ARIZONA COOPERATIVE EXTENSION
THE UNIVERSITY OF ARIZONA
College of Agriculture and Life Sciences

AZ1259

Revised 01/10

Rangeland Monitoring: Selecting Key Areas

Jeff Schalau

Introduction

Federal regulations such as the Endangered Species Act and the Clean Water Act continue to challenge ranchers and land management agencies alike. Ranchers looking to succeed in the face of these challenges should seriously consider starting a rangeland monitoring program on their land and/or allotments. Rangeland monitoring programs gather basic information describing rangeland attributes (i.e., species composition, cover, utilization, weather, etc.) using systematic, repeatable methods. Over time, monitoring data can be used to determine compliance with state and/or federal regulations and to make ranch level management decisions. Rangeland monitoring is especially critical for those operating under grazing permits. As agencies are faced with their own challenges, the task of monitoring is being shifted to the permittees. Once started, a rangeland monitoring program is a long-term commitment of time and resources. The key areas selected then become the foundation of the overall monitoring program.

Site Selection

First, a Collaborative Resource Management team should be assembled to provide input on study site locations. The team should include agencies and individuals having a broad base of interests and concerns about rangeland management. Land management agencies (Arizona Department of Environmental Quality, Arizona Game and Fish, Bureau of Land Management, Natural Resource Conservation Service, USDA Forest Service, US Fish and Wildlife Service, etc.), educational institutions (Cooperative Extension and other Universities), interested public parties, and/or concerned citizens groups should all be represented on the Collaborative Resource Management team. Members of this team should also be invited to take part in the rangeland monitoring process.

Attempting to monitor 100% of any given rangeland is not physically possible. Instead, representative study sites are selected based on their ability to predict range conditions over much larger areas. Proper location of study sites will be the most important decision made during any monitoring program. Criteria used for site selection process should be well documented. Site selection should consider biotic (living organisms) and abiotic (soil, topography, climate, etc.) factors, operational factors (pasture size, water, period of use, etc.), and historic land uses.

Study Sites

Study sites may include critical areas and key areas. Critical areas are those containing special or unique values such as endangered species, riparian habitats and fragile watersheds. By nature of their uniqueness, these areas should be evaluated separately from larger management units. Key areas are sampling units that characterize general range conditions over larger areas such as pastures or grazing allotments. In other words, a key area represents the overall resource condition of that particular rangeland site.

Key Areas

Key Area selection requires historic knowledge of the larger area(s) to be monitored. This can be provided by the ranch owner/manager, range conservationists, or others familiar with the area. The site selection team should use aerial photos or soil/vegetation maps (available from BLM, USFS, or NRCS) followed by "ground-truthing" to verify site location decisions. When selecting key areas, the most important considerations are management objectives established for the particular management unit. In addition, other potentially interested or affected parties should be encouraged to participate during the key area selection process. Assembling this large group may seem burdensome, but agreement and/or acknowledgment by all interested parties at this stage lends greater credibility to the monitoring program.

The following are some criteria that should be considered in selecting key areas. A key area should:

- Represent the overall range site in which it is located.
- Be located within a single ecological site and plant community (i.e., not in a transitional zone).
- Contain the key species of interest (key species are generally an important component of the plant community, serve as indicators of change, and usually are forage species). Land management agencies can provide a list of key species they are most interested in having monitored.
- Be capable of and likely to show a response to management actions. This response should be indicative of the response that is occurring across the range type that the key area is intended to represent.

- Comparison areas (livestock exclosures) can be very valuable if paired with similar grazed sites within the same management unit. Wildlife exclosures are more difficult to maintain, but are also of great value where utilization by wildlife is a management concern.
- Key areas should not be selected completely at random. Rather, the monitoring sites should be selected based on known attributes (i.e. soil, vegetation, etc.) that are linked to management objectives and proximity to supplement feeding areas, watering points, and/or other range improvements. The key area location should have high potential for measuring desired vegetation changes that are tied to ranch objectives.

Other Considerations

The number of key areas selected depends largely on the amount of variability (i.e. number of ecological sites) across the management unit. However, funding and personnel constraints can also limit monitoring efforts. In general, it is best to select sites and measurements that can be collected in one or two days. Monitoring objectives should be clearly identified for each key area and periodically evaluated to determine their effectiveness. Key areas should also be located by GPS coordinates, noted on aerial photos and/or maps, and be clearly marked with monitoring material (e.g. t-post, re-bar) on site.

Key Area Selection at the Yavapai Ranch

In 1990, the Chino Winds Natural Resource Conservation District sponsored a Demonstration Project on the Yavapai Ranch. The Yavapai Ranch is about 15 miles south of Seligman, Arizona in northern Yavapai County. The Yavapai Ranch contains over 110,000 acres in checkerboard ownership. More than 50% is deeded land with the remaining ownership in grazing allotments administered by the Arizona State Land Department and the Prescott National Forest.

The Demonstration Project included water developments, fencing, and a monitoring program to demonstrate the effectiveness of applying Best Management Practices (BMPs) on rangelands in order to minimize off-site sediment movement caused by livestock grazing. The U.S. Environmental Protection Agency and Arizona Department of Environmental Quality provided funding for the project. The Collaborative Resource Management team included members from Yavapai Ranch, Arizona Department of Environmental Quality, Prescott National Forest, Natural Resources Conservation Service (then called Soil Conservation Service), University of Arizona Cooperative Extension, and the Friends of Prescott National Forest (a concerned citizens group).

The fencing and water developments were placed to better manage forage utilization within each pasture and improve livestock distribution on the east side of the ranch. The objectives were to allow plant cover to increase in over-utilized areas and increase forage utilization in underutilized areas. Both objectives should result in decreased sediment transport. In addition to the key area selection guidelines previously described in this article, the Yavapai Ranch had some specific monitoring objectives related to the demonstration project. To accomplish these, key areas would also: (1) need to be placed on sites that would be utilized by cattle; (2) have broad representation across the east side of the ranch; (3) be located near water (about a quarter mile) and (4) be located between the two sources of water in the pasture.

The new grazing plan specified shorter periods of more intensive use and longer periods of rest. The team first identified soil/vegetation types that would respond to these changes in management. Grassland sites were selected based on their potential for forage production and erodibility of soils. The ranch's east side has mostly gentle slopes (5%) and contained three major range types with potential for improving vegetative cover: loamy bottom in poor range condition, loamy upland in fair range condition, and limy upland in good range condition. Key areas for all three range types were identified. The loamy bottom range sites had been grazed year-round in the past and had the greatest potential for improvement. These sites had mostly annual weeds growing on them at the start of the project. The limy upland range sites had been underutilized in the past. They had mixed grass species and small shrubs. The new grazing plan called for increased utilization of this site. Monitoring would determine if it stayed in good condition with increased grazing pressure. The loamy upland sites were dominated by blue grama and had been utilized year round in the past. Monitoring should determine if the range condition improved with shorter periods of use and longer periods of rest.

The Collaborative Resource Management team started the process by identifying potential key area locations that typified these three range types using soil survey maps and visual site surveys. The team drove around the ranch with the maps and found potential key areas for each range site. They discussed the merits and liabilities of each key area location and chose each key area based on team consensus. Starting in 1992, the key areas were monitored twice per year. Starting in 1998, the EPA project was completed and monitoring was only conducted at the end of the growing season.

Yearly fall monitoring continues at the Yavapai Ranch and the data are used to drive management decisions. However, even the best-designed monitoring plans can have unexpected complications. On the Yavapai Ranch, grazing exclosures were used to monitor changes in vegetation in the absence of domestic grazing animals. Inside the loamy bottom grazing exclosure, heavy overland flow of water during intense rainfall events caused sediment transport causing both erosion and deposition. Increased disturbance due to erosion and deposition caused perennial plant cover to decrease inside the exclosure. This overland flow condition did not occur in the adjacent grazed loamy bottom

comparison site. This obscured the effects on vegetation due to grazing on this range site. Of course, the potential for overland flow of water was not obvious to the Collaborative Resource Management team when the key area was chosen. Had it been, then an alternate site would have been chosen for the exclosure.

Interpretation of monitoring data is not the objective of this publication. However, monitoring data from Yavapai Ranch comparison areas did show that range trend was more closely related to seasonal precipitation than to livestock management. Since the construction of range improvements and initiation of rangeland monitoring, time-controlled grazing and improved distribution have resulted in a stable to upward range trend on the Yavapai Ranch.

Summary

Unfortunately, there is no "cookbook" procedure that can determine the best key area locations and monitoring methods for any given ranch. Every Collaborative Resource Management team must consider ranch-specific goals. What are the overall objectives of the ranch operation? Is there a management plan or a set of goals? Has a "problem" been identified on the ranch? More specifically, should the key area be on a site with highest potential, medium slope or no slope, over utilized area, close to water? Again, it is impossible to answer these questions without identifying specific criteria for each situation. Each Collaborative Resource Management team would probably decide on a slightly different key area location when given identical conditions and criteria.

To reiterate, key area location is the most important step in starting a rangeland monitoring program. Once chosen, monitoring methods range from simple photo plots to advanced quantitative measurements. Most rangeland monitoring programs do not need grazing exclosures or elegant statistical designs. Remember, determining rangeland trend requires that repeated measurements be made over time. In all cases, the most valuable Collaborative Resource Management team member(s) will be the ranch owner and/or employee that knows the land's potential, it's seasonal variations, and how the cattle utilize it.

For More Information

You can find more information about rangeland monitoring methods in: *Sampling Vegetation Attributes: Interagency Technical Reference*, 1996, BLM/RS/ST- 002+1730.

ARIZONA COOPERATIVE EXTENSION
THE UNIVERSITY OF ARIZONA • COLLEGE OF AGRICULTURE AND LIFE SCIENCES

The University of Arizona
College of Agriculture and Life Sciences
Tucson, Arizona 85721

Jeff Schalau
Associate Agent, Agriculture & Natural Resources

Contact:
Jeff Schalau
jschalau@ag.arizona.edu

This information has been reviewed by University faculty.
cals.arizona.edu/pubs/natresources/az1259.pdf
Originally published: 2001

Other titles from Arizona Cooperative Extension can be found at:
cals.arizona.edu/pubs