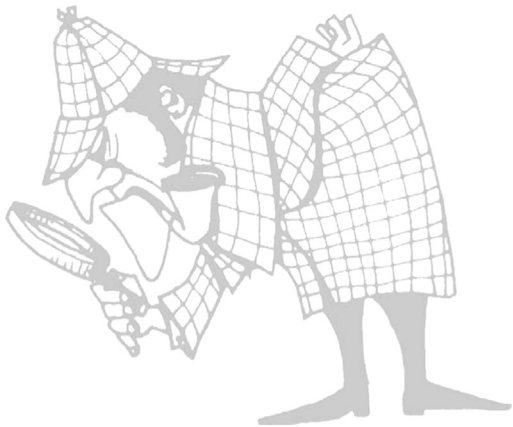

HIGHLIGHTS

Editor's Choice for Rangeland Ecology & Management

Rangeland Ecology & Management, 71(1):1-11(January 2018)

Weather-Centric Rangeland Revegetation Planning

Stuart P. Hardegree, John T. Abatzoglou, Mark W. Brunson, Matt J. Germino, Katherine C. Hegewisch, Corey A. Moffet, David S. Pilliod, Bruce A. Roundy, Alex R. Boehm, and Gwendwr R. Meredith

Rangelands encompass 40% of the Earth's land surface. Arid, semiarid, and subhumid ecosystems provide goods and services that support about 2.5 billion people. Thus, approximately one-third of the world's population depends directly on these arid rangelands for their well-being. These biomes store 45% of the global terrestrial carbon, support 50% of the world's livestock and wildlife, and provide habitat for one-third of the global plant and animal diversity. While arid rangelands are central to global sustainability, they are also one of the biomes most susceptible to degradation and invasion by harmful and unwanted species. Many areas are naturally harsh, primarily because of low and extremely variable rainfall combined with exceedingly high evaporation that creates periodic season-long heatwaves. The severe stress of these conditions ripple through each food chain to harm the entire food web, making the already fragile ecosystem susceptible to degradation. Conservative estimates indicate about 20% of the global arid and semiarid rangelands are degraded, and about 30 million more acres become degraded each year. Regional, national, and international programs widely recognize revegetation and restoration as central to combating global rangeland degradation and ensuring future global sustainability. Despite the globally known importance and major allocation of money invested in revegetation, success rates in these rangelands are alarmingly low.

In the United States, even with application of the most current science, technology, and funding models, revegetation and restoration success rates are often less than 5% in these degraded and invaded ecosystems. Fortunately, we have a solid force of scientists working together to improve our ability to revegetate and restore these poorly producing and functioning rangelands. In the first issue of ***Rangeland Ecology & Management*** this year, a group of these scientists have published an exciting article titled "Weather-Centric Rangeland Revegetation Planning" that discusses a new opportunity for improving rangeland revegetation success. They propose that revegetation and restoration outcomes could be improved by adopting a weather-centric approach that uses the full spectrum of available site-specific weather information from historical observations, seasonal climate forecasts, and adaptive management. Accurate and validated seasonal climate forecasts could greatly improve success and cost-efficiency by limiting revegetation activities to periods when forecasts suggest higher probabilities of the weather conditions needed for successful seedling establishment.

Regional weather monitoring data for historical information are now available from various meteorological networks developed for snow monitoring, wildland fire applications, and regional agricultural applications. Various new methods using landscape features, such elevation and aspect, can now be used to fine-tune weather data collected from nearby weather stations. In fact, one of these scientists developed a meteorological dataset for the entire United States from 1979 to the present by blending the temporal attributes and variables available from existing weather data collecting platforms that can provide ranchers and land managers useful site-specific historical information. Using these data to make weather forecasts rely on initial conditions to create a prediction of future conditions by solving a set of numerical equations that govern atmospheric motion.

It is also possible to create short-term (a few months) seasonal weather forecasts by using the same set of equations but relying more on the slowly evolving components of the

climate system, such as ocean temperatures, concentration and extent of sea ice, and soil moisture, and how they influence atmospheric thermodynamics and circulation patterns. In addition to daily historical weather forecasts, these seasonal climate data provide monthly and seasonal temperature and precipitation forecasts over periods of several months that are mathematically adjusted to be useful at the management scale. Management-scale seasonal climate forecasts from several climate-modeling groups for the subsequent 7 months (http://climate.nkn.uidaho.edu/downscaledForecast/) are currently available and are being updated automatically near the middle of each month. These scientists believe that because of the infrequent nature of favorable seedling establishment conditions in arid and semiarid rangeland, the decision to revegetate based on seasonal forecasts may be limited to only those years with relatively large signals for favorable conditions in the winter and spring.

As rapidly as global observation, monitoring technology, and large databased programs are growing, I can easily envision a system that provides validated weather and climate forecasts at the management scale for nearly all regions of the world. Enhancing the probability of revegetating degraded and invaded arid rangeland by matching the timing of seeding procedures with favorable weather conditions, however infrequent, would have a positive impact on many populations worldwide. (See the entire article in ***Rangeland Ecology & Management***, 71(1):1-11).

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