a microwave. Reweigh the sample to determine the moisture. Microwave slowly so as not to "burn" the sample. Microwave and weigh until there is no change in weight of the sample after microwaving. This process requires a scale that can accurately weigh small amounts of material and changes in weight due to water.

A quick-and-dirty method of estimating time to harvest a drought-damaged corn field is to use the "squeeze test." Select a few stalks (like described in the previous paragraph) and chop them into pieces about the same size that the silage chopper would using a heavy knife or cleaver. Grab a hand full of the chopped material and squeeze it for 30 seconds. If the juices drip from the material, it is too wet. In this situation, wait to chop in a couple of days or test again in a couple of days. If the sample doesn't drip any juices from the squeezed material, slowly open your hand:

- If the stalk material remains compacted and doesn't fall apart, the moisture level is acceptable for ensiling.
- If your hand is not wet and the stalk material falls apart when you open your hand, the material is too dry to ensile.

If the chopped silage is too wet:

- Stop chopping and allow the field to dry; OR
- Add whole corn, dried distillers grains, or ground dry forage.

To avoid the nitrates, the chopper head could be set to leave 8-inch stubble. This will result in a reduction in yield. The ensiling process will reduce nitrate 30 to 60%, so a compromise is leaving 6-inch stubble.

Droughted corn silage will be 85 to 95% the energy value of regular corn silage. The protein content will be slightly greater than regular corn silage. Before feeding, sample and test for moisture, energy (TDN), crude protein, and nitrates.

Pricing droughted corn silage is a bit of a challenge. Rule of thumb has been that each ton of 65% moisture corn silage in the bunker is priced at 9 to 10 times price of a bushel of corn (normal, well-eared corn). Pricing the standing crop is a little more difficult to determine. Some have priced it in the field at:

1. 5 times price of a bushel of corn (earless corn).
2. 7 to 8 times price of a bushel of corn (low grain corn – less than 100 bu/A).

Harvest costs on a per ton basis from drought-damaged corn undoubtedly will be higher than normal due to lower tonnage yields per acre. NebGuide Resources: Estimating Corn and Sorghum Silage Value; The Use and Pricing of Drought-Stressed Corn.

Green Chop

The droughted corn field could be salvaged as green chop. The field is chopped daily and fed daily. Set the chopper head to leave at least an 8-inch stubble to avoid some of the nitrates. Nitrates will be a concern. Do not allow the green chop to heat in the wagon. This will cause nitrates to be converted to nitrites and nitrites are 10 times more toxic than nitrates. Observe cattle frequently while they are eating the green chop.

Baling
The droughted corn field can be salvaged as hay. Nitrates are still a concern; consider leaving an 8-inch stubble, as a major portion resides in the bottom part of the stalk. One of the challenges is to get the hay dried down enough to make a good bale. Leaving an 8-inch stubble will allow air movement around the underneath side of the windrow close to the ground to help the drying process. Crimping the stems will help in the drying process. Before feeding, take a sample and test for moisture, energy (TDN), crude protein, and nitrates.

Grazing
Grazing the droughted corn field is a way to extend the grazing season. Introduce livestock slowly to this new forage by feeding them hay before turning in to reduce the chances of digestive problems. Nitrates are still a possible problem, so don't force cattle to consume the bottom part of the stalk. Acidosis could be a concern depending on the amount of ear development. Adapt cows and access may need to be limited depending on the amount of ear development and grain. Reduce losses due to trampling by cross-fencing and allowing cattle access to only enough feed for a couple of days of grazing. A watering source or system will need to be developed.

Windrow Grazing
Windrow the droughted field and leave windrows in the field for winter grazing. Nitrates are still a concern; consider leaving an 8-inch stubble, as a major portion resides in the bottom part of the stalk. Leaving an 8-inch stubble will allow air movement around the underneath side of the windrow close to the ground to help the drying process. Nitrates can still be a concern, so fill cattle up with a forage low in nitrates before allowing access to the windrows. Acidosis could be a concern depending on the amount of ear development. Adapt cows and access may need to be limited depending on the amount of ear development and grain. When feeding the windrows, fence off enough for a couple of days feeding to avoid wasting a lot of the forage.

Grazing Summer Annuals

Sometimes during drought, summer annuals such as millets, sudangrass, and canes are available as feed for cows. There may be the opportunity to harvest them as a forage crop. Some of these forages may have been grown under drought conditions. **If summer annuals are going to be grazed, use the following "thumb rules:"** fill cows up with hay prior to the turnout on the summer annual; don't force cattle to eat the base of the stalk (nitrates are going to accumulate in the lower 4-8" of the stalk); wait to graze until it's at least 18-24" tall to avoid problems with prussic acid. If summer annuals go through freezing temperature, wait for about 5-7 days after freeze so you get around prussic acid. Be aware that there is a greater concentration in new growth. The wilting process will reduce the prussic acid content of the annuals.

Substituting Pasture with Feed for Cows Grazing Pasture

There has been very little interest in replacing pasture with another feed during the spring/summer while cows are grazing pastures, other than supplementing cows with salt and minerals/vitamins, and rightfully so because the nutrient quality of cool- and warm-season pastures, in most cases, is high enough to meet the energy and protein needs of lactating cows. However, if forage production in a pasture is limited due to drought or availability of pasture is limited due to high price or high demand, replacing pasture with feed may be an economical alternative. For producers to consider using feed to replace pasture while cows are still grazing the pasture:

1. They must have the labor and equipment to deliver the feed.
2. To reduce feeding losses, consider feeding in bunks. However, providing the forage replacement on the ground would allow producers to move the cattle around the pasture to improve grazing utilization of the pasture while reducing erosion due to trampling around a single feeding location.
3. It must be cost effective and feeds must be relatively cheap compared to total pasture costs.
4. The feeds used as the substitute for pasture must not have a negative effect on forage digestion because part of the diet is forage from the pasture.

The thought process of replacing pasture with feed for cows grazing pasture would be to replace (substitute) some of the forage/pasture daily intake by the cow with an economical feed that doesn't have a negative effect on forage digestion. If this could be done, stocking rate could be increased on the pasture resource, which would spread pasture costs over more cows or the available pasture could be "stretched" and used for a longer period of time. In theory, the rumen has a certain capacity, and once filled, cattle will stop eating. So part of the rumen would be filled with feed other than grass from the pasture they are grazing. This management strategy cannot have a detrimental effect on pasture longevity and sustainability.

Harvested forages such as alfalfa, grass hay and summer annuals could be used in a grazing situation to replace grazed forage and not have a negative impact on the total digestibility of the diet. The challenge using harvested forages to replace pasture is that harvested forages are usually expensive, especially in drought conditions. A second challenge is to get cows to eat the harvested forage instead of vegetative grass in the pasture. Cows likely won't consider eating the harvested forage until grass in the pasture is depleted. If there is daily access to a loafing area where the cattle could be gathered and fed the harvested forage before turning them out to pasture, then consumption of the harvested forage may be possible. This practice would take labor and fuel in addition to the feed and equipment to deliver the feed.

Grains, such as corn, are not a good choice, even if they were cheap as a feed substitute for cows grazing pasture. Data suggest that grains have a negative associative effect on forage digestion. Grains are high in starch, and feeds that are high in starch tend to lower the pH of the rumen and make it an acid environment, which promotes an increase in microbes that digest grains, not forages. The consequence of this is a decrease in forage digestibility.

We have studied supplementing mixtures of wet distillers grains mixed with low quality hay or crop residue to grazing cattle in an attempt to replace grazed forage, without removing the cattle from the pasture. Corn distillers byproducts are very palatable, and mixing them with low quality forage or crop residues has been shown to increase consumption of low quality roughage, and when fed to cows grazing pasture, will replace pasture consumed. The amount of the pasture replacement has been variable. In one study, each pound of the 45:55 ratio of WDGS:grass hay mix consumed by cows replaced 0.22 lb of the grazed forage. This is lower than the targeted goal of 50% pasture replacement that was planned. This potentially could have negative impacts on native range health if it were stocked at a rate with cows with an assumed 50% replacement rate. The fiber content of the mix may not have been high enough to provide enough bulk to limit grazed forage intake as desired. In another study, cow/calf pairs grazed pasture and received either 50:50, 40:60, or 30:70 WDGS:wheat straw supplementation at 50% of the estimated dry matter intake. The 30:70 WDGS:wheat straw treatment almost replaced grazed forage on a 1:1 basis. As the amount of WDGS increased in the supplement, the amount of replaced grazed forage decreased. For producers with crop residues in close proximity to their cattle, the 30:70 WDGS:residue combination may be a viable option to reduce grazed forage intake. Studies indicate that a blend of 30:70 WDGS:roughage appears to be the optimum blend to get the most forage replacement. Using this combination of byproduct:forage, producers could plan that for every dry matter pound of the combination fed, 0.5 to 1.0 lb of forage in a pasture on a dry matter basis could be replaced. Resources: Crop Residues or Low Quality Hay Combined with Byproducts as a Forage Substitute, NebGuide G2099; Byproducts with Low Quality Forage to Grazing Cattle and research results in the 2012 NE Beef Report (page 53).

Secure Feeds for Fall and Winter

Sampling and testing forages for quality should be an annual management practice. In years of drought, forage quality can be much different than in the past from the same hay fields. Before feeding forages or silage, test them for moisture, energy (TDN), crude protein, and NITRATES. Knowing the nitrate content allows the use of other forages to be included to dilute the nitrates to safe levels before feeding if needed. Avoid livestock losses due to nitrates by managing around high levels.

CRP Hay

CRP hay will vary in quality depending on the type of grass (warm- or cool-season grass) and the amount of dead material in the field. Nitrates will typically be of minimal concern.

Corn Stalk Bales

Corn stalk bales can vary in quality. If husk and leaf are the primary components of the bale, the bales will be 82-85% dry matter 52-54% TDN, and almost 5.5-6.5% crude protein. This is almost as good as some average quality grass hays. As the amount of stalk increases in the bale, quality decreases. Drought-damaged corn fields can be swathed and baled. Quality and nitrate level will vary. Quality will depend on the amount of leaf and corn in the bale.

Straw
Straw will typically be 4% crude protein and 40% TDN. For cows, it will work in diets that include distillers grains or corn silage. If straw is fed with corn, a protein will likely need to be included.

Soybean Stubble
Soybean stubble is a challenge to work into cow diets. It can be used to stretch a high quality forage such as alfalfa. Remember that soybeans are a legume, and as legumes mature, they increase in lignin content. Lignin is not digested in the rumen.

Grazing Crop Residues
Crop residues are a good feed for beef cows. In drought years, dry-land corn fields are likely harvested as silage, hayed, green chopped, or grazed. In Nebraska, there are more than enough irrigated corn fields for cattle to graze in the late fall and winter. Securing corn stalks for winter grazing should be considered early and arrangements made with the row crop producer. Stocking rate when a corn field is grazed is a function of grain yield. There is a nice spreadsheet to help determine stocking rate on our beef website: http://beef.unl.edu/learning/cornStalkGrazingCalc.shtml

Forage Feeding Losses

If you do get into feeding harvested forages, make sure hay waste is minimal because hay is expensive. Waste is a function of how tightly the bale is wrapped and how the bale is presented: loose on the ground, in a windrow, bale processor, in a bale feeder with skirts, or in a bunk. There can be 5-35% waste depending on how the hay is fed. Losses need to be accounted for when rations are developed. Management strategies to reduce hay feeding waste/losses can increase the need for equipment.

Nitrates

Usually cattle die from nitrates when they are hungry and get exposed to hay with high nitrates. Cattle can be adapted to nitrates in feeds/forages. Giving cows time to establish microbes that convert nitrites to ammonia by feeding small portions of the moderate/high nitrate feed over a week to 10-day period will help them adapt to nitrates in feed. Nitrates in the blood stream convert hemoglobin to methemoglobin, and methemaglobin will not carry oxygen.

Nitrite change hemoglobin to methemoglobin

- Methemoglobin can't carry oxygen.
- Blood is chocolate brown.
- Bluish coloration of unpigmented skin, mucus membranes.
- Animal dies due to lack of oxygen.

Treatment of cows with nitrate toxicity includes: Methelene blue IV (converts methemoglobin back to hemoglobin) or purge the rumen with saline or Epson salts.

Understand how the nitrates are reported in an analysis and the potentially toxic levels:

- Nitrates (NO_3) – 10,000 ppm, potentially toxic
- Nitrate Nitrogen (NO_3N) – 2,200 ppm, potentially toxic
- Potassium Nitrates (KnO_3) – 16,300 ppm, potentially toxic

High-nitrate feeds need to be combined with low-nitrate feeds to dilute nitrates to a safe level to reduce the risk of cattle losses to nitrates.

Editor's Notes: Referenced Beef Reports are available at http://beef.unl.edu/reports. Other Institute of Agriculture and Natural Resources publications available at http://www.ianrpubs.unl.edu.

EVALUATING GRAZING SYSTEM OPTIONS
Three Bar Cattle Co.

John Ravenscroft, Nenzel, NE

The Three Bar Cattle Co. is a family-owned ranching operation 35 miles south of Nenzel, NE. This puts the ranch in the center of Cherry County. The family members on the ranch are: John and Cheryl; oldest son, Eric, and his wife, Shannon, and their children -- Jaylynn, Tyler, Elle, and Tucker; middle son, Kevin, his wife, Liz, and their daughters -- Kayleigh and Lilly. Our third son, Brant, is in Enid, OK at Air Force flight school along with his wife, Emily, and their daughters -- Caroline and Nora. We are fortunate to have part of our family close and involved in the operation.

There are two planning sessions that are very important to our operation. The financial planning is done before our fiscal year starts in January. We have a computer program into which we can put each month's projected income for the year. Then we put in the planned expense for each month. With the plan we can see before the year starts if what we want to do will be financially possible. If it is not, we can make adjustments. We put expenses in a little higher and the income a little more conservative. As the year goes by, we can monitor this plan to see how we are progressing and make necessary adjustments. It helps to make decisions on our inputs.

The planning we do that is more fun and easier to talk about is the grazing plan. We do a general grazing plan before the financial plan to get numbers of livestock for sale. The more detailed grazing plan is done before the growing season starts. There will be a plan for each herd in each cell. I will discuss each grazing cell.

We have been buying heifer calves weighing from 450 to 550. We have an order buyer that buys these calves starting in January. They will usually all be here by late March or early April. The heifers are spayed the last of April and start their grazing in the spayed heifer cell. This year there are 1200 heifers in this cell with 19 paddocks making up 8145 acres. The stocking rate is 6.78 acres per head, which equates to 19 animal days per acre for one day. The first time through the paddocks we manage our moves so we don't get back to where we started for at least 30 days. With the cool-season grass we think this works out well. The next time around we keep monitoring the re-growth and adjust our moves accordingly. The goal is to not get back to where we started before the grass that was grazed is recovered. This gives the grass a chance to build up root reserve and send out rhizomes. With the drought conditions this year, each paddock will only be grazed twice. For a wet year like last year, about half of the paddocks are grazed three times. The warm-season grass does grow in drought conditions, but it is at a much slower rate. We like to give it at least a 90-day rest if possible; 100 to 120 days is better. Give it as much rest as possible.

This year the cow cell is made up of 28 paddocks. The total acres are 11,518. There are approximately 1000 cows and calves, which makes 11.5 acres per pair. If figured for 180 days, this leaves 15.6 animals on one acre for one day. The cows calve out in the paddocks starting May 1st. Depending on the grass conditions, they are usually weaned in November. There is a possibility that they could be weaned early this year. The cows are wintered in smaller herds. They are fed range grass and protein supplement in the winter program. In the last 25 years, hay had to be fed one year for a short period because of snow. We have had a history of buying our cows and using terminal cross bulls. The decision was made to start raising our own replacements. Last spring we started the first-calf heifers calving the 1st of April. The idea is to give them more time before they are bred back. The plan was to graze them in a separate three-paddock cell this summer, but due to the drought, they were co-mingled with the cow herd July 16th.

The ranch has a yearling meadow cell. This year there are 1299 acres included with 900 head. This is figured for 140 days, which makes a stocking rate of 1.4 acres per head, 97 head on one acre for one day. These are our home-raised yearlings. Included are some two-year-olds that will be harvested and marketed as grass fat.

This brings us to the replacement heifers. This year there were 300 head in this herd. They started out according to the plan, with seven paddocks of 2282 acres, 7.6 acres per head. This is an example of having to re-plan and make adjustments. Their water source consisted mostly of a creek, but the creek dried up as it does on real dry years. The adjustment that was made was moving the first-calf heifers in with the cows. This gave us 3685 more acres and four more paddocks with water. This changed our stocking rate to 12 acres per head, 14.6 head per acre per day.

Eric and Shannon have started a registered red Angus herd. As of right now there are 90 head in this group. They have five paddocks with a total of 1775 acres, 20 acres per head. We are flexible with this herd.

The ranch is haying the best parts of eight meadows with a total of 1000 acres. The hay production so far has been around 1/3 of last year. It looks like we will end up with around 500 bales. We had 1100 bales left from last year. If we have a winter like we have been having, this should get us through.

I should also mention that we have a 130-acre center pivot with grass alfalfa mixture. Also, we have a New Zealand K-line irrigation system irrigating 200 acres. Five of the meadows were grazed the last of April; this along with the late frost and limited moisture have caused lower hay production.

Writing Your Drought Plan

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and
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Drought is a natural part of every rancher's production environment. In the Great Plains, the frequency and duration of drought tend to diminish from west to east as average annual precipitation and length of the frost-free period increase and from south to north as evaporation rates decline and growing-season day length increases.

Computers, cell phones, and digital cameras are an inseparable part of our lives. Information is processed by our electronic equipment according to numerous default settings unless we take time to understand and select other options. If we ignore the defaults on our electronic equipment, most of us are satisfied. In contrast, the default settings of drought all have extremely undesirable outcomes. Collectively, drought default or do-nothing settings provide the best possible opportunity for business failure.

The best management decisions are always on the front side of a drought. Preparation of a drought plan and maintaining a positive attitude are guaranteed to reduce anxiety and prevent management paralysis.

Ranchers who use written drought plans are much more likely to avoid costly and sometimes career-ending mistakes than those with no drought plan. Risk of business failure is greater during and following drought than at any other time. Increased cost of production, damage to rangeland resources and depressed livestock markets can cause measurable changes in the solvency and recovery potential of range livestock enterprises.

The "Managing Drought Risk on the Ranch" website (drought.unl.edu/ranch plan) contains a wealth of information for ranch management. Guidelines for developing your drought plan are a subset of the available information. Most of the content is organized into the categories of (1) during, (2) after, or (3) prior to drought. Start with the category that matches your current conditions. The website will be equally valuable for dealing with forage deficits caused by fire, hail, or grasshoppers. The entire website is of considerable value for ranching success regardless of current climatic conditions.

It is wise to annually check or review the personal, financial, and ecological health of your ranch. The personal health and wellness of you, your family, and other hands-on folk can be affected by physical, relational, mental, or spiritual issues. A check of the financial health of the ranch should include liquidity, solvency, and unit costs (Fig. 1). An understanding of your current financial health and the potential financial crises of allowing drought to proceed in default modes should be a strong motivation for preparing a written drought plan.

Knowledge of the average carrying capacity in years with near-average precipitation and your current rangeland condition (Fig. 2) and residual herbage will be critical for determining when to reduce forage demand as drought develops. A rangeland inventory is also important for pastures that have the potential for improved species composition and herbage production during non-drought years. For example, western wheatgrass or needlegrass remnants may be low in vigor, but relatively abundant on loamy plains sites dominated by blue grama. If so, carrying capacity of these pastures could be increased up to 50% during non-drought years. Resilience of rangeland vegetation after drought is directly related to range condition. In contrast, overgrazing blue grama/ buffalograss sod with cool-season remnants during drought will reduce or eliminate cool-season midgrasses and cut herbage production potential in half compared to good to excellent condition rangeland (Fig. 2).

We highly recommend a team approach in the development of your written drought plan. Ideally your team should be composed of on-ranch people and off-ranch mentoring or advisory folk. Be sure to gather information and

Liquidity	Not A Problem	Caution	Serious Problem
Net Cash Flow: Annual Inflow -- Outflow	Large Positive	Small Difference	Large Negative

Solvency	Not A Problem	Caution	Serious Problem
Debt/Asset	< 40%	40 - 60%	> 60%
Networth: Total Assets – Total Liabilities	Large	Moderate	Small
Change In Net Worth	Positive	Small	Large Negative

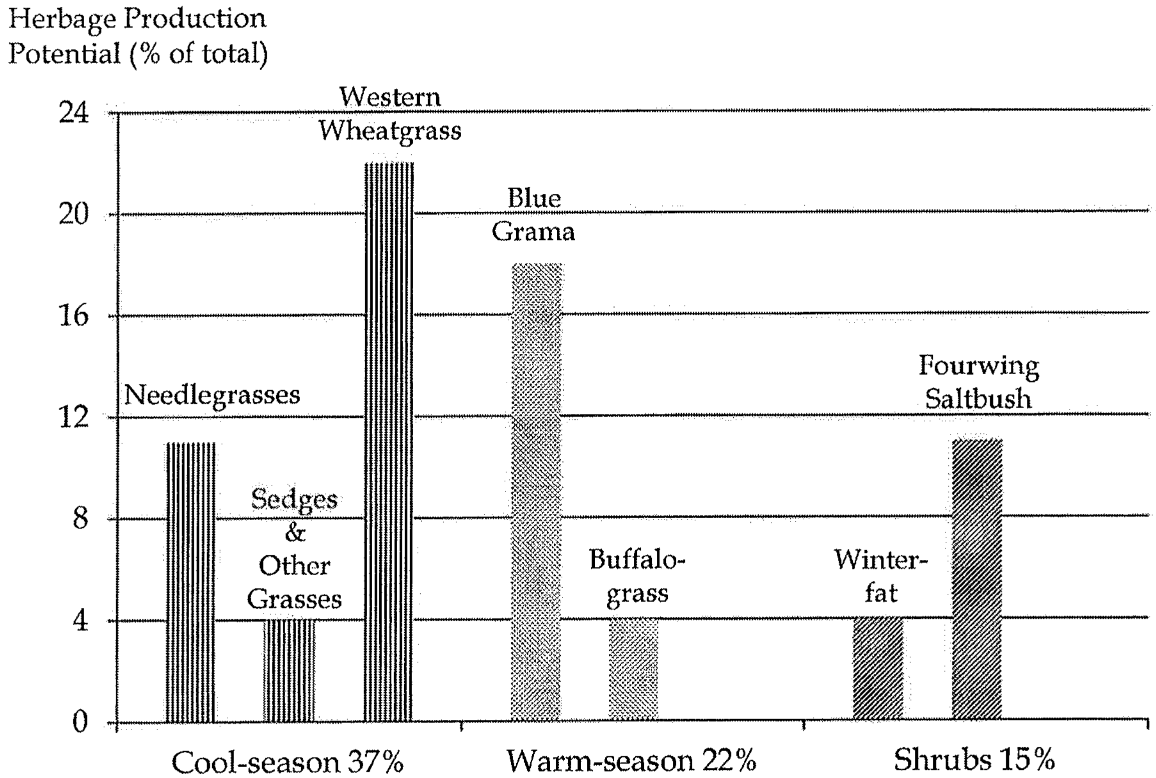
Unit Cost	Not A Problem	Caution	Serious Problem
$/cwt[1]	Low	Above Average	High

[1]Compared to benchmark herds.

Figure 1. Guidelines for evaluating financial health.

(Hughes, et al 2010)

(A) Loamy Plains Ecological Site



(B) Loamy Plains Ecological Site

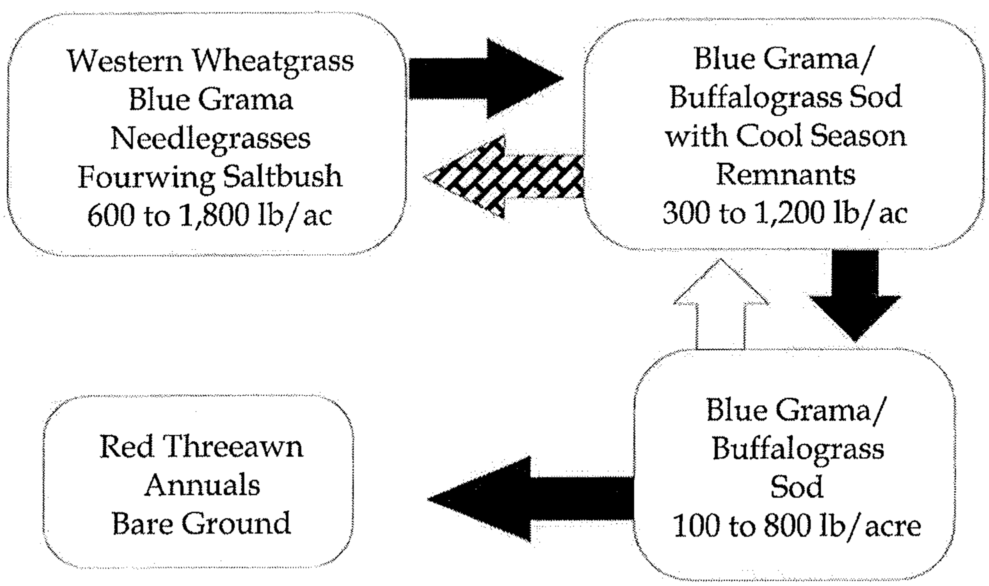


Figure 2. Guidelines for evaluating ecological health (websoilsurvey.nrcs.usda.gov). The example is for the Loamy Plains ecological site, (A) potential species and their contribution to herbage production in average years, (B) state and transition model.

consider Risk Management Agency (RMA) designed rangeland insurance. You will also need to review federal tax codes for drought induced sale of livestock.

The planning process should not begin until ranch goals and strategic objectives have been written. The Alexander family in Kansas has a clearly written set of ranch goals and strategic objectives (Fig. 3). They also have a drought plan that enhances the likelihood of accomplishing their mission.

Alexander Ranch Goals (Kansas)

① Manage all integrated resources to maximize protein production, in order to ② Shape a harmonious existence with nature, and to ③ Maintain economic viability.

Strategic Objectives

① Regenerate the range while using the optimum percentage of herbage grown.
② Enhance water and nutrient cycling and energy flow.
③ Continue the management education process (Ancora Imparo, I am still learning).

Figure 3. Examples of clearly written ranch goals and strategic objectives.

Use your ranch goals and strategic objectives to select action plans when managing forage demand. For example, if you have a registered or other specialized cow-calf enterprise, initially you may choose to manage forage supply more than forage demand. In contrast, commercial livestock producers should primarily focus on reducing forage demand with early sale of livestock subsets. Replacing grazing days with hay days dramatically increases cost of production. Complete liquidation of commercial cow herds is always a viable alternative to minimize loss of financial and ecological health.

Overgrazing is the level and date of grazing beyond which preferred plant species cannot recover before pastures are grazed in a subsequent year. The primary plant response to overgrazing is reduced root length. Percentages of root loss increase as soil depth increases, e.g., deep roots are most at risk.

Plant recovery after grazing is dependent on available soil water and favorable air temperatures. Soil water deficits are maximized by drought. The combination of grazing and drought stresses is the primary mechanism for long-term loss of rangeland productivity.

Failure to leave adequate plant cover reduces the effectiveness of precipitation during and after drought. Optimum levels of remaining herbage for hydrologic condition for different kinds of rangeland are listed in Figure 4. With the exception of shortgrass prairie, remaining herbage on grazed pastures during drought is nearly always below the optimal levels. There is an industry-wide opportunity for improved stewardship of rangeland during drought.

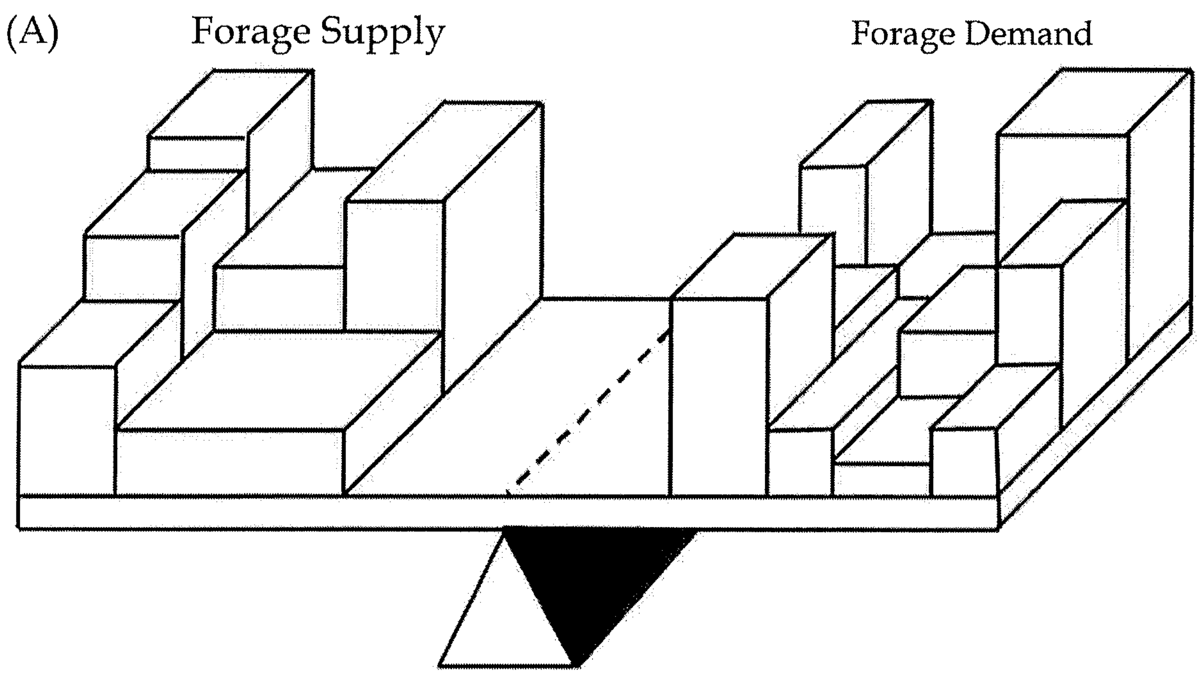
Optimum Total Remaining Herbage

Prairie	lb/ac
Shortgrass	300 - 500
Mixed-grass	750 - 1,000
Tallgrass	1,200 - 1,500

Figure 4. Amount of remaining standing herbage at the end of the grazing season needed to optimize hydrologic condition and to improve vigor and composition of preferred mid- and tallgrasses (Hanselka 1995).

A strategic objective of every ranch should be to strive for drought resilience. Avoiding overgrazing then becomes a critical objective especially for native rangeland during drought. Herbage deficits can occur at different times of the year and the magnitude of these shortages differs among years. Consequently, drought plans need to identify prioritized subsets of livestock for sale or relocation. Sorting criteria should be based on ranch goals and objectives. They may include those listed in Figure 5.

When action plans involve removing livestock, they need to be implemented quickly. When the likelihood of drought is relatively high, put the first-to-go livestock subsets in separate herds at turnout. Put a drought clause in



(B) Reducing Pre-drought Demand

Class	Sort By
• Stocker Steers	Ownership
• Stocker Heifers	Enterprise
• Breeding Heifers	Risk
• Heiferettes	Quality
• Cows	Age
• Bulls	Weight
	Pregnancy
	Weaning

Divide average weight by 1,000 lb = AU

Figure 5. Timely adjustments must be made in rangeland forage demand to minimize risk to carrying capacity and animal performance (A). Drought plans should identify livestock class and sorting criteria for specific target dates (B).

every grazing lease and the necessary terms to make early removal of cattle efficient and equitable. Attach a copy of your drought plan to each grazing lease.

"Drought effects are not linear, they ramp up!" This common observation includes all of the undesirable default options. The antagonistic increase in feed and forage costs, while livestock prices plummet, ramps up weekly. Imbalances between forage supply and forage demand ramp up daily. Even in non-drought years, herbage production rates decline as the summer grazing season progresses while forage demand increases 35% to 40% as cattle gain weight (Fig. 6). In average years, plants "outgrow" livestock on the front half of the season. When this does not happen in drought years you must act quickly. Drought-induced

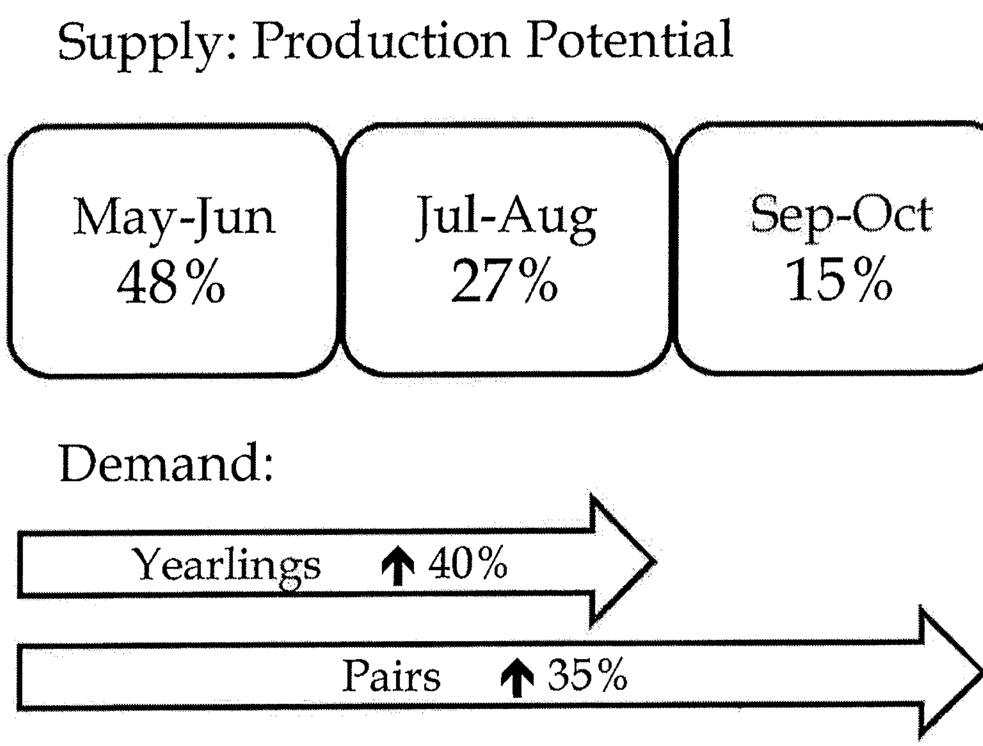


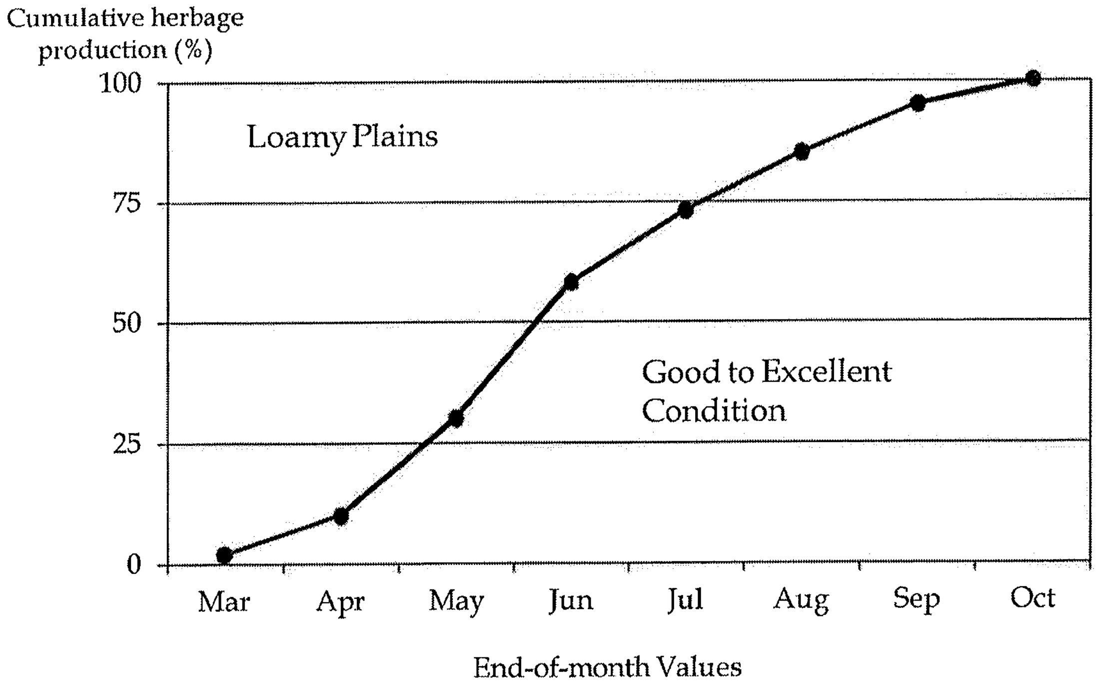
Figure 6. Relationship between herbage supply and herbage demand on loamy plains sites during years with average precipitation.

movement of cattle to the market can drop sale prices by 10% to 20% in a week or two. Prolonged delays can result in tens of thousands of dollars in lost revenue.

Knowing when forage deficits are eminent requires monitoring and knowledge of average seasonal plant growth and precipitation patterns for your location (Fig. 7). Measurable shortages in soil water prior to and into the beginning of rapid plant-growth intervals cause measurable forage deficits. Additionally, average pounds of herbage produced per inch of precipitation declines from the beginning to the end of the growing season. Measurable forage deficits caused by early precipitation/soil water deficits will not be recovered during the balance of the growing season.

The National Resources Conservation Service (NRCS) provides plant growth-curve information (Fig. 7A) for many range sites on websoilsurvey.nrcs.usda.gov. The information may be limited to range sites in good to excellent condition (historical climax plant communities (hcpc)). Check with local NRCS and university range management advisory personnel for additional information. Precipitation and temperature forecasts and an enormous amount of summarized climate data are available at droughtmonitor.unl.edu. Site specific precipitation and temperature records including long-term and monthly data are available at regional climate centers. Enter hprcc or wrcc into your search engine for the high plains and western climate centers, respectively.

(A)



(B)

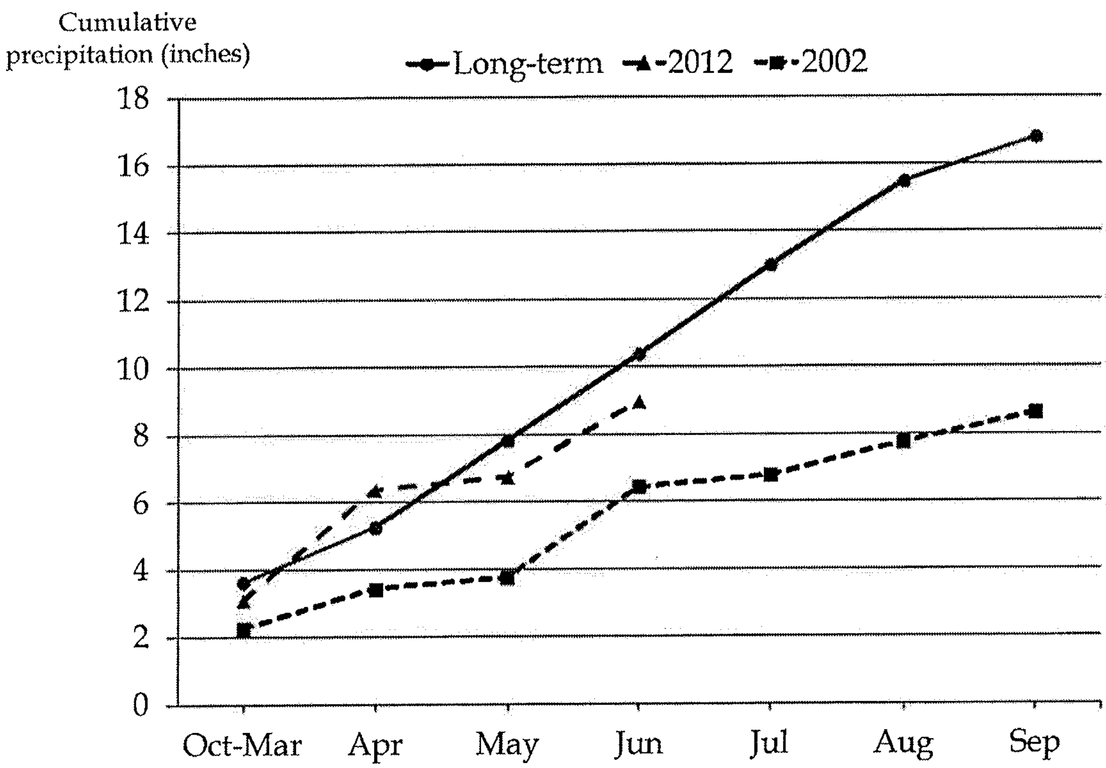


Figure 7. Seasonal pattern of herbage production (A) and long-term precipitation (B) for loamy plains range sites near Burlington, Colorado.

Plant growth on good to excellent condition rangeland is almost always correlated with dormant-season precipitation, October-March. In contrast, the effect of dormant-season precipitation on blue grama/buffalograss sod communities may be insignificant. They are very responsive to spring and summer precipitation.

Work with NRCS and university folk to identify the earliest possible indicators of pending forage deficits. Indicators often include, but are not limited to, climate variables, soil water, or vegetation. Use the most important indicators to select critical levels and trigger dates for removing pre-drought forage demand. Potential indicators include:

- Soil water
- Preceding-year growing conditions and plant growth
- Plant-year precipitation
- Precipitation in recent months
- Near-term precipitation and temperature forecast
- Current standing herbage
- All residual herbage

Examples of possible trigger dates, levels of important indicators, and reductions in pre-drought forage demand are provided in Table 1. Additional examples are on the "Managing Drought Risk on the Ranch" website (drought.unl.edu/ranch plan).

The objectives of your written drought plan are to reduce financial hardship, and minimize risk to animal performance and carrying capacity. You are now ready to fulfill my favorite admonition. It is from a west Texas rancher: "Put your pastures to bed properly." It is a simple and priceless guideline. Whenever the grazing season is ended, your pastures will have adequate

Table 1. Reductions from moderate stocking based on forage deficits that are likely to occur by the trigger dates on Loamy Plains sites in good to excellent range condition, 15-18 inches.

Trigger Date and Indicator		Reduce Pre-drought Demand	
		Initial	Additional[1]
① Before Spring Turnout:			
≥ Severe drought last year during May, June, & July		40%[2]	
May & June, or June & July		30%[2]	
② April 1:			
October-March precipitation < 65% of long term (LT)		15%	
③ April 30:			
May, June, & July air temperatures are forecast @ above average and precipitation @ even chance		20%	
④ May 1:			
No meaningful precipitation (≤ 0.10 in per event) during March & April		15%	
⑤ June 1:			④
March-May precipitation	< 75% LT	25%	10%
	< 50% LT	45%	30%
⑥ July 1:			⑤
May-June precipitation	< 75% LT	35%	25%
	< 50% LT	75%	45%
⑦ July-August: If plant growth slows or stops earlier than in a near-average year, estimate remaining animal-unit days of grazing based on the **usable** percentage of standing **palatable** herbage. Remove cattle incrementally or when estimated herd days have occurred.			

[1]Added to the preceding trigger date and indicator reductions.
[2]Consecutive years of severe, extreme, or exceptional drought may require complete rest to avoid long-term damage to rangeland vegetation.

remaining plant cover for optimum infiltration of rainfall and snowmelt. Midgrasses and tallgrasses have not been grazed down to the level of a billiard table. You are a good steward and a wise business person.

There are 3 critical guidelines for grazing management after the drought breaks:

- Do not graze weed infested pastures.
- Restock based on the recovery of mid- and tallgrass by looking at the **cover** and height of preferred species.
- Delay entry of summer pastures by 1 to 2 weeks.

Drought can cause considerable tiller mortality even in rested pastures. When drought breaks, preferred species can look robust because more soil water and nutrients are available to remaining plants. Give them time to fully recover before fully returning to pre-drought levels of forage demand. Ride slowly through all of your pastures after drought, frequently looking down.

After-drought assessments need to include annual inspections of personal, financial, and ecological health. Use grazing and precipitation records to study cause and effects when recovery differs among pastures. You may also want to add reliable livestock water and add or modify cross fences based on drought experiences or the potential of improving plant vigor or species composition with rotation grazing.

Never forget that drought resilience of rangeland increases as the vigor and relative abundance of preferred midgrasses and tallgrasses increase; these changes are nearly impossible with season-long continuous grazing. When adequate remnant populations of preferred species occur, range condition can be efficiently improved with deferred- or rest-rotation grazing. A minimum of 4 pastures of similar carrying capacity and reliable livestock water are required. An upper limit of 5 to 8 pastures for yearlings and 6 to 8 for cows will provide cost effective control over timing of grazing and provide the opportunity to rest selected pastures (Fig. 8).

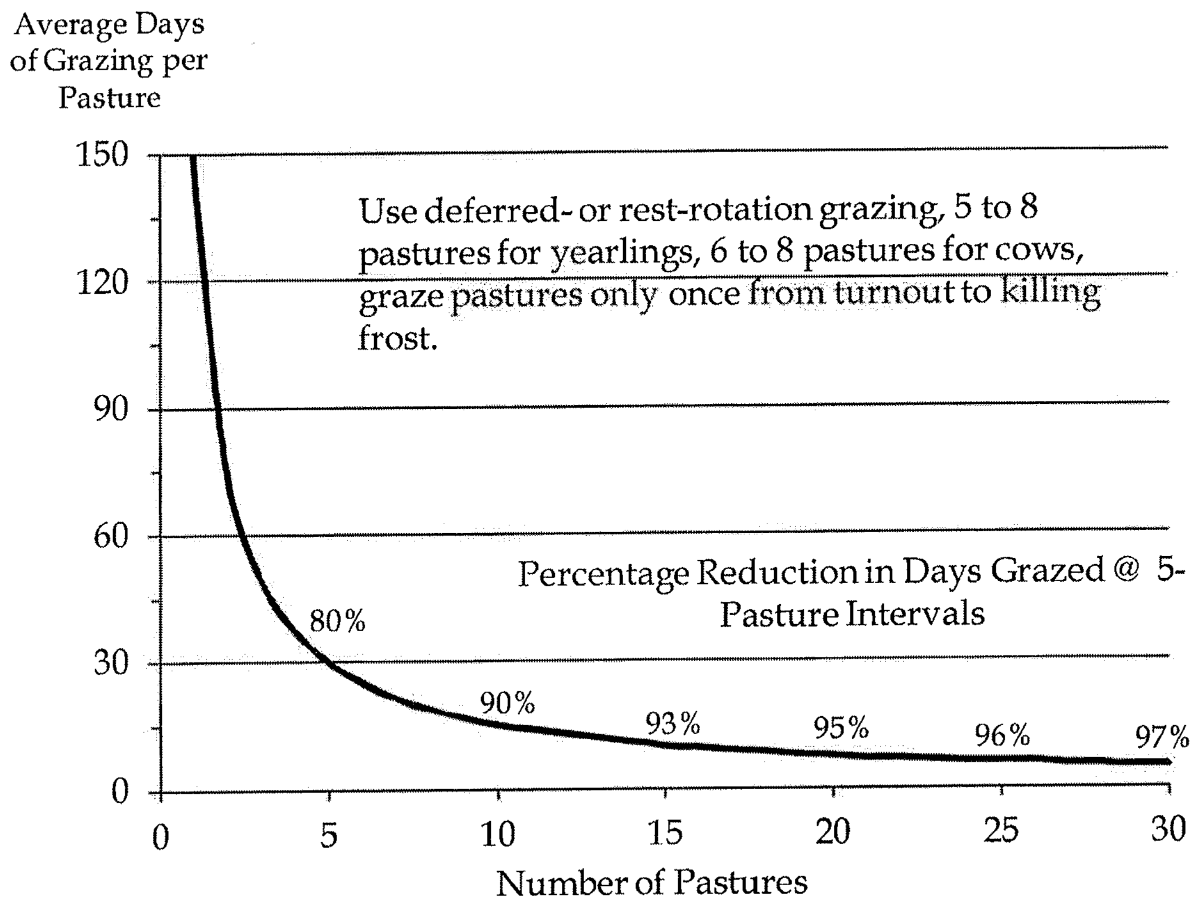


Figure 8. Relationship between number of pastures of similar carrying capacity on the average days of grazing per pasture for a 5-month grazing season. Upper limits of pastures needed to sustain herbage production are also suggested.

Multiple growing-season grazing periods are counter productive to increasing the vigor and relative abundance of preferred species. On semi-arid rangeland, graze pastures only once from turnout to killing frost to optimize drought resilience of rangeland. Additionally, pastures must not be grazed during rapid-growth windows of preferred species in consecutive years. Pasture-use sequences need to be changed every year. Providing full growing-season deferment to every pasture once every 3 to 4 years will maximize drought resilience of semi-arid rangeland. Use moderate stocking rates and use grazing and precipitation records to critically evaluate your management.

Pasture, Rangeland, Forage Crop Insurance

Is this a good Risk Management Option for Me?

Amy Roeder, USDA Risk Management Agency

E-mail questions to: rma.kcviri@rma.usda.gov

Who are we?

USDA, Risk Management Agency (RMA)

- Mission: To promote, support, and regulate sound risk management solutions to preserve and strengthen the economic stability of America's agricultural producers.
  - Operate and manage the Federal Crop Insurance programs.
    - For crop year 2011, RMA ,managed over $113 Billion worth of insurance liability.
- We merely administer the program. We do NOT sell crop insurance products. Only crop insurance agents sell.
- RMA web site: http://www.rma.usda.gov/

History

The Agricultural Risk Protection Act of 2000 (ARPA) mandates programs to cover pasture and rangeland

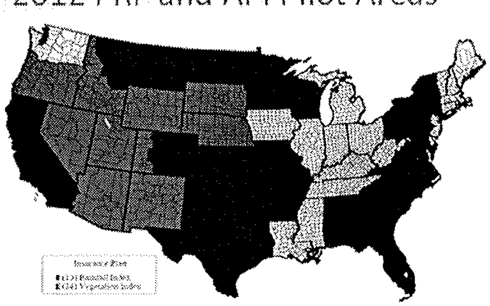
- Sec 522(c)(6) states: Research and Development Priorities – The corporation shall establish as one of the highest research and development priorities of the Corporation the development of a pasture, range, and forage program.

Challenges

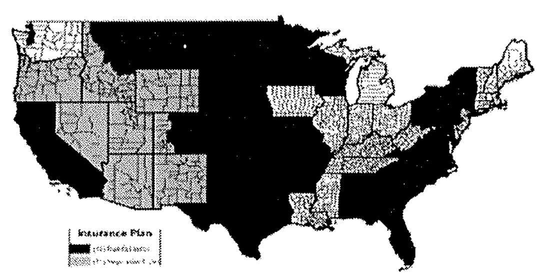
1. Various plant species
2. Timing of plant growth
3. Lack of individual/industry data
4. Vast range of management practices across the industry
5. Publicly announced prices not available
6. Crop continuously harvested via livestock
7. Various livestock species and segments

4

2012 PRF and API Pilot Areas



2013 and Succeeding Crop Years - Pasture, Rangeland, Forage Availability



Program Overview

AREA plan only
- Losses cover an area called a grid

- No individual coverage
  - Does NOT measure actual individual production
- Index – based on deviation from normal/historical
- No loss adjustments, records, etc.
- Timely payments
- Does not reward poor management practices
  - Producer cannot influence outcome/losses

7

Intended Use

Grazing
- Established acreage of perennial forage
- Intended for grazing by livestock
- Acreage must be suitable for grazing

Haying
- Established acreage of perennial forage
- Intended for haying
- Acreage must be suitable for haying

8

Program Overview

Not required to insure 100% of acreage
- Forage utilized in the annual grazing or hay cycle can be insured without insuring all acreage
- All acres within a property may not be productive, e.g., rocky areas, submerged areas
- Provides additional flexibility for the insured to design the coverage to their specific needs
- Because the program is an area program, there is no opportunity to 'move' production
  - Producer cannot affect outcome/loss

9

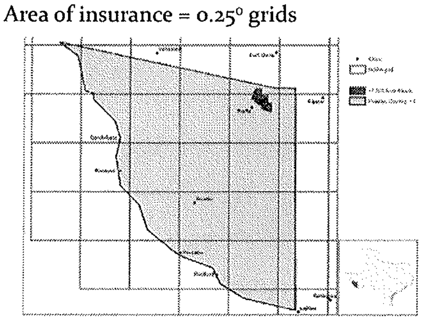
Rainfall Index Overview

Rainfall Index Program
- Area Based Plan
  - Approximately 0.25 degree grid vs. county area
- Utilizes NOAA <u>Climate Prediction Center</u> data
  - Utilizes multiple point data, not a single point system
- Deviation from Normal 1948 to present
- Single Peril vs. Multiple Peril
  - Lack of Precipitation is the only cause of loss
- Review of Historical Indices is critical

10

Grid Overview

- Area of insurance = 0.25° grids



11

Rainfall Index Overview

Index Intervals
- Multiple Intervals offered – (11 intervals)
- Crop Year divided into 11, <u>2-month</u> intervals
  - 1st Interval begins with January-February
- Ability for producers to manage appropriate timing risks
  - Correlate to individual growth patterns and production seasons and practices
- The <u>2-month</u> intervals provide for greater reaction to precipitation events vs. a yearly average

12

Rainfall Index Overview

Index Intervals

- The purpose of the program is to insure against lack of precipitation
  - Precipitation correlates to plant growth.
- Producers must select at least two 2-month intervals
  - Total annual forage production is influenced by precipitation in more than one 2-month interval; therefore, producers are required to insure in more than one interval.

13

Technical Description of CPC Gridded Rainfall Data

- Gridded rainfall data is pre-processed by NOAA
  - **RMA does not further process or change data**
- Total 6,000 reporting stations daily – minimum
  - Normally over 15000 report daily
- Only stations reporting data by the cut off are used.
- Stations reporting weekly or monthly are not used
- Cressman interpolation translates point information into gridded information

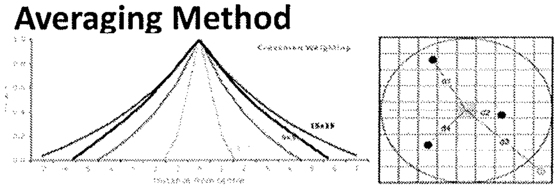
14

Cressman Interpolation Methodology

- Interpolation is based on the idea that things closer together in space are generally more similar than those farther apart
- Estimates rainfall for a target grid using stations within a search radius around the grid
  - Search radius **varies regionally** by **season** and **density of the available stations/data sources**
  - NOAA currently uses 4 scans. **Magnitude of scan varies with region and season in some areas**
  - Impact of an individual station/data source on the target grid's precipitation decreases with increasing distance between the data source and the target grid

15

NOAA CPC Uses Weighted Averaging Method



- Four Passes – with each successive pass, the scan radius is decreased, the weight of the closest station has higher effect on the target grid
- 4 passes insures that distant stations influence rainfall prediction in target grid, but weighting with distance decreases the influence

16

Insurable Interest

- Intended Use – Haying – who has financial risk
  - Much like other crops
    - Share
    - Cash
- Intended Use – Grazing – Financial Risk based on
  - Percentage of interest of the livestock being grazed
  - Percentage of value gained – determines share
    - Month/Head leases considered cash leases
    - Actual $ per pound gained is cash lease. $2.00 pound gained = cash lease
      - Share of gain is share lease. 1/3 of pounds gained = share lease

Will this work for me?

- All first order weather stations reporting to NOAA CPC by their DAILY cut off time are used IF they pass the NOAA CPC quality control steps.
  - NOAA CPC does not release which stations report
  - Reviewing NWS, NCDC, WFO, producer gauge results to calculate or estimate results is not appropriate and will not provide useful comparisons.

18

Will this work for me?

- Precipitation is interpolated to the grid and not measured within a grid.
  - You must understand that even if there is a weather station that reports daily to NOAA CPC inside your grid, the results will NOT equal that weather station
- Similar to NASS data used for area crop policies
  - Producers reporting to NASS – unknown
  - Surveys NASS eliminates in their quality control - unknown

19

Program Overview – RI

Indemnity Overview

- The only insurable cause of loss is when the final grid index value is less than the coverage level (deductible) selected by the producer

- Indexes are based on normal/historical and deviation from normal/historical

20

SUBSIDY!!!

- Government subsidizes premium
- Coverage Level of 70% - Government Subsidy = 59%
- Coverage Level of 75% - Government Subsidy = 59%
- Coverage Level of 80% - Government Subsidy = 55%
- Coverage Level of 85% - Government Subsidy = 55%
- Coverage Level of 90% - Government Subsidy = 51%

Will this work for me?

- Focus MUST be on the Historical Indices web site
  - Have past results tracked with observed results?
  - How did it perform in a "spotty dry" year?
  - Do production trends follow historical indices results?

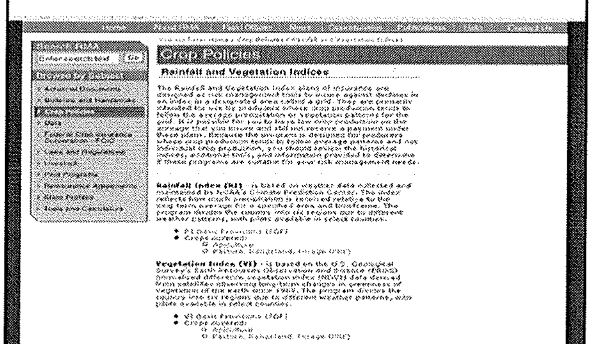
22

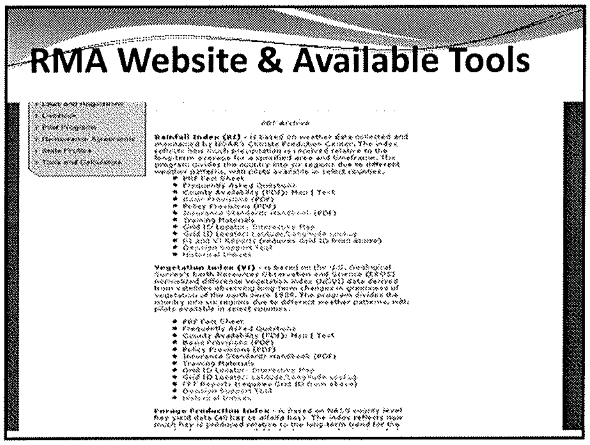
Summary: Rainfall & Vegetation

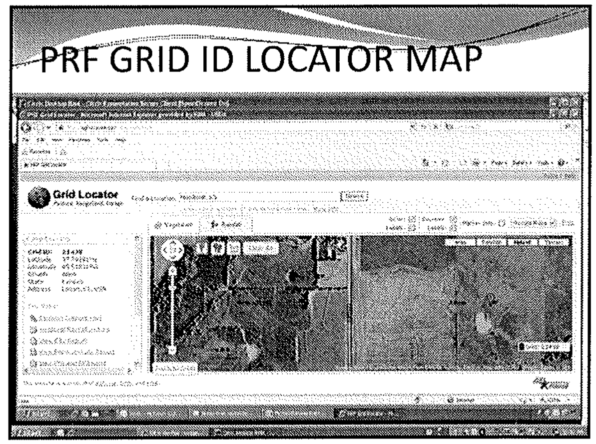
- Critical that the Historical and Decision Support Tools are understood and used
  - Must spend time reviewing the historical and comparing to past production
- The basis of decision to purchase MUST be based on an analysis between the historical results as compared to a producer's results.
- As with any area plan – results may not track 100% of the time
- Critical the appropriate Index Intervals are selected

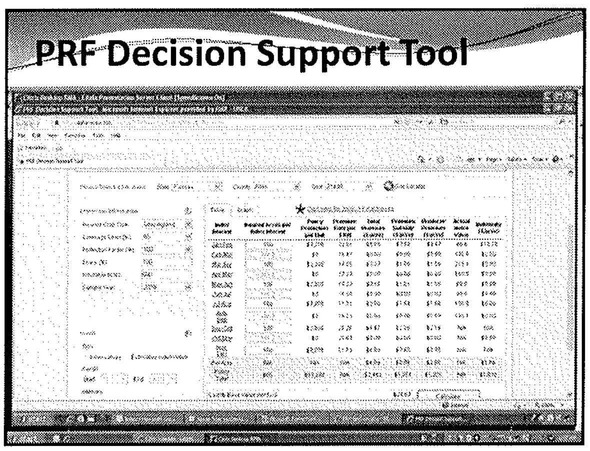
23

RMA Website & Available Tools




RMA Website & Available Tools


PRF GRID ID LOCATOR MAP
Grid Locator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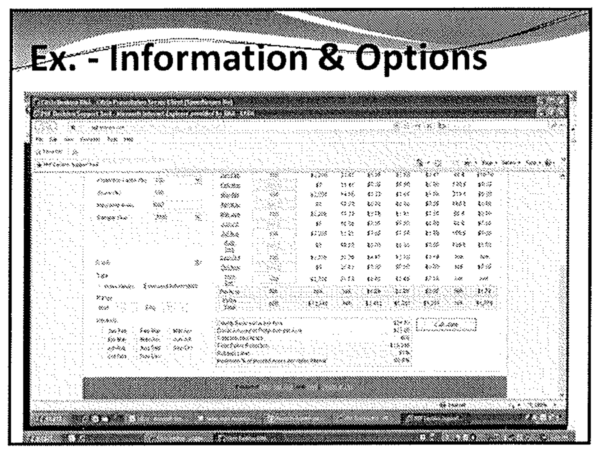
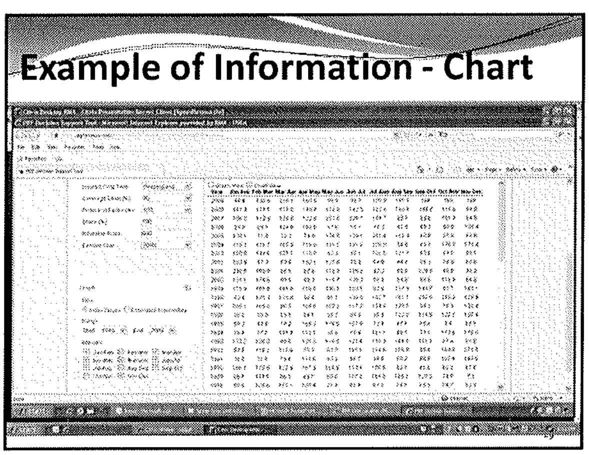
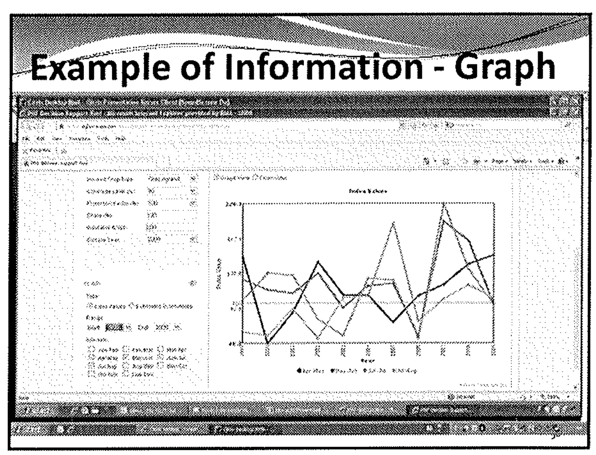

Ex. - Information & Options


Example of Information - Chart


Example of Information - Graph

Managing for Biodiversity and Livestock: Fire and Grazing

Sandy Smart, Ph.D. Professor of Rangeland Ecology
Department of Natural Resource Management
South Dakota State University

Introduction
Biodiversity is an essential component to any healthy, functioning ecosystem. It can serve as a guide to the land manager that the water cycle, nutrient cycle, and energy flowing through the system are properly balanced. Grasslands, whether in the form of pastureland, rangeland or Conservation Reserve Program land, are important ecosystems that provide a variety of goods and services such as: 1) forage for livestock, 2) habitat for wildlife, 3) plant and animal diversity, 4) hydrologic function for ground water recharge, 5) carbon sequestration, and 6) open space for aesthetic value.

In the Great Plains, grasslands, which provide nearly 80% of the feed for beef cattle, are the backbone of the cow-calf industry. Mismanagement, introduction of exotic species, and fragmentation of native grasslands in the eastern portion of the Great Plains by row crop agriculture and urban sprawl have made them vulnerable to noxious weed and non-native species invasion, increased wildlife nest predation, and general loss of habitat.

During the last 50 years, scientific scrutiny of standard grazing practices designed to optimize livestock production on grasslands of the Great Plains has led to observations that other ecosystem services that grasslands provide are constrained. Strong profit motives are likely responsible for decisions to apply high stocking rates that often result in a landscape dominated by shorter, more grazing-resistant plant communities. It's easy to place blame on this practice because of the striking impacts overstocking has on wildlife, water quality, and plant diversity. Yet, some more sophisticated techniques of rotational grazing often result in a uniform vegetation structure across the landscape, albeit not as short as heavy continuous grazing.

Recent investigations suggest that age-old management tools (water developments, fencing, salt and mineral placement, herding) aimed at improving grazing distribution have resulted in a predictable habitat structure that may actually reduce plant and animal diversity across a managed landscape. Grassland bird diversity has become the focal illustration to prove this point. Proponents of a multiple-use concept, meaning grasslands could be managed for both ecosystem goods (livestock production) and services (habitat, carbon sequestration, diversity, etc.), argue for a change in how we manage livestock grazing.

Fire and Grazing
In the last 10 years, a new strategy called "patch-burn grazing" (Fig. 1) has been proposed as an alternative to conventional rotational grazing techniques. The concept behind patch-burn grazing is to reintroduce ecosystem processes that once dominated the Great Plains. Historical evidence suggests that fire and large ungulate grazing co-existed for a long time in the Great Plains such that these ecosystem processes created a shifting mosaic of vegetation structure across the landscape.

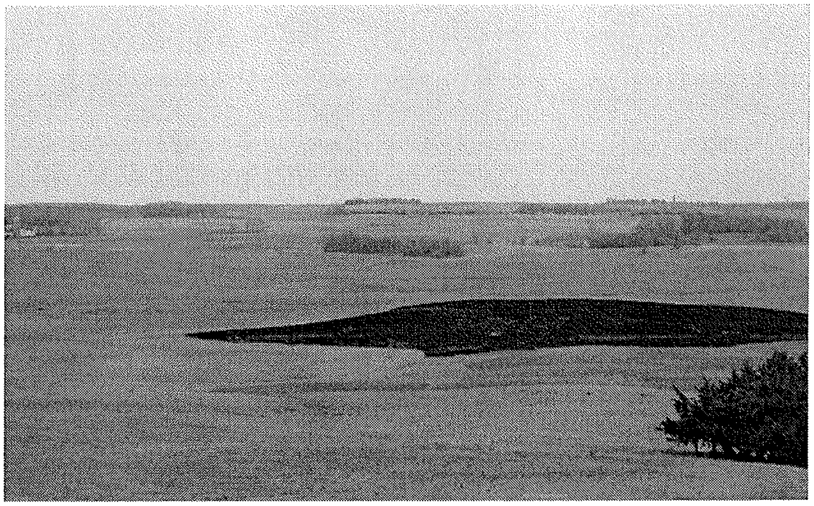


Figure 1. Patch-burn in eastern South Dakota tallgrass prairie, spring 2007. Photo by A.J. Smart, 2007.

This mosaic of vegetation structure created a tight evolutionary bond between plants and animals, and maximized regional diversity. Patch-burn grazing offers several intriguing benefits to the landscape and the land manager. First and most obvious, patch-burn grazing brings back fire as a management tool to the landscape. Fire has been suppressed in the Great Plains for the last 100+ years. There are unique places such as the Flint Hills of Kansas or the Osage Hills of Oklahoma where fire is still a consistent part of the land management process. However, for the most part, fire is quite rare, especially in the northern Great Plains states of South Dakota and North Dakota.

Secondly, no rest period is required after fire. Cattle can be placed in the pasture immediately after the burn or can even be in the pasture when the burn occurs. Thirdly, no fences or additional water developments are needed. The desired outcome of patch-burn grazing is to increase the structural heterogeneity across the landscape, hopefully resulting in increased plant and animal diversity; "if you build it, it will come." Several recent publications from the southern Great Plains have provided evidence that plant and animal diversity has increased through patch-burn grazing. Traditional grassland management has shown less forbs, insect species, and grassland birds compared to patch-burn grazing.

This patch burn-graze strategy has been tested in the tallgrass prairie ecoregion of Oklahoma and Kansas where the predominant native grass species are warm-season, and where late-spring burns are effective in controlling exotic cool-season species. In addition, these experiments have been carried out on large tracts (>4,000 acres) in a region where grassland fragmentation is less severe. In the northern tallgrass prairie region of the US, landscapes are highly fragmented, tract sizes are smaller, and dominant plant species are quite different, which makes them vulnerable to invasive species and reduces environmental quality.

Preliminary results of patch-burn grazing studies conducted in the northern tallgrass prairie of eastern South Dakota indicate similar ecosystem processes of burning and grazing have resulted in increased spatial structural heterogeneity across the landscape. We used a multivariate technique called principal component analysis to compare continuous seasonal grazing to patch-burn grazing in vegetation structural components across the landscape. As shown in Figure 2, the first axis, which accounts for 52% of the variation, separates the sites based on the amount of grass, litter, and visual obstruction. The second axis, which accounts for 23% of the variation, separates the sites based on native versus introduced species.

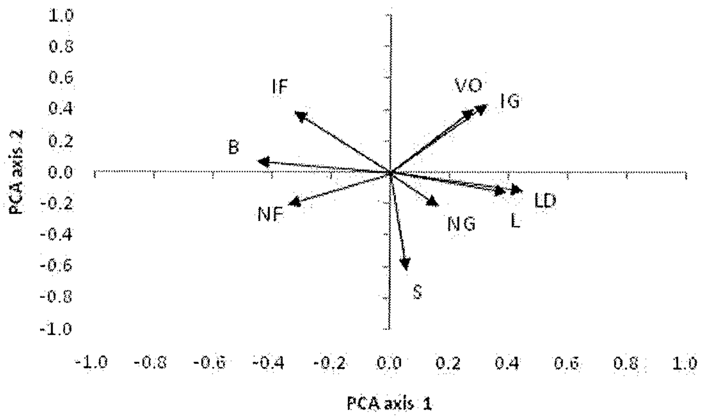


Figure 2. Eigenvector loadings on principal component axes for vegetation components measured in August 2008 from continuous grazing and patch-burn grazing in an eastern South Dakota native prairie. First principal component (PCA axis 1) and second principal component (PCA axis 2) account for 52% and 23% of the variation, respectively. VO= visual obstruction, IG=introduced grass cover, LD=litter depth, L=litter cover, NG=native grass cover, S=shrub cover, NF=native forb cover, B=bareground cover, and IF=introduced forb cover.

Sampling locations within treatments were separated based on principal component scores for axis 1 and axis 2 (Fig. 3). Continuous grazing resulted in sampling locations being more similar and representative of higher visual obstruction, introduced grass, and litter. Patch-burn grazing sampling locations were spread farther apart based on principal component scores. The two sampling locations on the left side of the graph were burned in 2007 and 2008 and the two sampling locations on the right side of the graph have not been burned. Notice the two unburned sampling locations within the patch-burn grazing treatment are more similar to the continuous grazing treatment. These data provide evidence that structural heterogeneity is increased through patch-burn grazing compared to traditional continuous grazing in native northern tallgrass prairie.

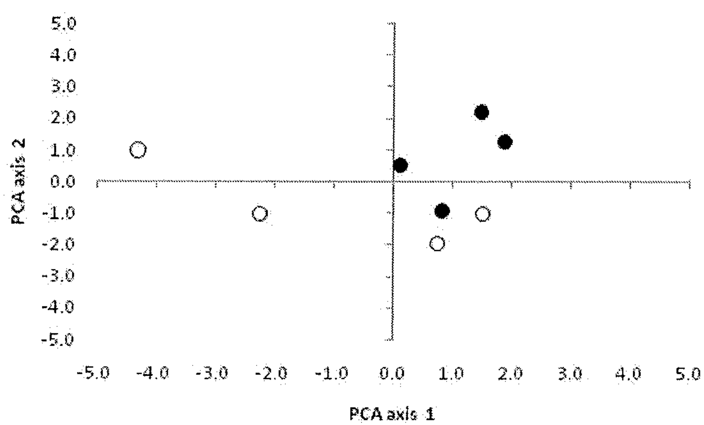


Figure 3. Principal component scores of vegetation measurements conducted in August 2008 from sampling locations within continuous grazing (closed circles) and patch-burn grazing (open circles) in an eastern South Dakota native prairie measured.

We have not yet collected other ecosystem service measurements, such as invertebrate or grassland bird diversity. Further research is needed to confirm the response to patch-burn grazing by other ecosystem structural components. However, we believe that the northern tallgrass prairie will respond in a similar manner as the southern tallgrass prairie.

Advocates of multiple-use management for grasslands in the Great Plains have suggested that incorporating ecosystem processes of fire and grazing is beneficial at restoring a shifting mosaic of vegetation structure across the landscape. Supporters of patch-burn grazing use landscape heterogeneity in vegetation, insects, and grassland birds as evidence to support their claims. Alternatively, one needs to consider that fire is a tool just as grazing is a useful tool. Grazing also can be manipulated by stocking density, timing, intensity, and recovery period. The next section will discuss grazing systems that can be implemented to create biodiversity while maintaining livestock production.

Grazing without fire

Rotational grazing gives the manager the tools to accomplish a variety of objectives. As mentioned in the introduction, native grasslands in the eastern portion of the northern Great Plains are particularly vulnerable to introduced cool-season grasses and weedy forbs (native and introduced). Grazing strategies that incorporate strategic timing of grazing to put pressure on introduced species can release the native species from competition (moisture, nutrients, and sunlight). Many of the commonly used grazing systems can accomplish this goal, while at the same time create structural heterogeneity across the landscape that benefits plant and animal diversity. The following section will discuss these systems in more detail.

Rest and deferred rotation

Historically and still to this day, rest-rotation and deferred rotation grazing strategies have been effective tools to provide contrasting vegetation structures that have benefited wildlife and plant vigor. Essentially, one pasture or paddock is left ungrazed for an entire year (rest-rotation) or until the key forage species has headed out (deferred rotation).

In the eastern Great Plains, deferred rotation can be just as effective as resting the entire year. This is partly due to the fact that the Great Plains receives most of its precipitation during the growing season. During this time plants not grazed during the growing season are able to develop a full canopy and a healthy root system, and store reserves in stem bases and rhizomes. In the inter-mountain west, most precipitation falls as rain and snow from October through April. In this type of climate, pasture receiving an entire year rest is benefitted the most because the majority of the precipitation is outside the summer growing season. A deferment during the hot dry summer does little to help the vigor of plants because root growth and carbohydrate storage occurs during the wet and cool months of spring and fall.

Deferred and rest-rotation systems can be fenced with inexpensive temporary electric fencing or with different levels of permanent fences (single, double, triple high-tensile electric, or barbed wire). Water also needs to be provided to each paddock or pasture. This can be accomplished by temporary means (if specifically used in summer) or provided by permanent sources (if purpose is to use in winter).

Since a ranch is typically split into many pastures, the deferred or rested pastures will produce vegetation unimpeded by grazing livestock that results in excellent nesting cover for a variety of game and non-game birds. In addition, previously grazed pastures would display a varied vegetation structure depending on how much was defoliated and how much regrowth occurred in the previous year. This type of system should produce a mosaic of vegetation structure types across the landscape, benefiting a wide variety of plant and animal diversity.

Intensive early stocking

Intensive early stocking is a modification of season-long continuous grazing in that the pasture is double stocked but only grazed half the year. This type of system was developed in the central tallgrass prairie ecoregion of Kansas and Oklahoma. Historically it also was incorporated with annual burning, but it doesn't necessarily have to be burned to work effectively. The reasoning behind this strategy was to avoid the typical reduction in animal performance that comes in late summer. In addition, livestock prices tend to be higher in mid-summer compared to early fall due to historic patterns in supply and demand.

In the eastern northern Great Plains, intensive early stocking is quite useful in putting pressure on exotic cool-season grasses such as Kentucky bluegrass and smooth bromegrass, while releasing the native tall warm-season grasses. We have conducted a couple years of intensive early stocking in eastern South Dakota and have not seen the typical response in animal performance (Table 1), but have noticed an increase in native warm-season grass composition and higher residual forage at the end of the growing season compared with season-long continuous grazing (Fig. 4).

Table 1. Early- and late-season average daily gain (ADG), overall average daily gains, gain per hectare (ha), and standard errors for intensive early stocking (IES) and season-long continuous (SL) stocking systems in eastern South Dakota (Schell 2011).

Treatment	**0-60 day ADG**	**60-120 day ADG**	**Overall ADG**	**Gain/ha**
	------------ kg/d	------------		- kg/ha -
IES	0.56(±0.09)[a]	NA	0.56(±0.07)[a]	70.98(±4.32)[a]
SL	0.61(±0.09)[a]	0.67	0.64(±0.07)[a]	78.76(±4.32)[a]

[a] Means followed by different letters within the same column are significantly different ($P < 0.05$)

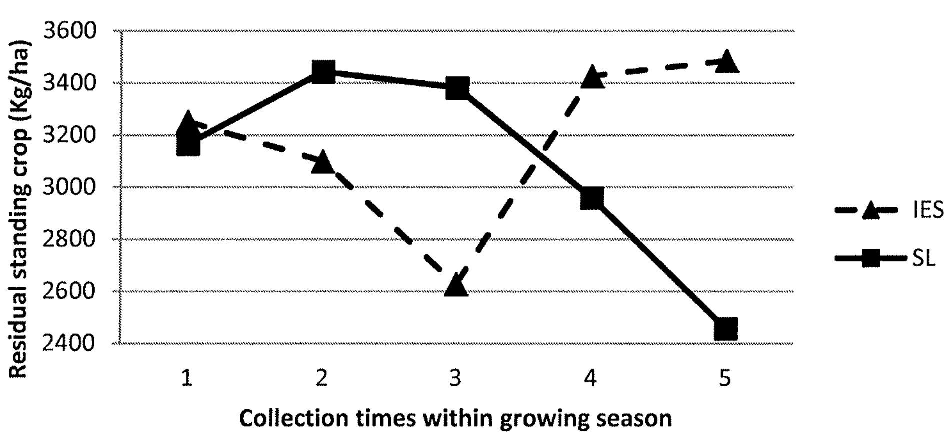


Figure 4. Residual standing herbage for intensive-early stocking (IES) and season-long continuous (SL) stocking systems in eastern South Dakota (Schell 2011). Collection times refer to the beginning of the grazing in late May (1), 30 days later (2), the end of the IES grazing (3) ,30 days after the end of IES (4), and at the end of the season-long grazing treatment (5).

In South Dakota, wildlife agencies such as SD Game, Fish and Parks Department and US Fish and Wildlife Service routinely practice a modification of intensive early stocking on their managed game and waterfowl production land. In their cases, the grazing is typically on a rotation cycle of 1 out of 3 years or 1 out of 5 years. This frequency maintains an acceptable species composition of warm-season grasses. Recently, SD Game, Fish and Parks Department has been trying to restore native prairie tracts using repeated intensive early stocking for many years (>5) in a row. They have seen positive results in the recovery of over-rested Kentucky bluegrass-dominated native prairie (Fig. 5).

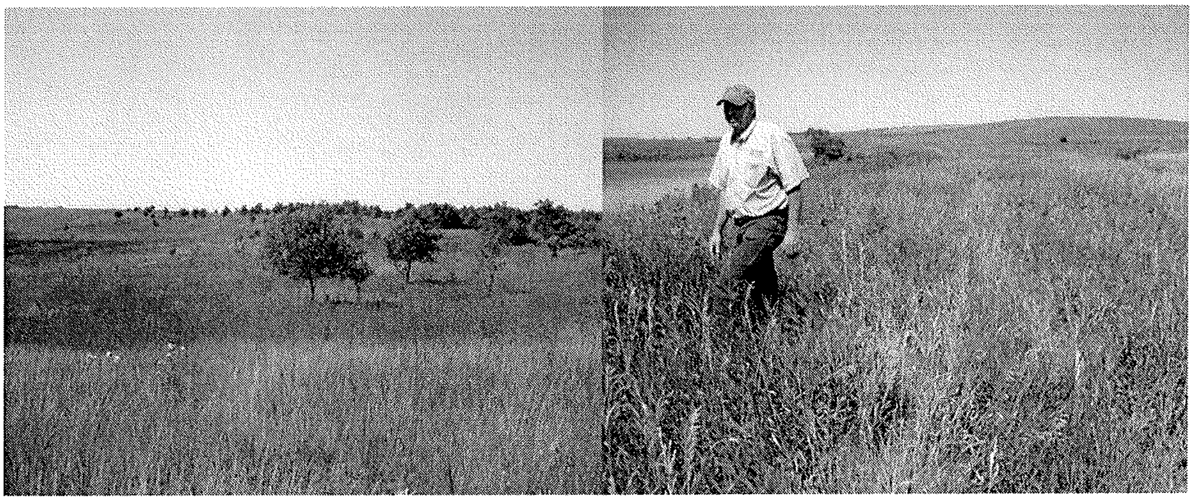


Figure 5. Native prairie response to repeated early season high intensity grazing for >5 years on SD Game, Fish and Parks' game production area located near Clear Lake, SD. The tallgrass in the foreground (left picture) is big bluestem. Prior to the initiation of this prescribed grazing treatment, this area was predominantly Kentucky bluegrass and smooth bromegrass (right picture). Photo by A.J. Smart, 2011.

High intensity low frequency

High intensity low frequency grazing involves a moderate to high stocking rate to accomplish a uniform grazing with low residual plant height followed by a long recovery period (normally one to two years). The idea behind this strategy is to favor grazing tolerance mechanisms of some species (decreasers) and hurt the species with grazing avoidance mechanisms (increasers and invaders). Caution needs to be exercised using this grazing strategy because animal performance can suffer if daily forage intake is limited and/or forage quality is poor as livestock graze lower into the plant canopy. Few producers practice this grazing system because of this limitation. However, it can provide a shifting mosaic of very short structured vegetation and tall structured vegetation across the landscape.

The Forty Bar Ranch near Iona, South Dakota practices a modification of high intensity low frequency grazing by incorporating different levels of intensities (light, moderate, heavy, and intense). The recovery period is typically 15-18 months or five seasons. For example, if a pasture is grazed in the fall (2010), it won't be grazed until the spring of 2012 (Fig. 6). Since this ranch has all four grazing intensities happening on the ranch at once, there is a shifting mosaic of vegetation structure on an annual basis. In addition, livestock performance is good because they are moved often enough and not assigned to a particular grazing intensity the entire grazing season. This gives the manager the flexibility to tackle certain vegetation objectives for each pasture.

Figure 6. An example of High Intensity Low Frequency grazing at the Forty Bar Ranch near Iona, SD. This pasture was grazed intensively in the fall of 2010 (photo on the left) and was not grazed until spring of 2012. The photo on the right was taken exactly one year later on 9-24-2011. Dominant grasses of this ecological site consist of western wheatgrass, green needlegrass, little bluestem, sideoats grama, and big bluestem.

Ultra high stock density

Ultra high stock density or "mob grazing" is a relatively new concept. The main focus of this grazing strategy is to trample standing forage to build soil organic matter and ecosystem health. In order to maintain animal performance, it is recommended to graze off the top 20% of the plant during each grazing cycle. Some of the trampled stems will break off and become litter and some will remain intact to produce regrowth. If the goal is to graze the pasture more than once, then you need to be careful not to trample too much herbage until the last grazing cycle. The number of grazing cycles will be dependent upon how much rainfall is received and how much residual leaf area is present. If you wait until the forage is mature, you may desire to graze more of the plant (40-50%) and trample the rest of the herbage.

Under the management scenario described above, it is also possible to combine rest-rotation or deferred rotation with ultra high stocking density. Thus, there should be some portions of the farm/ranch with mature standing forage from the previous year, current ungrazed forage from this year, newly trampled forage and various residual heights from grazed areas. Ultra high stocking density can be used to graze and trample brush, help trample in legume and grass seed, and increase soil health.

Conclusion

In summary, eastern grasslands of the Great Plains are vulnerable to invasion of exotic species, land fragmentation, and habitat loss. The combination of fire and grazing, or grazing alone applied strategically, is an effective way to increase biodiversity while maintaining livestock production on grasslands. Managers should consider their current objectives, infrastructure, labor, and knowledge and skill level before deciding which grazing/fire strategy they should adopt.

Making Decisions During a Drought: Some Economic Factors

Presented By
Dr. Matt Stockton
July 31, 2012
University of Nebraska-Lincoln
West Central Research Extension Center

Some factors that affect the decision making process

- **Knowledge** (things you can or do know)
- **Tradition** (things from your perspective)
- **Emotion** (things you feel)
- **Limiting Options** (things you refuse to do or think about)
- **Self Honesty** (integrity)

The First Issue Is Deciding "IF"

- Are you in a drought?
- When is the best time to make this decision?
- Hopefully you have a drought plan and have already started to implement it.

More Questions

- Once you decide there is a drought, the next questions are:
  - How severe is it?
  - How long will it last?
- These questions may not be answerable, but they do affect the choices you have to make.

Some Discussion

- These questions require lots of thought and work for individual managers.
- No one can tell you which are the correct choices.
- Many of these choices may make the difference between success and failure.
- There are some systematic things you can do that may help you through the process.

Things to clear the muddied waters

- Decisions need to be based on facts, or the best available information.
- Choices should be made that align with your business and personal goals.
- The decision maker needs to understand the amount of risk his/her choices will create and the amount of risk he/she or the business can withstand.

More things to clear the muddied waters

- Objectivity will help you make the choices based on their merit.
- Ability to move past emotion and make a clear choice is difficult, but will help you move forward.
- Choices need to be made thoughtfully, in a time when there is no panic, when possible -- before crisis, not during.

A Simple Foundation for (Good) Business Choices

- To remain in business, "Costs" must be less than "Revenues."
- In the short term this may not always be the case.
- The Question of "Cash Flow"
  - This may require careful planning using credit, or reserved resources.

Drought Creates Business Stress

- It is a temporary shift in factors that can affect costs including:
  - Feed
  - Labor
  - Capital
  - Resource reserves
  - Future resource availability

Possible Revenue Impact Areas

- Seasonal trends
- Cyclical trends
- Local/Regional/National Market effects
- Institutional effects
  - Tax law
  - Disaster Relief
  - Insurance?

Other Factors that Influence Economic Decisions/Choices

- Personal Goals
- Business Goals
- Beliefs about your current environment
- Understanding of your options
- Availability of other resources

Working through a simple example

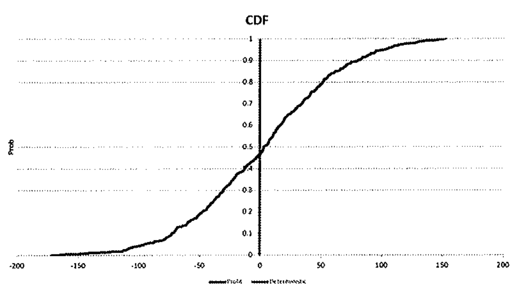
- One question that everyone should probably think about: what is my expected profit given the drought?
- If profits are severely negative, operators should consider alternatives to continuing production or find ways to cut expenses.

One tool used to estimate profit is the Cow Calf Cost Cow-Q-Lator

www.agmanagerstools.com

- Calf Cost Cow-Q-lator NSimetar(1).xls

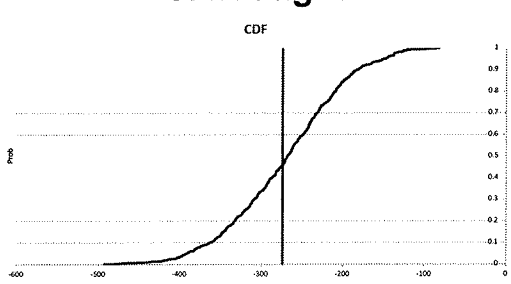
Profit Estimate Prior to the Drought



Changes in Assumption

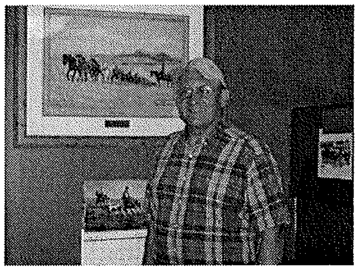
- Increased hay fed by 1.75 tons
- Price range increased by $100+
- Lowered calf weaning size on average by 100 pounds

Profit Estimate as the Result of Drought



Summary

- To make good choices, knowledge about the outcome of those choices needs to be created.
- Choices should be considered long before choices make themselves.
- In most cases early preparation costs less than last-minute solutions.
- Know your costs and be honest with yourself.



Al Svajgr, Cozad, NE

Agrow, Inc.
Darr Feedlot Inc.

Cattle Programs

- Winter Grazing Backgrounding
- Fall-Winter Backgrounding
- Yearling Grass Program
- Fall Calf Grass Program
- Finishing Darr Feedlot Inc Program

Winter Cornfield Grazing

- December to March timeframe
- 3 calves weighing 550#/acre
- Duration 125 days
- Supplemental bunk feeding
- Expect gains of 1.75#/hd/day

Supplemental Cornfield Diets

- Alfalfa hay mix of 4-6#
- Corn Silage of 12#
- Wet Distillers Grain of 5#
- 40% Liquid Protein of 0.6#
- Dry Rolled Corn as needed

Fall Grazing

- Turnip, Oats, Radish, Wheat combo
- 2-3 calves weighing 500#/hd/acre
- Duration 45-60 days
- October-December
- Expect 2# or more /hd/day

BEEF-The Final Product

Decision Making Using Monitoring to Manage Grasslands of the Nebraska National Forests and Grasslands Units in the Sandhills

Bill Vodehnal, Nebraska Game and Parks Commission / US Forest Service Liaison

Livestock grazing is the primary management tool for US Forest Service (USFS) lands in Nebraska, but management philosophies are quite different from typical private ranches in that the primary focus for management is broader than principally livestock production. The USFS generally implements a multiple-use concept for grassland stewardship on the Nebraska National Forest – Bessey Division (90,170 ac) near Halsey, NE and the Samuel R. McKelvie National Forest (116,060 ac) near Valentine, NE. Ultimately, management strives for a diverse plant species composition and a mosaic of grassland structure.

The USFS utilizes four broad goals to guide management of all lands in Nebraska. Goal 1 focuses on ensuring sustainable ecosystems both in terms of health and conservation. This entails improving and protecting watersheds to ensure they are functioning properly from a water quality and quantity perspective. It entails providing ecological conditions to sustain viable populations of native and desired non-native species and to achieve objectives for Management Indicator Species (MIS) such as the plains sharp-tailed grouse and greater prairie-chicken. It entails increasing the amount of forests and grasslands restored to a healthy condition to reduce risk from fire, disease, insects, and invasive species. Goal 2 focuses on multiple benefits to people, thus providing a variety of uses, values, products, and services to the public. Goal 3 focuses on scientific and technical assistance, thus developing the best scientific information to deliver technical and community assistance and to support ecological, economic, and social sustainability. Goal 4 focuses on effective public service, thus providing appropriate access and safety with USFS roads, trails, facilities, and operations.

The Forest Service identifies the Nebraska National Forest – Bessey Division as a geographical area. Another Sandhill geographical area is the Samuel R. McKelvie National Forest near Valentine, Nebraska. These geographical areas give direction for managing grasslands that are specific objectives for managing plant species composition and vegetation structure for the Bessey Division and Samuel R. McKelvie NF. Vegetation structure is visual screening or the height and density of vegetation. The prescriptions for vegetation are related to sustaining healthy ecosystems and meeting the needs of MIS, threatened and endangered species (TES), and other wildlife.

The desired plant species composition objectives for Nebraska National Forest – Bessey Division and Samuel R. McKelvie NF are late seral (30-50%), late intermediate seral (30-50%), early intermediate seral (1-20%), and early seral (1-20%).

1. In the early seral stage, the sands and choppy sands ecological sites will be dominated by sand bluestem and little bluestem will be the codominant species. Prairie sandreed, hairy grama, switchgrass, sedges and sand lovegrass are also important grasses in the early seral stage. On the more productive dry valley ecological sites, blue grama will be the dominant species while sedges will be the codominant species. Prairie sandreed, sand bluestem, switchgrass, sand lovegrass, and little bluestem are also important grasses on dry valley sites.
2. In the early intermediate seral stage, the sands and choppy sands ecological sites will be dominated by hairy grama while little bluestem will be the codominant species. Sand bluestem, sedges, prairie sandreed, switchgrass, and sand lovegrass are also important species in the early intermediate seral stage of the sand and choppy sands ecological sites. On the more productive dry valley ecological sites, sedges will be the dominant species while blue grama will be the codominant species. Little bluestem, switchgrass, prairie sandreed, sand bluestem, and hairy grama are also important grasses on dry valley sites.
3. In the late intermediate seral stage, the sands and choppy sands ecological sites will be dominated by little bluestem and sand lovegrass will be the codominant species. Sand bluestem, sedges, prairie sandreed, hairy grama, and switchgrass are also important grasses in the late intermediate seral stage. On the more productive dry valley ecological sites, little bluestem will the dominant species while sedges will be the codominant species. Switchgrass, blue grama, sand bluestem, hairy grama, and neddleandthread are also important grasses on dry valley sites.
4. In the late seral stage, the sands and choppy sands ecological sites will be dominated by sand bluestem while switchgrass will be the codominant species. Sand lovegrass, sedges, little bluestem, prairie sandreed, and blue grama are also important species in the late seral stage. On the more productive dry valley ecological sites, switchgrass will be the dominant species while sand bluestem will be the codominant species. Little bluestem, prairie sandreed, needleandthread, blue grama, and sedges are also important species on dry valley sites.

The two geographic areas are managed to meet vegetation structure objectives of 40-60% high structure, 40-60% moderate structure, and 0-5% low structure. High vegetation structure can be achieved on moderate and highly productive soils dominated by mid and/or tall grasses (late or late intermediate seral stage composition). Grasslands on moderate to highly productive soils but dominated by short grass species generally do not have the capability to provide high vegetation structure unless management is changed to increase the composition of mid to tall grass species over a period of years or decades.

Moderate structure can be achieved on moderated to highly productive soils dominated by mid and/or tall grasses depending on grazing use levels. Grassland dominated by short grass species will not achieve moderate structure regardless of grazing levels.

Minimally productive soils, prairie dog colonies, and grassland areas grazed by livestock at high intensities provide low structure. Low vegetation structure can result from a dominance of low stature plant species or from heavy utilization of mid and tall grasses.

A similarity index is used as the monitoring method for determining species composition objectives. A similarity index is a comparison of the present plant community on an ecological site with the kinds, proportions, and amounts of plants in other vegetation states possible on the site. The present plant community is compared to reference plant communities. As an example, in a choppy sands ecological site (MLRA 65), four reference plant communities would be Sand Bluestem (Historic Climax Plant Community), Bluestem/Prairie Sandreed (e.g., result of continuous summer grazing), Blowout Grass/Sandhill Muhly (e.g., result of continuous heavy grazing), and Excessive Litter (e.g., result of no grazing or no fire) plant communities. A similarity index to historic climax plant community is defined as the present state of vegetation on an ecological site in relation to the historic climax plant community for the ecological site. It is expressed as the percentage, by weight, of the historic climax plant community. The similarity index to historic climax reflects change over time and is the result of how climate and management activities have affected the plant community. Similarity index sampling follows a 100-foot transect utilizing tools such as a measuring tape for transects, clippers for vegetation collection, bags for collected vegetation, scales for obtaining weight of collected samples, and clipping ring that provides a representative sample which can be converted to species composition per acre.

Vegetation structure is evaluated by using a modified Robel pole and/or photo-guide that was developed by USFS. A Robel pole is a one-inch pole containing alternating gray and white one inch bands. The pole provides a visual obstruction reading (VOR) or measures the height and density of vegetation by looking down through the vegetation from four meters away and one meter high and recording the last band visible. Approximately ¼-mile transects are conducted in the spring with 20 stations each and Robel pole readings taken from each of the cardinal directions. Ecological sites are separated into hills (sands and choppy sands ecological sites) and valleys (sub-irrigated, sandy, sandy lowland ecological sites) with VOR objectives to meet needs for MIS species. The standard for high structure in the hills is 2.0 or more inches, moderate structure is 1.5-1.9 inches, and low structure is less than 1.5 inches. The standard for high structure in the valleys is 3.0 inches or more, moderate structure is 2.0-2.9 inches, and low structure is less than 2.0 inches.

Photos were taken at the beginning and end of each vegetation structure transect, thus providing a pictorial view of vegetation to correlate with the overall mean VOR of the transect. A photo-guide key was developed that represents low, moderate, and high cover for both hills and valleys from the photos. The photo-guide is currently used to rate each pasture within an allotment to determine if the allotment is meeting vegetation structure objectives. It is a less time consuming method to determine vegetation structure levels, thus more area can be evaluated on an annual basis for all allotments to make management decisions.

The Nebraska National Forest – Bessey Division and Samuel R. McKelvie NF employ an array of grazing systems from season-long use to multi-pasture rotations. Through vegetation monitoring and evaluation of results of sampling for each pasture within an allotment, adjustments to grazing management can be made to maintain or trend toward desired conditions. This is an adaptive management approach, which is the process of making use of monitoring information to determine if management changes are needed, and if so, what changes and to what degree. Many management actions are available to move resource conditions in appropriate directions. These include:

1. Change the grazing system.
2. Adjust stocking rate.
3. Do not graze in June or July in consecutive years.
4. Adjust turn-on date.
5. Do not allow grazing duration to exceed 45 days per pasture.
6. Incorporate periodic rest (e.g. non-use for 12 or more months).
7. Relocate, add, increase capacity of, or remove existing water development (e.g. pipeline, tanks, windmills, wells).
8. Relocate, add, or remove existing fence line (e.g. electric, standard, permanent or temporary).
9. Early spring grazing.
10. Change the grazing season (e.g. dormant season grazing).

Teach Cows to Eat Weeds: The Science, the Steps and the Reasons Why Cows Should Eat Weeds

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In 2004, I taught a small herd of shorthorns, longhorns, Herefords and Angus cross heifers to eat Canada thistle, leafy spurge and spotted knapweed. What began as a two-grazing-season pilot project at Grant-Kohrs Ranch National Historic Site in Deer Lodge, Montana, has turned into a mission to change the way we think about forage and weeds, and to increase awareness of how flexible our livestock can be when it comes to food.

Over the past nine grazing seasons I've taught over 1,000 cattle, a flock of sheep, and the bison on one of Ted Turner's Montana ranches to eat many of our most problematic weeds. The steps I use are based on decades of research about how animals learn, and how they choose what to eat. Working in California, Colorado, Montana, Oregon, Vermont, New Hampshire, Utah, and British Columbia and Alberta, Canada on a wide variety of farming and ranching operations, I've learned what it takes to adapt the process so that anyone, anywhere can use it.

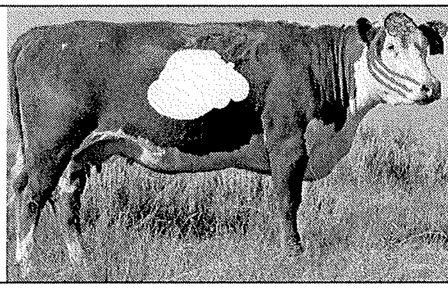
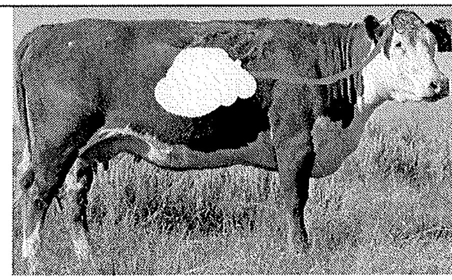
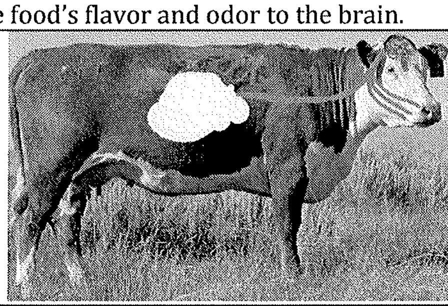
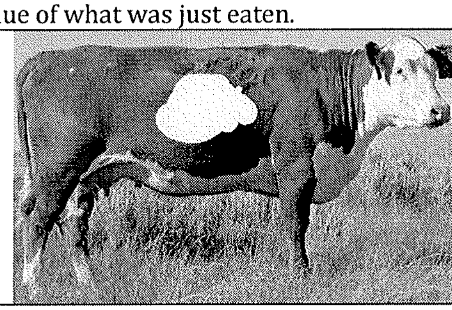
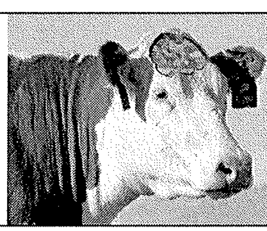
It's now possible to teach a cow to eat a new weed in as little as 8 to 10 hours spread over seven days. Educated cows teach their offspring and herd mates, breed back and calve at expected rates, and gain weight as well as, and sometimes better than, non-weed-eating cattle. Once cows learn that a weed is tasty, they continue to eat it the rest of their lives. Even better, the training process seems to result in "open-mindedness" about what food might be, so educated cows try other weeds in pasture on their own. The result is that by mixing educated animals with untrained animals and moving them through a variety of weedy pastures, in as little as one grazing season a producer could have a herd that eats just about everything found in pasture. In fact, my experience is that cows can eat just as many weeds and as much brush as the herd of goats I managed for my seven-year research project on fire danger mitigation.

Some Science

The breakthroughs in science that are at the foundation of teaching cows to eat weeds came from Dr. Fred Provenza and his colleagues at Utah State University. Over the past three decades they did research on how animals choose what to eat. What they learned is:

• Young animals learn from their mothers what to eat. They will add foods they see herd mates eating, but we will always be able to trace their primary food preferences back to what mother ate. It follows, then, that cows usually don't eat weeds because Mom didn't eat them and herd mates don't eat them. (You can watch a demonstration of this here: http://www.youtube.com/watch?v=nx5-2N-tjN0&list=PL110C96F913F016F2&index=4&feature=plpp_video)

• Animals also choose foods based on "palatability." When there just isn't enough of what Mom ate to make a meal, animals will sample new foods. They choose whether to keep on eating that food based on feedback from nutrients and toxins in the food. Here's how it works:

	
When an animal takes a bite of food, nerves in the mouth and nose take information about the food's flavor and odor to the brain.	Nerves running from the rumen to the brain constantly send signals about the nutritional value of what was just eaten.
	
The brain matches feedback from the rumen to the taste and smell of a food, then categorizes tastes and smells as good or bad based on the food's nutritional value.	Other nerves throughout the body send their own signals to the brain, indicating that maybe a little more protein might be necessary, or a little less, or that the belly is full now and it's time to stop eating.
	**This gives us a new definition for palatability. Foods taste good or bad based on a combination of nutrients and toxins in the plant, and the animal's physical condition. As an animal's physical state changes, so do the kinds of foods it likes best.**
The brain considers the changing nutritional needs of the animal and adjusts how much and what the animal eats to take advantage of the nutrients and toxins in a food. In general, an animal eats more of foods high in nutrients, and less of foods low in nutrients or high in toxins.	

(This Youtube video shows the effect of nutrients on what animals will or won't eat: http://www.youtube.com/watch?v=cIR_5362qQc&list=PL110C96F913F016F2&index=1&feature=plpp_video)

Since all plants contain toxins, researchers were interested in how the feedback system would respond. What they found is that if a food contains nutrients that are useful to the animal, plant toxins simply reduce the amount it eats. The higher the level of toxins, the less the animal eats. Further, they found that both nutrients and toxins could offset the effects of other toxins and that animals could figure out how to mix foods to their best advantage. This is important to producers because it explains why we can expect that animals can safely choose what to eat in pasture. (This video shows animals learning from experience with toxins: http://www.youtube.com/watch?v=7bD0OznhBw8&list=PL110C96F913F016F2&index=7&feature=plpp_video.)

How good is a cow's ability to mix its own diet?

Researchers at Utah State University ran an experiment with 2 groups of steers. One group was fed a Total Mixed Ration. The other group was served all the ingredients in the TMR in separate boxes so they could choose what and how much they wanted to eat. Both groups of steers gained weight at similar rates, but the steers mixing their own diet gained weight for 20% less cost.

The steers' message to us: Letting animals mix their own diets can save us a lot of time and money.

The Steps

The first step in my training process is based on this new understanding of palatability. I knew that if a plant is nutritious and toxins are not a problem, if my trainee tries it, she will get good feedback and then continue eating it. Fortunately, weeds are very nutritious. Over the last nine years I've learned that most weeds are more nutritious than grass, and often are the equivalent of, or better than, alfalfa in protein. I've also found very few that are dangerous to livestock. (For more on nutrients and toxins in weeds, visit my website at: http://www.livestockforlandscapes.com/edible.htm. I have also put a list of plants farmers and ranchers should be taking advantage of on my blog site at: http://thetaoofcow.com.)

The second step of the process is to choose trainees. Which animals and how many you'll train depends on how your operation functions. Some producers choose to train their replacement heifers because they are pastured separately. Others have several herds of cow-calf pairs in various pastures. They choose the herd that is most accessible by vehicle. Of the two dairies I've worked with, both chose to train in the barn because animals were used to being fed there. I recommend doing whatever is easiest for you. As you choose, consider where the weeds are and be sure the group you train will have access to that pasture. The number you choose is also based on how you operate, but keep the following in mind:

• The process works best when trainees compete with one another for the feeds we give them during the training process. I've found that when I train less than 10 animals, there is not as much competition. This doesn't mean you have to train more than 10 animals. You just have to pay more attention and make adjustments if necessary.

• You don't have to train all the animals you have. I've trained as many as 110 cow-calf pairs because that worked best for the Montana rancher I was helping. In the west where the scale is larger, I typically train herds of about 50 cow-calf pairs. It takes about 30 minutes per feeding on days 1 through 4 to feed a group of 50, and about 45 minutes to gather enough weeds for days 5 through 7. The further east I go, the smaller the trainee group becomes, until I'm working with 10 to 20 animals at most.

Once I know my plant is safe to eat and I've picked my trainees and training location, I'm ready to start the training process. Since animals develop expectations based on their experiences and then respond accordingly, I want to create an expectation that everything I bring them is good to eat, even if it looks a little strange. In effect, what I'm doing is creating a "language" that includes visual and audio cues that tell my trainees, "Here she comes again! I bet she's bringing good stuff! We should run over there and eat whatever it is!" Here's how it works:

• **Morning and afternoon for 4 days I bring the trainees an unfamiliar, but very nutritious food.** This is as simple as going to your local feed store and picking up 8 different bags of feed. It doesn't really matter what you choose as long as it's got good protein. Be sure to pick things that have different flavors, sizes, shapes and smells. By trying lots of different things they get used to the idea that food can come in all shapes and sizes, so when you bring them the target weed to try, it's just one more strange looking thing in a series of strange things. I use one 50-pound bag of feed per 25 animals per feeding. So if you have 25 trainees, you'll need 8 bags of feed for these 4 days.

Why 8 different new foods?

When I looked at the data from experiments with animals trying new foods, it seemed to take them a little over a week to become comfortable with a new food.

I translated this into trying 8 different foods. I condensed it into 4 days because trainees showed me they were quick learners, and to make it easier for human schedules.

• **It's important that the same person bring the food at about the same time every day.** I've learned that each person does things in a slightly different way so animals have a hard time developing solid expectations.

• I let them know I'm coming before they can actually see me by honking the horn on my truck as I drive to the training area. I honk a lot because I want them to come in from where ver they're grazing, and because it is the first cue telling them, "Something great is coming!" (See Pavlov's Dog.)

Pavlov's dog

Animal behaviorist Ivan Pavlov noticed that his dog salivated when he was fed. Pavlov began ringing a bell before feeding the dog. Eventually the dog associated the ringing of the bell with being fed, and he would begin to drool when he heard the bell.

I've found that when I honk, cows begin to salivate, so they're ready to try whatever I bring them to eat.

• I use empty 250-pound supplement tubs as my feeders. The feeders are just another cue saying "Look! Here's something good!" and their depth creates competition. Two cows or three heifers can put their heads in one tub at a time, but one animal can't really see what the other is eating, so they all grab whatever they can get. I assume they're each thinking, "Well, she's eating it, so it must be good! I'm going to grab whatever I can get before she eats it all!"

• On Day 5, I introduce the target weed for the first time. I skip the morning feeding and feed weeds in the afternoon, mixed with about a ½ bag of a feed they've eaten on one of the first 4 days. On day 6, I provide another afternoon feeding of the target weed mixed with about a ¼ bag of feed. On day 7, I feed the weed plain. I don't pick a lot of weeds, because this is just a snack, and trainees may not finish all I bring them. That's fine. All I want is for at least one cow to swallow one bite of my target weed so that they will get the good feedback from the weed's nutrients. When that happens, I know they will eat the weed in pasture.

Why skip the morning feeding?

First, I want the animals to come to the tubs whenever I show up so that I can always use them as a tool. Research shows us that when animals get intermittent feedback for something they do, they will keep on trying until they get the feedback. For example, if a rat gets a pellet every time he presses a lever, when he stops getting the pellet, he stops pressing the lever. But if he gets the pellet sometimes when he presses, and not other times, he will always press the lever on the off chance that this is the time he gets a pellet. Translated to the cow training, when I skip the morning feedings, I start the process of ensuring that they don't quit coming to the tubs when I stop putting things in them.

Second, I don't really like picking weeds any more than the next person, so once a day works for me and for the animals.

• Trainees in pasture may start eating the target weed after their very first snack. By paying attention to what I see them doing and eating in pasture, I can often reduce the number of times I feed weeds. I look for bent over and bitten off stems and leaves. I also take time to sit down in pasture with my trainees in a patch of the target weed. Because they are accustomed to being fed by me, they come over to see what I'm doing. When I do nothing, they get bored and begin grazing, often sampling the target weed. As soon as I see evidence of grazed weeds, I end the training.

• **If you have more than one target weed, you can introduce it to your trainees as soon as they've finished the first weed.** You don't have to start again from the beginning. If your trainees are in a pasture with that weed, you can wait to see if they try it on their own, and if they don't, you can always bring the tubs back out, and throw a bit of the second weed in the tubs to show them that it is good to eat.

Each group of trainees behaves differently, so I observe what they're doing and adjust the process here and there to meet their needs. More information about challenges I've encountered and how I've solved them is available in my book, "Cows Eat Weeds" and the DVD, "Teaching Cows to Eat Weeds." Both are available on my website. You can see a condensed version of the training here: http://www.youtube.com/watch?v=sVk-YKq_xNo&list=UUTLRnl4QeHrvHMrHLTsVAeg&index=1&feature=plcp. Other videos are available on my youtube channel at http://www.youtube.com/kathyvoth.

Why Cows Should Eat Weeds

Forage quantity, quality and cost limit how many cattle a producer can raise, and how much money he makes doing it. When cows eat weeds, producers can potentially raise more cattle, and spend less money doing it. Let's break it down:

Forage Quantity

Economist John Morley found that, based on average pasture weed populations, if a producer's cattle ate just 70% of the weeds available, that producer would have about 43% more forage. This is just an average; your percentage will be different based on your past weed management practices.

One of the questions most producers have about weeds is whether they will regrow after being grazed once like grass does. The answer in many cases is "Yes." Depending on the time of year, every weed I've seen grazed by cattle has responded by producing more stems or buds of some kind.

Nevada Rancher Lance Knudsen, who trained his cows to eat Russian Knapweed says that "Knapweed has become a really good source of feed this year when the grass isn't doing much because of drought. We graze it before it seeds out and it just keeps growing back. After just a week and a half we have 6 to 7 inches of regrowth and we can put the cattle in again." This is in an area receiving little to no precipitation. He said he'd already grazed that pasture three times for the 2012 grazing season, when typically he can only get one week's worth of feed from it. His cattle began eating all the thistles in his pastures as well without any additional training. He noted that as soon as the cattle graze the buds off the tops of the musk thistle stems, the branches below produce buds, and when the cattle eat those buds, the branches below them produce more buds. "So feed is being created as they graze it," he said.

Forage Quality

Weeds are high quality forage, maintaining much higher levels of protein through the growing season than typical pasture grasses. Because they have a higher leaf to stem ratio than grasses, they generally have better digestibility numbers as well. A maintenance ration for cattle requires 8% protein, so when grasses dry in mid-summer and drop below 8%, weeds can provide the protein cattle need to maintain, or even to gain weight. Higher levels of protein in weeds can also provide the nutrients rumen microbes need to process lower quality forages, so we can take advantage of forage that might not otherwise have been useful.

Examples of 15-20% Protein Weeds

Canada Thistle	Leafy Spurge
Spotted Knapweed	Russian thistle
Russian Knapweed	Distaff thistle
Whitetop	Musk thistle
Pigweed	Bindweed
Wild licorice	Ragweed

Typical protein values of grasses run between 2 and 11%

Cost

Weeds are a free and widely available forage. In addition to being nutritious, they are often available when other forages aren't either because of the time of year, or due to drought conditions. They reseed themselves with ease, and require no effort at all to raise.

What's Next?

I've done the easy part. I translated the science available into easy steps that anyone can use to teach their livestock to eat weeds. To make sure it works, I've trained lots of animals in a wide variety of places and circumstances. What I've found is that educated cattle teach their offspring and herd mates, breed back and calve at expected rates, and gain weight as well as, and sometimes better than, non-weed-eating cattle.

The rest of my mission is much more difficult. The weight of centuries of prejudice about weeds is difficult to throw off. Even when I outline the benefits of these misunderstood, much maligned plants, my audience members shake their heads skeptically. Yet, little by little, I am making progress. The numbers of people asking me to speak at conferences is increasing dramatically, sales of my instructional materials are increasing slowly but surely, and the number of people calling me about the success they're having with their weed-eating cattle is on the rise.

Research into how farmers and ranchers adopt new things tells me that it takes about 10 years of background work before a few will begin to consider it, and 20 years total for an idea to become old hat. With that in mind, I'm planning a huge celebration in 2023, when most of you will have forgotten that weed-eating cows was ever a new idea.

(For links to scientific articles and more background on the work done by researchers at Utah State University, visit http://www.behave.net.)