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What SageSTEP Can Do for You

The SageSTEP team is now in our eighth year of conducting research on sagebrush rangelands in the Great Basin. Over the years we have been fortunate to interact with a number of highly skilled individuals, including many of you who subscribe to our newsletter. While most research projects are lucky to enjoy as much as 4 years of funding, we are pleased and grateful to continue to receive financial support from some of the organizations benefiting from our research. Our long-term presence and our focus on outreach have made SageSTEP a familiar name among many of you working on sagebrush rangelands and juniper woodlands. Still, some of you may wonder what exactly we are still doing after all these years and, more importantly, why it should matter to you.

In short, our goal is to provide high-quality research information to help you make land management decisions. We know that there are countless factors to consider when you are trying to maintain healthy and productive landscapes while also planning for different types of resource uses. Whether you want to reduce wildfire threats, increase

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For questions, comments, or to subscribe to this newsletter contact summer.c.olsen@usu.edu.



An important part of SageSTEP is sharing research results with people who make land management decisions. Our outreach program uses a variety of methods such as conducting field tours like the one pictured above held in southeastern Idaho in June of this year. At one stop on the tour we discussed the effects of spraying the pre-emergent herbicide imazapic, which has shown to be effective even five years after spraying (sprayed subplot surrounded by invasive species in the image on the right).

native grass and forb production, provide wildlife habitat, or manage for other uses, we are striving to provide information that will help you better understand these landscapes and the impacts management actions can have on them.

How do we produce information that managers can use?

We all know that scientists can entertain themselves for hours on end with the tiniest details about what an ant eats or how many seeds a plant produces. Fortunately for those of you working on the ground, limited time and funding help us focus our energy on a specific set of questions, and the questions SageSTEP seeks to answer have developed with input from individuals like you who work in the field. In 2006, we started collecting vegetation and fuels data at all 21 of our research sites. We were able to continue this intensive data collection for 2–4 years post-treatment at all of our sites, depending on the year treatments were implemented. This was necessary to get a complete picture of what was happening at the sites prior to implementation of fuel reduction treatments, and to document the rapid changes immediately following treatment.

Collaborators at universities and government agencies in all of the Great Basin states are working together to analyze the field data and produce results that are scientifically sound. We are using these results to answer the management questions established at the onset of the project. Our outreach program has been an integral part of SageSTEP since day one and is designed to share this information with those working on the ground in formats requested by land managers.

How do we share research information with those who could benefit from it?

Throughout the course of the project, our scientists have shared unpublished data in formal and informal settings so that practitioners would have the most up-to-date research information for management decisions that couldn't wait for official scientific publications. We often share results as they first emerge in our newsletter, and all of our outreach products are available free of charge via our website www.sagestep.org. One of our most popular venues

for information sharing has been our manager workshops, where scientists and managers can share ideas and information on the ground. As the scientific process has taken its course, supporting publications have and continue to be published in scientific journals and can be cited in management documents. For more information about specific products, visit the "Publications and Research Products" section of our website (<http://sagestep.org/publications.html>).

Through our outreach program, we strive to get our information out to the broadest audience possible. We work in partnership with other organizations like the Great Basin Science Delivery Project, the Joint Fire Science Program and our agency partner offices to spread the word about the availability of information and importance of science in management decisions. We hope that those of you making decisions about land management will find the science you need to apply to the landscapes within which you work.

Several years have passed since we implemented our fuel treatments and the most conspicuous responses to treatment have now taken place. But treated sites continue to change and many questions can only be answered by continued observation over time.

Where do we go from here?

Now that several years have passed since we implemented our fuel treatments, the most conspicuous responses to treatment have now taken place. But treated sites continue to change in their response to treatment, albeit at a slower rate. Thus we continue to observe the longer-term responses to fuel treatments as well as responses to unexpected wildfires that have passed through some of our sites in both treated and untreated areas. So we are asking questions such as: Does cheatgrass

that invaded after prescribed burning become less dominant as the years go by? If so, what were the pre-fire conditions that led to this result? Is herbicide spraying after disturbance worth the cost? Do the fuel reduction benefits of juniper removal persist over time? What are the impacts of change on wildlife populations over time, not just the individuals affected by a particular event? These, and many more, are questions that can only be answered by continued observation over time.

The slower rate of change has prompted us to reduce our data collection to seven sites per year on a rotating basis so that each site will now be monitored every three years. Our outreach program continues to offer products and events to spread the word about what we are learning. We recently held two field days highlighting different aspects of our research and their application to other areas. We encourage anyone who is interested to participate in these events as time goes by, to share our increased understanding of how restoration treatments play out in the long run. Currently, we are preparing articles for a special issue of

Rangeland Ecology and Management due to come out in 2013, which will provide citable results from the first 2–4 years after treatment implementation, for many of the variables we've been measuring. In addition, we continue to welcome suggestions of outreach products you would like to have access to.

In addition to what we can do for you, we'd like you to know what you can do for us. In a nutshell: **spread the word**. We know there are many individuals out there who could benefit from the information produced by this project and others like it. The mobility of employees at government land management agencies creates an endless stream of new individuals to reach out to, and we know that many of these people will want to have access to our information as we move forward. At present, we have plans to continue monitoring through 2015, which would give us between 7 and 9 years post-treatment response information. As this horizon approaches, we will be able to assess the extent to which these systems continue to change, and thus determine if there is a need to monitor even further into the future.

2012 Field Day Information Now Available Online

If you were unable to attend the SageSTEP field days in California and Idaho you can view photos, notes and handouts from the tours on our website. Learn more about what was discussed and view images of post-treatment landscapes. Click on the links below to view the webpages.

2012 Sagebrush & Fire Field Day
June 7, 2012
Idaho Falls, Idaho
<http://sagestep.org/events/2012-ID-field-day.html>

Woodlands, Sagebrush & Fuels Treatments Field Day
May 30, 2012
Northeastern California
<http://sagestep.org/events/2012-CA-field-day.html>



SageSTEP Butterfly Communities: A Story of Variation in Space and Time

Jim McIver, Ecologist and SageSTEP Project Coordinator

Back in the fall of 2010 (Newsletter Issue 13), I presented some preliminary information on what we had seen in the butterfly world in the first few years of SageSTEP. As I noted in that article, butterflies are excellent organisms to use as indicators of environmental change, because they are conspicuous, easy to identify, and functionally linked to native host plants that we want to preserve. Furthermore, as insects go, butterflies are popular – nobody wants to support management practices that result in serious declines in butterfly populations. I expected that analysis of butterfly response to treatment would therefore be straightforward. What I did not expect is that butterfly communities would be so variable in both space and time that the simple analyses I had planned would not be possible. In this article, I'd like to describe this variation, and discuss how I've had to tweak the analyses to accommodate it.



The juniper hairstreak (*Collophrys gryneus*) is common at most woodland sites—but not all.

As noted in Issue 13, we continue to observe that butterfly communities are strikingly different depending on the site we visit, *independent of treatment*. Some sites are dominated by hairstreaks, some by blues, and some by ringlets. For example, average butterfly counts taken over the years in control plots at the four western juniper sites clearly illustrate this among-site variation (Figure 1). Note the domination of ringlets at Devine and Walker, the co-dominance of ringlets and hairstreaks at Bridge Creek, and the fairly balanced abundance of several species groups at Blue Mountain. Now imagine that we want to use these counts to test for treatment effects.

For most of the species groups we might choose to analyze, the variance among sites within the western juniper region, *independent of treatment*, is very large—so large that it makes it very difficult to pick up a meaningful signal of positive or negative treatment response. The among-site variation 'swamps out' other patterns, including those related to treatment type. So the tactic I've used to counter this problem is to classify sites based on their dominant species groups, and then use as replicates only those sites that have sufficient representation of the chosen species group.

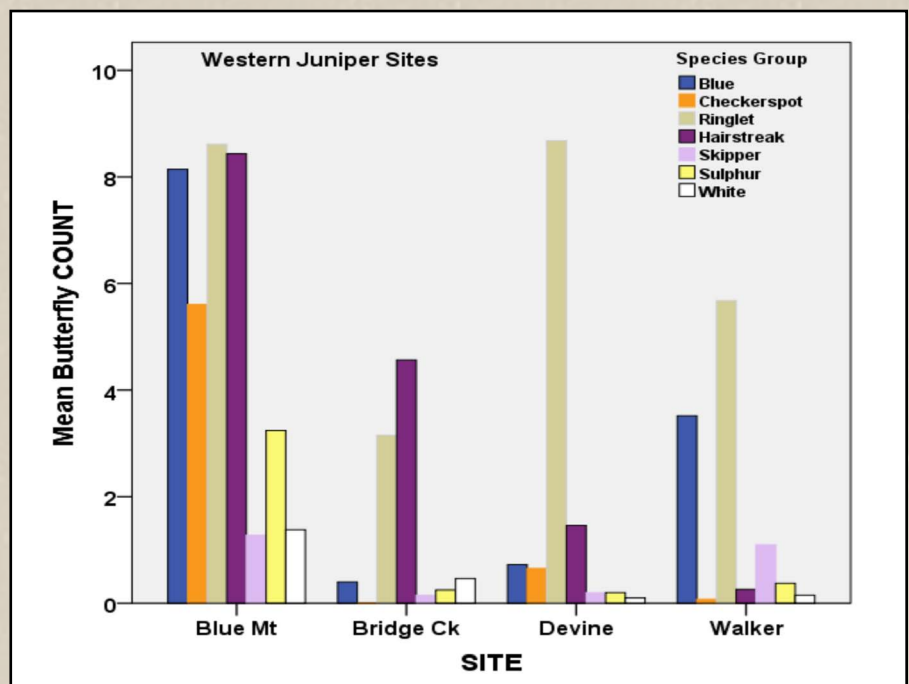


Figure 1. Average butterfly counts in control plots at western juniper study sites illustrate the among-site variation in species. This natural variation makes it difficult to tease out the effects of fuels treatments on butterflies.

In Figure 1, only ringlets occur in sufficient abundance at all sites to analyze for treatment effect. Hairstreaks on the other hand, occur in sufficient numbers to be analyzed at Blue Mt. and Bridge Creek, as well as at the pinyon-juniper sites Marking Corral and South Ruby. Similarly, Blues can only be analyzed at Blue Mt. and Walker, as well as the Utah juniper-pinyon site Onaqui.

An additional source of variation in butterfly numbers can be seen when we look at survey data taken over several years of time. To illustrate this Figure 2 shows the butterfly counts observed within plots at the Blue Mt. site between 2006 (pre-treatment) and 2012 (5 years post-treatment). First, look at the control plot (top panel), which experienced no juniper removal treatment. You can see that no two years are alike, each year having a unique assemblage of species groups, and strikingly different counts. Two survey years (2008, post-treatment year 1; and 2012, post-treatment year 5) had relatively low counts, represented by just three species groups each, with the group identities completely different for each year. Contrast this with Years 3 and

4 (2010 and 2011), which had much higher counts, represented by six species groups each. With this kind of variation observed in the untreated control plot, it makes it quite difficult to use the pre-treatment year as the 'baseline', or starting point in any kind of analysis. When I tried to use my original notion of analysis on these data (repeated measures), I encountered so much inter-annual variation in the control that it swamped out any other pattern in the data. To deal with this problem, my only recourse was to drop the pre-treatment data, and then aggregate all post-treatment data into one 'sample'. I reasoned that while this tactic made for a rather blunt analysis method, I would still be able to pluck out treatment effects of large enough magnitude, in order to identify meaningful 'unintended consequences' of treatment.

With these analysis caveats in mind, how have butterflies responded to SageSTEP treatments?

So far, most treatments have been associated with increases in butterfly numbers and/or richness, with two exceptions: a decrease in Juniper hairstreak numbers after removal of their larval host plants (juniper) in the woodland experiment, and a decrease in white butterflies after treatment with the broadleaf herbicide Spike in the sage-cheat experiment.

Let's start by having a look at the positive effects. First, at woodland sites, we have observed increases in both blue and sulphur butterflies in plots treated by either fire or mechanical means. There are at least two possible mechanisms for the observed treatment-induced increases in blue and sulphur butterflies. It is possible that treatments enhanced the survival of either butterfly eggs or larvae, thus resulting in larger adult populations.

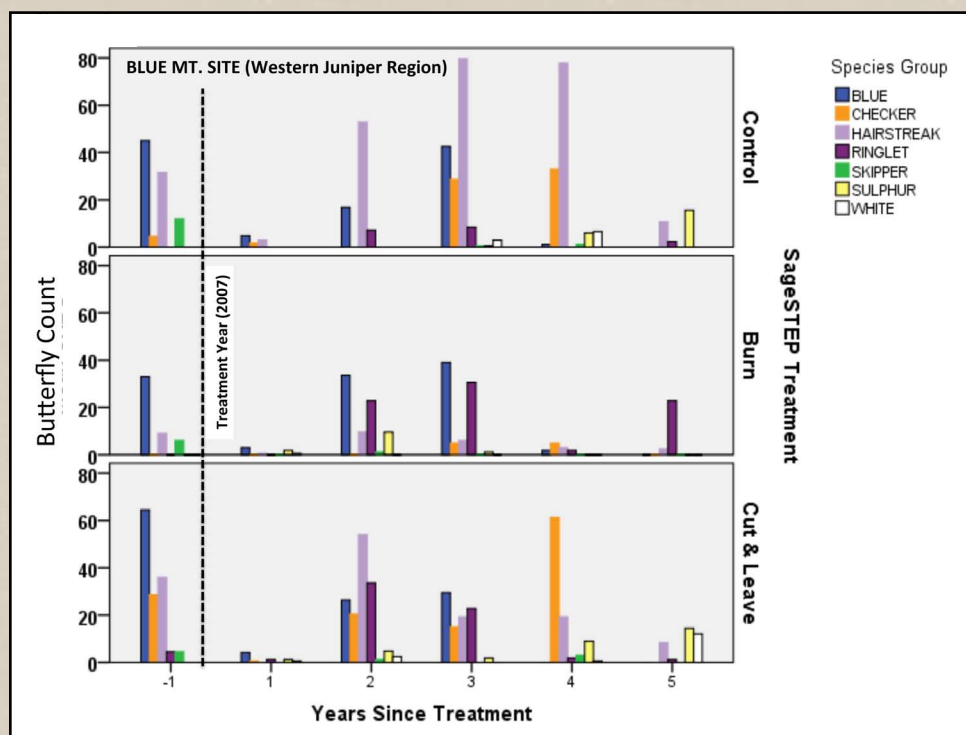


Figure 2. Number of butterflies observed within different treatment plots at the Blue Mountain western Juniper site in northeastern California. The x-axis shows years since treatment with -1 representing the 2006 pre-treatment year and 5 as 2012, which was 5 years post-treatment. The control plot shows great variation even though no management action was taken. These unexpected results changed the way we are looking at the data in order to better understand treatment effects.



The Melissa Blue (*Lycaeides melissa*) is uncommon, seen only at some woodland sites.

On the other hand, it is possible that treatments enhanced forb nectar production, by removing trees and shrubs that compete with forbs for water. This would have the effect of creating nectar 'bulls-eyes', which might attract butterflies to treated plots from a distance. The first mechanism is a more likely explanation for the response of blues, because these small butterflies tend to be fairly sedentary as adults, typically not straying too far from the host plants on which they developed as larvae. For sulphurs however, which are strong fliers, it is more likely that the treated plots served as 'bulls-eyes', pulling in individuals from the surrounding landscape. In any case, it will be very interesting to see if these effects persist for the long-term – so far, enhanced numbers of both blues and sulphurs have been observed for up to four years after treatment.

Second, at sagebrush-cheatgrass sites, burning caused significant increases in the number of butterfly species observed at nearly all sites, and this effect has persisted for four years post-treatment. Because this effect involves the addition of species in the year immediately following the treatment, the more likely mechanism is the bulls-eye effect. This is because it is hard to imagine how a treatment applied the autumn after eggs were laid, could result in additional new species developing within the plots. Certainly, if a treatment were to result in the colonization of a new host plant species within a plot, a

concomitant effect on butterflies might be eventually observed, if that plant species were critical for hosting a new butterfly species. But such an effect would not be observed as an increase in butterfly richness until at least the second field season after treatment.

As far as 'negative' effects go, we've now made the predictable observation that Juniper hairstreaks tend to decrease in numbers when their larval host plant (juniper) is removed. This effect is not absolute however, as Juniper Hairstreaks continue to be observed during most surveys in woodland plots, regardless of whether or not the plot has any living juniper trees. This is likely because these hairstreaks are active enough to fly occasionally from one plot to another. The only negative effect we've observed so far that may be classified as an 'unintended consequence', is the observation that most lower elevation sagebrush-cheatgrass plots treated with the broadleaf herbicide 'Spike', tend to have fewer white butterflies, compared to adjacent plots. This effect has been observed at most sites, and has persisted for at least four years after treatment. The mechanism for this effect is unknown as yet—once again, we need further monitoring over several years to determine whether this effect persists for the long run.

To conclude, butterfly work so far has demonstrated the substantial among-site variation in butterfly communities across the SageSTEP Network, as well as considerable inter-annual variation in numbers over the years. With a few exceptions, sagebrush steppe restoration treatments appear to cause subtle and transient effects on butterfly communities. So far, most treatments have been observed to increase butterfly numbers or species richness, with the exception of species that utilize target species as host plants (Juniper hairstreaks), or those species (whites) that are sensitive to as yet unknown effects of broadleaf herbicides. In short, there are few unintended consequences of the more widely used sagebrush steppe fire and fire surrogate treatments.

For more information about this research, contact James.McIver@oregonstate.edu.

Upcoming Events

Restoring the West Conference 2012 Balancing Energy Development and Biodiversity

October 30-31, 2012

Logan, Utah

<http://www.restoringthewest.org/>

Association for Fire Ecology Fire Ecology and Management Congress Uniting Research, Education and Management

December 3-7, 2012

Portland, Oregon

<http://afefirecongress.org/>



SageSTEP is a collaborative effort among the following organizations:

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

Funded by:



For more information visit our website:

www.sagestep.org

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