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## Synergistic Monitoring – Addressing the Threats and Identifying Opportunities

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# Synergistic Monitoring – Addressing the Threats and Identifying Opportunities

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## ABSTRACT

*For many years, land managers and scientists have been applying a variety of land treatments to improve or protect rangeland ecosystems. Collectively, we have studied the response of these treatments and wildfire events to identify opportunities for maintaining or improving Nevada sagebrush ecosystem health and functionality. In partnership with collaborators, we initiated a State-wide effort to capture, consolidate, and summarize implementation, monitoring, and research information for these events. We are conducting field studies to identify and fill information gaps. We seek a new and expanded information base that is available to Nevada land managers, scientists, and others interested in healthy and resilient sagebrush sites. We plan to identify the consequences of passive and active management; develop predictive tools for adaptive management; identify research needs; and increase accessibility to location, implementation and monitoring information for these events. Through the collaborative integration of our field study results with historic and current research and monitoring information, we seek to increase knowledge of landscape-level and site-specific ecological processes. This will further develop our ability to manage and predict rangeland health, integrity, resilience (after disturbance), and resistance (to undesired change under significant disturbance regimes) in the context of multiple-use management.*

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## INTRODUCTION

We estimate that more than 25,000 land treatment and wildfire events have occurred in Nevada since the early 1900's, and land managers and scientists from across the United States have conducted substantial monitoring and research studies on many of them (Swanson and others 2010). In 2008, the Synergistic Monitoring Project (SynMon) initiated the collaborative harvesting and compilation of implementation, monitoring, and research information available for these events. The purposes of this effort are: (1) to capture and summarize what is currently known about event outcomes; (2) to facilitate and support future study of established monitoring and research sites; and (3) to identify information gaps that we plan to bridge through follow-on field studies and data publication. The intent is that all of the activities described below will occur each year over the project's lifetime, according to annual geographic,

ecologic, and/or other topical focus areas developed in conjunction with our collaborators. We intend to widely share this information for its future use in the study and management of wildfires and land treatments across Nevada's sagebrush ecosystems.

## Information Harvesting

Through the generous support of collaborators, we currently have a spreadsheet populated with varying amounts of information for each of over 6,000 wildfire, land treatment, research, and related Nevada events. We also house a database containing location, implementation, planning, and/or monitoring or research information for many of these sites. We continue to add more information for listed events and new events as time and funding permit and new information becomes available.

It is important to note that the USGS's Great Basin Integrated Landscape Monitoring Pilot (GBILMP) Project has a similar information harvesting and analysis effort underway for those Great Basin lands under the jurisdiction of the U.S. Department of Interior (USDI 2007). GBILMP and SynMon have been mutually supportive, although our SynMon project has also been harvesting information from U.S. Department of Agriculture (U.S. Forest Service, Natural Resources Conservation Service, and Agricultural Research Service) and several state, county and private management, academic, and other entity offices.

In the long term, we hope to build a complete, easily-accessed spreadsheet and database containing the locations, implementation data, and ecological outcomes for all Nevada sagebrush ecosystem wildfire and land treatment events. In the interim, we are using currently stored information to help identify information needs, to build plans for out-year monitoring and research activities, and to centrally place-hold key monitoring and research information related to Nevada sagebrush wildfires and land treatments.

### Identification of Information Needs

During 1999-2006, almost 6 million acres of Nevada lands experienced wildfire, with some sites burning multiple times (Kozlowski and others 2010). Plant communities on many of these lands subsequently transitioned from native vegetation states into cheatgrass *Bromus tectorum* L. and/or exotic forb-dominated states (Miller and Narayanan 2008).

Through the course of several collaborator meetings, it became clear that northeastern Nevada was a priority area for which many ecological questions exist. Within this geographic area, wildfire and land treatment questions focused on Wyoming big sagebrush sites. A need was expressed for learning about ecological resiliency and resistance threats as well as opportunities posed by wildfires and various land treatments under varying ecological site and state scenarios. Interest was shown in the identification of threshold points, interactions among shrubs and herbaceous vegetation, and decision tools

for wildfire and land treatment management. Also, we discussed the identification of locations and foci for future research and the potential for investigating lower-intensity field data collection techniques covering multiple parameters and applicable across larger geographical scales. Field studies were planned accordingly.

### Field Studies

In 2010, we completed reconnaissance-level field studies on 50 northeastern Nevada wildfire, preventative land treatment (aerating, burning, disking, herbicide spraying, mowing), and aroga moth visit sites. For field study purposes, we defined preventative land treatments as those native vegetation manipulation efforts designed to directly or indirectly protect, maintain, or improve native plant community health, functionality, diversity, resiliency, and/or resistance to invasive species occupation under wildfire or other significant disturbance events. None of the studied sites were known to have been seeded, or had unwanted vegetation control or other rehabilitative kinds of treatments as part of the respective event. The purpose of these studies was to specifically address the following:

1. A scientist contemplating a new land treatment for study might be challenged by finding a place to do the treatment, getting the land owner to permit the treatment, paying for the treatment, and of course, getting the treatment completed. Can similar experimental quality be achieved by studying existing treatments that are already in place?
2. Do low-intensity, reconnaissance-level data collection techniques provide data sensitive enough to effectively support the analysis of targeted ecological parameters at larger scales? Do they quantify apparent outcome differences - such as those apparent in Figures 1 and 2?
3. Can the study sites be designed and located in a manner such that others may easily locate and re-study them (or integrate them with other studies) in the future?



**Figure 1.** A northeastern Nevada Wyoming big sagebrush site that experienced wildfire in 2006. Elevation: 5630 feet. Vegetation dominants: cheatgrass and exotic forbs.



**Figure 2.** Another northeastern Nevada Wyoming big sagebrush site that experienced wildfire in 2006. Elevation: 5360 feet. Vegetation dominants: native perennial graminoids, mostly bottlebrush squirreltail, *Elymus elymoides* (Raf.) Swezey.

#### 4. Address several hypotheses:

- a) Certain events lead to vegetation responses that are more likely to result in perennial resilience and long-lasting fuel reduction, wildlife habitat, livestock forage, and other benefits.
- b) The outcome of events differs among ecological sites.

c) Vegetation response differs markedly as the pre-event cover of shrubs exceeds some proportion of total plant cover in pre-event vegetation composition or in non-event control sites.

d) At levels of shrub cover close to the threshold proportion, event response is strongly correlated with the proportion of annual versus perennial herbaceous species cover in the pre-event or control site shrub understory.

e) Event responses differ according to several factors, such as land use or general management practices; weed infestations; topography or elevation; duration of fire exclusion period; and/or treatment implementation characteristics.

f) The effects become obvious within five years and remain obvious for at least two additional decades after the event (some locations will not allow testing of this hypothesis for some time).

The point intercept technique was used, since it can minimize observer bias and inter-observer variation among years (Wirth and Pyke 2007), and can capture a variety of abiotic and biotic structural component parameters. In an effort to complete data collection on as many sites as possible, we used a minimal sampling intensity - 200 points per event site, and 200 points for each adjacent control site – which Mueller-Dombois and Ellenberg (1974) indicate may yield satisfactory results. We collected both ground-level (bare soil, litter, rock, cryptogam, and basal vegetation) and vegetation foliar (live, dead, and decadent) cover by species on event and control areas. Shrub canopy height and width dimension data were also collected. All sites were mapped, benchmarked, and photographed, per Perryman and others (2006) and Swanson and others (2006).

We have initiated the analysis of these field data and will publish results as sufficient data permit testing of one or more hypotheses. This should continue in other geographic areas until the conclusion of this effort.

## APPLICATIONS

We anticipate that the subsequent integration of SynMon and other monitoring and research data from northeastern Nevada Wyoming Big Sagebrush sites will contribute knowledge toward:

1. Identification of those ecological sites and/or states in which a particular wildfire could be managed for its beneficial effects, versus those for which a wildfire should be extinguished to avoid detrimental effects.
2. Identification of the kinds of land treatments that might best meet management objectives under a variety of scenarios.
3. The scheduling and/or programming of out-year maintenance treatments.
4. Conducting environmental effects and other analyses – such as efforts directed toward comparing the effects of alternative land treatments and no treatment.
5. Achieving and sustaining ecological health, functionality, and resiliency.
6. Permanent benchmarking of historic and current monitoring and research sites.
7. Streamlined monitoring protocols to address multiple information needs across larger scales.

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