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## INSIDE THIS ISSUE:

**Soil Health** 2-3  
**Continued**

**Your Neighbor's Ranch** 4-5  
**Isn't a Business**

**Drought Plan-  
ning** 6

5

**SD HSYF Places** 6  
**1st**

**Grasslands on a  
Comeback** 7

# Grassroots

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## Soil Health on Rangelands: Energy Flow by Sandy Smart

Last issue I introduced the concept of soil health and the importance of monitoring it through ecosystem processes. This issue, I want to focus on energy flow. Energy flow is driven by the solar input from the sun and the uptake of CO<sub>2</sub> through photosynthesis. Energy is displayed in two forms, kinetic and potential. Kinetic energy is energy in motion. Potential energy is energy that is stored. An easy way to think about energy flow is to use the analogy of a solar panel collecting the sun's light energy (kinetic) and converting it into electricity stored in a battery (potential). However, instead of creating electricity, plants are creating sugar (6 carbon glucose molecule) and linking them together to form complex carbohydrates that eventually become food for herbivores (potential energy). This, of course, is all controlled by available water as the equation for photosynthesis is:  $6 \text{ H}_2\text{O} + 6 \text{ CO}_2 + \text{light energy} = \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2$ , where the water molecule is split and oxygen is created.

As managers, we cannot influence how much sun energy we receive or how much CO<sub>2</sub> is in the atmosphere. However, we can influence the type of solar panel (green plants) we choose to keep on our land. The photograph (figure to the right) is a good illustration. The picture shows big bluestem (large leaf blades) and Kentucky bluegrass (narrow leaf blades). This photo was taken in early June in an area that received repeated clipping once a week in May. Kentucky bluegrass is a cool-season, C3 plant, which uses the 3-carbon fixation pathway. Its enzyme responsible for carbon fixation works at an optimum temperature of about 65°F. Sometimes the enzyme tries to fix O<sub>2</sub> instead of CO<sub>2</sub> and results in wasted energy (photo respiration). Big bluestem is a warm-season, C4 plant, which uses the 4-carbon fixation pathway. Its enzyme responsible for carbon fixation works at an optimum temperature of about 90°F. It has a high affinity for CO<sub>2</sub> and rarely (if ever) tries to fix O<sub>2</sub> (essentially has no photo respiration).



Big bluestem and Kentucky bluegrass  
(photo: S. Smart)

Energy Flow Continued on page 2

# Soil Health Continued by Sandy Smart

Warm-season, C4 pathway plants are also more water efficient (meaning for every unit of water used they fix more units of carbon than C3 plants). Thus warm-season plants have an advantage over cool-season plants during the hot, dry summer periods. Cool-season plants have an advantage in the early spring, when it's cooler, and often wetter.

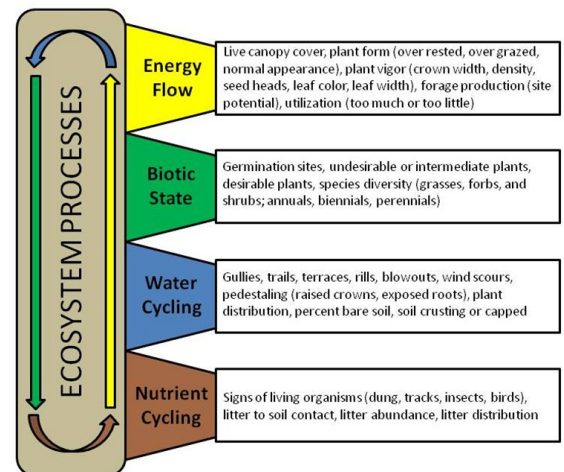
Ideally, it would be nice to have a mixture of both cool-season and warm-season plants to take advantage of having an even distribution of actively growing leaf material (solar panel) throughout as much of the growing season as possible. When pastures are overtaken by a single species (e.g., Kentucky bluegrass, smooth brome grass, or cheatgrass, you pick one) the potential to harvest as much CO<sub>2</sub> as you can diminishes. A well-managed prairie contains both C3 and C4 plants, made up of grasses (85%) and broadleaves (15%). As a manager you would like to increase the abundance of grasses with wider leaves and forbs compared with plants that have narrow leaves. This way you can maximize the leaf area of your actively growing canopy (solar panels).

Now let's turn our attention to the monitoring diagram of the ecosystem processes (pictured right). The yellow represents energy flow. A grassland manager would monitor live canopy cover, plant form (over rested, overgrazed, normal appearance), plant vigor (crown width, density, seed heads, leaf color, leaf width), forage production (site potential), and utilization (too much or too little). We've already discussed the idea of canopy cover in detail.

Plant form in terms of appearance (over rested, overgrazed or normal) is a way to gauge if the flow of biomass of an individual plant is in the right propor-



Little bluestem grazed heavily in a patch-burn graze system (photo: S. Smart).



Ecosystem processes and monitoring diagram (modified after Pyke et al. 2002; Pellant et al. 2005; Orchard 2013).

tion (feeding livestock, feeding itself, feeding the soil). If it is over rested it will have a greyish color to it and too much of the biomass is being oxidized (carbon going to the atmosphere) instead of getting eaten by livestock or getting trampled as litter. Sometimes bunchgrasses can build up too much material and loose vigor. We all have seen overgrazed plants. The picture (see photo to the left) is of little bluestem grazed close to the ground from a patch-burn area.

Soil Health Continued on page 3



# Soil Health Continued

by Sandy Smart

From a plant vigor perspective we would look for crown width in bunchgrasses, tiller density in rhizomatous grasses, number of seed heads, leaf color, and leaf width. The denser the stand the more leaf area you will have. If leaf color is light green or yellow in color that means it is most likely deficient in nitrogen and not so much an energy flow problem (although nitrogen is limiting potential).

Forage production potential can be accessed from the web soil survey (<http://websoilsurvey.sc.egov.usda.gov>) to get a baseline of what the climax plant community would produce or any plant community that is predicted from the state and transition model. The best method is to set up an exclusion cage (see <http://www.landekg.com/grazing-cage/> for a free grazing cage design made out of one cattle panel and uses no T-posts) and use a clipping ring to estimate forage production (see photos to the right).

Estimating your own forage production and mapping it is an important first step in determining if grazing distribution is a problem (especially in large pastures). If grazing is determined as being uneven through mapping of grazing utilization (over grazing in some spots and under grazed in others), then you might gain efficiencies by cross fencing and adding livestock watering tanks. The expected increase in efficiency from a season-long continuous grazing system to a simple rotational grazing system (4 pasture once over or twice over) should be between 10-40%. Research by NDSU at research stations near Dickinson and Streeter, ND during the 1980s showed an increase in carrying capacity of short duration grazing (8 pastures) versus season-long continuous grazing. This research was summarized by Dr. Don Kirby (former Department Head of Animal and Range Sciences at NDSU) and was given as a key note address in 1993 at the First Interprovincial Range Conference in Western Canada (available online at: <http://library.ndsu.edu/repository/handle/10365/16878>). It is a great paper that documents the potential grazing efficiencies of rotational grazing systems. Ultimately, we can increase the energy flow (forage produced and eaten by livestock to produce beef) through monitoring and understanding our forage resources. Next issue I will be discussing the biotic state.

*Sandy Smart is a Rangeland Management Extension Specialist and Professor in the Department of Natural Resource Management at SDSU. He coordinates the USDA-SARE program for South Dakota.*



Grazing exclusion cage (top photo) and estimating forage production by the clipping method (bottom photo). Photos by S. Smart.

## Your Neighbor's Ranch Isn't a Business by Dave Pratt



Photo courtesy of NRCS photo gallery

The *Ranching For Profit School* is based on a very simple concept; knowing how to grow crops and raise livestock isn't the same thing as knowing how to run a business that grows crops and raises livestock. Most of us were introduced to the production side of ranching at an early age and have been getting a lot of experience at it ever since. But most of us aren't as comfortable on the business side of the operation. Dad taught us how to build a brace and vaccinate a calf, not how to get everyone in the family on the same page or hold them accountable without getting the silent treatment at the dinner table.

Most ranches are a pile of assets and a collection of jobs, not real businesses. In his book, *Cash Flow Quadrant*, Robert Kiyosaki says that people who own a business can leave for a year and when they come back they will find the operation working even better than when they left. If you can't leave, or if things would fall apart if you did, according to Kiyosaki, you don't own a business, you own a job.

You might think that Kiyosaki's criterion doesn't apply to ranching. A year may be extreme. Let's change it to a month, or even a week! The number one reason people say they can't come to the *Ranching For Profit School* is that they can't get away from the ranch for a week. A week! If you can't get away for a week to make an investment that will pay dividends for the rest of your life, you don't own your job, your job owns you!

Whether you accept Kiyosaki's rule of one year, or my watered down criterion of a month or even a week, here are some other things to consider:

1. Would you react to a new idea that would increase your profit by thinking, "When will I find the time to do that?!" If you would, you own a job and the last thing you need is another one. A business owner would think, "How can I get someone to make that happen?"
2. If you sold the ranch would you only be selling a business or just a collection of assets? If it is a business, in addition to the assets you would sell documented production, sales, finance and management systems that show how to use those assets to serve customers, create positive cash flow and produce a profit.
3. Does your ranch have a purpose beyond profit and does it serve someone other than you? The primary purpose of a business is to serve a customer. Only by serving a customer can a business make a profit and serve the owner. Interestingly, when our focus shifts from ourselves to our customers, we get better results for ourselves.

**Your Neighbor's Ranch Continued on page 5**



# Neighbor's Ranch Continued by Dave Pratt

4. Does \$2,750 (the tuition for the *Ranching For Profit School*) seem like a lot to spend on professional development? It is a lot to spend on doing your job better, but it's a drop in the bucket to invest in building a better business.
5. Have you ever said, "I really ought to manage this *as though* it were a business?" This phrase acknowledges that your ranch isn't really a business. We can act *as though* it is a business for a while, but it isn't sustainable to pretend.
6. Does your ranch make an economic profit? Without the subsidies that most ranchers use to survive (e.g. off farm income, inherited wealth, working for less than it would cost to replace yourself), would your ranch be able to cover all of its costs and have a healthy return on investment? If it isn't profitable, it isn't sustainable. In fact, it isn't even a business. It's a hobby. Most ranches are very expensive hobbies.

At *Ranching For Profit* one of our objectives is to help participants transform their ranches into businesses. As you might have guessed from the questions I've posed, the transformation is as much psychological as it is physical. Making the transition from self-employed to business owner requires a fundamental paradigm shift. It is as much about how we think and feel as it is about what we do.

If we aren't currently getting the results that we want financially and personally, we have to start doing things differently. Intellectually we know that the jobs involved in raising and marketing livestock are different than the jobs required to run a successful business that raises and markets livestock. But the barrier to transforming our ranches into successful businesses is this: Even if we recognize that the ranch is a business, we don't see ourselves as business men and women. We see ranching as our job and our ranches as our place of work.

This December the SDGC is hosting three *Ranching For Profit* workshops to help you begin the rewarding transition from owning a job to owning and operating a sustainable business. I hope you will join us.

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Dave Pratt will teach *The Three Secrets for Increasing Profit* at Ranching For Profit Workshops December 15, 16 and 17 hosted by SDGC. Dave will also lead Hard Work & Harmony, a workshop on working together in family businesses at the SDGC annual meeting December 18.

*Dave Pratt, Ranch Management Consultants, Inc.*



Steve and Nancy Oswald (Photo: D. Pratt)

# Drought Management by Garnet Perman

Ample moisture in the past couple of weeks has relieved some of abnormally dry areas of the state. Others need several more inches before conditions can be considered “normal”. We revisited the drought mentors from 2012 to see what they have been doing in a year what started out equally dry with the interesting twist of excellent cattle prices.

Rick Doud, Midland, destocked completely in 2013 and started custom grazing. His ranch was in a pocket of heavy snowfall last fall. Old grass caught the snow and held in the moisture. That and an inch of rain early in May was enough to enable a normal stocking rate this spring. Destocking in 2012 and a hit from Atlas in 2013 has Dan Rasmussen’s 33 Ranch cow numbers down about 10%. “So right now, our drought plan is being understocked,” he said. Good grass production in 2014 left them with plenty of old grass and litter which eased them through the dry spring. If conditions warrant, the next step will be to sell the steers and heifers from last year. The role soil health plays in production and stocking rates is something he’s paying more attention to.

Higher cattle prices and a corresponding increase in pasture rent made the decision to take cattle in instead of buying yearlings easy for Dave Steffen, from Burke. He noted that the soil beneath the old grass that caught snow was damp down to two feet. “Residue is key,” he said. Steffen calculated this year’s 85% stocking rate based on the Drought Tool developed by NRCS “That Drought Tool is pretty darn good,” he said. He’s committed to three months and will decide in August if the custom grazed yearlings can go another month. Ed Blair has seen plenty of dry years, but luckily, this year isn’t all that memorable in the Vail, SD area. Again, good grass production going into the fall made a difference for them earlier in the spring and they’ve had good rains in late April and May. His first drought plan step is to pull the calves off, and second is to get rid of the old cows rather than heifers. “Heifers cost less to keep than older cows,” he said. They run a young cow herd. “Old” cows are 7 or 8 years old. “They still have good value,” said Blair. He keeps an eye on prices of supplemental feed, buying hay to stockpile when it’s cheap and looking for lease opportunities like crop aftermath if hay is expensive. He always runs a least cost ration for his cow herd as a decision making tool.

Moisture has been extremely short in the Highmore area since last July. Even after receiving 3 inches of rain over Mother’s Day, Jim Faulstich is proceeding almost like it didn’t rain. “We know our grass has been hurt,” he said, “so custom grazing yearlings is not even an option.” Their cull cows are identified in case dry conditions persist. For Faulstich, grass that wasn’t grazed last year has been a life saver. Maintaining a good cover of residual grass in their pastures has been an integral part of each of these five producers drought plan. Their drought plans started last year with a grazing plan that allows for plenty of carryover.

The South Dakota Drought Tool is a Microsoft Excel spreadsheet which may be downloaded for free from the SD NRCS website. - See more at: <http://igrow.org/livestock/beef/grassland-considerations-if-drought-persists/#sthash.hd0rCeit.dpuf>

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

## The Green Side Up by Pete Bauman

The South Dakota Grassland Coalition is organizing the 2015 Annual SD Bird Tour **"BIRDS AT HOME ON THE RANGE"** for June 5th and 6th. Birds are indicators of grassland health, and as usual the 2015 Bird Tour will be conducted on a working ranch where participants can experience the interaction of bird conservation, wildlife, and livestock.

This year's tour is quite unique in that it will be located near Marvin, SD on the grounds of the old Blue Cloud Abbey. The site is now under new ownership and this year's tour will be hosted by Abbey Grasslands owner/operator Tracy Rosenberg. Participants will have the opportunity to visit this working ranch/grassland while also having the unique opportunity to lodge or camp at the historic Abbey of the Hills.

Birds are an increasingly important indicator of landscape health, and many progressive ranchers understand that bird diversity in their pastures is a sign of a healthy ranch. For grassland birds to flourish they need to be able to successfully live and reproduce in the short timeframe between the last snows of spring and the first snows of autumn. To be successful, birds require several habitat variables that will allow them to raise their young.



Yellow rumped warbler (Courtesy NRCS Photo Gallery ).

The first order of business for most grassland birds is locating adequate breeding habitat. For some species, breeding requirements can be complicated as territories and breeding partners are gained through songs and courtship displays requiring specific habitat conditions, such as a small isolated wetland that holds a pair of blue-winged teal or a grazed hilltop where sharp-tailed grouse perform their unique mating rituals. After breeding, nesting habitat is next on the list. The hen teal and hen sharp-tailed grouse no longer need the pond or hilltop; rather they both need adequate grassy cover and litter to hide their nests from predators until the young hatch.

Once the young have hatched, it's moving time again. This might be the most crucial move of the summer. The hen's brood of young requires adequate habitat, where they can forage for insects, and also find safe cover to avoid predators. For the hen teal, it's back to the water where her ducklings can forage on aquatic invertebrates while taking cover in the exposed vegetation of the pond edge. For the grouse, she needs to find open areas for her chicks to pick for insects while offering quick escape into heavier vegetation. The key to the next several months is for the young to put on as much weight as possible before they are 'shipped out' in the fall, similar to the calves in the pasture. The critical forage for the birds during this time are insects produced in the grasslands while the calves rely on momma to convert that grass to milk. If calves and birds both come off healthy in the fall, it's a great indicator that a healthy balance has been achieved!!!

Join us for the Tour and hear Rosenberg's unique story of transition from an Iowa crop farm to a South Dakota grass-based cattle operation. This affordable family friendly event will include birding, presentations, social, meals, and hands-on fun including bird banding, creek ecology, and kid's activities. See the events tab at our website ([www.sdgrass.org](http://www.sdgrass.org)) or contact Judge Jessop or Pete Bauman for registration information.

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



Sandy Smart  
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## Calendar of Events

Event	Date	Location	Contact Person	Phone
Youth Range Camp	June 3-5	Sturgis	Tate Lantz	605-690-8049
Professional's Range Camp	June 3-5	Sturgis	David Ollila	605-394-1722
Bird Tour	June 5-6	Marvin	Judge Jessop	605-280-0127
Rangeland Days	June 23-24	Chamberlain	Tina DeHaai	605-734-5593 ext 3

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](mailto:alexander.smart@sdstate.edu), (605) 688-4017