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Soil Health on Rangelands: Biotic State by Sandy Smart

In the last Issue I wrote about soil health and energy flow. In this issue, I want to focus on the biotic state. But first a short history lesson. Early on in the range management profession (late 1800s and early 1900s), scientists and practitioners saw the need to better understand rangeland management because the western rangelands of the USA were showing signs of widespread degradation. In 1916, Fredrick Clements published his seminal book, "Plant Succession". Clements is credited as the "father" of plant ecology and the range management profession built their theories of range science on his important work.



Native tallgrass prairie, Deuel County, SD
(Photo: S. Smart, 2006)

In 1949, E.J. Dyksterhuis published his landmark paper in the newly formed Society for Range Management's *Journal of Range Management* on the "Condition and Management of Range Land Based on Quantitative Ecology". Dyksterhuis, a Soil Conservation Service employee, built on Clements' ideas of plant succession and laid out the concept of quantifying range condition or what we call today the similarity index. This paper gave us a way to calculate a range condition score (1-100%) and classify the vegetation as either "poor" (1-25%), "fair" (26-50%), "good" (51-75%), or "excellent" (76-100%) condition in relation to what the expected climax plant community should look like. He grouped plants into three categories on how they responded to heavy grazing (Decreasers, Increasers, and Invaders) and expected percentages of these three categories in the climax stage. Over time, the range profession cataloged and studied rangeland plants as to how they responded to grazing, drought, and fire.

In the early 1940s, universities across the Great Plains started stocking rate studies to understand what happened to rangeland plants and livestock production at different grazing intensities. In 1942, South Dakota State University (South Dakota State College back then), began a long-term stocking rate study at the Cottonwood Range and Livestock Research Station in western South Dakota. This study, managed later by James K. "Tex" Lewis in the early 1950s and continued by Patricia Johnson,

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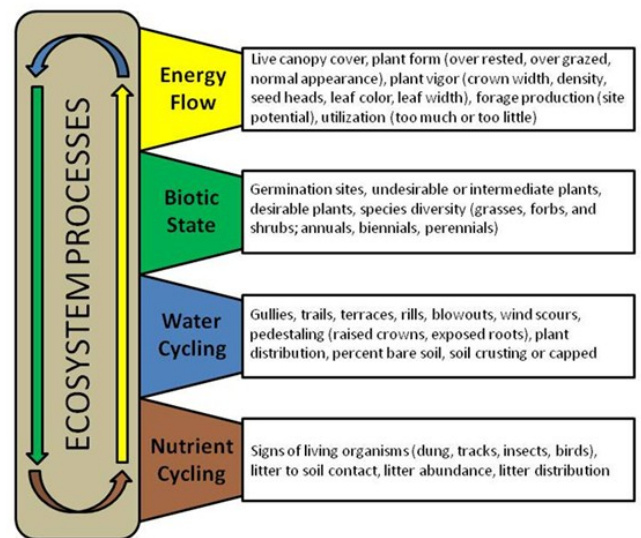
Biotic State Continued by Sandy Smart

became a hallmark of South Dakota's important contribution to our understanding of range management. Along with my colleagues, I used the information from Cottonwood to publish several important papers on grazing efficiency, livestock economics, and drought. In my range science classes at SDSU, I emphasize to students that we are really "plant detectives", like Sherlock Holmes of range science, reading the vegetation on the landscape and interpreting how our range management practices work. This starts at an early age with kids that attend Rangeland Days and in high school with FFA and 4-H programs in South Dakota.

Okay, back to the biotic state (see figure below). You probably have guessed from the previous discussion that being able to identify plants and how they respond to grazing, drought, fire, etc. is key to monitoring the health of your rangeland vegetation and ultimately your soils. Decreaser species (desirable) are those that livestock find palatable and regrow fairly rapid if adequate residual leaf area is left. If decreaseers are grazed too hard (not leaving enough residual leaf area) and too frequent (not having long enough rest period), they will begin to decrease in plant vigor (biomass, cover, density, and height) and can eventually be replaced by other species. Familiar decreaseer species are western wheatgrass, big bluestem, sideoats grama, purple coneflower, and leadplant.

Increasers (undesirable) are those that respond positively to heavy grazing. They are usually less palatable and thus don't get grazed to the same extent that decreaseer species do under heavy grazing. Increasers usually don't regrow as fast as decreaseer species to survive in a grazing environment, because they tend to put more energy into grazing deterrents. Increaser species are blue grama, buffalo grass, red threeawn, cudweed sagewort, scarlet globemallow, western snowberry, and pricklypear cactus.

Invaders are those that need a disturbance to create a niche for them to establish. Invaders are usually annuals or biennials. These plants are poor competitors and when pastures are grazed properly, invaders tend to disappear. Some familiar plants classified as invaders are foxtail barley (perennial), cheatgrass, curlycup gumweed (biennial), common sunflower, and snow-on-the-mountain.



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

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Biotic State Continued by Sandy Smart

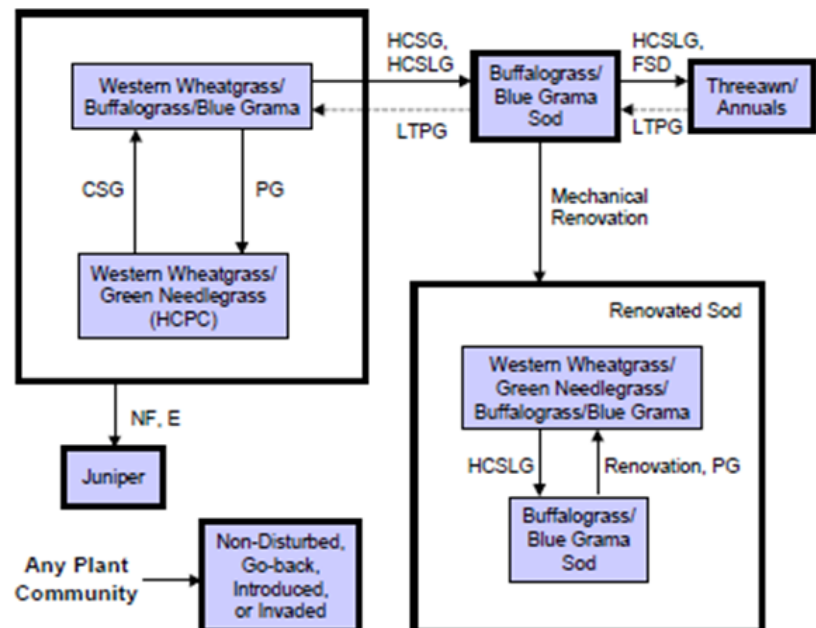
Each range site (or ecological site in today's terminology) has a particular set of plants that make up the climax plant community. Soils, slope and aspect play an important role in dictating what the expected climax plant community should look like. Not all soils and landscape positions will produce the same vegetation. Grasslands typically have about 80% of their biomass as grass, 15% as forbs, and 5% as shrubs. These percentages vary quite a bit depending on your region and ecological site. The Natural Resources Conservation Service (NRCS) has a great web site called the web soil survey where you can map out the ecological sites of your pastureland. Through this website you can view the percentages of each plant type (grasses, forbs, and shrubs) that comprise the plant community.

You use these percentages to determine how similar your plant community is to the climax plant community or any other community as defined by the plant community model (see figure). The beauty of these models is that you can determine what actions need to be taken to jump from one plant community to another.

Our ability to interpret the plant community using this framework enables the range manager to make informed decisions with confidence regarding their grazing practices to improve rangeland health. If you don't know what you are looking at how do you know if something is wrong or needs improvement?

Plants are an indicator of your management. Monitoring the biotic state will help you make informed decisions regarding overall rangeland and soil health.

Plant Communities and Transitional Pathways



CSG - Continuous seasonal grazing; CSLG - Continuous season-long grazing; E - Encroachment; HCPC - Historical Climax Plant Community; HCSG - Heavy continuous seasonal grazing; HCSLG - Heavy continuous season-long grazing; LTPG - Long-term prescribed grazing; NF - No fire; PG - Prescribed Grazing; Dashed lines signify transitions returning across a threshold, which typically require significant inputs or long periods of time.

Plant communities and transitional pathways for a Clayey ecological site in western South Dakota. Provided by NRCS. Available online at: <http://efotg.sc.egov.usda.gov/references/public/SD/R060AY040SD-CLAYEY.pdf>

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.

Work Less and Make More by Dave Pratt

Several years ago I gave a presentation in Calgary similar to the program I'll be doing at the SDGC workshops this December. Among other things, I showed participants how to use the *Ranching For Profit* profitability benchmarks. One of the benchmarks measures labor productivity. I like to tell people, "Don't hire people to work. Hire them to produce results." Gross Product per FTE is the indicator we use to measure the results. Gross Product is a measure of the total value produced and FTE stands for Full Time Equivalent. The industry average for GP/FTE is less than \$100,000. The benchmark is over \$200,000.

When I explained this benchmark, a young man sitting in the front row muttered aloud in a distressed tone, "Man, I wouldn't want to do that." I'm sure he didn't intend for me to hear his remark and I didn't want to put him on the spot so I didn't follow up with him, but I was puzzled. I wondered why anyone wouldn't want to produce more value. After pondering the question for a while it came to me. I'll bet he was raised the same way and was taught the same lessons I was.

Growing up, if I went to my Mom and asked her for money, she'd give me extra chores or suggest that I check with the neighbors to see if they had any jobs I could do. The lesson I learned was that to make money I had to work. Of course the corollary is that to make more money, we have to do more work. We carry this *work to make money* paradigm into adulthood.

I bet when the young man in the front row heard me talk about producing twice the value per employee, he assumed that he'd have to work twice as hard to do it. Already working six or seven days a week, he could not imagine working harder or longer.

But *Ranching For Profit* alumni who consistently exceed the \$200,000 Gross Product/FTE benchmark aren't working any harder than their neighbors. They are just working on the things that make money. Whether owners or employees, the people I meet on ranches with a high Gross Product per FTE seem happier, more engaged and less stressed than people on ranches with lower Gross Product per FTE. That shouldn't be surprising. If you were to make a list of the things that make you feel great about a day's work, isn't "accomplishing something" at the top of the list? Who do you think accomplished more, the person producing \$100,000 of value or the person producing more than \$200,000 of value?

We've all heard the expression "Work smarter, not harder." That sounds good, but exactly how does one go about working smarter, especially given the never-ending nature of ranch work? It boils down to two mornings each week.

The Pareto principle, also known as the 80-20 rule, suggests that roughly 80% of the impact we have comes from 20% of the things we do. We recommend that our alumni apply the Pareto principle by spending 80% of their time Working *In* The Business (WITB) and 20% of the time Working *On* The Business (WOTB). WITB work includes working cattle, putting up hay, feeding that hay, fixing things and all of the other jobs that go along with growing crops and raising cattle. The WOTB work includes all of the things that go along with running a business that grows crops and raises cattle (e.g. planning). Alumni who spend at least 20% of their time

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Work Less Continued by Dave Pratt

working on their businesses produce powerful results. A lot of us are putting in 60-80 hour weeks, but if we were to apply the 80/20 rule to a five day week we'd be doing WITB four days a week and WOTB one day a week. Rather than a full day, we suggest that the WOTB be split into two mornings each week.

We think of WOTB as \$100 per hour work and WITB as \$10 per hour work. We all have times when we are worth \$100 per hour and times when we are barely worth \$10. For most of us our \$100 per hour time is in the morning. You aren't going to produce \$100 per hour results in your \$10 per hour time. Our advice is: prime time for prime work.

By spending two mornings a week on WOTB, many of our alumni have discovered another way to apply the 80/20 rule. They use their WOTB time to identify the enterprises that produce highest gross margins and those that have sub-par gross margins or require a lot of overheads to keep them going. By cutting the low margin enterprises, they free capacity to expand their best enterprises, simplify their operations, work less and make more.

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.

Rangeland Days: Advancing Youth Education by Sandy Smart

The 32nd Annual Rangeland Days was held on June 23-24 in Chamberlain, SD. We had over 100 kids and 30 adults participate. New Rangers (ages 8-10) learned plant identification. Wranglers (ages 11-13), Scouts and Go Getters (ages 14-18) learned about plants and range judging.

In addition, students participated in the poster and public speaking contests. The overall Top Hand award went to Quirt Beer, Lemmon, and the winner of the public speaking contest was Kimberly Alburto, Milbank.

Kimberly will represent South Dakota in the High School Youth Forum public speaking contest at the next Society for Range Management meeting in Corpus Christi, TX Jan 31-Feb 4, 2016. Thanks to the Brule-Buffalo Conservation District for hosting the 2014-2015 event.



New Rangers learning about plants on Doug Feltman's Arrow Ranch along the Missouri River south of Chamberlain, SD. (Photo by S. Smart, 2015)

Leopold Conservation Award Tour: Jorgensens by Garnet Perman

The Dirty 30's taught Martin Jorgenson, now 91, about conservation and the resilience of Mother Nature. He recalled both cropland and pasture being as bare as the concrete floor of the Lazy J Grand Lodge. "Then we got some rains, and the grass came back." He recoils at the thought of putting marginal land into crops. He helped start an Integrated Resource Management program with the NCBA when holistic management was barely a whisper in agricultural circles. Under his guidance, sons, Greg and Bryan, continued to build the family operation that today includes a 1,000 head genetic parent stock cowherd, a 4,000 head bull business, 10,000 acres of no-till cropland and a hunting business that can lodge and feed 40 hunters at a time. Martin's grandsons, Cody and Nick are also part of the family business. The operation also includes 11 employees, some of whom have worked for Jorgensens for over 30 years.

The cattle are the core of the family business, with most of the crops raised for feeding the cattle. Wheat is the only cash crop, which is also the basis of a certified seed enterprise. Pheasant habitat is also considered when planning crop rotations. They switched from fallowing and conventional tillage to no-till in 1991 and employ a rotational grazing system in their pastures.

Bryan, who is in charge of the farming enterprise, is a soil health evangelist. His goal is to have a shovel full of no-till farmland look exactly like a shovel full of native sod without sacrificing yield. He uses the word "system" often and emphasizes the importance of working with nature. The key he said is to keep the soil biologically active for as long as possible during the growing season just like a diverse native prairie does. To do that, he's developed a very diverse 4-6 year rotation that includes cover crops, winter wheat, corn, milo or sorghum, soybeans, alfalfa, oats, or peas and spring wheat. Bryan's son Nick is their precision ag guy. They use technology to monitor when and where to put chemical. No dry phosphate is used. "The wrong nutrient or too much shuts down Mother Nature's system," Bryan said.

Greg and Cody manage the cattle enterprise. According to Greg, an excellent environment is critical to observing genetic expression in their line bred herd, so they move the cows and calves through a pasture rotation which includes cover crops and other crop aftermath. Manure from the feedlot is used for fertilizer. Jorgensens' "systems" approach lends itself to growing wildlife as well as cattle and crops, so pheasant hunting income has long been part of the picture. Four years ago, the family bought a neighboring hunting enterprise that included the clientele. They built a spacious new lodge three years ago and transitioned from doing day hunts to doing a four night, three day hunting package. They can house 2 groups of twenty hunters, with Bryan and his wife, Brenda doing the hosting and cooking. Cody and Nick guide. The lodge is also used for local Christmas parties and other community events.

Weekly meetings are critical to managing such a large, diverse operation. An executive session starts every Monday morning at 6:30 with an employee meeting at 7:30. The family also has an annual meeting with an advisory group that includes their accountant, banker and others. SDSU College of Agriculture Dean Barry Dunn said at the Leopold tour on July 8, "This family has found a way to live with the land, not from the land... This is the future of agriculture."

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

Transitioning the Ranch by Cliff Millsaps

There wasn't a son or daughter looking to take over my operation, and I didn't want to auction it off to just anyone either. I had years spent moving the operation toward a more ecological balance and I wanted to transition to someone like-minded. For the right person or family my property was capable of building equity and providing a modest living and I wanted someone careful, but not afraid to pursue new ideas. There may have been some luck involved, but I've outlined the things that aided in my success.

The first task was to convince myself to retire. Not a fence sitter decision, but a decisive one. Then I put feelers out everywhere, letting people know that I was looking for someone to take over. Advertising a little, I told about the great perks, left off the part about how the pay sucked. At least at first. One thing that may have helped me find someone was the operation wasn't overly equity intensive. A couple hundred grand in cattle, thirty grand in equipment, and after a conservation easement, a half million in property. The property could be leased until the equity was accumulated to get the loan to buy it.

Of the interested people, a few were serious and I decided on a neighboring woman, Jessica Kruse. Jessica had already started a small grass-fed beef side operation as part of her family's small cow calf and grain operation. She had some experience, a similar direction as mine, and most of all, a really positive, open minded, and realistic outlook. Also, she seemed willing to live frugally and work at building equity for a while.

I was upfront about how soon I would be willing to move over, and we both had and asked a lot of questions, letting each other know what commitments we were willing to make. No snap decisions, but no stringing each other along either.

Probably the one thing that hangs up most non-family transitions today is land values. It may be an issue even within families. What I wanted more than money was to see the land treated well, and also have it make a living for the next generation. I didn't want to give it away, but was willing to make the terms so the next operator would be likely to succeed. What really helped the ecological ethic was selling a conservation easement, which for those of us without a wad of money, allowed some money for retirement projects.

For the prospective grazer looking for land, you might look to see who has put land in conservation easements. The rents or purchase price could be a lot lower, but most, if not all, the production potential is still there. The same mind set that puts a conservation easement on land, will likely be willing to lease it for much less to someone looking to operate it in an ecological fashion.

By having some money for retirement projects makes it easier for me to help try getting the next operator going. I gave her the security of a five-year lease at a rate I felt should allow her to build equity. Equity can provide collateral, and with collateral she can get the type of loan needed to buy the land someday. I want Jessica to have a chance at owning land, the same opportunity I would have wanted if I were in her position. I went so far as to write the contract so that most of the rent will be applied to the purchase price, which makes it more likely that they will buy it down the road. If I should die and my heirs' auction the land off at the end of five years, Jessica or her family will have some credit toward the winning bid. This gives her incentive to invest in long-term projects. Conventional operations that are successful often get a leg up to get past the initial years, and it has been shown that conservation oriented operations can stand on their own, but benefit from the same help. So if we landowners find a new operator willing to put in the long hours and hard work, we should help them get through the early years' pitfalls, and let the world see less exploitative farms as financially viable.

Cliff Millsapps raised grass-fed beef near Gary, SD and sold in local markets in eastern South Dakota.



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Calendar of Events

Event	Date	Location	Contact Person	Phone
SDSPA/NPSAS Tour “High Tunnels”	July 20	Mission Hills, SD	NPSAS office	701-883-4304
NPSAS Kencove Fencing Field Day	Aug 11	Milbank, SD	NPSAS office	701-883-4304
Pasture Walk	Aug 28	Mound City	Jeff Hemenway	605-352-1239
SD Grazing School	Sep 15-17	Chamberlain, SD	Judge Jessop	605-280-0127

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