Market Based Approach for Restoring Rangelands and Critical Wildlife Habitat in the Sagebrush Biome

Conservation Innovation Grant

Cooperative Sagebrush Initiative and Ecosystem Management Research Institute

Tom Esgate, Project Director, CSI
Jon Haufler, Science Coordinator, EMRI

Descriptions of Demonstration Projects

February 2011 update

THIS DOCUMENT IS A PROGRESS REPORT THAT CONTAINS DRAFT MATERIAL PROVIDED AS AN UPDATE OF PROJECT STATUS. INFORMATION IN THIS REPORT SHOULD NOT BE CONSIDERED TO BE FINAL, AND SHOULD NOT BE CITED.

Introduction

The Cooperative Sagebrush Initiative (CSI) is a collaborative effort of landowners, government agencies, industry, academia, and conservation groups whose purpose is to provide leadership, coordination, and funding for sagebrush conservation and recovery. CSI has a primary objective of maintaining and improving sagebrush ecosystems and, in so doing, providing for sagebrush associated species such as sage-grouse. CSI has recognized that mitigation, especially associated with energy production activities will be important for maintaining sagebrush ecosystems. Mitigation of energy developments can occur both on-site and off-site. A challenge in the use of off-site mitigation is assuring that ecosystem services, including wildlife habitat for sagebrush-associated species, produced by off-site mitigation are commensurate with on-site impacts. If benefits produced by off-site mitigation can be quantified and shown to be equivalent to impacts from developments or other activities, then it may be possible to develop a credit trading system where landowners or agencies may produce benefits that industry or other developers would be willing to purchase to replace resources lost on-site through their development activities. CSI members were interested in such a credit trading system, but required a reproducible and defensible tracking system based on appropriate ecosystem service metrics in order for it to be potentially implemented. This project was initiated to develop and evaluate a metric system for mitigation in sagebrush ecosystems and to further evaluate the potential for development of a mitigation credit trading system based on the metrics. The proposed metric system relied on the use of ecological sites as classified and described by the Natural Resource Conservation Service as a basis for assuring equivalency of sagebrush ecosystems and ecosystem services. The system also used an evaluation of wildlife habitats to evaluate equivalency of benefits and impacts at landscape scales.

In this report, scientific names of all species are included in Appendix C. The report summarizes findings in the main body, and includes more detailed data and maps in Appendices.

Objectives

The objectives of this project were to:

- Report on the effectiveness of NRCS ecological sites as a basis for mitigation metrics of ecosystem services,
- Test a market-based offset system within working landscapes across western states,
- Develop opportunities for producers to realize economic benefits from habitat management practices on private and grazing permit lands by accruing merchantable credits while maintaining and enhancing forage productivity,
- Engage western industry, agriculture, conservation groups, and state and federal agencies in a new economic relationship,
- Create demonstrations of habitat and species credit trading arrangements with broad applicability to other regions and resource sectors, and
- Test and evaluate the capacity of market based incentives to recover populations of declining species.

Metric System

The metric system used in this project requires that impact and mitigation sites be compared at both the site and landscape scales to assure that sagebrush ecosystem services and sagebrush-associated wildlife species are commensurately mitigated. The initial conceptual framework for the metric system was described by Haufler and Suring (2008) as follows:

"The basic framework for quantifying services lost at impact sites and gained at mitigation sites requires assessments of the following:

1. The *existing level* of services provided at the impact and mitigation sites prior to the initiation of development and mitigation activities. These services are considered to be influenced by both the characteristics of the specific impact and mitigation sites as well as the surrounding landscape;

2. The *resulting level* of services expected at the impact and mitigation sites after the impact development and mitigation activities are carried out, considering both site and landscape effects;

3. The *duration* of the change (or period of time over which a change in services occurs) at the impact and mitigation sites; and

4. The *length of time* before the mitigation is expected to be fully successful at the mitigation site.

By assessing the above factors, it should be possible to design a metric system that allows consistent quantification of mitigation required to offset expected impacts from a broad range of development activities. The basic units proposed to quantify benefits associated with mitigation activities or detriments associated with development impacts are really a variety of ecosystem services lost or gained over time. They are calculated in the same manner, so that a "credit unit" has an equal, but opposite, value as a "debit unit." Thus, the benefits of credit units produced are intended to fully and specifically offset the detrimental debit units from a development."

"In the case of the sagebrush biome, the number of credit units or debit units associated with any activity should be a function of the following factors:

1. The area affected by the activity;

2. The ecological sites occurring in the affected areas;

3. The existing conditions within the area (essentially a measure of quality evaluated relative to a baseline);

4. The extent of change (positive or negative) caused by the activity relative to the existing conditions;

5. The spatial or landscape context in which the area is located (related primarily to habitat quality for selected species); and

6. The timing and duration of the expected change."

This metric system relies on NRCS ecological sites as an underlying framework to ensure that ecosystem benefits produced by off-site mitigation are similar to those being impacted by energy or other developments. The metric system measures impacts and mitigation benefits based on comparisons to native sagebrush ecosystems for each ecological site, and incorporating changes to conditions for wildlife species assessed at landscape scales. Haufler and Suring (2008) described the use of ecological sites for this purpose.

"The area affected must be characterized in terms of its existing and inherent (potential) conditions. Natural Resources Conservation Service (NRCS) ecological sites (http://esis.sc.egov.usda.gov/) provide a classification system that can facilitate identification of biotic and underlying abiotic drivers of ecosystem diversity that could provide consistency for measuring ecosystem services and thus mitigation benefits. Ecological sites classify areas that have similar soils and other abiotic and biotic conditions within defined precipitation zones within a Major Land Resource Area (MLRA). MLRAs are geo-climatically defined areas delineated by NRCS that have been mapped for the entire U.S. (NRCS 2006, http://soils.usda.gov/survey/geography/mlra/). Ecological site classifications have been developed for most MLRAs, with ecological site descriptions developed for each specific ecological site within these MLRAs. These sites are linked to soils, and are therefore mapped wherever NRCS soils mapping has occurred.

For each ecological site, various plant communities described as specific "states" *(may be termed either states or plant communities*) as influenced by natural or anthropogenic disturbances have been identified. The dynamics of these plant communities or states are incorporated into a state and transition model for each site. Changes among states are defined as "transitions," with some changes crossing "thresholds" that may make transition back to a prior state difficult (Friedel 1991, Laycock 1991). Various states that might occur on each ecological site have been described in ecological site descriptions (ESDs) for most MLRAs in the Rocky Mountain West, with work proceeding on those areas not yet completed. Descriptions of states for a specific ecological site should include all of the states that occurred historically under historical disturbance regimes (historical states), and other states produced as a result of recent (post-European settlement) anthropogenic influences including introduction of exotic species (anthropogenic states). Past influences of Native Americans are incorporated as part of the historical states. Some ecological site descriptions have not included descriptions of the full range of historical states and transitions, so these may need further development for some MLRAs. A full state and transition model for an ecological site should include descriptions of all

of the states that occurred historically as well as any currently common states produced by anthropogenic influences.

Use of ecological sites as defined by NRCS assures that ecosystem services are being considered in equivalent locations having similar abiotic environments. For example, two loamy ecological sites within the same MLRA and precipitation zone should have the potential of supporting similar states with similar potential productivity and thus have the potential to contribute similar ecosystem services. The services they are producing at any time will be determined by the existing plant community occurring at that time, but the potential of loamy sites should basically be the same. A saline upland ecological site in the same MLRA and precipitation zone would have different plant communities or states associated with it than the loamy ecological site, as the different soil properties favor the occurrence of different plant species and support different productivity, growth rates, and other factors. While both may contribute some similar ecosystem services, such as contributing to the habitat of a certain species, they are

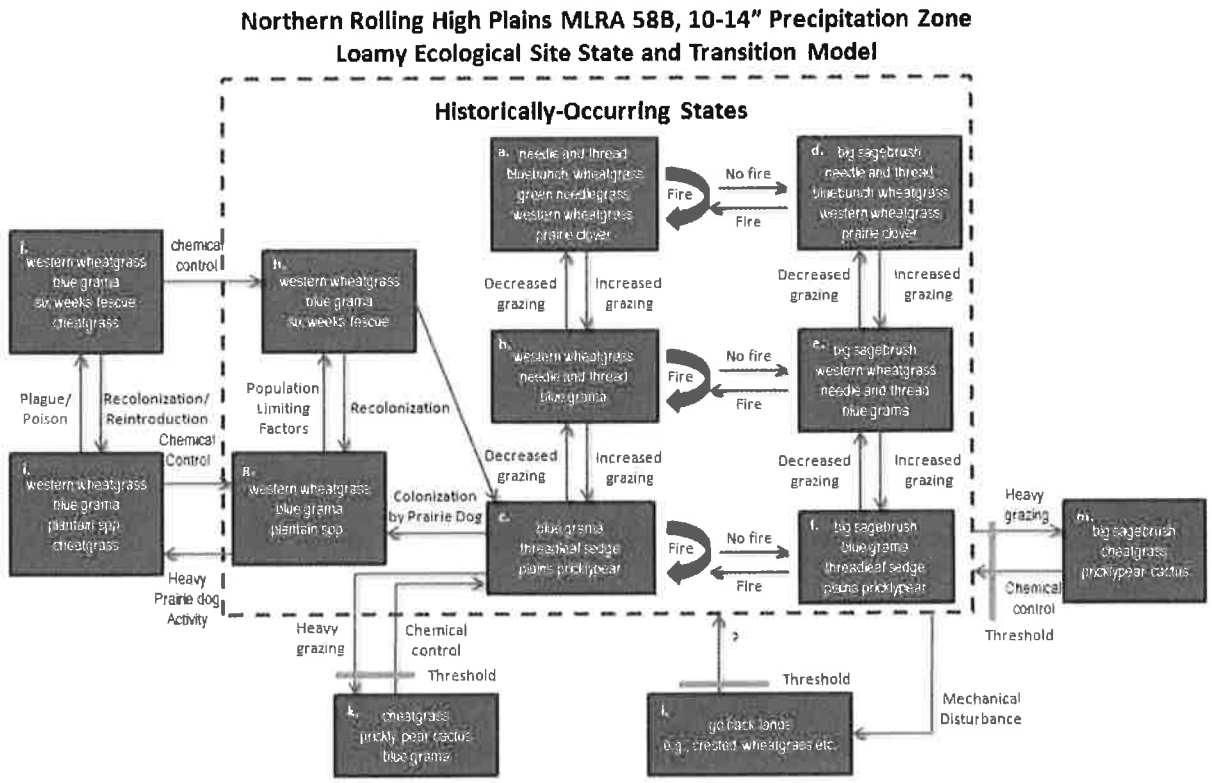

Figure 1–State and transition model for loamy ecological sites within the 10-14" precipitation zone of MLRA 58B, the Northern Rolling High Plains. States identified outside of the dashed box did not occur historically but rather are the result of recent anthropogenic changes.

inherently different in their compositions, productivity, and other factors. For any one ecosystem service, such as habitat for one species of interest, it may be possible to measure the contribution of existing conditions for that one ecosystem service. However, other ecosystem services provided by the site, for example grazing productivity, will be inherently different, so

that if the goal is to produce a system that tracks equivalent credit or debit units for a suite of ecosystem services, then use of ecological sites can help assure that equivalent services are capable of being provided. Other ecological classifications could serve a similar function. However, other systems are not currently available within the sagebrush biome that consider underlying site potential with the same level of development, mapping, and acceptance by potential users as the NRCS ecological site classification system.

Ecological sites within an MLRA and precipitation zone have been described by NRCS in its ESD process (http://esis.sc.egov.usda.gov/). While ESDs have been prepared for many MLRAs within the sagebrush biome, others are still being prepared. NRCS has indicated that completing the ESDs is a high priority, and these should be available in the near future. Where ESDs are lacking, developers can produce their own descriptions of ecological sites if they have the appropriate knowledge of the ecology of the area. Each ESD provides descriptions of the site, its plant compositions and productivity, soils, and an array of other characteristics. In areas where soils have been mapped, the specific ecological sites occurring on an impact or mitigation area will also be available on a map. In areas where soils have not been mapped, on-site sampling will be needed to determine the specific ecological sites of the impact and mitigation areas based on the soils present in these areas."

While ecological sites form the underlying framework for quantifying credits and debits at mitigation and development sites, actual characteristics of existing or resulting vegetation provide the actual data driving the metric system. Sites must be stratified not only by ecological sites, but also by differences in existing and resulting vegetation. By characterizing these conditions in comparison to reference communities developed for each ecological site, the metric system determines the gains or losses associated with impacts or mitigation at the site level.

Landscape level comparisons assess the overall value of impact and mitigation areas to selected species of concern, and include consideration of total available habitat and cumulative human impacts. Development impacts and mitigation benefits to wildlife species on two sites that have the same ecological site and similar existing plant communities may differ from each other because of landscape influences. Surrounding plant communities, terrain, human developments, or other land characteristics may influence the value of each site to a particular wildlife species and result in different effects. Wildlife population responses may also differ due to different range distributions , presence of competing species, or other factors. For these reasons, landscape level analyses are important to use as potential modifiers to site level metrics. Various methods are potentially available for modeling habitat responses at the landscape level (Beck and Suring 2008). In this metric system, we used an approach to habitat modeling termed habitat based- species viability (Roloff and Haufler 1997, 2002) to compare species responses to habitat changes resulting from impact or mitigation.

Methods

Project locations

The metric system was tested at 7 different sites where mitigation treatments were applied. A map of these locations is shown in Figure 2. At each location, monitoring was conducted pretreatment and then repeated for 1-3 years post-treatment, depending on when during the project the treatments occurred.

Figure 2. Locations of 7 project locations where mitigation treatments were conducted and monitored using the mitigation metric system.

Site level methods