SOUTH DAKOTA GRASSLAND COALITION

Grassroots

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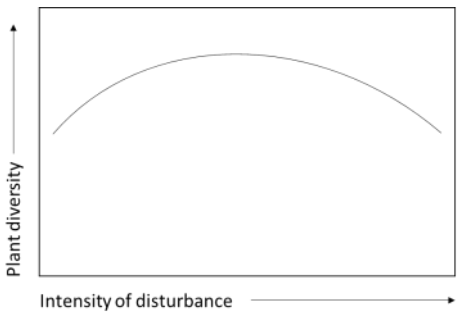
INSIDE THIS ISSUE:

Range 101: Intermediate Disturbance Hypothesis By Sandy Smart

In the March 2016 issue of *Grassroots*, I discussed the importance of plant succession and how this theory relates to range management. Recall the principle forces at work in succession are 1) the biological tendency of grassland vegetation to organize itself in higher complexity and longer-lived species as time progresses in the absence of grazing pressure, and 2) the opposite effect of grazing pressure whereby grazing animals select the more desirable longer-lived species which force the plant community to a more rudimentary stage. This kind of "tug-of-war" is what range scientists call equilibrium succession, where the forces of succession are equal to the forces of grazing pressure to maintain a plant community. This theory works well to predict the impacts of grazing on the make up of the plant community in grasslands where invasive species and woody vegetation are not major players.



A similar idea with respect to succession is the intermediate disturbance hypothesis. As depicted in the figure to the right, the hypothesis predicts that plant diversity is highest under intermediate levels of disturbance and lower diversity is expected under high or low levels of disturbance. A recently published research article by Gao and Carmel (2020) examined the literature regarding the validity of this hypothesis. They found that the intermediate disturbance hypothesis works well to predict plant diversity in mesic grasslands but not so well in arid grasslands. It also underscored the importance of what type of grazer is used. Mixed goats and sheep grazing focused on both forbs, shrubs, and grasses, and at any level of grazing intensity, plant diversity was reduced. In arid grasslands, any level of grazing intensity by cattle or sheep resulted in lower plant diversity compared with no grazing.

Grasslands in South Dakota are sub-humid in the east and semi-arid in the west, thus we would expect the intermediate disturbance hypothesis to be valid under cattle grazing or sheep grazing. The neat thing is most ranchers find the sweet spot for beef production at a stocking rate between moderate and heavy grazing. Thus putting them just to the right side of the peek on the humped-shape curve. Where it likely does not work is on prairie dog towns. Prairie dogs are known for their intense "clipping" of grassland vegetation, yet plant diversity is often higher on prairie dog towns than off towns, albeit in annual species rather than perennials. The important thing to remember is this hypothesis is about plant diversity. Plant diversity is just one aspect of grasslands. We need to consider other structural components, such as plant height and density, when referring to ecosystem services which grasslands provide like grassland bird nesting cover, brood rearing, pollinator habitat, etc.

The Green Side Up by Pete Bauman

Make more money by doing less: the latest research on dung beetles in Eastern South Dakota

Researchers from SDSU and the Ecdysis Foundation under the direction of Dr. Jon Lundgren continue to work on improving our understanding of the role of dung beetles and other insects in pasture management and the relationship between forage quality, livestock, soil health, insects, and chemical pesticide applications.

How do dung beetles generally function?
This is a question asked by a lot of people new to the conversation on dung beetles. Simply put, dung beetles forage, lay their eggs, and live their life cycle in and around the manure of a variety of animals. However, for the sake of this article, we'll focus on dung beetles associated with livestock manure in pastures.

Why should I care about dung beetles?
If you care about your cattle, you will want to care about dung beetles. They play a critical role in the cycle of pasture nutrients and forage production. As dung beetles and their larva occupy a manure pat, they bore holes and tunnels through the manure, helping cool the manure and reducing its ability to serve as a host for livestock pest species development. The holes and tunnels pave the way for small predators looking for a meal of pest eggs or larvae. In addition, depending on the specific species of dung beetle, they can consume and relocate much of the dung material, often burying it in the soil. This process is incredibly beneficial to soil health, nutrient cycling, fertilization, and ultimately grassland production. Further, by breaking up the dung pat quickly, vegetation is not smothered and thus pasture production potential is not only maintained, but increased.

What do I need to do to have dung beetles?
Managing dung beetles in your pasture has much less to do with what you should start doing than it does with what you should *stop* doing. Overall, chemical pesticide pour-ons or injectables have residual effects on dung beetles. These chemicals are designed to persist in manure with the intention of killing pest larva, such as flies. However, these chemicals can be toxic to dung beetles or their larva. Now, many producers are of the opinion that eliminating the pest is more important than protecting a few dung beetles, but this is proving to be a very short-sighted assumption. Research is showing that the reduction in dung beetles from systemic pesticides can also reduce the natural predators of these livestock pests. Further, and ironically, this research also found that livestock operations utilizing the most frequent treatments of pesticides, such as ivermectin, actually have more pest larva in the dung than do operations that choose to use no pour-ons!!.

From a pasture management perspective, there is much to be gained by considering the following options to spend less money and potentially grow more grass. If livestock management is based on fairly frequent rotation, livestock are moved away from the source of pests more frequently. If dung beetles are present and active, the dung is less hospitable to the pest species, and we have less pests and a healthier predator population to control them. If dung beetles break down the dung quickly nutrients are also recycled quickly, eliminating the false notion that artificial fertilizers are necessary. If dung pats are broken down and recycled, more grass grows in those areas where dung pats were smothering the grass.

The Green Side Up Continued Page 3

The Green Side Up Continued by Pete Bauman

If livestock are managed, overall production is increased. Well managed pastures have less opportunity for weeds, and thus less need to spend money on chemicals which can further degrade the system.

Profitability isn't solely based on income, but on what you don't spend. Consider these points. Now consider the irony of spending time and money on livestock treatments for pests, such as ivermectin, for cattle going out to pasture. Then, because there are no insects to break down the manure, the pasture appears underproductive, so you spend money on commercial fertilizer. Then, because the livestock are not being rotated frequently or at all, bare ground persists and becomes infested with weeds, which then you spend money on spraying!!!!

In this difficult farm economy, less can be more. Less inputs on pasture expenses and more emphasis on managing the herd can reap rewards of a functioning pasture system that requires very little artificial inputs.

Photo 1: Dung not inhabited by dung beetles and other arthropods tends not to break down, covering significant area and reducing pasture productivity by hindering growth of covered vegetation (Photo by Pete Bauman).

Photo 2: Dung deposited where dung beetles are present stimulates use by other arthropods as well, advancing breakdown of the dung pat allowing vegetation to grow through the dung. Notice the holes in the dung pat indicating use by dung beetles (Photo by Pete Bauman).

To view the research papers referenced in this article, click on the following links:
https://www.sciencedirect.com/science/article/pii/S1439179119302610
https://peerj.com/articles/5220/

Shoo Fly! by Garnet Perman

Flies—the plague of summer! Fly control is part of a comprehensive management plan for cattle. Chemical control has been the method of choice since DDT became available about 80 years ago but resistance to chemicals is an increasing problem. According to Dr. Mike Hildreth of SDSU, no new classes of insecticides are being developed and the permethrins, the active ingredient in most products are less and less effective. Many producers use a pour on that is actually an endocide designed to kill worms. It is effective for flies although it isn't labeled for that use. Hildreth said, "the danger in using it for fly control is that eventually worms will become resistant and that could present a bigger liability than flies." Treated ear tags are easy to use, but again, resistance in flies and lice is an issue. Management and mechanical means of fly control may soon be the only means of controlling flies left.

Rotational grazing is one management tool. Moving cattle not only stimulates forage production, but it moves the cattle away from hatching flies. Mechanical options include backrubbers, dust bags, oils, and traps of various kinds. One company has even developed a vacuum system. Traps are used in other parts of the world and work particularly well in dairies where cows get used to walking through them on the way to the milking parlor.

One benefit of foregoing chemical is natural bio controls show up. Dung beetles return to pastures once chemical is discontinued. Their activity limits fly populations and improves soil fertility. High intensity, short duration grazing helps attract dung beetles. Charlie Totton, Chamberlain, didn't use a lot of fly control chemical but quit completely five years ago. He thinks the dung beetles were there but in a year or two the population had noticeably increased. He has many tunnelers and found rollers last year. He has also noticed an increase in the number of cowbirds. Several hundred cow birds eat insects flushed up by the herd. White cattle egrets also eat flies.

Linda Simmons in NE South Dakota tried several insecticides over the years. Topical products only worked about 50% of the time. A severe horn fly infestation after using a feed-through product, sent her searching for other methods of fly control. She found a walk through trap that was first invented about 90 years ago. The University of Missouri improved on that invention and showed that it could be effective against horn flies. Inexpensive, easy to use chemicals came into wide use about the same time, so the more labor intensive mechanical trap never took off. Simmons applied for and received a Sustainable Agriculture Research and Education (SARE) grant to build it and count flies.

The trap is not 100% effective, but keeps flies down to the 200 flies per cow threshold recommended by the Extension Service. She uses it about four times per grazing season, but it could be used more often if needed. The downside is it needs to be set up and cattle need a bit of training to use it. She mounted it on the mouth of a corral and locked the cows in. They figured out how to get through it on their own. One idea would be to place it at the entrance to a water tank, so the cattle would be forced to go through it at least once a day.

The following links tell more about fly traps: https://projects.sare.org/sare_project/fnc14-977/ contains information about Simmons' project. The following link contains more information and pictures of various fly traps: http://www.iowabeefcenter.org/bch/HornFlyTraps.pdf

Garnet Perman is a freelance writer and ranches with her husband, Lyle, near Lowry, SD.

Creating Your Own Grazing Plan by Dan Rasmussen

Here are four steps to create your own grazing plan:

1st Step- Write down your **goals** for the grazing season.

Setting goals helps give you direction. An example of a goal for a grazing plan would be: One of your pastures has lots of bare ground between plants with very little litter. The time the cattle are left in this pasture will be shortened to achieve your soil health goal. More standing forage will be left to help create a litter base. Litter protects the soil and feeds the soil biology. Goals are useful in every step of grazing planning.

2nd Step- Prepare A Simple **Resource Inventory.**

A simple **resource inventory** involves walking through your pasture and deciding how long a herd of cattle can stay in the pasture to achieve your grazing goals. A more accurate measurement can be done by clipping and weighing a forage sample or using a grazing stick. The time the cattle are in the pasture determines the amount of grass left for soil and pasture health.

3rd Step-Prepare a **Grazing Chart**- Spreadsheets Make it Easy.

Once the length of time is determined for the herd this info may be entered into the **grazing chart** (Fig.1.) In the example, see "East #9" entered in May for 8 days. This process is done for all the pastures.

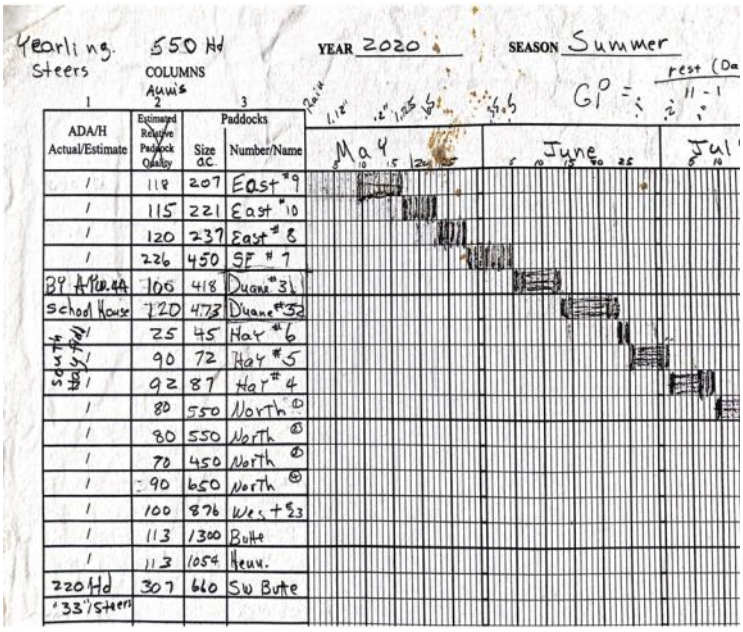


Figure 1. A grazing plan is a tool to be used throughout the season. Notice coffee stain on this plan (Photo. Dan Rasmussen).

Grazing charts may be purchased at the Holistic Management International website.

4th Step- Re-evaluate often- **Adjust the plan** by observation of the pastures.

The grazing plan is only an estimate of when you will enter and leave pastures. As the season progresses, it will be necessary to **adjust the plan** based on weather conditions and whether you are meeting your original goals.

A grazing plan is one important part of the whole ranch plan. To learn more about whole ranch planning watch the SDGC website calendar for schools, workshops and pasture walks throughout the year.

Dan Rasmussen is a third-generation cattle rancher living in south central South Dakota. Dan served on the board of the South Dakota Grassland Coalition for 18 years and is currently the education coordinator for the Grassland Coalition.

SDGC Outstanding Grassland Graduate Student Award by Sandy Smart

Dr. Sandy Smart and Abby Blanchard (SDSU NRM M.S. student) receiving the SDGC Outstanding Grassland Graduate Student Award 2019-2020 (Photo by Jiyoung Kim).

Abby Blanchard, recently received the Grassland Coalition Outstanding Grassland Graduate Student Award this spring. Unfortunately, we were not able to formally recognize Abby at the SDSU Natural Resource Management Department's annual scholarship and awards banquet due to COVID-19, so we presented her with the award pictured here in June. Abby received her recognition and a $250 award sponsored by the SDGC.

Abby, hails from Petoskey MI and graduated with a B.S. degree in Fisheries and Wildlife Management from Northern Michigan University. Abby came to SDSU in 2018 and started working with Dr. Lora Perkins on a project aimed at restoring saline-sodic soils back to native grassland plants.

Saline-sodic soils have become a growing problem in the Northern Great Plains, often leaving the soil unvegetated which decreases soil health and increases erosion. Abby's research project looks at identifying suitable native plants for revegetating these areas. Abby also has a passion for wildlife and her research project helps to expand her practical knowledge regarding habitat restoration. This is a critical nexus, especially in the Prairie Pothole Region which has been prone to land conversion and the focus of "Every Acre Counts".

Here is excerpt from Abby's application letter which highlights the significant impact this opportunity has had on her educational pathway.

> "Throughout my undergraduate and graduate career, my research interests have broadened. Initially, I was focused on wildlife ecology and management, with an interest in becoming a wildlife biologist. Volunteering at deer check stations, conducting waterfowl surveys, and learning radio telemetry techniques spurred this passion during my undergraduate years. After my Research Experiences for Undergraduates (REU) program, I expanded my interest to encompass habitat ecology, with a focus on climate change, ecosystem function, and invasive species. I searched for graduate programs with an ecology and natural resource focus, looking for projects that were habitat ecology centered with aspects of wildlife ecology. I was fortunate enough to get a graduate assistantship with Dr. Perkins, working on revegetating salt-impacted soil using native plants. My project combines my research passions and allows me to gain valuable experience working with plants, further expanding my research repertoire. As I begin to wrap up my graduate program, I have realized that my initial plans of becoming a wildlife biologist have transformed into becoming a wildlife habitat ecologist. I find that this position would better suit my passions and help achieve my goal of working within the natural resource profession. As a wildlife habitat ecologist or a related position, I will be able to combine my initial interest of wildlife ecology with a central focus on habitat and ecosystem function. I believe that in the face of climate change, habitat ecologists will be crucial to the future of wildlife and I look forward to assisting with this challenge." *Abby Blanchard*

SRM CORNER - *News from the SD Section of the Society for Range Management*

By: Pat Johnson

Gary E. Larson
1950 – 2020

A precious resource and great friend of those who love and work in rangelands was lost when Dr. Gary E. Larson passed away on the morning of June 27, 2020 at the age of 69. Gary was a proud and loving husband to wife, Pam, and father of son Ross and daughter Alyssa. His full obituary can be viewed at: https://www.eidsnessfuneralhome.com/obituary/gary-larson. Gary was Professor Emeritus in the Natural Resources Department at South Dakota State University. Throughout his 36-year career as professor at SDSU, Gary taught taxonomy to thousands of students and was the director and curator of the C.A. Taylor Herbarium. Even after retirement, Gary provided taxonomic assistance to others and volunteered in the herbarium to continue the work of digitizing the collection.

Gary was a gifted, world-class botanist. He generously shared his deep knowledge of the flora of the Northern Great Plains and the Black Hills of South Dakota with students, colleagues, friends, and the public. He co-authored two books with his friend and colleague, James R. Johnson (Professor Emeritus, Animal and Range Sciences, SDSU): "Grassland Plants of South Dakota and the Northern Great Plains" and "Plants of the Black Hills and Bear Lodge Mountains". These books are the "go-to" rangeland plant ID guides for thousands of professionals and amateurs, filled with beautiful photographs and information for identifying and learning the history and uses of plants in the Northern Great Plains. A dog-eared copy of one or both can be found on the dash, seat, or glovebox of nearly every agency and ranch pickup truck in the region.

Gary was one of the great teachers of our time. His taxonomy courses required considerable hard work and study; he expected much from his students. Many of them felt that those were the hardest courses they took in their degree programs. However, they absolutely loved Gary. Tributes have poured in from former students describing his kindness, caring, and willingness to help students learn. He stayed late and kept the lab and teaching herbarium open for students needing extra time to master the identification clues and scientific names of the plants in his courses. He proudly followed their careers and became a mentor and friend to them, still teaching and providing ID help long after they graduated. There are many rangeland managers, rangeland management agency personnel, field botanists, wildlife biologists, and others who owe their plant ID skills and love of grassland plants to Gary Larson.

Gary was, for decades, the coach for the SDSU Range Plant ID team that competed at SRM meetings. His teams were always well prepared and very competitive, with over 50% of them placing in the top 5 and 25% in the top 3 teams in the international contest. Gary has been remembered by the other Plant ID coaches as a respected teacher, mentor, colleague, and friend. "He was humble, but extremely prepared and full of knowledge…and his name is pretty darned prominent in the SRM plant ID contest herbarium…he was one of a very few who took the time to challenge other students through the contest" (Barry Irving, U. of Alberta). Many of his students and colleagues continue to stand in awe of his skill, dedication, and successes in teaching students to know and identify rangeland plants.

Gary was also a great teacher and resource for his many friends and colleagues throughout the region. "He was unendingly generous with his time and knowledge" (K.C. Jensen, SDSU). So many of us would send him our "unknowns" either as a physical specimen or in a photo (the plants were usually pretty battered and dried up and photos were often poor quality) for help in identification. He always responded, providing common and scientific names (at least to genus, and often to species if the specimen wasn't too badly mangled). He also gave us information on key features to help with future identification and to distinguish plants from similar species. His death leaves a huge hole for many of us and "represents a huge loss to our botanical community and beyond" (Maribeth Latvis, SDSU).

Gary Larson will not only be remembered as a great taxonomist, scientist, colleague, and teacher; he will also be remembered by so many as a kind, humble, caring, positive, and genuine friend. His death still stuns us, and his loss leaves a hole in many hearts. Every time we identify the plants we see as we walk through the prairies and hills we think of Gary and thank him for the great gift he gave us of his knowledge and friendship. Rest in peace Gary, in God's loving arms. We will miss you.

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Calendar of Events

Event	Date	Location	Contact Person	Phone
SD Grazing School	Aug 25-27	Wall	Judge Jessop	605-280-0127
SD Grazing School	Sep 15-17	Chamberlain	Judge Jessop	605-280-0127

Please remit any comments, suggestions, or topics deemed necessary for further review to: Sandy Smart, SDSU Box 2140B, Brookings, SD 57007, alexander.smart@sdstate.edu, (605) 688-5503