SOUTH DAKOTA GRASSLAND COALITION

Grassroots

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Range 101: Frequency of Grazing by Sandy Smart

In the last issue I discussed the importance of timing and intensity of grazing in relation to plant development and its impact on future plant health. In this article I will discuss the importance of the **frequency of grazing**. This is one of the key concepts behind the rationale of specialized grazing systems.

But first an important history lesson. Prior to the invention of barbed wire and perhaps even before the domestication of livestock, grazing animals likely did not stay and graze in one area year round, especially in areas with a lot of climatic variability. We have examples from Africa and North America that most grazing animals seasonally migrated. In addition, fire, predators, weather, and presence of water (or lack thereof) caused local, annual shifts in animal grazing patterns. Thus, the season-long continuously grazed pasture (no matter how big) was never the gold standard. However, there probably existed areas that were grazed more than once per year, year after year. Grassland ecologists call these “grazing lawns”. They tended to be near water sources and in migratory pathways. There also likely existed areas that were grazed more than once per year, but received rest from grazing for several years. This concept is often associated with fire and grazing and is called “pyric-herbivory”. Both patterns likely occurred in the Great Plains of North America with bison, elk, and other herbivores. These patterns were also influenced by Native Americans for thousands of years. In the mixed-grass and shortgrass prairies, fire was probably less important than in the tallgrass prairie regions. The point is that grassland plants have developed under different scenarios in different areas resulting in native plant species that are adapted to frequent heavy defoliation (like buffalograss) and others that are not (like green needlegrass).

After the Civil War, barbed wire was introduced into western landscapes, mass migrations of settlers moved west, the bison were extirpated, elk were pushed into the mountains, and fires were suppressed. These changes resulted in an abrupt shift away from how North American grasslands functioned for the past tens of thousands of years. Early observers saw the decline in western rangelands and were quite alarmed. Essentially the Society for Range Management was formed out of this need to better protect grazing lands from degradation. In the 1940s, many universities started stocking rate and grazing system studies. SDSU was no exception, and started one of the longest stocking rate studies in the USA at the Cottonwood Range and Livestock Research Station in 1942. It was quickly determined that stocking rate was the primary

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problem that caused the decline in our rangelands. In the 1950s and 1960s, researchers focused on deferred and rest rotation systems and compared them to continuous season long grazing. It wasn't until the late 1970s and early 80s, when Alan Savory proposed a much more intensive system in Africa, did we start looking at more sophisticated grazing systems. We all remember the wagon wheel, the first grazing cell design, which turned out to be a disaster (pardon the Trump euphemism I couldn't resist). The purpose of such systems were to limit the number of times an animal would bite a plant and allow the plant to rest in between grazing periods to recover. This makes perfect logical sense, but not all rest is equal. For example, early in the growing season, when the grass is in the vegetative stage, the apical meristem (main growing point) is near the soil surface because no stem has formed yet. If the plant gets grazed it regrows new leaves from the existing shoot. The rest period doesn't need to be very long because we are still early in the growing season, when favorable temperatures and moisture coincide and the day length is getting longer. If the plant gets defoliated in the middle of the growing season, the stem has elongated and the apical meristem is now exposed and could be removed by the grazing animal. The temperature has increased, and the chances of adequate moisture start to decrease (especially after June which is the wettest month in the Great Plains). At this point regrowth is likely to occur from basal buds (if the apical meristem is removed) or from the existing stem (if the apical meristem is left intact). Now rest periods need to be lengthened because regrowth is much slower under hotter, drier conditions. When plants are heading out with seed (July or August), grazing definitely removes the apical meristem and regrowth only occurs from basal buds. Now temperatures are much warmer and moisture is spotty. Day length is decreasing and plants are depositing the products of photosynthesis into roots, rhizomes, and buds rather than new shoot growth. This process explains why, when good growing conditions return in the early fall (September and October), plants don't produce nearly what they do in the spring. Therefore, we tend to recommend shorter rest periods early in the grazing season (rotate fast when grass is growing fast) and longer rest periods later in the season (slow the rotation down when grass growth slows down).

Back to frequency of defoliation. What factors determine the chances that a plant is grazed more than once? Usually, regrowth potential is influenced by the plant's environment. Plants near water sources, on flat areas, or near shade, tend to get grazed more than once if allowed. Stocking density (# head/acre) also increases the likelihood that a plant will get grazed more than once. In western parts of our state, where forage production is low, we tend to make bigger pastures to hold larger herds. As the size of the pasture gets bigger, there is less chance that a plant gets grazed more than once. In addition, when livestock graze a plant, it usually doesn't regrow much after July. The likelihood that plants get grazed more than once increases from west to east because pasture size decreases and length of favorable regrowth conditions increases. In eastern SD, it is difficult to find a pasture over 640 acres where cattle travel at most just 1.4 miles (on the diagonal) to get from one corner or the other.

Length of *adequate* growing conditions is an important factor, and is related to the 'brittle vs non-brittle' environment concept Savory introduced. Jim Howell, in his book entitled "For the Love of Land: Global Case Studies of Grazing in Nature's Image" does a fantastic job explaining this

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concept (even better than Savory; a must read!). Overall, the concept basically says that in cold, brittle environments that are characterized by a short growing season with a long, cold dormant season, a rotation is probably less important from a plant physiology standpoint because growth is constrained by a short growing season. Plants usually won't get grazed more than once during this time period because of little regrowth. Additionally, if a plant gets grazed once during the growing period and once during the dormant period, it really only counts once from a plant physiological stand point.

Conversely, if a plant is grazed multiple times during the growing season, then the plant will suffer from not having enough products of photosynthesis to establish a healthy root system, grow rhizomes, and form basal buds for next year's growth. What often occurs in cold, brittle environments, with a condensed growing season, is cattle tend to graze plants more severely and under graze (not graze at all or lightly graze) plants further away from water sources rather than graze a plant multiple times.

In non-brittle environments (warmer, wetter), favorable growing conditions exist much longer and grass regrowth potential is much higher. In these environments, rotational grazing to purposely introduce rest between grazing events is very appropriate. These environments may tolerate 3 to 5 grazing cycles per grazing season. Generally these are areas east of the Great Plains. The Great Plains is a transition of non-brittle to brittle environments as you move east to west, and obviously, there is no magical line that can be drawn on a map, as this line can fluctuate dramatically between seasons and years. Annual fluctuations in precipitation result in annual fluctuations in regrowth potential. Some years it can be quite good, other years there is hardly any regrowth.

The issue with frequency of defoliation is complicated because the length of "true" growing conditions is not the same as our "grazing season". Often people assume plants are defoliated multiple times in cold, brittle environments but what really is happening is areas near water are grazed too heavily once and areas further away are lightly grazed or not grazed at all. Thus it is a livestock distribution problem. In less brittle environments with a longer "true" growing season, regrowth potential is high and introducing a rest in between grazing is useful if the desire is to graze a pasture multiple times.

The bottom line is that plants can be defoliated more than once per grazing season if they have adequate time to rest and recover between grazing events. In brittle environments (Great Plains and west), this is less likely to occur during a condensed growing season. In our western South Dakota environment, forage production is low such that pastures tend to be much larger than in the east. At a ranch scale, managing livestock distribution can be challenging as cross fencing and additional water sources can be expensive. Splitting pastures with low cost or even temporary fencing is much more cost effective than trying to do it with permanent fencing. Providing adequate water is a key factor when splitting pastures. Traditional water developments such as dugouts and dams have given way to pipelines and tank systems. Some producers like Pat Guptill, from Quinn, use portable watering systems that move with the cattle while others like Randy Holmquist, from Reliance, have built lanes to allow livestock to travel back to permanent watering sites.

Sandy Smart is an Extension Rangeland Management Specialist and Professor in the Department of Natural Resource Management at SDSU.

SDSU Extension

The Green Side Up: Pasture Above Ground Water System Tidbits by Pete Bauman

I wanted to share a bit of personal experience regarding a recent above ground pasture pipe project I assisted with. In this case, the producer purchased over 20,000 feet of HDPE pipe from a supplier, along with the associated compression fittings.

I've worked with these kinds of systems for years, and had never had any problem putting compression systems together by myself. However, on this project we struggled to get the fittings to work, and my initial inquiries into why, basically left me scratching my head. We had to hone the ends of the pipe, use soapy water, and it still required 2 grown men to push the fittings on. Obviously, something wasn't right.

Generally, above ground pipe systems have a few commonalities. The type of pipe used in these systems is not your general black pipe found at home improvement stores. Flexible above ground pasture pipe is made of high-density polyethylene (HDPE) and is usually rated at 160 psi. This is a very tough material that can withstand being driven over by light vehicles. Some producers even allow water to freeze in these pipes (although this isn't necessarily recommended). Pipe size can vary depending on application, with 1", 1 ¼", 1 ½" and 2" inside diameter pipe being popular in our region.

Above ground systems also offer many components that allow for flexibility, including T's, elbows, valves, drain ports, and other compression fittings with large, threaded collars that are designed to be installed by hand, allowing for quick coupling and decoupling of components. Compression fittings are generally rated at 200 psi.

The difficulty putting this system together was very odd, so I reached out to Coalition member Rick Smith, owner of PastureWorks. Rick has worked with many producers on custom systems and I was curious if he was having any issues with any of his recent customers. He hadn't, but he did acknowledge that some of these new fittings were more difficult to install than the older ones. We discussed some possibilities for the problems and Rick agreed to do some fact checking with various manufacturers on these issues.

Here's what he found. Rick cautions that producers and installers should pay particular attention to the type of pipe they are purchasing and design their systems components accordingly. Smith has found that pipe can either be manufactured to inside diameter tolerances or outside diameter tolerances. Both can work, but it is important to know what type of pipe you have so that the correct couplers are purchased to match the pipe. Pipe that is manufactured based in inside diameter tolerances can have some variations in outside diameter, and thus the correct couplers should be used to avoid difficulty in installation. Unfortunately, in our case, the supplier provided pipe that was inside tolerance pipe, and the compression fittings were based on outside tolerance pipe. Therefore, the slight variations in thickness of the pipe wall affected the outer pipe diameter, resulting in many of the fittings being very difficult to install.

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The Green Side Up: Continued by Pete Bauman

Price differentials for in inside vs. outside tolerance pipe can be significant, as can that of inside vs. outside tolerance compression fittings. So, a word of caution……ask these questions of your supplier before you make the purchase, because I think many of us have assumed some of the new fittings on the market are universal….but it turns out they are not!!

Above ground systems offer a great amount of flexibility in delivering water and offer excellent options for changing pasture designs over time or space. Quick compression fittings and a variety of adapters for several thread types allow for excellent flexibility. However, some producers do not desire to maintain as much flexibility in their systems, and for those individuals more permanent options exist.

The first additional level of permanence is to use welded couplings with an above ground HDPE pipe system instead of removable compression couplers and fittings. Wayne Vincent with Common Sense Manufacturing of Faulkton utilizes welded couplers on many of their overland water systems.

Welded fittings are installed utilizing a simple machine that heats the pipe and the fitting and welds the two together. He suggests that if a producer is sure about where they want their pipes to be located and don't need a lot of flexibility to move the system around, welded fittings can be advantageous, as the welded joints are stronger than the actual pipe if done correctly. A variety of sizing bushings and threaded adapters allows for fusion (welded) fittings from the start of the pipeline at the water source all the way to the float valve at the tank. When compared to trying to install PVC pipe with primers and glues, installing the welded system is faster and stronger.

While Vincent does install above ground systems, he wanted to share a fairly rare problem that he's witnessed in relation to air entrapment in high spots in some overland systems causing a rupture in the pipe. It takes the perfect storm of factors for entrained air to rupture a pipe, and he believes the primary contributing factors are likely due to hot pipe/hot water (due to exposure to the sun) exposed to a rush of cold water (usually sourced from a well or rural water). This issue can be prevented by installing air gaps at the top of the rise, on either side of the drop.

Vincent also has shallow-buried several HDPE welded pipe systems in recent years. Shallow bury systems are usually with 2 feet of the soil surface (not below the frost line). Shallow bury appears to normalize pipe temperatures and thus appears to avoid the entrained air rupture issues associated with some above ground systems. However, shallow bury systems can still get a vacuum lock associated with high spots on occasion and air gaps are still recommended.

Pete Bauman is an Extension Range Field Specialist in Watertown, SD.

SDSU Extension

Winter Road Show to Feature Dr. Dwayne Beck by Garnet Perman

One of the presenters at the SD Grassland Coalition's upcoming Winter Road is South Dakota's own internationally known conservation agriculture innovator, Dr. Dwayne Beck, manager of Dakota Lakes Research Farm in Pierre.

Beck earned a Ph.D. in Agronomy with a focus on soil health at SDSU. Since 1983 he has been a research manager and professor with SDSU, first at the James Valley Research Center near Redfield, and since 1990, he's managed Dakota Lakes Research Farm near Pierre. Beck pioneered the development of no-till farming machinery and methods, plant rotations and cover crops. He was inducted into the South Dakota Hall of Fame in 2007 in recognition of the positive impact his cutting edge research has had on the economy and environment of the state. He was honored with the American Agricultural Editors Association Distinguished Service Award in 2008.

Beck has traveled extensively, learning what not to do and gleaning workable ideas to adapt to the Northern Plains. In addition to innovative research, he is known for his practical approach to managing agricultural ecosystems and teaching skills. His work has been featured in many agricultural publications and he has presented at conferences worldwide, most recently at the 6th World Conference on Conservation Agriculture. He enthusiastically shares research with a diverse audience at the Dakota Lakes site, from individual farmers wanting advice on how to implement their own no-till system, to various groups of governmental and private organizations. A recent example of that diversity was a visit from representatives of companies such as Nestle, Coca Cola, Unilever and Nike interested in how they can support environmentally sound agricultural practices.

His approach to agricultural research has always attended to producing healthy food, clean water, healthy soils, and wildlife diversity with profitability and practicality in mind. No-till was developed as a solution to dealing with irrigation run off. "We started when there wasn't chemicals, so we had to use crop rotation and sanitation," said Beck. "Dakota Lakes works because it's a farming operation."

His goal in developing integrated systems is informed by studying natural ecosystems and mimicking them as much as possible. Livestock is an important component of a natural prairie ecosystem. According to Beck, the sweet spot in conservation agriculture balances livestock, annual diversity and perennials. He was working on water tanks for the Dakota Lakes cattle herd when interviewed for this article.

Climate change with a practical twist is part of the current research. One of the goals at Dakota Lakes is to be fossil fuel neutral by 2026. "Eighty percent of operational costs can be traced to fossil fuels," Beck said. " One hundred and twenty years ago it was zero. It needs to be there again and nobody is working on it." His presentation at the Winter Road Show will most likely include information on rotations for shorter growing seasons, livestock integration and research results from swath and bale grazing at Dakota Lakes.

SDSU Research Update: Finding a Fox by Emily Mitchell

Emily Mitchell, an SDSU graduate student, is on a mission. Using trail cameras, she is searching for a small, elusive inhabitant of the grasslands in the Dakotas: the swift fox. This canid, or dog-like species, is about the size of a house cat and is one of the rarest foxes in North America. Swift foxes, featured in the stories of the Native American tribes from the Great Plains, once reached as far south as Texas and north into the Canadian Provinces of Alberta and Saskatchewan. They were common throughout much of the Great Plains when Lewis and Clark explored the Dakotas. However, a variety of factors have caused the species to decline rapidly in not only the Dakotas, but throughout their historic range. It's a complicated story, but the primary factors include historic predator control programs, the loss of native grassland to agriculture, and a larger than normal coyote population, which kill their smaller cousins to reduce competition for food. The swift fox is currently considered a threatened species in South Dakota and exists in only one county in North Dakota.

After swift foxes were reduced to one known remnant population in Fall River County, South Dakota, reintroduction efforts took place in the early 2000's. They were reintroduced in four locations in the west-central portion of the state over the course of almost a decade. Currently, only one of those reintroduction areas, Badlands National Park, still retains a population of swift foxes. However, during and after the reintroductions, swift fox sightings were regularly reported in the northwest corner of South Dakota and the southwest corner of North Dakota. Unfortunately, it is unknown if these sightings represent a flourishing population, or just a few dispersers traveling through the area. We also don't know if these foxes came from the reintroduced populations, remnant population, or neighboring populations in Montana and Wyoming. This coupled with little knowledge about the predator community in this region makes it unclear how well swift foxes are surviving in northwestern South Dakota and southwestern North Dakota.

Using camera-trap surveys, radio-collaring, den surveys, disease assessment, and genetic analysis, Emily and her team are working to shed light on the current status of swift foxes in the Dakotas. Setting trail cameras in a grid across eight counties (Butte, Harding, Meade, Perkins, Adams, Bowman, Slope, and Hetinger), and baiting them with cat food and a pungent, skunk-based scent lure, she will record locations of swift foxes and their nemesis, the coyote. She will use this information to help her assess the distribution of the swift fox and other carnivore species. When Emily finds a swift fox on one of her cameras, she captures and places a radio collar on the fox. This allows her to record their movements and locate their dens, as well as monitor how long they live and what they die from. She will use genetic tests to look at relatedness to both the reintroduction sites and populations in neighboring states. Sylvatic plague, commonly known as black plague (the same disease that decimated Europe) could play a role in the area as well, so captured foxes will also be tested for exposure to the disease.

At the end of her project, her results will be combined with similar studies in Montana and Nebraska. This will allow researchers and wildlife managers to assess the swift fox population not only in the Dakotas, but in the Northern Great Plains and have a better understanding of what is currently preventing the species from being as wide spread as it once was. The majority of her research is being conducted on privately owned property. The cooperation of landowners has been crucial in the success of her research. With over 600 camera locations she relies heavily on hundreds of landowners to allow her access to their property. Without the cooperation and hospitality of the local landowners her research would not be possible.

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Calendar of Events

Event	Date	Location	Contact Person	Phone
SDGC Winter Road Show - Dwayne Beck	Dec 12-16	Yankton, Winner, Belle Fourche, Water-town, Chamberlain	Judge Jessop	605-280-0127
SDGC Annual Meeting	Dec 16	Chamberlain	Judge Jessop	605-280-0127
SDSHC Winter Road Show - Doug Peterson	Jan 17-20	White River, Belle Fourche, Lemmon, Chamberlain	Josh Lefers	605-770-2989
Northern Plains Sustainable Ag Society Winter Meeting	Jan 26-28	Aberdeen	www.eacdev.com/npsas/	

Please remit any comments, suggestions, or topics deemed necessary for further review to: Sandy Smart, SDSU Box 2170, Brookings, SD 57007, alexander.smart@sdstate.edu, (605) 688-4017