12-2019

SageSTEP News, Fall 2019, No. 35

SageSTEP

Sagebrush Steppe
SageSTEP
Treatment Evaluation Project

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Issue 35, Fall 2019

Introducing the Fuels Guide for Sagebrush and Pinyon-Juniper Reduction Treatments: 10 years post-treatment

By Sam Wozniak, Soil Conservationist, USDA-NRCS

The *Fuels Guide for Sagebrush and Pinyon-Juniper Reduction Treatments: 10 years post-treatment*, is now available for download on the SageSTEP and Bureau Land Management Technical Note Publications websites (fig. 1).

This guide is intended to help land managers better understand the variability in long-term responses of fuel loads and vegetation to woody-plant reduction treatments in the Intermountain West. It pairs photographs of sagebrush and pinyon-juniper treatments with fuel loading and plant height, cover, and density data (fig. 2).

The guide is split into sagebrush and pinyon-juniper sections, and further subdivided by region, woodland development phase or sagebrush groups, and treatment type. The sagebrush section includes the following treatments: mowing, herbicide application (tebuthiuron), prescribed fire, and an untreated control. The pinyon-juniper section includes cutting, prescribed fire, and an untreated control for each region, and an additional mastication treatment for the Utah Juniper region.

There are few resources for land managers that depict the long-term responses to fuels treatments in the Intermountain West, making this guide unique. Fuel beds change substantially from the early years after treatment to ten years down the road; shrub and herbaceous fuels recover, while duff, tree litter, and fine down woody debris decompose. Fire behavior specialists and fuels managers can use the fuels guide to quickly estimate fuel loads in the field, and use the data in fire behavior modeling and fuels treatment planning. Although hard copies are not currently available, the guide can be used on a tablet in the field, or a subsection can be printed.

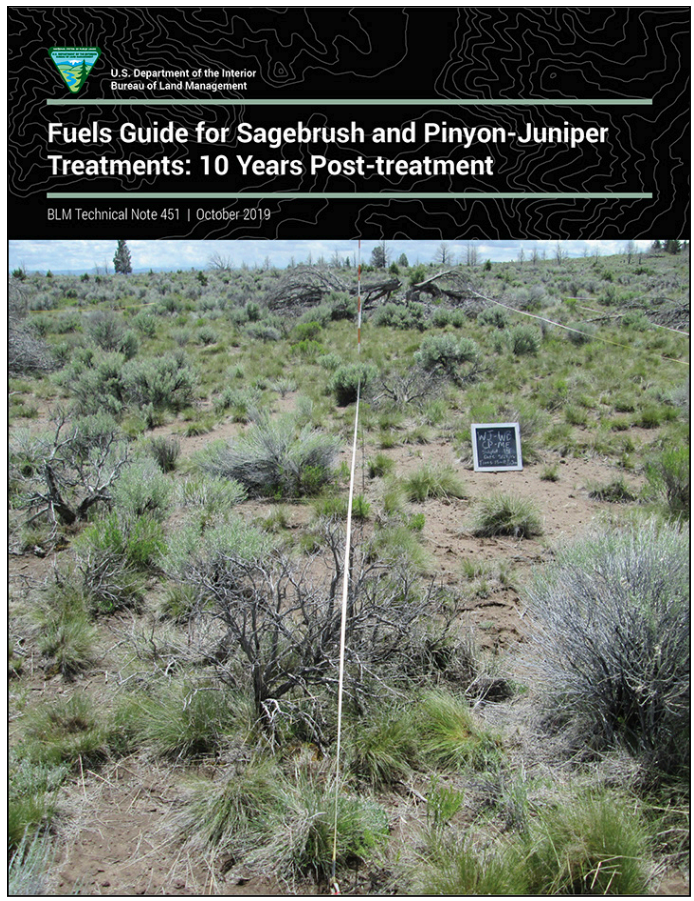
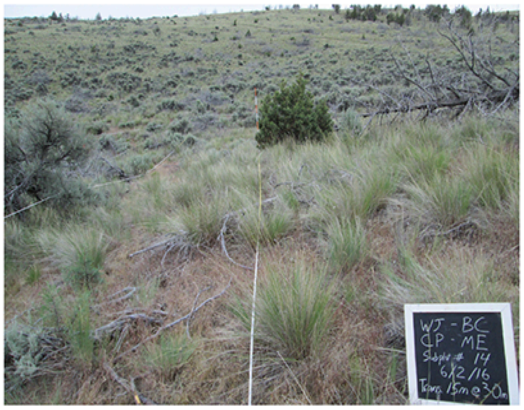


Figure 1. This newly published field guide was designed to help land managers better understand variability in the long-term responses of fuel loads and reduction treatments. The document is split into sagebrush and pinyon-juniper sections, and subdivided by region, phase, and treatment type. See the next page for an example of the guide's layout.

The photographs in the guide provide a wealth of information, and could be used by students or new land managers for a better understanding of long-term vegetation recovery after a disturbance.

Western Juniper: Cutting, Phase 3

Bridge Creek	
865 m | 2838 ft	
6/2/2016	
Cover (%)	
Trees	1
Shrubs	10
Perennial Grass	48
Annual Grass	44
Bare Ground	2



Walker Butte	
1419 m | 4656 ft	
5/20/2016	
Cover (%)	
Trees	3
Shrubs	12
Perennial Grass	33
Annual Grass	0
Bare Ground	26

Western Juniper: Cutting, Phase 3

Variable	Category	Component	10th	Mean	90th
Total Cover (%)	Tree	JUOC	<1	1	2
	Shrub	Total	3	14	37
	Herbaceous	Perennial Grass	34	49	61
		Annual Grass	11	24	42
		Forb	4	11	17
	Litter & Duff	Interspace Litter	2	6	11
	Bare Ground	Bare Ground	<1	6	14
Density (#/acre)	Tree	JUOC < 1.6 ft tall	2	82	173
		JUOC > 1.6 ft tall	5	77	127
	Shrub	Total	357	2246	4600
Height (ft)	Tree	JUOC	2	3	6
		JUOC Canopy Base	0	<1	<1
Height (in)	Shrub	Total	10	26	39
	Herbaceous	Grass	9	11	14
		Forb	3	7	9
Fuel Loading (tons/acre)	Tree	JUOC	<0.01	0.23	0.42
	Shrub	Total	0	0.50	1.47
	Herbaceous	Live	0.13	0.25	0.31
		Dead	0.05	0.14	0.23
	Down Woody Debris	10-hr	1.06	2.06	3.62
		100-hr	1.79	3.35	5.27
		1000-hr sound	6.01	12.75	23.71
		1000-hr rotten		0	
	Litter & Duff	Interspace Litter	0.08	0.19	0.35
		Tree Litter + Duff	<0.01	0.75	1.39
Bulk Density (lbs/ft^3)	Tree	JUOC Canopy	<0.0001	0.0011	0.0017
	Shrub	Total	0	0.0054	0.0171
	Herbaceous	Live + Dead	0.0144	0.0255	0.0349

Figure 2. This example layout includes cutting treatment in Phase 3 in the western juniper region. In the photographs, notice that cut tree skeletons are still intact, and that the shrubs and grasses have largely recovered. Left of the photographs is cover data by plant functional group describing the plot in the photograph.
The right side of the layout summarizes data (for all cutting plots in the Phase 3 development of the western juniper region) including: cover by functional group, tree and shrub density, height by functional group, fuel loads, and bulk density. The mean, 10th percentile, and 90th percentile are displayed to show the range in variability of the data.

A closer look: Biological soil crusts as restoration targets in sagebrush steppe and woodland communities

By Lea Condon, Disturbance Ecologist,
USGS Forest & Rangeland Ecosystem Science Center

Across the globe, biological soil crusts – commonly called biocrusts – aid ecosystem functions like nutrient and hydrologic cycling, soil stabilization and the maintenance of albedo (the amount of light reflected by the earth's surface). Biocrusts are a mostly photoautotrophic (creates its own food) soil surface community composed of moss, lichen, cyanobacteria, algae, and fungi (fig. 1). Biocrusts occur in all plant communities across arid and semi-arid ecosystems in the western U.S.

Across the sagebrush steppe of the Great Basin, biocrusts help to increase the ecosystem's resistance to invasive species, especially in the presence of fire and grazing. Mosses, lichens, and perennial grasses are associated with reduced cover of cheatgrass (*Bromus tectorum* L.). Similarly, when looking at both vascular plants and morphological groups of biocrusts along disturbance gradients of fire severity, grazing intensity and invasion by cheatgrass, perennial grasses increase in cover with low to moderate levels of fire severity and grazing intensity. However, morphological groups of biocrusts are abundant along different portions of these disturbance gradients. Some mosses are lost following fire, but are more tolerant of grazing. Losses to the cover of tall mosses (mosses over 1 cm tall) – such as *Syntrichia ruralis* (Hedw.), F. Weber and D. Mohr – appear to foreshadow the loss of perennial grasses. Lichens are generally sensitive to grazing, but are somewhat tolerant of fire.

There is a growing body of research on active restoration of biocrusts. Dryland mosses have been restored with regular increases in cover of 30 percent a year, and the same methods have been successful in the semi-arid intermountain grasslands of western Montana and the Colorado Plateau. However, successes with the lichen component have been limited to ruderal groups – species that are first to colonize after disturbance such as *Cladonia* sp., or material that has been lifted from one place and laid down on top of the soil surface in another (also known as salvage efforts). Many ruderal species and groups are present with disturbance or quickly recover following the cessation of disturbance. In these cases, it is not clear if active restoration is necessary or beneficial to ecosystem processes.

Figure 1. *An example of biological crusts from the Great Basin, U.S.A.*

The levels of restoration success are dependent on the restoration goal. SageSTEP addresses many common restoration goals across the region, such as recovery of native vegetation, hydrologic function and sagebrush obligate birds. SageSTEP has previously included the response of biocrusts – as a single entity (moss + lichen), to fuel reduction treatments within the sagebrush-cheatgrass and woodland sites, and separately as mosses, lichens and cyanobacteria on the Onaqui woodland site for responses to prescribed fire. The first three years of data from across the woodland sites indicate that mowing treatments are not as detrimental to biocrusts, (moss + lichen), compared with prescribed fire (fig. 2). However, sites level difference indicate that not only did cover of biocrusts vary by site prior to treatment, but the post-treatment responses varied as well (fig. 3). For example, compare the crust response at Bridge Creek v. Onaqui, through three years of time – while both fire and mechanical treatments caused a decrease in crust at Onaqui, only fire had that effect at Bridge Creek. And at Scipio crusts declined in all plots through time. Further work is needed to understand these kinds of site-level differences.

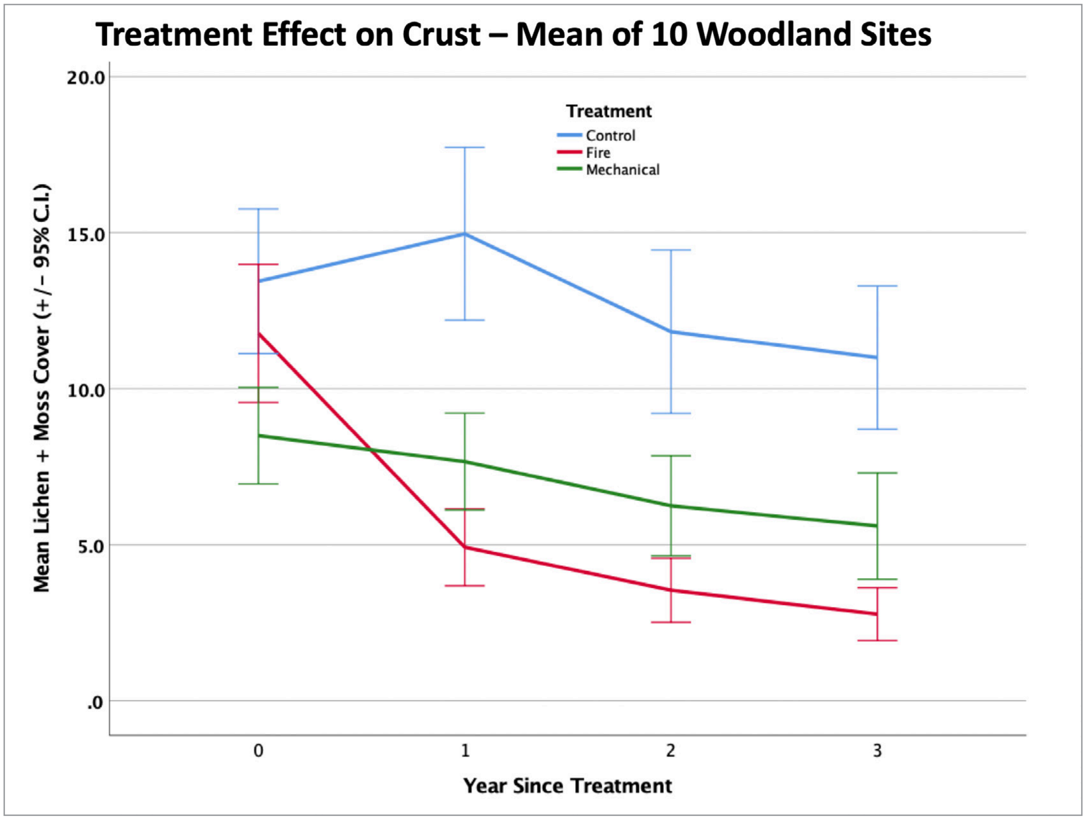


Figure 2. *Short-term response of biological crust (moss + lichen) to fire and mechanical treatments, averaged over 10 woodland sites (mean +/- 95% confidence intervals).*

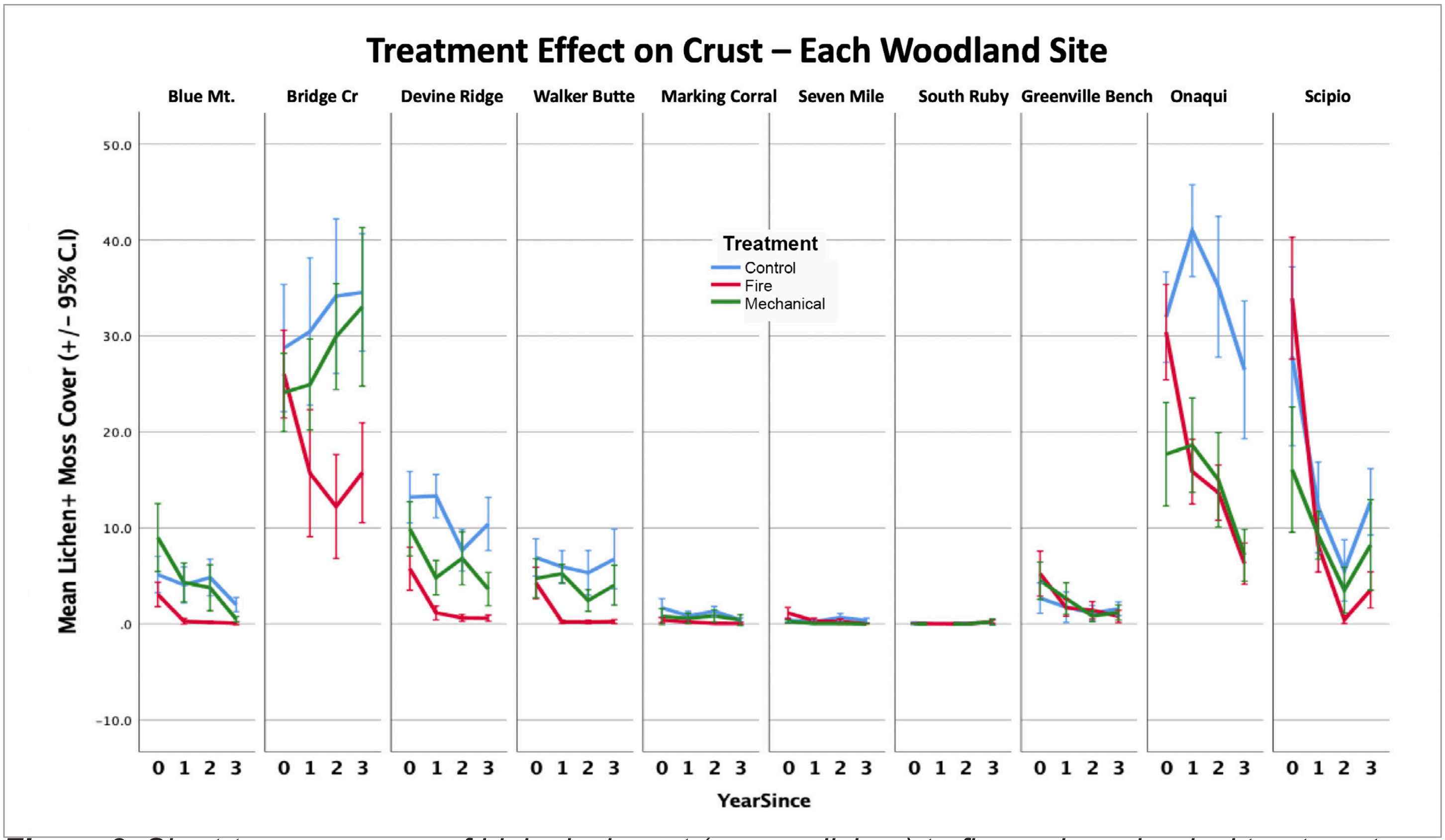


Figure 3. *Short-term response of biological crust (moss + lichen) to fire and mechanical treatments for 10 woodland SageSTEP sites (mean +/- 95% confidence intervals).*

The response of biocrusts to fuel reduction treatments sets this interesting and often overlooked vegetative group, as another restoration component to consider if reduced cover of cheatgrass is a management goal.

Want to know more about biological soil crusts?

Bowker MA, Antoninka AJ, Chuckran PF (2019) Improving field success of biocrust rehabilitation materials: hardening the organisms or softening the environment? Restoration Ecology doi.org/10.1111/rec.12965

Condon LA, Pyke DA (2016) Filling the interspace–restoring arid land mosses: source population, organic matter and overwintering govern success. Ecology and Evolution 6, 7623-7632.

Condon LA, Pyke DA (2018a) Fire and grazing influence site resistance to cheatgrass invasion 520 through their effects on shrub, bunchgrass, and biocrust communities. Ecosystems 21, 1416-1431. doi: 521 10.1007/s10021-018-0230-8. 522

Condon LA, Pietrasiak N, Rosentreter R, Pyke DA. (2019) Passive restoration of vegetation and biological soil crusts following 80 years of exclusion from grazing across the Great Basin. Restoration Ecology doi.org:10.1111/rec.13021

Condon LA, Pyke DA (2018b) Resiliency of biological soil crusts and vascular plants varies 523 among morphogroups with disturbance intensity. Plant and Soil 433, 271-287.

Miller RF, Ratchford J, Roundy BA, Tausch RJ, Hulet A, Chambers JC. (2014) Response of conifer-encroached shrublands in the Great Basin to prescribed fire and mechanical treatments. Rangeland Ecology and Management 67(5), 468-481. doi.org/10.2111/REM-D-13-00003.1

Pyke DA, Shaff SE, Lindgren AI, Schupp EW, Doescher PS, Chambers JC, Burnham JS, Huso MM. (2014) Region-wide ecological responses of arid Wyoming big sagebrush communities to fuel treatments. Rangeland Ecology and Management 67(5), 455-467. doi.org/10.2111/REM-D-13-00090.1

Slate ML, Durham RA, Pearson DE. (2019) Strategies for restoring the structure and function of lichen-moss biocrust communities. Restoration Ecology doi:10.1111/rec12996

Warren SD, St. Clair LL, Johansen JR, Kugrens P, Baggett LS, Bird BJ. (2015) Biological soil crust response to late season prescribed fire in a Great Basin juniper woodland. Rangeland Ecology and Management 68, 241-247. doi.org/10.1016/j.rama.2015.03.007

Warren SD, St. Clair LL, Leavitt SD. (2018) Aerobiology and passive restoration of biological soil crusts. Aerobiologia 35, 45-56.

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