SageSTEP News
Sagebrush Steppe Treatment Evaluation Project
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Measuring the Economic Value of Fire and Fire Surrogate Treatments to Maintain Healthy Ecosystems in the Sagebrush Steppe

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SageSTEP research measures how effectively pre-fire treatments prevent landscapes from crossing irreversible thresholds to ecological states characterized by invasive annual weeds and frequent large wildfires. A key measure of the value of a treatment is how much money it saves, or in other words, the sum of the costs averted if the treatment is done compared to the costs that would be incurred by doing nothing. This article describes general approaches and some preliminary results of the SageSTEP economics research to estimate the value of fuels treatments (defined here as methods implemented in the sagebrush steppe to meet management goals). We discuss an example estimating the value of treatment in terms of wildfire suppression costs.

Costs averted: What is a cost?

Transitions from healthy sagebrush to weed-dominated ecological states impose costs on society due to reduced ecosystem productivity and changes in wildfire regimes. These costs include reduced net revenues from livestock production, losses in hunting and other recreational opportunities, losses from reductions in non-game wildlife populations, increases in property and infrastructure losses from severe wildfires, and

SageSTEP economists are answering questions about the cost-effectiveness of fuels treatments versus wildfire suppression.

In this issue:

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increases in wildfire suppression costs. The unit of change used in this research to estimate costs and benefits of treatments is the transition from one ecological state to another. Because our goal is to consistently measure costs that correspond with the biophysical units of ecosystem change that are meaningful to rangeland managers and policy-makers, we standardized our measures of economic value according to State and Transition Theory.

Wildfire suppression costs averted

This example estimates and compares the value of treatments across three ecosystem types: Wyoming sagebrush, mountain big sagebrush, and mountain big sagebrush with pinyon-juniper (p-j) encroachment. Treatment is applied when each ecosystem type is in one of three or four states depending on whether p-j is present: 1) healthy sagebrush, 2) decadent sage with some cheatgrass or p-j encroaching on sagebrush and some cheatgrass, 3) closed p-j with some cheatgrass, and 4) cheatgrass-dominated. To get good estimates of the "costs averted", we use data from a large sample supplied by the USDA Forest Service's Rocky Mountain Research Station of 397 representative "multiday" (that is, relatively large) wildfires that occurred in the Great Basin between 1995 and 2007. We created a regression model using these data, which include information about wildfire suppression costs, the type of vegetation fueling each of the wildfires, wind conditions, proximity to housing, month and year the wildfire occurred, geographic location, altitude and rangeland vegetation (Rollins et al 2010). We matched the wildfire fuel vegetation categories from the data to corresponding states in stylized state and transition models for each of the three ecosystem types and used this information to calculate the contribution of each state to overall wildfire suppression costs.

Next, we used a simulation model to estimate the value of a treatment expressed as wildfire suppression costs avoided. The costs associated with each vegetation type and state are used along with parameters representing average fire size, period of time between wildfires for each state, and probabilities of treatment success to develop estimates of the value of treatments applied to systems that will return each to a healthy sagebrush plant community. Any of the parameters used in the simulation model can be chosen to correspond with a specific region. For demonstration purposes, we use starting values that correspond roughly with conditions that could be found in many areas in the Great Basin.

Results are summarized in Table 1. The first two sets of results are shown for Wyoming sagebrush sites and mountain big sagebrush sites that are in one of three states and the last set of results includes p-j encroachment into mountain big sagebrush sites in one of four states. A successful treatment is defined as a treatment that brings the area back to the "healthy sagebrush" state. We assume that the probability of treatment success

Table 1: Present-valued per-acre wildfire suppression costs averted

Ecosystem state	Healthy sagebrush	Decadent sage with cheatgrass	Cheatgrass-dominated
Lower elevation: Wyoming sagebrush (<6,500 ft)			
Fire suppression cost savings (per acre)	$29,610	$-22,180	$230
95% CI	$17,730–$41,500	$-19,850–$-24,520	$110–$350
Higher elevation: Mountain big sagebrush without p-j encroachment (>4,700 ft)			
Fire suppression cost savings (per acre)	$5,850	$71,160	$360
95% CI	$3,930–$7,770	$40,460–$101,860	$20–$710

Higher elevation: Mountain big sagebrush with p-j encroachment (>4,700 ft)				
Ecosystem state	**Healthy sagebrush**	**P-j, sagebrush and cheatgrass**	**Closed p-j with cheatgrass**	**Cheatgrass-dominated**
Fire suppression cost savings (per acre)	$990	$32,3170	$14,690	$80
95% CI	$600–$1,390	$19,170–$45,460	$490–$24,480	$4–$165

is less than 100% in all states, but the assumed success rates are higher for healthier states and close to 0% in cheatgrass-dominated states. Treatment is assumed to be repeated each time the area returns to the starting state. So treatment applied in Wyoming sagebrush with a starting state as "decadent sage with cheatgrass" recurs after the number of years that it takes for the area to again be "decadent sage with cheatgrass". The fire suppression cost savings reported here are per-acre savings over 200 years of treatment.

Overall, our results strongly indicate that prevention is economically superior to attempted rehabilitation from a cheatgrass-dominated state. This is in contrast to observed practice where post-fire restoration appears to take priority over pre-fire prevention.

The model suggests that treatments applied to a lower elevation Wyoming sagebrush site after it reaches the state "decadent sage with cheatgrass" would not result in any savings, but rather, in net costs of over $22,000 per acre. On the other hand, applying treatment to prevent movement from the "healthy sagebrush" state averts over $29,000 per acre in wildfire suppression costs. For mountain big sagebrush sites with and without p-j encroachment, the model predicts substantial costs averted from treatment in all states. The greatest returns are to be had by treating areas without p-j encroachment that are characterized by "decadent sage with some cheatgrass", and which have not transitioned over a threshold where fire would result in cheatgrass domination. For sites with p-j encroachment, the greatest gains from treatment occur when some p-j has encroached, but before a closed canopy forms. Thus the model concurs through economic analysis with recommendations by Miller et al. (2005) based on ecological research to treat pinyon and juniper woodlands when they are Phase 1 or Phase 2 condition rather than when they have progressed to Phase 3.

All three models show some gains from treatment in cheatgrass-dominated areas. This occurs even though the probability of treatment success is assumed to be very small on these sites. The reason for the gain is that the data are driven by actual wildfire suppression expenditures, which are highest in the cases where trees and long burning fuels are present. However, in the case of cheatgrass-fueled wildfires, while expenditures may be lower, these fires occur more often once the state is achieved, so the benefits of treatment are a function of the short fire return intervals. Thus even though the probability of success is extremely low, the cost of wildfire suppression is high enough due to frequency of fire that the expected value of treatment is positive.

Overall, our results strongly indicate that prevention is economically superior to attempted rehabilitation from a cheatgrass-dominated state. This is in contrast to observed practice where post-fire restoration appears to take priority over pre-fire prevention. Additionally, it is important to note that the results of this model ONLY tell us the costs of fire suppression that have been avoided and do not take into account other potential benefits of fuels treatments such as reduced smoke and improved air quality by avoiding intense wildfires, reduced property damage, maintaining livestock productivity, and the value of other biological goods and services provided by these systems. Given that the productivity of these systems is generally much lower with each transition to a less healthy state, the magnitude of total costs averted is likely to increase with each transition, and total costs averted by treatments are likely to be higher than reported here. These general results do not imply that it would never be economically beneficial to rehabilitate cheatgrass-dominated sites; however, such treatments may be strategically applied to sites located near sensitive habitats or where fire suppression costs may be especially great near residential developments, or in other situations.

This is just one example of how the SageSTEP economics research can assist land managers in making decisions about the cost-effectiveness of fuels treatments. For further information about this research, contact Dr. Kim Rollins at krollins@cabnr.unr.edu. A PowerPoint presentation with audio on this same topic can be found on our website at http://www.sagestep.org/events/ut_workshop_10/Rollins_CostsAverted/Rollins_CostsAverted.html. The second publication below, as well as other related publications will be available on our website at http://www.sagestep.org/pubs/pub_list.html.

References

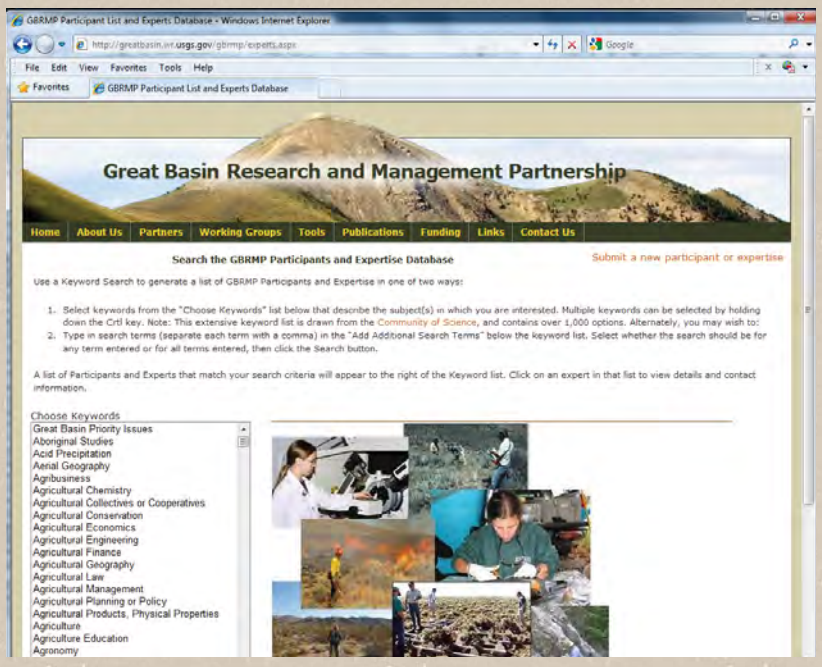
Miller, R.F., J.D. Bates, T.J. Svejcar, F.B. Pierson, and L.E. Eddleman. 2005. Biology, Ecology, and Management of Western Juniper. Oregon State University, Agricultural Experiment Station Technical Bulletin 152.

Rollins, K. M. Kobayashi and M. Landis. 2010. Invasive Annual Weeds and Wildfire Suppression Costs in Great Basin. Working paper, Department of Resource Economics, University of Nevada, Reno.

Great Basin Science Delivery Project Underway

The Joint Fire Science Program recently funded an implementation project for Great Basin Science Delivery. This project aims to improve the distribution and application of technical information on public lands in the Great Basin. During the planning phase of this project in the fall of 2009, land managers from the Bureau of Land Management, USDA Forest Service, National Park Service and US Fish and Wildlife Service were interviewed in focus groups to assess science information needs and desired delivery modes.

One of the primary science delivery needs mentioned in almost every focus group was a web-based clearinghouse of easily accessible information. The Science Delivery Project is collaborating with staff from the US Geological Survey's Snake River Field Station and the Great Basin Research and Management Partnership (GBRMP) on this endeavor: http://greatbasin.wr.usgs.gov/gbrmp/. The website delivers several novel coordination management tools including a regional Metadata Server, a Science Locator project-based collaboration tool, a semantic Consortia Database and search tool, a Publications database, and a user-friendly Participants and Expertise Database. The expertise database is currently being populated, so please visit the website and add your information.



The Expertise Database on the GBRMP website is a tool that facilitates collaboration by providing a mechanism for groups and individuals to locate and contact experts in various fields.

In the Expertise Database, users engage the Great Basin science and management community on a personal level. The purpose of this database includes obtaining technical expertise and sharing information concerning project and funding opportunities within different organizations. By enrolling in the Expertise Database, you are notifying your peers of your interests and availability as well as supporting access to scientific information in the Great Basin. The effectiveness of such a partnership depends on active participation of its members. To join or to search the database, visit http://greatbasin.wr.usgs.gov/gbrmp/experts.aspx. We welcome your participation!

Additional tools for sharing scientific information will be developed as the project progresses. Questions about the Great Basin Science Delivery Project should be directed to the project coordinator, Genie Montblanc, emb@cabnr.unr.edu.

2010 Land Manager Workshop Information Online

Field tour participants learn the history of woodland encroachment at a local campground.

Thanks to everyone who participated in the SageSTEP Learning Together land manager workshop last month in Tooele and the West Desert, Utah. We had a great turn out for both the indoor session and the field trip. If you were unable to attend but would like to learn more about what researchers and managers discussed at the workshop, visit the workshop webpage: http://www.sagestep.org/events/ut_wkshp_2010.html. There you will find links to PowerPoint presentations with audio, handouts summarizing research findings, handouts used on the field tour by researcher Robin Tausch, and other useful information for those who work in the sagebrush steppe and pinyon-juniper woodlands of the Great Basin. Thanks to everyone who helped make the meeting a success!

Guide to Stakeholder Groups in the Great Basin Now Available

There are many organizations in the Great Basin with an interest in how the sagebrush rangelands of the region are managed. A new SageSTEP publication and online resource, *Guide to Stakeholder Groups for Great Basin Sagebrush Steppe Restoration*, provides information about stakeholder groups to assist managers as they deal with issues facing these systems. The field guide was created for land managers to consult as they plan and carry out projects, particularly on public land where groups often have conflicting interests. When properly informed, stakeholders can become important partners in working toward restoration and management goals. Conversely, they can hinder the progress of management projects when they feel that their perspectives and needs are not being considered. As land managers work to incorporate the priorities of stakeholders into restoration plans, they may begin to avoid conflicts or be better prepared to address conflicts when they arise.

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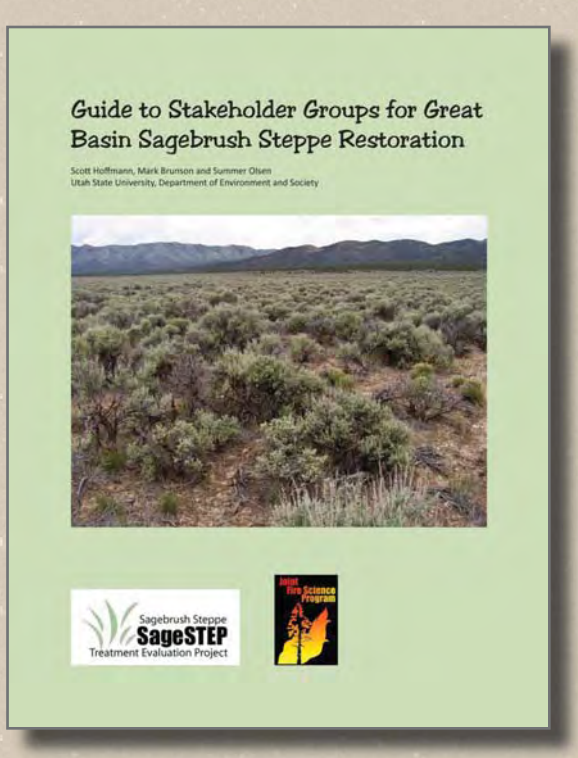
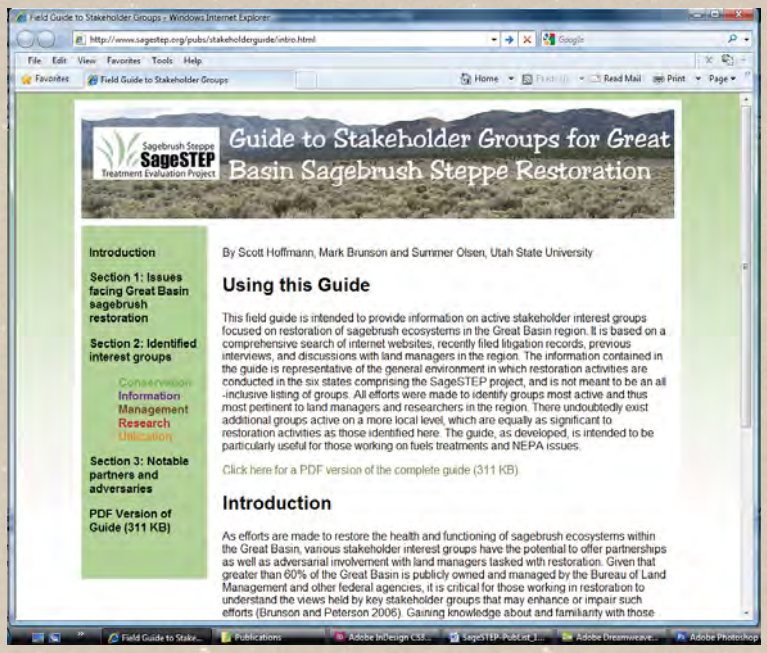




The Field Guide to Stakeholder Groups is available online and as a printable PDF document.

This guide identifies and categorizes stakeholder groups into five color-coded categories: Conservation, Information, Management, Research and Utilization. Section 2 of the field guide lists identified groups, the category(ies) they fall in, the group's mission statement, a URL where more information can be obtained, and the geographical focus area of their activities. Section 3 of the guide, entitled *Notable partners and adversaries*, provides information about improving relationships with stakeholder groups as well as a list of groups that have filed litigation within the past five years.

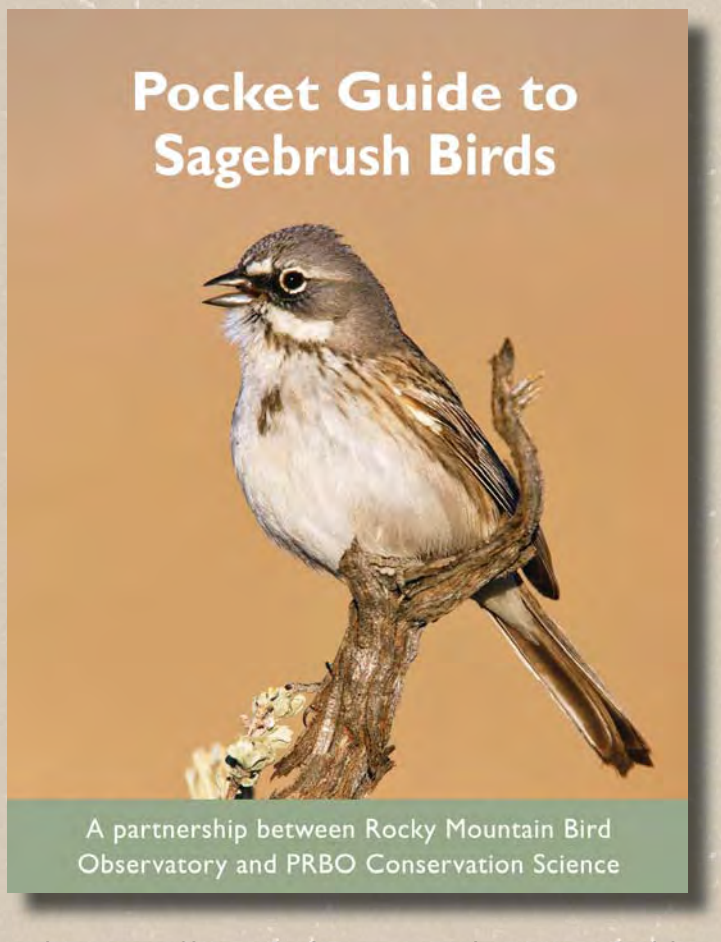
The Field Guide to Stakeholder Groups is available through the SageSTEP website at http://www.sagestep.org/pubs/stakeholderguide/intro.html. There is an online version as well as a link to a printable PDF version of the guide.

Pocket Guide to Sagebrush Birds Encourages Land Managers to Consider Avian Needs

Sagebrush is one of the largest yet under-appreciated habitats in North America. Although a symbol of the American West, to many the sagebrush landscape is perceived as a vast wasteland. Once an expansive 63 million ha (156 million ac), only a small fraction remains. Continuing threats include energy development, urban sprawl, over-grazing, exotic species invasion, drought and uncharacteristic wildfire. These have resulted in the sagebrush ecosystem being ranked as 3rd among the top 20 most threatened bird habitats in the U.S. by American Bird Conservancy.

Sagebrush habitats are home to unique avian species including Sage-Grouse, Brewer's Sparrow, Sharp-tailed Grouse, Sage Sparrow and Sage Thrasher. Degradation of sagebrush is causing population declines for many of these species making them high priorities for conservation. Birds are sensitive to habitat change and are considered indicators of the ecosystem health. Raising awareness for these birds will be a critical step in conserving this important habitat and the wildlife that depend on it.

Rocky Mountain Bird Observatory and PRBO Conservation Science are working cooperatively to develop the *Pocket Guide to Sagebrush Birds*. This guide is designed to fit in a shirt pocket for accessibility in the field. It will emphasize 40 bird species that utilize sagebrush habitats and will include tips on species identification, biology, and conservation status. Because not all of these species require similar habitat types and not all sagebrush is managed for the same goals, this guide will discuss how avian needs can be incorporated into land management plans. It will be a tool for raising awareness with landowners and resource professionals and help open doors for voluntary efforts and conservation partnerships throughout the West.



Funding is being provided by multiple partners including the U.S. Fish and Wildlife Service, Natural Resources Conservation Service, Intermountain West Joint Venture, Bureau of Land Management, SageSTEP, Wyoming Game & Fish Department, Boy Scouts of America, and many more. The *Pocket Guide to Sagebrush Birds* is expected to be ready for distribution by mid-June 2010. If you are interested in obtaining copies of the guide or providing funding for additional printing, contact Laura Quattrini at 970-482-1707 x10 or laura.quattrini@rmbo.org.

Upcoming Events

Eastern Nevada Landscape Coalition 11th Annual Meeting
June 10-11, 2010
Ely, Nevada
http://www.envlc.org/calendar.html

95th Annual Ecological Society of America Meeting
Restoration of Disturbed Sagebrush Steppe, Symposium
September 8-9, 2010
Fort Collins, Colorado
http://warnercnr.colostate.edu/REL-Piceance-Conference/

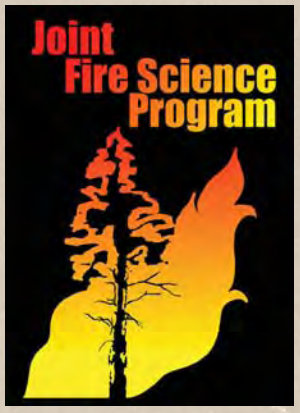
Global Warming: The legacy of our past, the challenge for our future
August 1-6, 2010
Pittsburgh, Pennsylvania
http://www.esa.org/pittsburgh/

Restoring the West Conference 2010
Managing Plant and Animal Conflicts in the Intermountain West
October 26-27, 2010
Logan, Utah
http://www.restoringthewest.org

SageSTEP is a collaborative effort among the following organizations:

- 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:



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