Phases and Stages

Phases and stages, circles and cycles,
Scenes that we’ve all seen before.

Let me tell you some more….

Above is an excerpt from the song, “Phases and Stages”, by Willie Nelson off of his 1974 album by the same name. It tells the “his and hers” story of a marriage breaking up. This was Willie’s first concept album and preceded the one that really made him a household name; 1975’s multi-platinum “Red Headed Stranger”. I own both of these albums (actual vinyl albums) and as the saying goes, back in the day I ran a needle through both of them till they were scratched to the point that you would not want to listen anymore. But enough nostalgia, let’s get on to the topic at hand. Why did I choose this title? I just thought this would be a good way to lead into a discussion of State and Transition Models (STM). Some of you may think this sounds like some sort of 7th grade science fair project. But no, STM’s are one of the best range management tools available to us. They are both practical and scientific. Before we get to a discussion of their applicability, we should spend a little time on some history of ecology and ecologists to set the stage. For some of you this will be old news, but if you are not familiar with the names Clements and Gleason, just for fun next time you are among a bunch of range ecologists, throw out one of their names and say something like “I think he had it right…”. Then sit back and enjoy the show. Under the right circumstances this could be more entertaining than wolves, horses, and rotational grazing combined.

Gleason in 1926 proposed the ecological concept of individualistic plant response. Briefly stated, a plant community is a collection or assemblage of species with similar environmental requirements: xerophilic species grow in arid climates, wetland plants in mesic environments. Scientists who espouse the individualistic way of thinking point to gradual vegetation changes along environmental gradients as an illustration of...
this principle. Communities, they argue, are more for human convenience that for any biological purpose. In this view, changes in plant assemblages occur because the individual species in a similar area reacted to some event that caused them to change. The individualistic concept was developed in response to, and criticism of, Clements who in 1916 proposed that plant communities do in fact exist, that they change, and that change is called succession. Plant succession toward a sustainable climax is considered by many to be a fundamental ecological principle. Basically this states that plant communities have a “goal” they are trying to reach and given enough time, will do so unless impeded by some disturbance. A disturbance could be acute, such as a wildfire or severe growing season defoliation. Climate change or urbanization would be examples of chronic disturbance. Proponents of the succession/climax concept refer to plant invasion on soils left by retreating glaciers or volcanic eruptions as evidence that their point of view is the correct one.

Clementsian ecologists would say that the plant community is like an organism, that it is the result of interactions between its inhabitants and their environment. Gleasonists on the other hand would say that the assemblage is just the sum of its parts. Non-equilibrium is their mantra. Please understand that this a very brief and incomplete treatment of the subject, but I think it is important to set some context for the rest of this discussion. If you are interested in learning more, just google “Clements and Gleason”. You will find some fascinating reading and gain insight into why many of us in the range profession think the way we do.

So what does this history mean to practical range managers? Well, the principles of climax, succession, and disturbance can be applied to monitoring and management of rangelands, but sometimes in different ways and it may depend on which side of the previous discussion a person finds themselves. The “condition and trend” method (attributed to Dyksterhuis 1949) commonly used in range management is based upon these ecological principles. Condition refers to a system of giving a numerical score to a range or ecological site based on the percent composition of plant species compared to the climax community. Climax (as it is most often practically applied) is the assemblage of plants estimated to have been on that site prior to European settlement (in North America). This is based on historical records or characterization of relic areas. The closer a site is to its “original” mixture and relative proportions of species, the higher the score. The higher the score, the better the condition. Trend refers to the direction the site is moving – ecologically – and can be toward or away from the goal. Together, condition and trend give the rangeland manager a snapshot of where a particular land area is ecologically and where it is likely headed. This technique has been used widely in the range profession for many years and is probably the most basic concept taught in range management. It is not without its detractors, however.

In my experience, setting the climax community as the gold standard is difficult for some producers to grasp, especially as they are standing knee-deep in something like buffel or lovegrass while being told their range is in poor condition. The story about one belligerent rancher comes to mind:

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A preacher stopped by to visit this rancher one day and noticing the lush grass, fat cattle, and full tanks remarked “what a fine ranch you and God have here sir!” To which the rancher replied “well, you should have seen it when God had it by himself!”

The idea here being that condition may be in the eye of the beholder. A thick, healthy stand of an introduced grass may not look the way it did to the Sinagua but in the short-term, it may just be the best method of providing animal
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nutrition, holding a highly erodible stream-bank, or sequestering carbon. Alternatively, if the management goal is restoration of native sites on public land, to achieve biodiversity for wildlife habitat, or a minimal input sustainable grazing operation, climax and succession are very useful concepts.

State and transition is another method of assessing rangeland health. The underlying concepts of state and transition have been around for some time but in the range profession, the application of STM is often attributed to Westoby et al. in 1989. This method is based on the idea that changes in plant communities or ecological sites proceed along multiple paths. Additionally, this method considers alternate plant responses to varying disturbances. For example, STM considers not only the nature of the disturbance, but the spatial and temporal scale of the disturbance as well. While condition implies a comparison to some standard, “state” is just that, the current state of a plant community. It holds no relationship to another “state”. Transition is one of several paths of change along which the community can move. Some of these transitions are bi-directional, i.e. they are ecologically reversible. Others are not. These transitions contain thresholds, which once crossed, cannot be remedied without agronomic inputs. State and transition, like condition and trend, require characterization of the soils, plants, and topography of a site. It is considered more useful in arid, non-equilibrium environments while condition and trend (based on climax/succession) is considered more applicable in those communities less variable and capable of equilibrium.

So let’s see if we can wrap all this up in one package that makes sense. Or as a Nashville song writing critic said about one of my compositions many years ago… “You’ve got a couple good verses and a chorus, now write me a killer bridge, tag it and quit.”

How can we apply the STM concept in range management? We apply it as a tool to characterize ecological sites and determine the effectiveness of our management in keeping those sites functioning and sustainable. We can then keep on doing what is working (with subsequent monitoring of course) or plan for appropriate management alternatives if need be. First we need to define what an ecological site is. The NRCS provides the following definition:

*An ecological site is defined as a distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances.*

We then go out and collect the appropriate soil and vegetation data to identify the site and determine the “state” it is in. Take a look at Figures 1 and 2 for an example STM and accompanying photos from the Mogollon Transition MLRA in Arizona. For the sake of our discussion let’s assume our data tells us that our site is in the shrub-dominated state, but with a few indicators that we are not too far off from the mixed shrub, herb state. Monitoring records and photos from similar nearby sites on the allotment indicate that 20 years ago this site would have been solidly in the mixed shrub, herb state. Looking at the actual grazing use numbers, precipitation, and fire records we find that the site has not burned in over 25 years, animal numbers have been consistent the past 10 years and that growing season precipitation in a gauge ½ mile away has been below the long term average 6 out of the last 10 years. Both the rancher and the range con tell us they feel that off-road recreational use has picked up in this general area the past 3 years.
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So, this information lines up with transition arrow 1a as probable cause for the change in states and indicates the potential for a move to the shrub dominated, eroded state. Let’s hypothetically say that this site is pretty close to a popular campground which would make a prescribed fire more difficult to implement. Management discussion might then revolve around a more flexible stocking rate (with monitoring…) and or timing of grazing along with better monitoring and enforcement of recreational activities. And as always, a little well-timed and distributed rain would certainly help.

Now I know that some of you sharp-eyed rangers, or those who have applied both the condition and trend as well as the STM will point out that Figure 1 contains an HCPC (historical climax plant community), i.e. the mixed shrub, herb state. You may also ask then what is really that different between the way these two methods described are applied in the real world? In my opinion, you have a valid argument. Bring it up in that discussion with a group of range ecologists about Clements and Gleason. I do like the STM and the ability to account for multiple routes of change in response to various disturbances, and that you can plan for different management strategies to achieve your goals. A state other than the gold standard may be the most sustainable under a reasonable management strategy (i.e. doable with the resources you have) or it may better fit a set of given grazing or wildlife objectives. So that is my bias.

Figure 1. Example State and Transition Model. From USDA-NRCS ecological site description. Mogollon Transition, Arizona.

Figure 2. Representative photos of four “states” in Figure 1. From USDA-NRCS ecological site description. Mogollon Transition, Arizona.
anyway.

I hope that this was informative for you and I hope you will spend some time doing your own research on these topics. Don’t just take my word for it. I will leave you with one last illustration of an STM and will use our old buddy Willie as a visual aide. Take a look at Figure 3. Is STM more clear now? Phases and stages, circles and cycles, scenes that we’ve all seen before… let me tell you some more.

Article by Doug Tolleson

Figure 3. I will let you all supply the states and transitions here… we can compare notes around the campfire sometime.
Recently I came across an interesting article that described an outdoor education model that was popular in Germany and other neighboring nations called “WaldKindergarten” which translates to “Forest Kindergarten”. The outdoor, self-discovery education model accepts children ages 2 to about 6 years old. The younger kids spend most of their day outside in park settings where they can be better monitored while the older group spends the school day in the forest where they are encouraged to explore and ask questions while hiking, observing flora and fauna and learning how to use tools like knives and fire in a supervised environment. Waldkindergarten teachers note how all the children’s senses are stimulated and they remain engaged the entire day because of the unique self-discovery model. Students learn from each other as well as from their own experiences and mistakes.

Children are outside in all types of weather and one teacher explained it in a creative way. They said “the children are like little onions with lots of layers -they dress appropriately for all kinds of weather.” Even nap time often occurs in tent-like structures in the shade of old growth trees. Many WaldKindergartens seem to utilize a “wagen” that is equipped to be a mobile classroom and often includes a wood stove for warming up on cold days. (They remind me of the wagons used by nomadic sheep herders in days gone by.)

The first “WaldKindergarten” style school was started in Germany the 1960’s and they can now be found in most European countries, as well as a growing demand in Japan and South Korea, and the idea is just recently catching on in the United Kingdom, Canada and here in the United States. The first Waldkindergarten style schools was opened in Portland, Oregon in 2007.

Harry de Quetteville’s article “Waldkindergarten: the forest nurseries where children learn in Nature’s classroom” states “while forest kindergartens are blooming in Germany, American studies show that children elsewhere are becoming increasingly cut off from the natural world, which can lead to a variety of behavioural problems. After spending 10 years travelling the United States to research the topic, in 2005 the author Richard Louv published a book, Last Child in the Woods, that coined a term for the younger generation's
Lisa’s Class is Outside Today….continued

detachment: ‘nature deficit disorder’.” (Nature Deficit Disorder – I think I’ll use that term from now on!)

De Quetteville continues on: “According to Louv, children have forsaken, or have been forced to forsake, the hands dirty and feet wet type of contact with nature, which their parents and grandparents had for a virtual outside. Never before have kids in western culture been so separated from nature,’ he says. Kids watch lots of nature programmes on television. They can tell you all about the rainforest. But, he says, they turn up in doctors’ waiting-rooms not with broken limbs sustained out of trees, but with repetitive stress injuries from playing too many computer games.”

Studies have shown graduates from Waldkindergarten have clearly outperformed their peers in categories such as cognitive tasks, social behavior, creativity and physical ability and possess a clear advantage over children “from the inside”, referring to children who attend traditional elementary schools with inside classrooms. These students were also found to be more robust after early years outside and girls especially benefitted from having attended a Waldkindergarten as the teachers noted they were tougher and physically more self-confident than other girls.

I can’t help but note the similarities between the WaldKindergarten model and the Range Rocks! program. Although we haven’t yet worked with kids as young as kindergarteners and we don’t have nap time (darn!) we do encourage youth to explore Arizona rangelands, question biological processes and learn through self-discovery. In my time working with Range Rocks! I have experienced firsthand the benefits this “nature classroom” offers to our youth. Students who have trouble focusing in the classroom often thrive in an outdoor learning environment where they can run, play, stretch their legs and remain engaged because THEIR questions are powering THEIR learning. Additionally, outdoor education allows students to use multiple learning modalities (that is, how students use their senses in the learning process) with the four main modalities being visual (seeing) auditory (hearing) kinesthetic (moving) and tactile (touching).
Lisa’s Class is Outside Today….continued

In any outdoor education program, youth learn to connect the dots, that is, they begin to realize how their actions can have a ripple effect on seemingly unconnected areas such as a local ecosystem and their community. Let’s face it, much of today’s youth are self-centered, and I say that in the nicest way possible! They want to know how it affects them. If you can show the student how the lesson you’re teaching connects to them and directly affects their life, you have obtained the holy grail of teaching in my opinion. Once students make that connection, they will be much more engaged in the lesson because it now affects them.

In researching this topic, I didn’t find any information that describes whether or not the Waldkindergarten model is offered to older students in elementary, middle and high school. I think it would be challenging for a “forest based learning model” to incorporate the increasingly rigorous curriculum requirements needed for student progression found in traditional schools, but perhaps a blend of both education models could be just what students need.

It seems the benefits to this early education model are outstanding, but I would be curious to learn more about the potential benefits students would gain from participating in this program over the course of several years. If the early indicators of success are accurate, I can only imagine what a high school aged Waldkindergarten student could achieve.

Much like the WaldKindergarten kids in Germany are experiencing unique self-discovery in a forest classroom, Range Rocks! allows Arizona students to experience self-discovery learning methods using the unique southwestern rangelands as their classroom. I wonder if they do an exchange program – forests for rangelands perhaps?

Save The Date

August 17 - 19, 2016

The AZSRM Summer Meeting will be held in Rucker Canyon of the Chiricahua Mountains in SE Arizona.

As long as we are on a classic country music roll; here are my nominations for the top three songs with fiddle solo’s in them. What say you?

1. **Faded Love** - Bob Wills and his Texas Playboys
2. **Amarillo by Morning** - George Strait
3. **Much Too Young to Feel This Damn Old** - Garth Brooks

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**Just me talking…**

Well, some of you know by now that this will be my last Rimrock Report. That was hard to say. This has been a great eight and half years. The reason is that I have taken a job with Texas A&M at the Sonora Research Station as an associate professor effective July 15, 2016. The Sonora Station is located in the Edwards Plateau region of southwest Texas and they just celebrated 100 years of significant range and livestock research. Some of you will know that Sonora is where Butch Taylor was superintendent for about 30 years. Not a lot of turnover at Sonora. It is a unique opportunity and I just could not pass it up. But that does not mean it was an easy decision and that I will not miss Arizona. It wasn’t and I will. Arizona is a great place for a range man and I have made some lifelong friends here. I have learned a lot about range in this state. Monitoring with some of the best field botanists in the west, leaving horse tracks with my compadres, sitting around a campfire swapping stories at SRM meetings, working out a NEPA issue with a group of folks who might not agree but at least agree to work out a solution, watching students fall in love with range, spending time on some historic old ranches, getting to know native range managers, logging miles in a truck heading to an extension workshop, serving on various committee’s with people who want to actually get things done, long days eating dust working cows… I could go on but I will spare you. As cliché as this sounds, sometimes it is just time to move on. Phases and stages. I want you all to know, however, that I appreciate everything you have done for me and the range program here at the V Bar V. Lastly, I wish all the best for all of the outstanding people in the Arizona range and ranching professions, at the V Bar V Ranch, at both the Camp Verde and Prescott extension offices and to all my colleagues across the state with the University of Arizona.

*Que Dios te bendiga y buena suerte amigos…* **Doug**