Central Grasslands Forum

NDSU Central Grasslands Research Extension Center
Streeter, North Dakota

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A Walk Through the Pasture

Kevin Sedivec, Interim Director, Central Grasslands Research Extension Center

It has been a while since we have visited. The winter of 2020-2021 was one of the mildest and driest winters I have experienced in North Dakota (and I have experienced 56 of them). It seemed like we never had snow because the warm temperatures melted it as fast as we got it. The center was fortunate – yes, fortunate – to receive 26 inches of snow.

As with much of North Dakota, the center has experienced a severe drought. More than 85% of the state is classified as in extreme drought (D3), with the center falling in this category. The fall of 2020 was the driest I could remember.

Dry falls lead to the abortion of fall tillers of cool-season grasses. These fall tillers are the first growth in the spring. So, with limited to no fall tillers, new growth has to come from rhizomes – which usually means a two-week delay in growth. With a two-week delay in growth, that means spring livestock turnout also should be delayed.

Native grasses reach grazing readiness at 3.5 leaves, and tame grasses such as smooth brome and crested wheatgrass at three leaves. Brome grass was at 3.5 leaves on May 8 and western wheatgrass at 3.5 leaves on May 20 at Central Grasslands.

Smooth brome

Western wheatgrass

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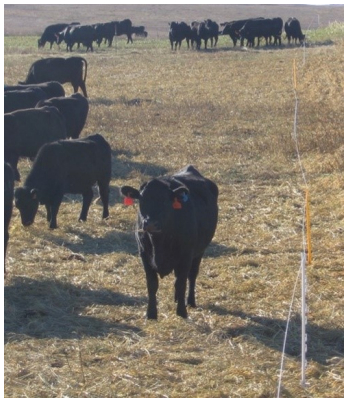

In This Issue

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Range Management During a Drought

Drought is a common event in the Northern Plains. Ranchers always should have a drought management plan that defines specific action plans based on trigger dates (dates based on precipitation and plant growth).

About 80% of plant growth occurs in May and June in North Dakota. Our major flush of regrowth occurs in September. So, if rain doesn't fall in May and June, available forage will be reduced. If rain doesn't fall in September, regrowth will be low and plants go into the winter stressed.

Development of grazing strategies that create resiliency in your operation reduce the risk of de-stocking or poor livestock performance due to overgrazing during drought. The center has been studying two strategies during the past four years that create resiliency in your operation.

Four-pasture Twice-over Rest Rotation Grazing

This four-pasture twice-over rest rotation grazing system is designed to be grazed using different stocking rates across the unit (Figure 1). One pasture is stocked heavily (60% use or more), with the first rotation cattle grazing at a 30% use. This cell is rested for 35 days and achieves high regrowth due to the uniform grazing. The second cell is grazing at full use (40% to 50%) and receives 52 days to recover. The third cell is grazed at a moderate use (20% to 40%) and receives 87 days to recover. The fourth cell is rested.

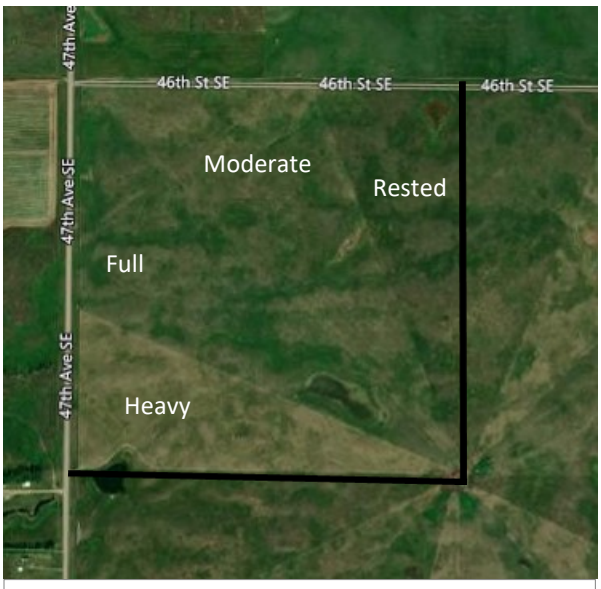

Figure 1. Diagram of four-pasture twice-over rest rotation grazing system at CGREC.

The overall degree of use across all cells was about 30% from 2018 to 2020. Although we were stocked 33% higher than the continuous grazing pastures, the overall degree of use was the same or lower. In terms of resiliency, we have created one cell we can add to the rotation during a drought, and three or four cells that were properly or undergrazed, creating more standing vegetation with strong plant vigor.

Each pasture receives all four grazing intensities during a four-year cycle, allowing the plants to recover when heavy use occurs. The heavy-use cell is rested the next year.

Patch-burn Grazing

Patch-burn grazing is designed to burn one-fourth of the unit every year, with the burn patch rotated each year to a new patch. During a four-year cycle, the entire unit is burned, creating four different burn patches (new fire, one year post fire, two years post fire and three years post fire; Figure 2). This strategy does not require interior fences.

Tracking GPS-collared cows, we found that the animals graze a majority of the time on the new burn, followed by the one year post burn. This grazing pattern creates areas lightly grazed (two and three years post fire or unburned areas), achieving resiliency in the plant community. Although 25% of the unit is heavily grazed due to high quality, and high palatable feed occurs at all times on the new burn, much of the unit is properly or undergrazed, creating more standing vegetation with strong plant vigor.

The patch-burn grazing was the best strategy at achieving the highest cow and calf performance, especially during dry years.

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A Walk Through the Pasture *(continued from page 2)*

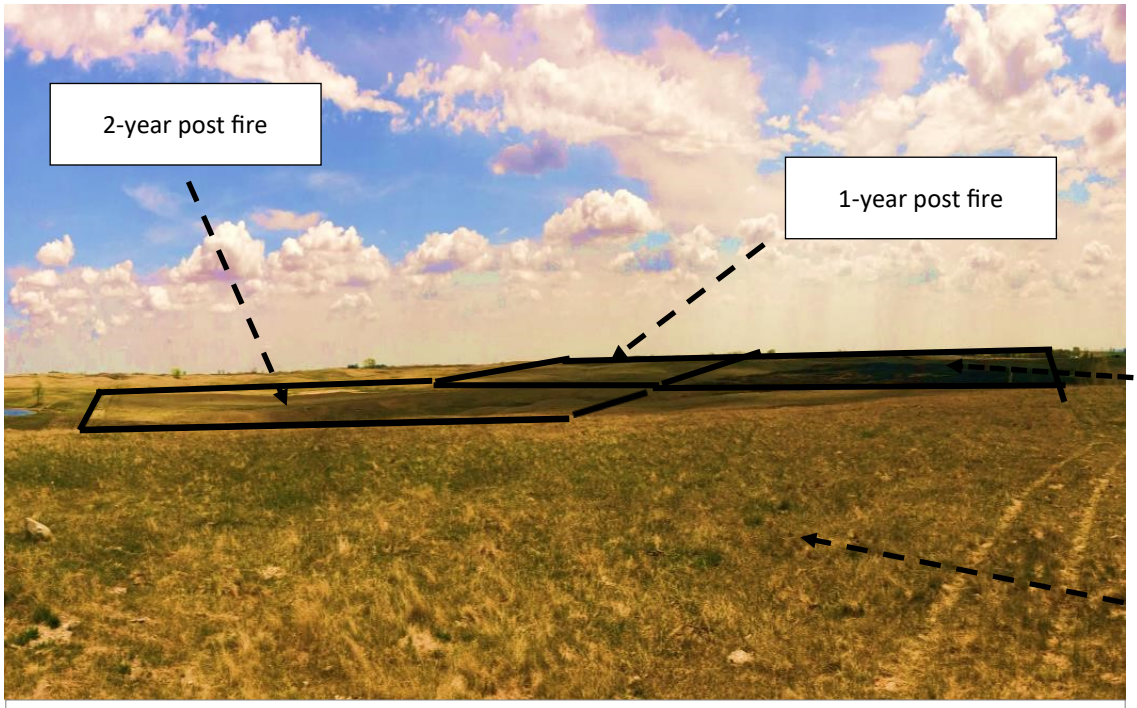

Figure 2. Patch-burn grazing treatment showing location of the new burn and all previous burns at the Central Grasslands Research Extension Center.

Photos by Kevin Sedivec

The importance of this message is always be prepared for adverse weather conditions, whether too wet or too dry. Improved grazing strategies will help you maintain your herd during a one-year drought. Droughts that cover multiple years also will impact the resiliency of any grazing strategy.

The Central Grassland's drought strategy for this year is to delay turnout for one week (May 25) to allow the vegetation to develop an adequate number of leaves and growth. We culled all animals that lost their calves or ended up open. We will run the same number of animals on all grazing treatments as the previous years.

We feel the twice-over rest rotation system and patch-burn grazing have excessive growth in cells or areas of the unit that will be feed if the drought substantially reduces forage production. The rotation system also has a rested pasture built in, so using that cell can occur if needed. We will be interested in seeing how the continuous grazing treatment responds if the drought continues into the summer months.

Let me end by providing an invitation to the 2021 CGREC field day July 27. We will hold two tours: a forage, livestock and cover crop tour from 10 a.m. to noon, and a tour showing the pollinator/bird, plant community and grazing management projects from 1 to 3 p.m. This year's tour may need some modifications due to COVID-19, but our plan is to provide a lunch and refreshments.

Whenever you get the chance, enjoy the outdoors and the pleasures it provides, from the beauty of our grasslands to the songs of the birds and brilliant colors of the flowers and butterflies. Enjoy the bounty our grasslands provide to raise livestock, knowing that our natural resources will provide you with food, water, shelter, energy, clean air and recreation. Have a great summer and enjoy a walk through the pasture.

Bale Grazing to Build Soil Health

Erin Gaugler, CGREC Range Research Specialist

What do you do with a piece of land that was farmed without inputs and depleted to a point of no longer being productive? To rejuvenate the land and demonstrate how sustainable agriculture can be adapted to fit any operation, Drew Gaugler and I considered bale grazing (Figure 1).

Figure 1. Siblings Erin and Drew Gaugler in one of their fields where they bale grazed during the winter of 2020-2021.

My brother Drew and I grew up on a farm and ranch in southwestern North Dakota. Upon graduation from high school, we knew that we wanted to be involved with agriculture. For 10 years, Drew worked in the oil industry and he found and created opportunities to become involved with ranching on a full-time basis.

I continue to be actively involved with farming and ranching while also working as a range research specialist at the NDSU Central Grasslands Research Extension Center. Through funding from a SARE (Sustainable Agriculture Research and Education) grant, Drew and I developed a project to address our resource concerns while also demonstrating the benefits and challenges of bale grazing.

Farmers and ranchers have critical insight about improving their systems. Whether they want to limit off-farm inputs, reduce erosion, create more time for family or community activities, learn marketing skills or find other ways to enhance their livelihoods, farmers and ranchers can turn to the North Central Region SARE (NCR-SARE) for grant opportunities and information.

In 1992, NCR-SARE began a competitive Farmer Rancher Grant Program exclusively to fund farmers and ranchers striving for agricultural sustainability. Practices are tested through on-farm research, education or demonstration projects and results are shared with other farmers/ranchers. Grant applications are reviewed and awarded on an annual basis. (For more information, visit https://northcentral.sare.org/.)

Prior to our management, much of the land included in the project area was abused. Farming practices and severe overgrazing left the soil to erode by wind and water (Figure 2A). As the top soil left the land, clay pans were exposed and forage production continued to suffer.

To address these resource concerns, we implemented and evaluated bale grazing (Figure 2B and 2C). To bale graze, producers typically leave baled hay in the field after cutting so that livestock can graze on the bales throughout the winter. Depending on the number of livestock and duration of grazing, additional bales can be hauled to the site or stockpiled. Just prior to grazing, bales are spread out and tipped on end, with special emphasis on places where additional organic matter is needed.

Sections are established with temporary fencing materials to limit-feed livestock. Animals graze through the field, from one section to the next, with continued access to water. While windbreak panels are offered, we have found that livestock prefer to stand behind a bale or find a low, protected area.

When bales are tipped on end, the snow swirls around and cattle can stand near or lay in existing residue (Figure 3).

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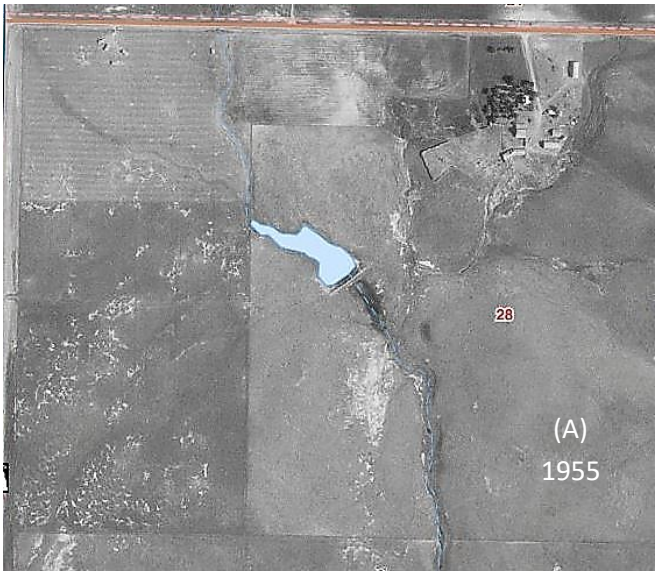
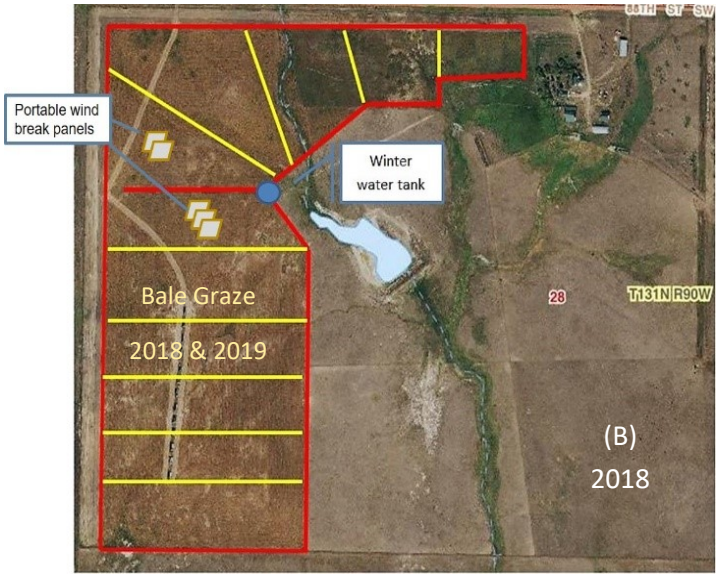
Bale Grazing to Build Soil Health *(continued from page 4)*





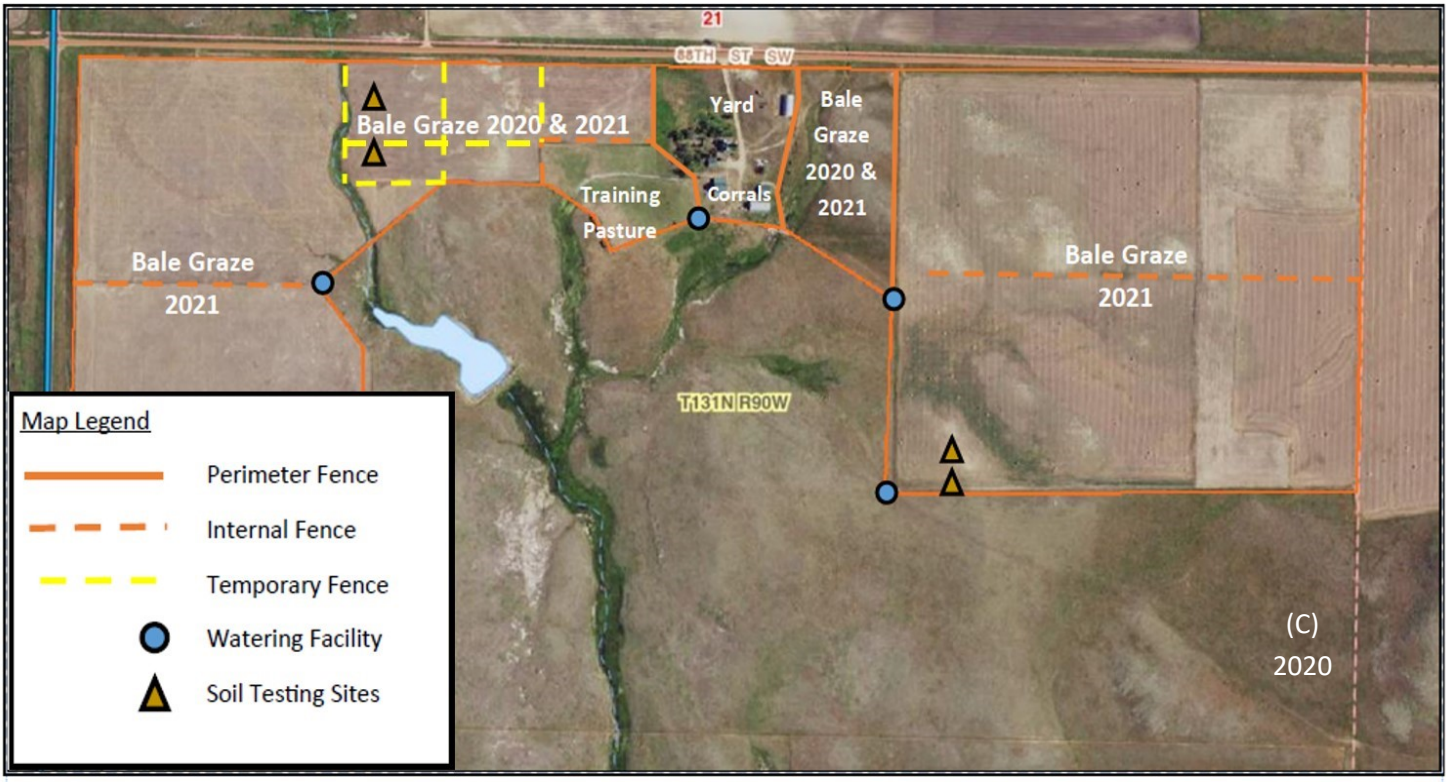


Figure 2. Aerial imagery of the project area included in the 2018 and 2020 Farmer Rancher SARE grant by Drew and Erin Gaugler.

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Bale Grazing to Build Soil Health *(continued from page 5)*

Figure 3. Cattle bedded down on leftover residue while bale grazing.

If the bales are left on their side, the snow drifts and wind protection is limited. If possible, producers should graze into the wind so that bales continue to be accessible for wind protection while grazing.

A primary goal of our first project was to build soil health. The soil samples collected during the fall of 2019 indicate that bale grazing had a direct effect on various parameters of soil nutrients (Table 1). The direct-impact samples were collected directly under a bale, whereas the indirect samples were collected outside of the area where a bale was grazed.

Micro- and macro-nutrients appeared to have a positive response to the direct impact of bale grazing. The response of indirect impact was variable. Focusing on nitrogen (N), phosphorus (P) and potassium (K), the direct impact response is quite dramatic. This is likely because the project area had been poorly managed for many years prior to acquiring management.

What also is important to note is that the levels of organic matter did not change from one treatment to the next. This will likely take time to regenerate because the soil was depleted to a point where it essentially was biologically inactive.

The forage response of bale grazing demonstrated a deeper and richer forage quality (Figure 4). After the first year of bale grazing, you could observe where every bale had been placed. Biomass production doubled and regrowth was quicker and also matured to seeding. In year two, the impact began to spread out.

While the initial goal was to build soil health, we also observed a reduction of labor and feeding costs, as well as an improvement in cattle behavior and health. Initially, we were concerned that the leftover residue would hinder future perennial crop growth, but it has not required any additional management.

Table 1. Soil nutrient response to bale grazing.

0-6"	Cover Crop Only	Bale Graze & Cover Crop (Direct Impact)	Bale Graze & Cover Crop (Indirect Impact)
pH	7.6	6.7	6.2
NO3-N (lb/ac)	**4**	**74**	**4**
OM (%)	2.9	2.9	2.9
P (ppm)	**4**	**13**	**4**
K (ppm)	**201**	**790**	**280**
Soluble Salts (mmhos/cm)	0.27	0.36	0.13
Zn (ppm)	0.5	1.8	0.8
Mn (ppm)	25.3	67.2	19.4
Cu (ppm)	0.4	1.0	0.5
SO4-S (lb/ac)	8	26	3
Cl (lb/ac)	10.4	18.3	14.3

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Bale Grazing to Build Soil Health *(continued from page 6)*

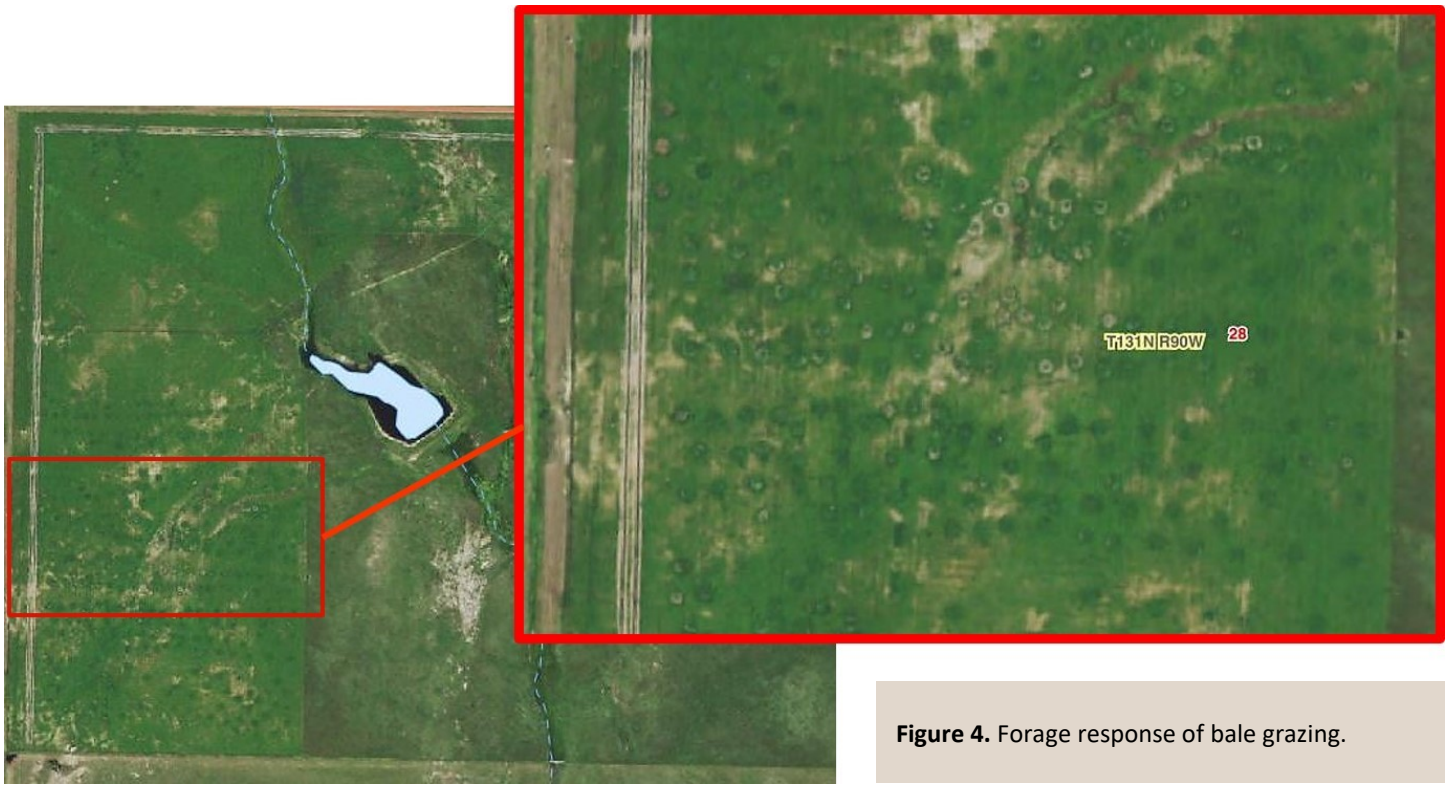

Figure 4. Forage response of bale grazing.

Drew remarks, "I guess what we've realized is that bale grazing can be set up in lots of different ways, depending on your goals, your resources and your commitment to time involved with it, or wanting to have less to do with it."

With an interest in improving forage utilization and manure distribution, Drew and I considered the idea of multispecies bale grazing. We applied for and received a second SARE grant and, while our project objectives are much the same, we want to see if we could do it more efficiently through the adoption of sheep. We also wanted to see if it could be done without an extensive amount of modifications to our current system, minimizing the amount of work that is traditionally required for managing sheep.

A small flock of Katahdin hair sheep are grazing with cattle in the 2020 project area (Figure 2C; Figure 5).

Visit the NCR-SARE website if you would like to follow along with our project or learn more about the grant and educational opportunities.

Figure 5. Multispecies bale grazing.

2021 Forage Agronomy Research Update

Justin Leier, Farm Technician, CGREC

Despite the struggles that 2020 brought on, we conducted two successful trials: an evaluation of annual forage grass species and our first silage corn variety trial, which went very well. Coming into the 2021 growing season, we have seven trials in the works and one already in the ground.

We will be repeating three trials that were conducted in 2020. These include the evaluation of cool-season annual forage grass species, the corn silage variety trial and the evaluation of NDSU grain oat varieties for forage production. This past year, warm-season annual forage grass species were included in the annual forage species trial. This year, the warm-season annual grass species will be evaluated in a separate trial.

Building on the success of our corn silage variety trial, we will conduct a sorghum silage variety trial. This will provide producers with agronomic information on sorghum, as well as help them make decisions between sorghum varieties or silage species.

We are trialing three experimental practices that we are testing on small plots. The first of these experiments was planted in September 2020. This experiment is evaluating mixtures of winter cereals with winter peas. Winter survival has been the main limiting factor to winter pea production in North Dakota.

The idea behind this experiment is that a cereal crop growing with the winter peas will protect the peas and increase survivability. This practice could increase feed quality of winter cereals much in the same manner as growing oats with peas produces higher quality forage.

We also will conduct an evaluation of annual legume species for biomass production and nitrogen fixation capacity. This trial will evaluate 13 forage legume species and compare nitrogen fixation to grain soybeans. Species will be evaluated for production, and also for growth habit and regrowth in the following spring to determine how each species can fit as a cover cropping or intercropping system.

Finally, we are welcoming a new graduate student to the forage research program this summer. Emily Leier, NDSU Extension agent in Emmons County and NDSU graduate in Animal Sciences, will be evaluating 15 forage crops in an attempt to answer two main questions: 1) What is the growth pattern in terms of phenology and date? and 2) When is the optimum harvest time based on quality and quantity?

Determining growth patterns will allow for the development of growth curves, which will help producers predict forage production based on growth stage and time. Determining optimum harvest timing will create models to help producers decide on when to harvest based on their goals with each forage. Species also will be compared for production, feed quality, cost and economic value.

We also will assess a third question incorporating livestock. Yearling heifers will graze winter cereals and cover crops to determine animal performance on the winter cereals and cover crops, soil health impacts from grazing an integrated livestock/cropping system and economics associated with each production system.

County Corner: Soil Health Issues That Cause Major Financial Losses

Crystal Schaunaman, NDSU Extension Agent, Agriculture and Natural Resources, McIntosh County

Recently Naeem Kalwar, Extension soil health specialist at the Langdon Research Extension Center, spoke at a meeting in Ashley, N.D., about soil salinity, sodicity and high magnesium (Mg^{2+}) levels versus calcium (Ca^{2+}) as some of the key soil health issues causing financial losses in the northeastern part of North Dakota, but also in McIntosh County. Most of this information below is in Kalwar's words because he truly is an expert in this area. Some parts have been modified to reflect south-central North Dakota.

I really appreciate how Kalwar explained this issue in terms I could understand (me not being a soil scientist). My takeaway from this article would be the following: 1) If you have areas of land that look like the picture below, take the appropriate soil samples to determine the cause. 2) Stop wasting your money seeding these areas and hoping the problem will get better on its own. 3) Take steps to correct the problem by applying amendments or growing a salt-tolerant plant.

Kalwar notes that wet weather results in shallow groundwater depths and brings excess salts and sodium (Na^{+}), which causes sodicity in the topsoil. Periods of drier weather do not help, either, because areas have not received enough free (gravitational) water to force the salts into the soil, and increased evaporation has caused more groundwater to wick up toward the topsoil, bringing more salts and Na^{+} with it.

A saline and sodic area resulting in net financial loss.

Photos by Naeem Kalwar

Naeem Kalwar, Extension Soil Health Specialist, Langdon Research Extension Center

Here in McIntosh County, some confusion has arisen as to what causes saline or nonproductive areas. Soil salinity is caused by the excess levels of water-soluble salts that compete with plant roots for water, resulting in drought-stressed plants despite decent moisture levels.

Soil sodicity is caused by Na^{+} that is not present as a salt and is attracted to the negative charges of soil particles such as clay and humus. By forming a relationship with clay and humus, Na^{+} separates clay and humus from soil aggregates, resulting in very dense soil layers. That process is called "dispersion."

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County Corner: Soil Health Issues *(continued from page 9)*

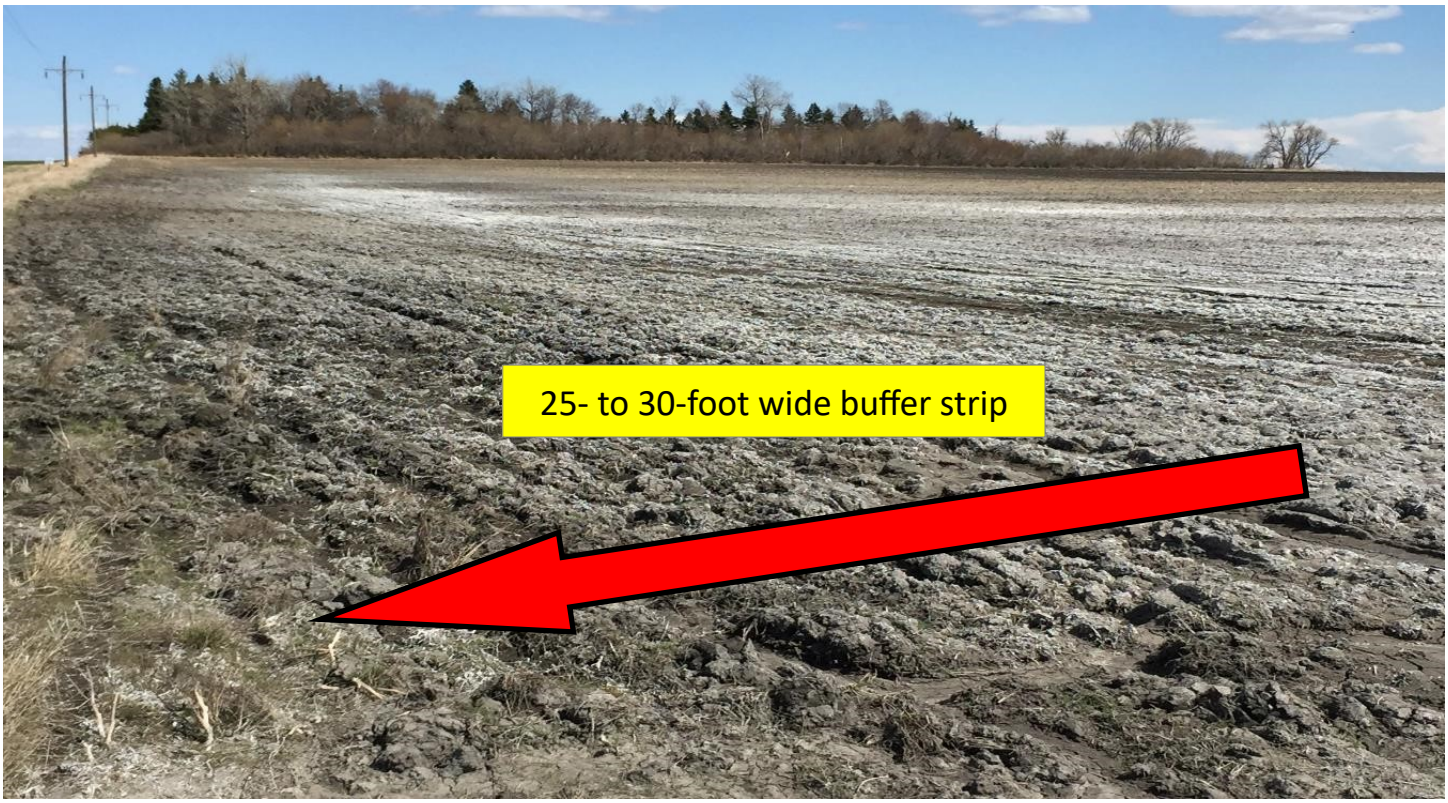
Due to dispersion, soil pore space shrinks, resulting in much slower water infiltration, compared with the same soils not having dispersion. Higher Mg^{2+} levels compared with Ca^{2+} result in excessive swelling of soils. That again shrinks soil pore space, resulting in much slower water infiltration, compared with the same soils not having excessive swelling.

The very first step to remediate these issues is to create zones based on the severity of issues, cropping history and landscape, and take soil samples 3 to 4 feet in depth from each zone in 12-inch increments. Each depth should be analyzed separately for electrical conductivity (EC), sodium adsorption ratio (SAR) and pH by using the saturated paste extract method. For calculating rates of soil amendments such as gypsum, the 0- to 12-inch depths also should be analyzed for cation exchange capacity (CEC) by using the Na^{+} saturation and NH^{+} extraction method.

Once soil results are available, the need for soil amendments can be addressed. Soil amendments are best utilized in powder form and incorporated after spreading. If application is not economically or logistically feasible, salt-tolerant perennial grasses can be established.

Emphasis should be placed on planting a salt-tolerant annual crop or salt-tolerant perennial grass mix based on soil salinity (EC) and sodicity (SAR) levels. A good vegetative cover will reduce evaporation, resulting in less wicking up of groundwater toward the topsoil. Good vegetation also will use excess soil water under wet weather and preserve more moisture in topsoil under drier weather.

Barley and oats are two annual crops that can produce good stands and profitable yields successfully on low to moderate salinity and sodicity levels (EC = 4.0 to 6.0 deciSiemens per meter [dS/m] and SAR = 7.0 to 10.0 in the 0- to 6-inch soil depths) where sensitive crops such as soybeans will result in net loss. However, once soil EC is more than 6.0 dS/m with a



A saline and sodic headland, which can benefit from a perennial salt-tolerant grass mix buffer strip.

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SAR of more than 10.0, even barley and oats may not grow well.

In this situation, planting a mix of perennial salt-tolerant grasses such as tall, slender or western wheatgrass, green wheatgrass (AC Saltlander) or Russian wildrye will be most beneficial. They are planted best in the spring or dormant-planted in the fall. Being perennial, grasses take about a year to get established and two years to suppress weeds on their own. From my perspective here in McIntosh County, this waiting period will be more economically beneficial than continuing to expect non-salt tolerant crops to grow in these areas.

Because salinity and sodicity spots are continuing to expand, planting 25- to 30-foot-wide buffer strips into marginally productive cropland of the above-mentioned perennial salt-tolerant grass mix is the best way to minimize the spread of salts and sodicity. One can say that planting buffer strips means taking more land out of the annual crops, but these areas eventually will lose money as the size of the saline and sodic areas keep getting bigger every year. An established perennial salt-tolerant buffer strip can not only provide better trafficability, but grass roots will intercept capillary water before it would wick toward the higher productive areas.

Mow, hay or graze these grasses so the roots continue to grow deeper below the ground. Cleaning the roadside and in-field ditches also will help improve the flow of water and surface drainage. In addition, we need to be patient with these issues. It took some time for these areas to become unproductive and it will take some time for these issues to go away, especially sodicity.

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For more information, contact your county Extension agriculture and natural resources agent or an Extension soil health specialist.

Kuchen Bars

From the kitchen of Sandi Dewald, Administrative Secretary, CGREC

Dough
1 c. butter or margarine, melted
2 eggs, beaten
2 c. flour
1 c. sugar
1 tsp. vanilla

Combine and mix well. It will be like cake batter when mixed.

Filling
2 c. cream
1½ Tbs. flour
5 eggs, beaten
1¾ c. sugar

Beat the eggs and add the rest of the ingredients. Mix well. Pour dough into a 10- by 16-inch greased baking sheet. Spread out as best you can.

Fruit
1 (15-oz.) can of peaches, drained and sliced (or fruit of your choice)

Arrange fruit on the dough and pour filling mixture on top. Sprinkle with cinnamon and bake at 350°F for 30 minutes or until set.

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www.ag.ndsu.edu/CentralGrasslandsREC
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Upcoming Events

June 15-18: Range Youth Camp
at Logging Camp Ranch

June 24: North Dakota Grazing Lands Coalition
Summer Tour at Brad Sand's Ranch starting at 1:00 pm CDT

July 27: CGREC Field Day

10 a.m. - noon: Forage, cover crop and livestock tour
1 - 3 p.m.: Pollinator, birds, grazing and patch-burn studies
Lunch and beverages provided

Contact Sandi Dewald for more information:
sandi.dewald@ndsu.edu or (701)-424-3606