

**Beef Cattle Sciences**

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Monitoring Grazing Lands in Oregon ¹

Professionally
Reviewed

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Introduction

A critical, but often overlooked step in the development of a comprehensive grazing management plan is a well-defined monitoring program for evaluating progress toward meeting management objectives. A monitoring program can benefit your ranch operation by: 1) determining the benefits gained from changes in grazing management or investments in range improvements; 2) facilitating a better understanding of rangeland plants and how they interact with each other, the environment, and grazing animals; 3) building confidence in the management strategy; 4) detecting negative trends early to prevent more extensive problems with weed infestations, loss of productivity, and vegetation composition shifts toward less desirable forage species; and 5) providing lessons of success and failure that can be shared with others as learning opportunities.

Although much of the information in this guide was written with public land livestock permittees in mind, it is just as important that ranchers monitor their private rangeland too. There may be no obvious source of assistance with monitoring private land, so a landowner needs to consider prospective methods in light of the time required and/or associated costs for each. A simple monitoring program is better than an elaborate one that never gets implemented or maintained. On private land, consider at least permanent photo

points and a record of observations. Photo monitoring can always be supplemented with quantitative vegetation measurements in the future as time allows or conditions and circumstances dictate.

Types of Monitoring

Two types of monitoring are needed on grazing lands to evaluate the effectiveness of a management strategy. First, there is a need to periodically compare existing conditions on your grazing land to those identified in your management objectives to determine if the management strategy is achieving the desired outcome. This type of monitoring is typically repeated every 3 to 10 years and is referred to as trend monitoring. Second, there is a need to monitor yearly effects of 1) inputs of your management such as forage utilization, stocking rate, and/or season of grazing and 2) inputs beyond the control of management such as those related to weather. Inputs are the factors grazing land is responding to over time. For example, if one is maintaining an irrigated perennial grass pasture, the principal management inputs may include the amount, timing, and frequency of irrigation and fertilizer applications. Factors not easily controlled through management would include weather inputs that affect the growing conditions for vegetation (e.g., temperature, seasonal change, and weather

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anomalies). The irrigated pasture will respond to management and weather inputs with varying forage production levels. The magnitude and direction of change in forage production can be explained by considering adjustments in management inputs (e.g., fertilizer and irrigation applications) along with those factors beyond the control of management (e.g., weather inputs). Because inputs on grazing lands frequently change from one year to the next, they must be monitored annually.

Establishing a Monitoring Program

1. *Participants* - The first step when beginning a monitoring program is to identify the appropriate participants in the program and each individual's or group's responsibility. At a minimum, monitoring on public grazing lands should be a cooperative effort between the permittee(s) and the agency resource specialist(s) responsible for managing the land. Depending on management objectives and the resource value(s) associated with the public land, it may also be appropriate to encourage participation from additional individuals or groups that have an interest in the monitoring program. Conversely, on deeded property, the landowner/manager, family members, and employees may be the only ones involved in the program.
2. *Inventory* – Clearly defined management objectives form the basis of a meaningful monitoring program. Development of useful management objectives, however, first requires a good understanding of the present situation. Monitoring, especially trend monitoring, requires comparing existing conditions to some set of prior conditions. Therefore, a logical starting point is to inventory the grazing land and define current resource conditions and production levels (Fig. 1). This can be accomplished in a variety of ways, but working at the management unit (i.e., pasture, field, allotment) scale will make the task more practical, because it is the scale at which management changes are applied. Where there is no quantitative data available, a qualitative description of the history of use may suffice to frame the current situation. A historical context provides a critical basis from which to communicate monitoring results to others. For example, the current plant community may not be what is desired, but it may represent a marked improvement from historical conditions. Information that may be useful (if available) to inventory and evaluate includes:
 - Previous/existing management plans for your ranch/allotment
 - Existing monitoring data/historical photos
 - Records of stocking rates and seasons
 - Kinds and classes of livestock
 - Past grazing systems (i.e. timing, frequency and intensity of livestock grazing)
 - Problems encountered on the rangeland (e.g., trespass livestock, recreational use, poisonous plants, invasive plants or weeds, unreliable livestock water)?
 - Range improvements (types and locations) and resources responses
 - Wildlife and feral animal numbers/use
 - Historical climate data
 - Soil surveys
<http://websoilsurvey.nrcs.usda.gov/app/>
 and ecological site descriptions
<http://esis.sc.egov.usda.gov/>
3. *Management Objectives* – After evaluating information gathered during the inventory, the next step is for all stakeholders in the operation or grazing land to cooperatively identify areas needing improvement and areas where current conditions should be maintained. Set realistic management objectives that take into account the potential of the grazing land and compatibility with the long-term goals of the ranching operation.

The following is provided as an example of how the process of developing a realistic, meaningful, and measurable management objective might occur:

Situation: A rancher is managing a cow-calf operation primarily on sagebrush steppe rangeland in southeast Oregon.

Goal: The long-term goal of the operation is to maintain or increase the grazing land's productivity to promote long-term sustainability of the ranch. Grazing land productivity can be characterized in terms of forage production for

livestock, vegetation types, wildlife habitat/populations, fisheries, yield of water, etc. depending on what is valued by the rancher.

Management Objective: A logical management objective for the sagebrush steppe rangeland that complements the goal of the rancher would be to maintain adequate cover of perennial bunchgrasses to limit soil erosion, promote water infiltration, maintain forage quantity and quality, and decrease the risk of weed invasion (i.e., principal factors for maintaining land productivity).

Management Unit-Specific Objective(s):

During the baseline information gathering (i.e., inventory) phase (Fig. 1) the rancher identifies two separately managed units of grazing land that support similar vegetation types and comparable growing conditions for vegetation (soils, precipitation, topography, elevation, etc.). The only significant difference between the two pastures is their management history; Pasture A has received livestock use during the growing season of perennial bunchgrasses annually, whereas use in Pasture B has been deferred until after the growing season every other year. Based on what is known about what the grazing land is capable of producing (i.e., potential), the rancher is satisfied with perennial bunchgrass cover and production in Pasture B. Conversely, perennial bunchgrasses in Pasture A are smaller, less vigorous and produce about 10% less cover than those in Pasture B. Consequently, a logical management objective specific to Pasture A would be to increase the cover of perennial bunchgrasses. A useful, well-written management objective, however, must include more specificity by answering the following questions: *Who*, *What* (and how much), *When*, *Where* and *Why*? By answering these questions, the rancher establishes an objective to increase the cover of desirable perennial bunchgrasses by 10% in the Pasture A over the next 10 years to limit soil erosion, increase water infiltration, increase forage quantity and quality, and decrease the risk of weed invasion. This example clearly identifies *who* is responsible for ensuring the objective is achieved (i.e., the ranch owner), *what* needs to change and by *how much* (i.e. cover of desirable perennial bunchgrasses will be increased by 10%; thereby making the objective measurable), *when* the desired change is to occur (i.e. over the next 10 years), *where*

the desired change is necessary (i.e. in the Pasture A), and *why* the change is needed (i.e. to limit soil erosion, increase water infiltration, increase forage quantity and quality, and decrease the risk of weed invasion).

4. *Selecting the Resource Attribute(s), Location and Timetable for Monitoring* - Once management unit-specific objectives have been clearly defined, the next step in the process is to identify 1) what (resource attribute) needs to be monitored; 2) when the information should be collected; and 3) where monitoring efforts should be focused. All of these decisions are largely determined by a well-written management objective. If the management objective is to increase perennial bunchgrass cover by 10% over the next 10 years in the Pasture A, the monitoring program must then include periodic measurement of perennial bunchgrass cover (i.e., the resource attribute) in Pasture A over the next 10 years. Methods to document or measure perennial bunchgrass cover may include repeat photo monitoring or ground cover transects, respectively. Although the exact locations of monitoring sites are not clearly defined in the provided management objective, the approach for selecting monitoring sites is identified. Making reference to the Pasture A as a whole suggests the objective applies to the entire management unit and, therefore, the rancher would attempt to select monitoring locations that represent what is occurring in the whole pasture. Such monitoring locations are referred to as key areas, and the approach involves selecting locations that are representative of the management unit (i.e., pasture, field, or allotment), meaningful to management decisions, and broadly applicable to management's influence on the larger area. Key areas are those portions of the management unit that are agreed upon by knowledgeable parties to be representative of the effects of grazing management on attainment of plan objectives on a larger scale. Guidelines for selecting key areas are beyond the scope of this paper but are well-described in Bureau of Land Management (1999a).

A different approach to selecting monitoring locations uses critical areas. Critical areas represent smaller parts of a pasture that receive special attention, such as important wildlife habitat, areas having threatened or endangered

species, highly erodible areas, or riparian areas. Critical areas are appropriate if management objectives are specific to maintaining or improving a small piece of land, such as a riparian area, within a larger pasture.

5. *Collecting Monitoring Information* - Trend monitoring is intended to detect change (trend) in the primary grazing land resources of soil, water, and vegetation, and therefore should be repeated consistently through time at permanently marked locations. Although stable soil and a functioning water cycle are always prerequisites to grazing land condition and productivity, vegetation is more easily observed and measured. Vegetation attributes correlate to soil stability and hydrologic function and serve as effective indicators for those critical processes that are more difficult to directly measure. Consequently, effectiveness of management is usually evaluated by vegetation response over time. Techniques for documenting or measuring trend in vegetation include repeat photo monitoring described by Borman and Chamberlain (1999) and a wide array of quantitative methods are described in Herrick et al. (2005), Swanson et al. (2006), and Bureau of Land Management (1999a).

Annual monitoring may include keeping yearly records of actual use, utilization patterns, growing conditions for vegetation (climate records), insect infestations, fire events, other disturbances, and condition and adequacy of range improvements. Techniques used for annual monitoring may include notes recorded in a pocket calendar or herd book, utilization mapping, residual vegetation sampling, and photography. Guidelines for collecting annual (short-term) monitoring information are described in Herrick et al. (2005) and Swanson et al. (2006).

6. *Interpreting Monitoring Information (tying long term and short monitoring together)* - Trend monitoring is conducted to detect changes or responses in vegetation. Trend is the direction of change in vegetation and is usually described in terms of being upward (i.e., toward management objectives), downward (i.e., away from management objectives), or stable (no apparent trend). Interpretation of vegetation trend is one of the most important elements of a monitoring program. Once the direction of change is identified, the challenge is determining

whether the changes were due to management, factors external to management (e.g., the weather), or a combination of management and external factors. Grazing lands are dynamic systems that constantly change in response to fire, animals, climate, insect infestations, weed invasions, and natural vegetation succession; not just to livestock grazing. Where practical, reference areas can be invaluable for interpreting the cause(s) of observed trends. A reference area is a location occurring on the same or similar site (i.e., soils, climate, vegetation, topography, etc.) where the effects of management inputs have been excluded. Thus, monitoring in these areas provides evidence of vegetation trend in the absence of inputs from management. These may be areas protected from livestock grazing by exclosures (fencing) or natural barriers (e.g., rimrock), or areas not included in an improvement project (e.g., areas not reseeded in a revegetation project).

Annual monitoring information is used for interpreting long-term trend in vegetation. Annual monitoring focuses on identifying management inputs and external factors that affect the response of grazing land vegetation over time. In other words, these are the factors that influence vegetation trend and may include growing conditions for plants (e.g., precipitation, temperature trends, drought, etc.), livestock and wildlife numbers, utilization patterns of livestock and wildlife, insect and rodent infestations, recreational use, trespass livestock, and timing, duration, and frequency of livestock grazing. Annual monitoring is also critical for making short-term (i.e., within year) management adjustments to ensure progress is made toward long-term management objectives. For example, making and regularly updating utilization maps is an important tool for modifying management. These periodic range inspections help identify if adjustments are needed in grazing management to meet long-term management objectives. Adjustments might be in the form of new or relocated water developments, fences or salt grounds, or changes to the grazing strategy by modifying livestock numbers or the duration and season of use.

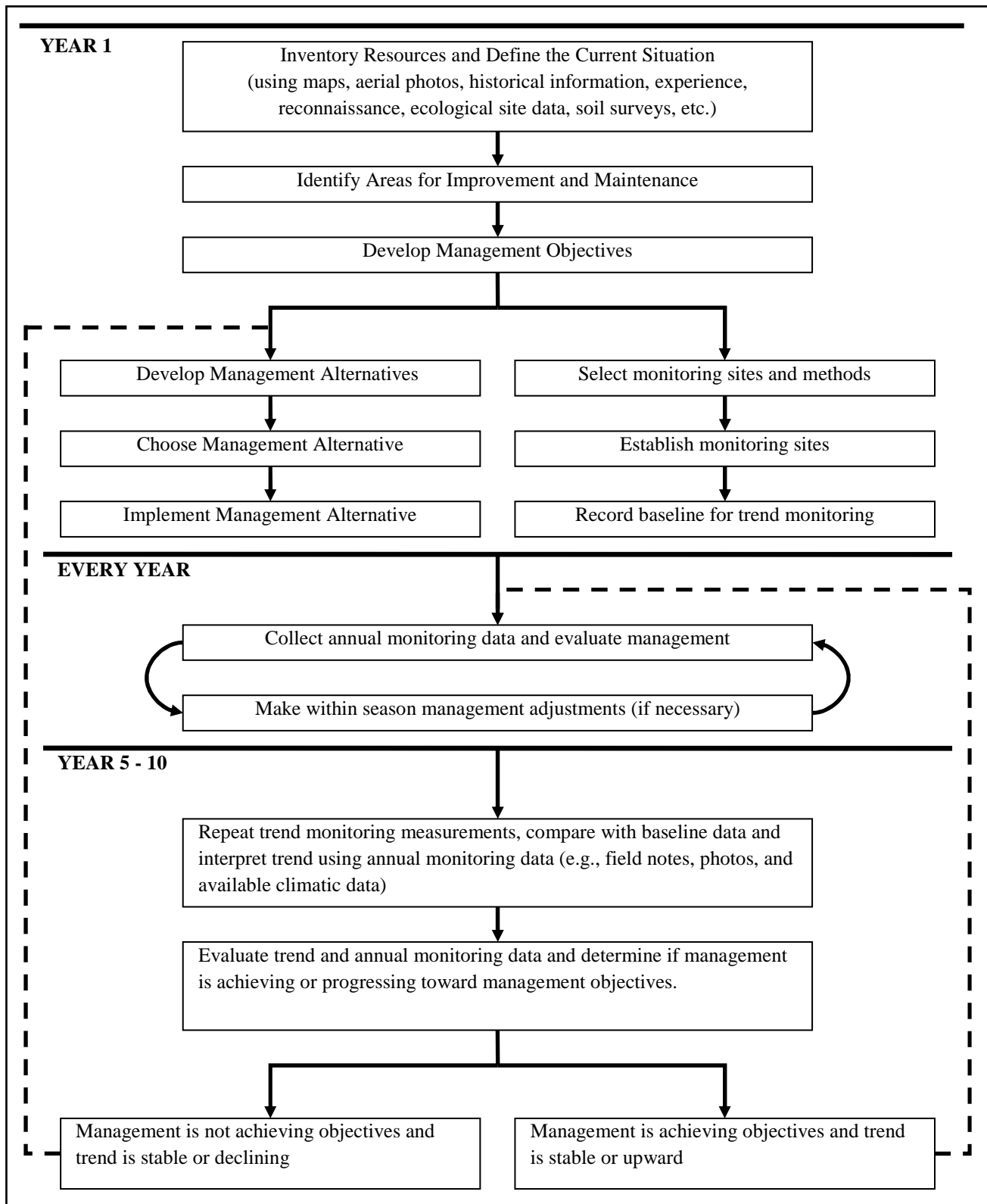


Figure 1. Management and monitoring program design, implementation and integration (Adapted from Herrick et al. 2005b).

Together, annual and trend monitoring are the best tools for identifying change in grazing lands (trend), its potential cause(s), and the

effectiveness of management decisions. Trend monitoring information indicating management objectives have been achieved with a stable or

upward trend provides justification for maintaining current management practices. The following two conditions may warrant an adjustment to the management strategy: 1) trend monitoring information indicates management objectives have not been achieved and trend is stable or not apparent, or 2) trend monitoring information indicates trend is downward. If there has been no change in vegetation, the decision must be made whether that is acceptable or not. Perhaps management objectives were unrealistic and not obtainable. If it is not acceptable, then a minor adjustment in management may be all that is necessary. In the case of the second conclusion, if it is determined that livestock grazing is contributing to the observed downward trend, a change in grazing management is probably warranted. All aspects of grazing management should be considered for adjustment including the timing, frequency, intensity and distribution of grazing; not just the stocking rate.

Conclusion

Monitoring is a diagnostic tool that must be properly applied with clear objectives in mind in order to be useful. Most tools have utility for a particular job and usually represent a gross waste of time and effort if they do not fit the application or the operator. For proper application, a useful monitoring program must be viewed as a multi-step process requiring 1) buy-in from appropriate stakeholders; 2) identification of management units needing improvement and maintenance; 3) development of clearly defined management objectives; 4) selection of appropriate resource attributes and methods for monitoring; 5) commitment to conducting both annual and trend monitoring and yearly interpretation of annual monitoring information and adjustments to the management strategy (if necessary); and 6) periodic interpretation of both annual and trend monitoring information to evaluate progress toward achieving management objectives.

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