SageSTEP News

Sagebrush Steppe Treatment Evaluation Project

Issue 4, Summer 2007

One Year Later: Post-Treatment Observations at Sites Treated in 2006

It has now been a year since the first SageSTEP study site was treated to remove juniper. In total, four woodland sites were treated in fall 2006 for juniper removal using prescribed fire, cut-and-drop, and tree mastication (UT only). One of our sagebrush sites threatened by cheatgrass invasion was also treated. While pre- and post-treatment data are still being entered electronically and awaiting analyses, researchers and site managers have made some early observations about what they saw on the ground this summer.

Vegetation Observations

Across the two western juniper sites where prescribed burn and cut-and-drop treatments were implemented (Bridge Creek and Walker Butte, see map on p. 4), researchers have observed:

- No increase in cheatgrass at either site.
- At Walker Butte the dominant perennial grass was Idaho fescue, which is reported to be somewhat sensitive to fire. Researchers observed minimal mortality and very good re-growth in the first post-fire growing season in spite of a dry year.
- At Bridge Creek, researchers observed good re-growth of perennial grasses in the burn treatment, especially for the dominant bluebunch wheatgrass.

("Observations" continued on **page 2**)

Burn plot at the Walker Butte site (near Christmas Valley, OR) in post-treatment year one.

In this issue:

One Year Later: Post-Treatment Observations at Sites Treated in 2006

Idaho Site Added to Sagebrush/Cheatgrass Study

Ants in the Sagebrush: Little Creatures with Big Plans

Collaborative Project Highlight: Mycorrhizae in Sagebrush Restoration

Manager Workshops Report

Restoring the West Conference: Sagebrush Steppe Restoration

Upcoming Events

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Sagebrush Steppe SageSTEP Treatment Evaluation Project

www.sagestep.org

- Response of understory vegetation in the cut-and-drop treatment plots was subtle, with noticeable differences primarily around the base of the cut trees. Past experience indicates large responses do not usually occur until the second or third year after cutting.

The Onaqui woodland cut-and-drop plot the summer after prescribed burning.

Observations at the Onaqui Utah Juniper site (see map on p. 4) where prescribed burn, cut-and-drop, and tree mastication treatments were implemented:

- No increase in cheatgrass in any of the plots.
- Perennial grass response to fire was excellent with good re-growth of bluebunch wheatgrass, western wheatgrass, and Sandberg's bluegrass. There was a slight increase in exotic annual forbs at lower elevations within the burn treatment.
- Vegetation response to the cut-and-drop treatment was not noticeable.
- Plant response to mastication (Bull Hog™) was minimal but researchers did observe both perennial grasses and forbs growing in the masticated debris piles, a good early indication of the benefits provided by a mulch layer.
- Researchers at this site anticipate that vegetation response to the treatments will be more profound in the coming years, especially in the cut and mastication treatments. Overall, across all treatments, weed encroachment was minimal and perennial plant productivity is expected to increase over time.

Observations at the Onaqui sagebrush-cheatgrass site, where prescribed burn, mowing, and herbicide treatments were implemented:

- No increase of cheatgrass on any treatment plot.
- Good re-growth of Sandberg's bluegrass and squirreltail in the burn, but not of preexisting forbs.
- Much of the sagebrush that didn't burn in the prescribed fire subsequently died, perhaps as a result of the weather. In the northern half of Utah precipitation has been well below normal and average temperatures somewhat above normal.
- The tebuthiuron herbicide treatment appears to have resulted in some reduction of sagebrush foliar cover, but the effect is not dramatic, at least not yet.
- Plateau pre-emergence herbicide was crossed with each of the three treatments (burn, mow, tebuthiuron) on the subplot-level and those subplots have been observed to have much lower amounts of cheatgrass, annual mustards, and bur buttercup present.

Vegetation returns to the Onaqui sagebrush burn plot the spring after prescribed burning.

Wildlife Observations

The SageSTEP wildlife study is looking at species composition and abundance of passerine birds and their response to treatment. Results at this point are still anecdotal, but wildlife researchers observed differential species responses to treatments. At the Onaqui site, the only extensive site (1000-acre plot) where experimental treatments were implemented, species richness and abundance did not differ notably

between the pre and post-treatment in the control core plot. In contrast, abundance of the canopy-dwelling Grey Flycatcher (*Empidonax wrightii*) and Juniper Titmouse (*Baeolophus ridgwayi*) decreased in both the mechanical and tree mastication core plots post-treatment but did not change notably in the burn core plot.

Wildlife researcher Matthias Leu of the USGS and two field technicians set up a mist net at the Onaqui site.

For shrub dwelling species, the Brewer's Sparrow (*Spizella breweri*) increased post-treatment in both the mechanical and tree mastication core plots. In contrast, the Spotted Towhee (*Pipilo maculatus*), which uses shrub habitats in the ecotone between juniper and sagebrush communities, decreased in both. The abundance of both species decreased in the burn core plot.

A Brewer's sparrow is color-banded and measured.

Wildlife researchers also observed changes in bird communities not related to treatments during the first two years of this study in response to weather or other events. For example, they did not detect Sage Thrashers (*Orescoptus montanus*) at the Castlehead site in Idaho during 2006 but found three males establishing territories in 2007. A snow storm in early June at the Onaqui site resulted in major nest failure across species; however, species responded differentially to nest loss. Both Sage Sparrows (*Amphispiza belli*) and Grey Flycatchers re-nested after the snow storm but many Brewer's Sparrow pairs abandoned their territories.

At the Seven Mile site in Nevada, breeding dynamics of Brewer's Sparrows also changed between 2006 and 2007 although treatments have not yet been implemented at this site. In the burn extensive site, researchers found nests of this species in 2006 but not in 2007. Although individuals occupied this site during both breeding seasons, fewer pairs initiated nesting in 2007. This study will be the first to document how woodland and avian species respond to changes in climate across large-scales.

Hydrology Observations

The hydrology and erosion pre-treatment experiments were implemented at two of the SageSTEP woodland sites in the summer of 2006. Runoff and erosion studies were conducted on the Onaqui Utah juniper site and the Marking Corral pinyon-juniper site (see map on p. 4). Preliminary results from small plot (0.5 m^2) rainfall simulations suggest runoff from interrill processes was greater on areas between shrub/tree canopies (interspaces), even though soils were also strongly water repellent under juniper and pinyon canopies. The average runoff rate on the interspaces was 40% greater than the average on sites beneath juniper canopies and over 70% greater than observed on sites beneath pinyon and sagebrush canopies.

A hydrology field technician collects data during a small plot rainfall simulation.

The strength of water repellency was measured using the water drop penetration time (WDPT) procedure. WDPT was greatest near the mineral soil surface under juniper and pinyon canopies. Strong soil water repellency (WDPT = 70 to 90 sec.) was observed under juniper and pinyon litter, while soils under sagebrush canopies and in interspace areas were easily wettable.

Patterns in litter depths were consistent with patterns in soil water repellency, suggesting a potential relationship in the strength of soil water repellency

and litter mass. Litter depths under juniper and pinyon canopies were 70 to 90 % greater than under sagebrush canopies and in interspaces. Higher runoff rates in the interspaces (between both tree and shrub canopies) are attributed to the low amounts of litter and ground cover present. The stronger water repellency of soils under juniper and pinyon canopies was mitigated by dense litter cover that increased storage of simulated rainfall, allowing more time for infiltration. Lower runoff rates under sagebrush canopies are attributed to interception and storage of simulated rainfall.

Hydrologists are also collecting data from large plot rainfall and overland flow (rill) simulations. Detailed analyses of these data are currently being conducted to provide statistical explanations of relationships between hydrology and erosion with vegetation and soils data. The results presented here are preliminary and serve as an initial look at a small subset of the 2006 hydrology data.

Wildfire Season

The record-breaking wildfires that burned across the west this year underscore the importance and potential value of SageSTEP research. Results of this project are aimed at helping managers make decisions about restoration projects that could reduce the frequency and intensity of catastrophic wildfires and allow for a return to more natural vegetation and fire patterns.

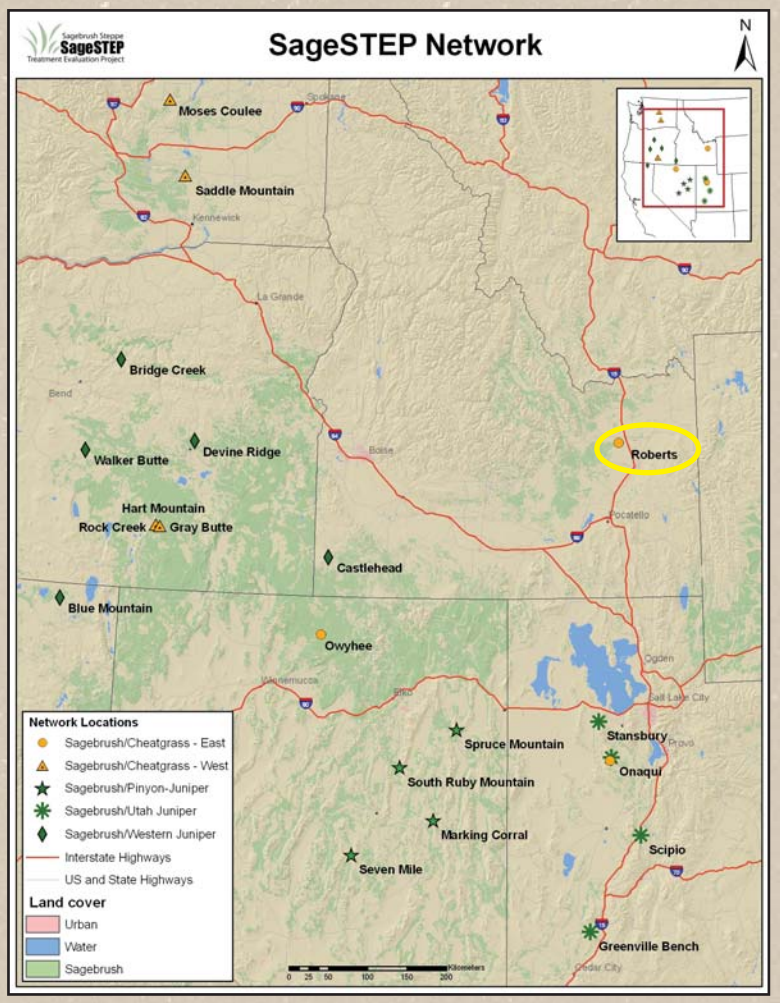
The SageSTEP study sites have not remained untouched by the intense wildfire season. Fires burned near the Greenville Bench study site in southwestern Utah, and the Castlehead site in southwestern Idaho. The latter burned a small portion of one of the study plots, but should not affect the data being collected at the site. The demand on firefighting resources throughout the west could potentially affect prescribed burn implementation at some of the SageSTEP sites this fall, but to date all scheduled treatments are still on track.

Idaho Site Added to Sagebrush/ Cheatgrass Study

Another site has been added to the SageSTEP study of sagebrush communities threatened by cheatgrass invasion. This study is looking at how fuels treatments (prescribed fire, mechanical thinning, and herbicide application) affect these communities. Researchers hope to determine what amount of native perennial bunchgrasses needs to be present in the understory in order for managers to improve land health without risking invasion of exotic annual grasses, such as cheatgrass, and having to conduct expensive restoration, such as reseeding of native grasses.

The Roberts site, in eastern Idaho, is part of the SageSTEP sagebrush/cheatgrass east region. This site is on land managed by the BLM's Upper Snake River Field Office. Pre-treatment data were collected at this site over the summer and fuels treatments are planned for this fall. Thanks to everyone who worked together to make this happen.

More detailed information and fact sheets for each site are available on our website at http://www.sagestep.org/locations.html. Just click on the site name to find out more.

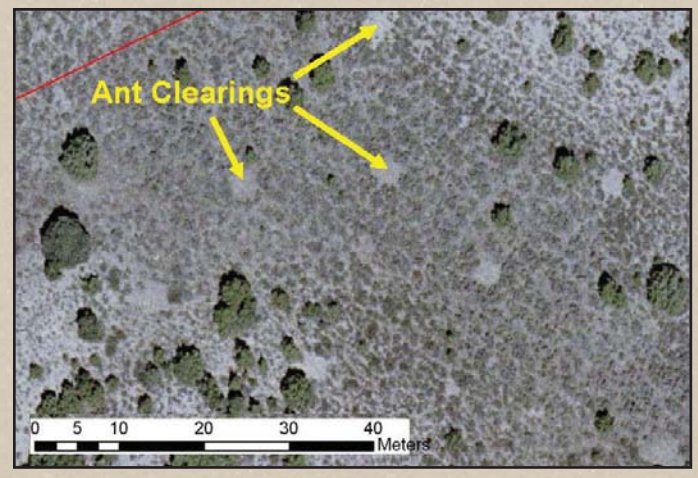


Locations of all SageSTEP study sites as of August 2007 (newest site circled in yellow).

Ants in the Sagebrush: Little Creatures With Big Plans

Seen from a distance, by an observer standing on the ground, the SageSTEP pinyon-juniper sites in Nevada all look pretty much the same. From a mile away, look at the 7-Mile site southwest of Eureka, or the South Ruby site south of Elko, and you will see various densities of both pinyon-pine and Utah juniper trees interspersed with sagebrush, over a gently rolling landscape. Yet upon closer inspection these sites are very different.

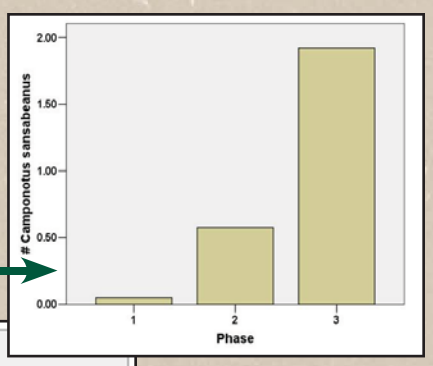
For example, look at the western harvester ant (*Pogonomyrmex occidentalis)*. At the Spruce Mountain site, throughout the burn plot, clearings created by these ants dot the landscape (see photo below), while at Marking Corral, similar photos show no such ant clearings. The nests at Spruce Mountain are so common that harvester ant foragers patrol most of the ground surface there between April and October, collecting, destroying, and distributing the seeds they find. Yet at Marking Corral, nests are relatively rare and the clearings are so small that they are not visible in aerial photos. What does this difference mean to plants that occur at these sites, in terms of where they can grow, and with respect to the fate of their seeds? Will the SageSTEP treatments change the way plants and ants interact at these two sites? These are the kinds of questions we hope to answer with the entomology work within SageSTEP.

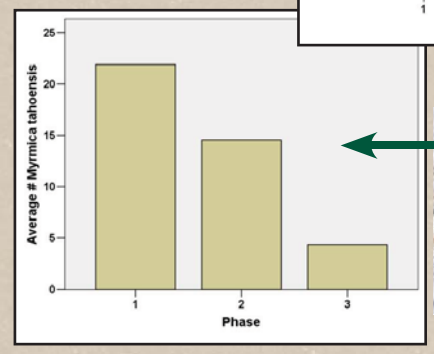


Aerial photo of the SageSTEP Spruce Mountain Site showing clearings created by western harvester ants.

When treatments are applied in the SageSTEP woodland experiment, we expect that trees will decline in relative dominance, while grasses, forbs, and shrubs will increase. What will happen to the animals? A clue as to what will happen with insects can be seen by comparing catches of ants from areas of plots that are currently in phase I woodland (trees small and inconspicuous) versus plots there are already in phase III woodland (trees large and dominant). Four ant species favor phase III woodland, ten species favor phase I, while eight species are common in all phases.

Camponotus sansabeanus





Myrmica tahoensis

Ant species *Camponotus sansabeanus* (above) and *Myrmica tahoensis* (below) and the average number of ants per trap in Phase I, II, and III woodlands.

Take, for example, two functionally very different ant species found at the four pinyon-juniper sites in Nevada (see map on p. 4). While the carpenter ant *Camponotus sansabeanus* prefers deep woodland, *Myrmica tahoensis* prefers sagebrush habitat with smaller trees (see photos). More than likely, SageSTEP treatments will change habitat quality for these two ant species in the years after treatments are applied -- we will likely see a decline in the functional role of the scavenging carpenter ant, and an increase in the role of the generalist *Myrmica*.

Presumably, other animal species (such as birds) and understory plant species will track the treatments in a similar way. Because we are studying such a wide range of species, we will be able to understand how SageSTEP treatments influence the whole, rather than just part of the system. This knowledge gives us much more confidence on the consequences of large-scale management treatments, as we attempt to improve the health of sagebrush systems across the Great Basin.

Collaborative Project Highlight

A collaborative project is a study outside of the core SageSTEP study that takes place on or in relation to one or more of the SageSTEP study plots. Each issue of SageSTEP News highlights a different collaborative project in order to share this the broad range of information with as many people as possible. More information about current collaborative projects and how to submit a proposal can be found at http://www.sagestep.org/collaborative_projects.html.

Mycorrhizae in Sagebrush Restoration: Mycorrhizal Dependency of Invasive and Native Grasses with Intraspecific and Interspecific Competition

Dara Scherpenisse, a master's student at Utah State University, is working with Dr. Gene Schupp to look at the role of mycorrhizal fungi in the establishment of vegetation in sagebrush ecosystems after disturbance.

Dara collects soil from the SageSTEP Onaqui sagebrush/cheatgrass study site.

Seeding is often used in restoration of communities invaded by *Bromus tectorum*, but seeding alone is often not sufficient. If the system is severely disturbed, arbuscular mycorrhizal fungi (AMF) populations may be diminished. AMF may be necessary for many native perennial species to establish and persist, especially in stressful environments. Benefits of AMF include increased nutrient uptake, drought tolerance, and disease resistance. Decreased levels of AMF after fire may negatively affect establishment of desirable perennial species.

Dara is using soil from the SageSTEP Onaqui sagebrush/cheatgrass site as a source of local inocula to be used in a greenhouse study. This study will address how mycorrhizal inoculum may be used in *B. tectorum* disturbed systems and to determine how mycorrhizal inoculum might be used to improve growth and performance of native perennial grasses when competing with *B. tectorum* in the Great Basin.

More information on this project can be found at http://www.sagestep.org/collaborative_projects/mycorrhizae.html.

Are you interested in conducting a study using our plots or data?	We welcome proposals for non-invasive research on aspects of sagebrush ecosystems that are not covered in the SageSTEP proposal. If you are interested, please contact Jim McIver, SageSTEP Project Coordinator (541)562-5396 james.mciver@oregonstate.edu or go to http://www.sagestep.org/collaborative_projects.html

Manager Workshops Report

SageSTEP researchers and cooperating managers in Utah and Nevada gathered this spring and summer for the first annual SageSTEP Manager Workshops. The Utah workshop was help April 24-25 in Salt Lake City and included a field tour of the Onaqui study site. The Nevada workshop was held July 16-17 with a field tour of the Marking Corral site.

Bruce Roundy explains how a weather station works on a field trip with Utah managers at the SageSTEP Onaqui site.

The workshops focused on "Lessons Learned" through the process of planning and implementation of this large multi-agency, multi-discipline project over the past few years. Lessons discussed include things like improving communication between managers and scientists, consideration for indirect impact on things like roads and campsites, and how to address budget issues and complete projects in a timely manner.

Information shared at these workshops will be used as treatments are implemented at additional SageSTEP study sites this fall and as the project progresses. A publication is in the works to make relevant information available to scientists and managers who plan large-scale collaborative research projects in the future.

We plan to hold similar workshops next spring to facilitate further discussion among researchers and managers. Anyone who is interested in attending is welcome. Dates and locations have not yet been determined. Look in our winter newsletter for more information or contact Nora_Devoe@nv.blm.gov.

The Restoring the West Conference is being held again this fall at Utah State University in Logan. This year the conference will focus on sagebrush-steppe ecosystems, why they are declining, and what can and is being done about that decline. This conference will appeal to restoration managers and researchers, including public and private land managers, landowners, and others.

The conference will include a full day (Sept. 18) of invited presentations and a poster session on current work on sagebrush steppe restoration, and a one day field trip (Sept. 19) highlighting current restoration efforts in northern Utah. A half day of optional workshops (Sept. 20) will be held the final day.

Several members of the SageSTEP research team will be presenting as a part of this conference including Steve Knick, Mark Brunson, Dave Pyke, John Tanaka, and Bruce Roundy. For more information about the conference, registration, and details on how to submit a poster abstract, visit http://www.restoringthewest.org.

Upcoming Events

Restoring the West 2007: Sagebrush Steppe Restoration
September 18-20, 2007
Utah State University
Logan, UT
http://www.restoringthewest.org

2007 Society for Ecological Restoration Northwest Chapter and Pacific Northwest Society of Wetland Scientists Joint Conference
September 25-28, 2007
Yakima, WA
http://www.ser.org/sernw/conference_07.asp

SRM Pacific Northwest 2007 Fall Meeting
October 18-20, 2007
Corvallis, OR
http://pnwsrm.org/pnwmeetings.html

Ecological Site Descriptions as a Management Tool: Understanding and improving applications for wildlife habitat management in sagebrush ecosystems
October 23-25, 2007
Park City, UT
http://www.rangelands.org/events_esd.shtml

SRM Utah Section Winter Meeting
November 1-2, 2007
Price, UT

15th Wildland Shrub Symposium
Bozeman, Montana
June 17-19, 2008
http://eu.montana.edu/shrublands

SageSTEP is a collaborative effort among the following agencies and universities:

- Brigham Young University
- Oregon State University
- University of Idaho
- University of Nevada, Reno
- Utah State University
- Bureau of Land Management
- Bureau of Reclamation
- USDA Forest Service
- USDA Agricultural Research Service
- US Geological Survey
- US Fish & Wildlife Service
- The Nature Conservancy

Funded by:

Joint Fire Science Program

For more information and updates, visit our website:

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