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Rangeland health & monitoring

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Principles of rangeland health

Intermountain West native bunchgrasses ranges are more susceptible to grazing damage than perhaps any other. In order to reach deeper soil moisture in a biome that receives precipitation primarily in the non-growing season, native grasses are comparatively tall and caespitose (bunch- rather than sod-forming) with elevated growing points that are susceptible to removal and subsequent tiller death during a critical period that often coincides with the period of livestock use. The key to successful range management is planning for rangeland health. Rangeland health has been defined by the National Research Council (NRC) as "the degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained" (NRC 1994). Those ecological processes can be broadly categorized into: soil stability and watershed function, nutrient cycling and energy flow, and presence of functioning recovery mechanisms.

Soil stability & watershed function: *"Soil degradation, primarily through accelerated erosion by wind and water, causes a direct and often irreversible loss of rangeland health. Soil degradation not only damages the soil itself by also disrupts nutrient cycling, water infiltration, seed germination, seedling development, and other ecological processes that are important components of rangeland ecosystems. In addition, soil degradation damages watersheds, which leads to further degradation of rangeland ecosystems as well as water pollution" (NRC 1994).*

Nutrient cycling & energy flow: *"The capacity of rangelands to produce commodities and satisfy values depends on the capture of sunlight energy through photosynthesis and on the accumulation and cycling of nutrients over time. Interruption or slowing of nutrient cycling or energy flows in time or space can lead to degradation as a rangeland site becomes increasingly lacking in available nutrients, energy, and biomass . . . The amount of nutrients available and the speed with which nutrients cycle between plants, animals, and the soil re fundamental components of rangeland health. Similarly, the amount, timing, and distribution of energy captured through photosynthesis are fundamental to the function of rangeland ecosystems" (NRC 1994)*

Recovery mechanisms: *"The capacity of rangeland ecosystems to adjust to change in ways that prevent loss of rangeland health depends on the presence or absence of functioning recovery mechanisms. Properly functioning recovery mechanisms result in the capture and cycling of nutrients; capture of energy; conservation of nutrients, energy, and water within the site; development of resistance to extreme events; and resilience to change – the processes through which rangeland health is sustained or improved" (NRC 1994).*

The dominant limiting factors to plant growth on western rangelands are moisture and soil fertility. For these reasons, it is critical to capture every drop or snowflake that lands on a site. If water runs off or blows away, within some expected range of climate variability, it is a sign of poor health or dysfunction. When water moves overland it usually takes some soil with it, and the uppermost layer of soil is crucial. Conditions that increase soil organic matter also increase water-holding capacity; conditions that promote soil health increase infiltration rates and percolation. Management that promotes rangeland health promotes water quality and quantity.

Retrogression, or decline in rangeland health, can occur relatively quickly on arid rangelands. The end result of unchecked retrogression – characterized by increasing bare ground followed by soil loss, decline of ecosystem diversity and total biomass production, increasing invasive plants, increasing annuals – is desertification. In order to determine whether current and historical livestock management is causing retrogression one must regularly measure indicators of rangeland health and compare to previous results. The manager then has either the knowledge to adjust the plan to correct problems or the evidence that the current management is effectively maintaining or improving rangeland health.

Declining rangeland health is bad economics

A livestock producer partly or wholly dependent on rangeland forage has economic success riding on their ability to avoid declining rangeland health, since total forage production tends to decrease with declining condition. This stems largely from inefficiency or interruption of nutrient cycling and reduced water-holding capacity and infiltration in soils. Not only does total production decline, but usable forage declines as species composition shifts toward unpalatable weedy forbs and annual grasses with lower feed value than perennial bunchgrasses.

The ecological and economic value of early identification of negative trends cannot be overstated. For Western livestock production systems the cost of supplemental feed (usually hay and grain) is often, and on average, more than 50% of operating costs. In addition, arid rangeland restoration or rehabilitation is quite expensive, unpredictable, and does not "pencil out" until many years of forage production have gone by.

Long-term forage production cannot be sustained when rangeland health is declining, so it is imperative to detect retrogression and adjust management to reverse the trend. This is referred to as adaptive management – a principle often espoused and seldom practiced. The limiting factor is usually not lack of conviction but inability to monitor meaningfully.

Known need

There is a recognized need to enable proactive graziers to document successes in land management and tell the story to a public that is highly skeptical and often critical of livestock grazing on public and private lands. In a conversation prior to his departure from Washington State University, the former range/watersheds specialist stated that off-the-shelf technologies are important, that people need something they can do, not just think about. Technologies for maintaining rangeland health, individual relationships and building trust will be the keys to rangeland health, watershed function, and the future of natural resources Extension.

Livestock production must be treated as a business in order to provide income for a family into the future. The long-term sustainability of this type of business includes economic, environmental, and social dimensions that are more practical than esoteric, and are interrelated. Producing profit, growing grass, and retaining (or increasing) access to public grazing lands are tied to rangeland health.

Ranchers individually and corporately (through county and state associations) have recognized the value of monitoring as a key to:

1. improved grazing management, identified above as adaptive management, whereby a grazier plans, measures results, adjusts the plan, and measures results;
2. communicating to the non-agricultural public the benefit of grazing by documenting positive changes in rangeland health with repeat photography and quantitative/qualitative measurements of vegetation attributes based on scientifically accepted protocols.

There is also a segment of the public and media that have begun to see grazing as a truly sustainable agricultural enterprise, as a valuable and flexible management tool, and as the last hope for preserving working landscapes in many areas of the growing West.

Rangeland health monitoring can take many different forms depending on your management goals, specific concerns previously identified, and how much time one wishes to devote to the activity. If you are interested in finding out how WSU Extension can help you effectively monitor your rangeland or pasture, please contact us by phone or by email at hudsont@wsu.edu.