



Bird Counts of Burned Versus Unburned Big Sagebrush Sites

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Abstract—Burned-over big sagebrush sites dominated by perennial grasses supported fewer species of birds and fewer total number of birds than sites of unburned big sagebrush sites.

Keywords: fire effects, neotropical migrants, *Artemisia tridentata*

Introduction

During a big sagebrush Y2K odyssey through the States of Idaho, Oregon, and Washington, I came across a valley perhaps 1,000 acres in size located approximately 13 miles north by northeast of Grasmere, ID (fig. 1). Three things were obvious about this valley: (1) it had burned in the recent past, (2) before burning it was covered with a stand of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), and (3) it had been reseeded with a mixture of perennial grasses and forbs—mostly nonnative. Cheatgrass (*Bromus tectorum*) dominated rocky terrain and steep hillsides where seeding had not occurred (fig. 1). I walked through the valley to see if I could find Wyoming big sagebrush seedlings to get an idea on how fast Wyoming big sagebrush was recovering. With a Global Positioning System (GPS) unit in hand to measure the distance traveled and a pair of binoculars around my neck (I like to bird watch when I am out), I started my search for seedlings. After walking for about one-quarter of a mile, I sensed something was missing besides Wyoming big sagebrush seedlings. Walking on for perhaps another 100 ft, I suddenly realized I had not spotted any birds; at that distance in big sagebrush

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I normally would have flushed three or four different species of birds. My walk in the valley covered 3.6 miles, and in that distance two horned larks (*Eremophila alpestris*) were flushed. On the southern edge of this valley and upslope was a small (49 x 203 ft) patch of Wyoming big sagebrush. Two horned larks and three sage sparrows (*Amphispiza belli*) were flushed from this small patch. I then formed a hypothesis that burned big sagebrush sites converted to perennial grass supports fewer birds and fewer species of birds than unburned big sagebrush sites. To test this hypothesis, I conducted an experiment.



Figure 1—Photo of valley described in text. It had burned in the recent past. Before burning, it was covered with a stand of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), and had been reseeded with a mixture of perennial grasses and forbs—mostly nonnative. Cheatgrass dominates rocky terrain and steep hillsides where seeding had not occurred (see arrows).

Materials and Methods

To test my hypothesis, burned big sagebrush sites paralleled with unburned big sagebrush sites were selected as I traveled through big sagebrush country in the States of Oregon, Idaho, Utah, Wyoming, and Montana. Oregon data were collected in 2000, and data from the remaining States were collected in 2001. Selected sites had to meet the following criteria: length of bird flushing transect 1 mile, buffer width 300 ft between the two types of sites (burned and unburned), burned sites dominated by perennial grasses, and at least 20 percent canopy cover of big sagebrush on unburned sites.

Flushing bird counts were conducted between June 11 and 23 and between the hours of 6:00 and 12:00 a.m. There appears to be a bias in the study methodology that may favor bird counts for burned big sagebrush sites. Often birds in unburned big sagebrush sites were heard but not seen, and flushing width seemed to be twice as wide as for the unburned big sagebrush transects—meaning birds counts were lower than actual for the unburned big sagebrush sites. Paired t-tests were used to detect differences between burned big sagebrush sites dominated by perennial grasses and unburned big sagebrush sites for number of bird species (Hintze 1992). As it turned out, the data for total number of birds were not normally distributed. A nonparametric test (a simple sign test) was used for this data set (Conover 1980). Thirteen paired sites were located: two in Oregon, four in Idaho, three in Utah, two in Wyoming, and two in Montana. The ages of five burns were known and ranged from 1 to 14 years (data on file at the Rocky Mountain Research Station Shrub Sciences Laboratory, 735 N 500 E, Provo, UT 84606).

Subspecies of big sagebrush was determined by morphological and chemical characteristics (Beetle 1960; Beetle and Young 1965; McArthur and others 1979). Subspecies represented were: Wyoming big sagebrush—five sites, mountain big sagebrush (*A. t. ssp. vaseyana*)—four sites, and basin big sagebrush (*A. t. ssp. tridentata*)—four sites.

Results

Results of bird counts are shown in table 1. The mean number of bird species found on burned big sagebrush sites dominated by perennial grasses was 2.23 and on unburned big sagebrush sites 7.54. These values were found to be statistically significant at the 5-percent level. Mean total number of birds found on burned big sagebrush sites dominated by perennial grasses was 7.62, and for unburned big sagebrush sites, 37.38. These values were statistically significant. Twenty-seven species of birds were identified on the 13 paired sites. Bird species and their numbers found on the transects are listed in table 2. Of the 27 bird species, two species were found only on burned big sagebrush sites: burrowing owl (*Athene cunicularia*) and long-billed curlew (*Numenius americanus*). Six species were found on both burned and intact big sagebrush sites: bank swallow (*Riparia riparia*), brown-headed cowbird (*Molothrus ater*), horned

lark (*Eremophila alpestris*), mourning dove (*Zenaida macroura*), vesper sparrow (*Poocetes gramineus*), and western meadowlark (*Sturnella neglecta*). Nineteen bird species were found only on unburned big sagebrush sites: American kestrel (*Falco sparverius*), American robin (*Turdus migratorius*), barn swallow (*Hirundo rustica*), Brewer's blackbird (*Euphagus cyanocephalus*), Brewer's sparrow (*Spizella breweri*), broad-tailed hummingbird (*Selasphorus platycercus*), chipping sparrow (*Spizella passerina*), cliff swallow (*Petrochelidon pyrrhonota*), common poorwill (*Phalaenoptilus nuttallii*), gray flycatcher (*Empidonax wrightii*), greater sage grouse (*Centrocercus urophasianus*), green-tailed towhee (*Pipilo chlorurus*), lark sparrow (*Chondestes grammacus*), loggerhead shrike (*Lanius ludovicianus*), mountain bluebird (*Sialia currucoides*), ring-necked pheasant (*Phasianus colchicus*), sage sparrow (*Amphispiza belli*), sage thrasher (*Oreoscoptes montanus*), and Swainson's hawk (*Buteo swainsoni*).

Observations and Discussion

What I thought was a never before described phenomenon, birds being more abundant in big sagebrush stands than stands of perennial grasses on big sagebrush burned-over sites, turned out not to be. Reynolds and Trost (1980a,b, 1981), studying the impact of crested wheatgrass plantings on wildlife on the Idaho National Engineering Laboratory (INEL), found, on what was probably Wyoming big sagebrush sites, that these sites were significantly richer in bird species than crested wheatgrass (*Agropyron desertorum*) sites. Also, the total number of birds was significantly higher on big sagebrush sites than on created wheatgrass sites.

Wyoming big sagebrush canopy cover for the Reynolds and Trost (1980a,b, 1981) study sites were 17 and 25 percent. They reported that the density of birds was significantly higher on Wyoming big sagebrush sites with 25 percent canopy cover than on sites with 17 percent cover. Rotenberry (1980) also found greater numbers of sage sparrow and western meadow lark (*Sturnella neglecta*) on sites where Wyoming big sagebrush canopy covers ranged from 25 to 30 percent than for sites with Wyoming big sagebrush canopy cover of 0 to 1 percent and 5 to 10 percent. These percentages of canopy cover for Wyoming big sagebrush far exceeds what the range management community considers normal or natural (Winward 1991). Perhaps this is best verbalized by Miller and others (1994):

In the early to mid 1800s, much of the sagebrush steppe was probably composed of open stands of shrubs with a strong component of long-lived perennial grasses and forbs in the understory....Shrub canopy cover probably ranged between 5-10% in the drier Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities...to 10-20% on the more mesic sites, occupied by mountain big sagebrush.

Speaking of the present, they noted that "Wyoming big sagebrush cover has increased from less than 10% to 20%, and mountain big sagebrush cover from less than 20% to 30 and 40%" due to overgrazing. These assertions are challenging on three fronts (Welch 2002):

Table 1—Bird counts on burned big sagebrush sites dominated by perennial grasses versus unburned big sagebrush sites. Each flushing transect was 1 mile long and at least 300 feet from the edge of the burn.

Site	Transect number	Vegetation	Number of bird species	Total birds	Age of burn	Location
Oregon						
Burns Junction	1	Grass seeding	2	4	?	N 42° 51.547 sn ^a W 117° 33.959
	2	Wyoming big sagebrush	7	44	—	N ? W next to above
New Princeton	3	Grass seeding	2	3	?	N 43° 01.582 sn W 118° 14.447
	4	Basin big sagebrush	8	37	—	N ? W next to above
Idaho						
Holbrook	5	Grass seeding	3	10	9	N 42° 12.709' sn W 112° 35.066'
	6	Mountain big sagebrush	11	44	—	N 42° 13.510' ns W 112° 34.795'
Stone	7	Grass native	2	2	14	^b
	8	Mountain big sagebrush	5	20	—	N 42° 01.856' ew W 112° 37.521'
INEL	9	Grass native	2	21	5	N 43° 25.490' sn W 112° 44.571'
	10	Wyoming big sagebrush	10	51	—	N 43° 26.435' ns W 112° 43.947'
Strevell	10	Grass seeding	2	6	?	N 41° 59.757' ew W 113° 11.511'
	12	Basin big sagebrush	5	44	—	^c
Utah						
Howell	13	Grass seeding	2	4	?	^d
	14	Mountain big sagebrush	7	21	—	N 41° 48.177' sn W 112° 22.066'
Vernon	15	Grass seeding	4	15	?	N 40° 08.104' ew W 112° 29.697'
	16	Basin big sagebrush	10	55	—	N 40° 07.529' we W 112° 30.739'
Jericho	17	Grass seeding	2	6	5	N 39° 43.716' sn W 112° 17.765'
	18	Wyoming big sagebrush	6	49	—	N 39° 44.329' ns W 112° 17.111'
Wyoming						
Nugget	19	Grass native	4	14	?	N 41° 49.435 ew W 110° 44.328
	20	Wyoming big sagebrush	8	32	—	N 41° 49.585 ew W 110° 45.410
Lander	21	Grass native	2	3	1	N 42° 37.620 ns W 108° 36.488
	22	Mountain big sagebrush	9	46	—	N 42° 37.653 sn W 108° 36.658
Montana						
Billings	23	Grass native	1	6	?	N 46° 01.621 we W 108° 31.814
	24	Wyoming big sagebrush	6	15	—	N 46° 01.016 we W 108° 29.225
Butte	25	Grass native	1	5	?	N 45° 49.427 we W 111° 52.263
	26	Basin big sagebrush	6	28	—	N 45° 14.614 ne-sw W 112° 53.510

^aTwo letter abbreviation denotes direction of bird transect: ns = north to south; sn = south to north; we = west to east; ew = east to west.

^bBird transect was not a straight line but a square shaped "u," with a starting point at N 42° 01.574'; W 112° 37.521', and going due west for 0.4 mile, then due north for 0.3 mile, and then due east for 0.3 mile.

^cLocation of the starting point was not noted, but was in the big sagebrush stand north of the grass seeding, and was traversed east to west.

^dBird transect was not a straight line. Starting point was at N 41° 48.854'; W 112° 22.132', and went 0.4 mile due south, and then 0.2 mile due west, and then 0.4 mile due south.

Table 2—Bird species and numbers found on the various transects of burned big sagebrush sites dominated by perennial grasses and unburned big sagebrush sites (common and scientific names by Alsop 2001).

Common name	Scientific name	Big sagebrush sites			
		Burned		Unburned	
		Transect number	Total number of birds	Transect number	Total number of birds
American kestrel	<i>Falco sparverius</i>			10	1
				18	1
American robin	<i>Turdus migratorius</i>			2	1
				6	1
				14	1
				22	1
Bank swallow	<i>Riparia riparia</i>	19	2	20	5
Barn swallow	<i>Hirundo rustica</i>			8	1
Brewer's blackbird	<i>Euphagus cyanocephalus</i>			14	3
				22	8
Brewer's sparrow	<i>Spizella breweri</i>			2	3
				4	10
				6	9
				8	9
				10	4
				14	6
				16	7
				18	10
				20	4
				22	16
				24	4
		26	4		
Broad-tailed hummingbird	<i>Selasphorus platycercus</i>			10	2
				16	2
Brown-headed cowbird	<i>Molothrus ater</i>			6	1
				10	1
		21	1		
Burrowing owl	<i>Athene cunicularia</i>	15	2		
Cliff swallow	<i>Petrochelidon pyrrhonota</i>			10	4
Chipping sparrow	<i>Spizella passerina</i>			16	1
Common poorwill	<i>Phalaenoptilus nuttallii</i>			4	2
				24	1
Gray flycatcher	<i>Empidonax wrightii</i>			16	3
				20	1
				22	1
Greater sage grouse	<i>Centrocercus urophasianus</i>			26	4
Green-tailed towhee	<i>Pipilo chlorurus</i>			22	4
Horned lark	<i>Eremophila alpestris</i>	1	3	2	9
		3	1	4	7
		5	7	6	2
		7	1	8	3
		9	18	10	3
		11	4		
		15	6		
		17	4	18	2
19	6	20	1		
Lark sparrow	<i>Chondestes grammacus</i>			14	3
				24	2
Loggerhead shrike	<i>Lanius ludovicianus</i>			16	1
				18	1

(con.)

Table 2—Con.

Common name	Scientific name	Big sagebrush sites			
		Burned		Unburned	
		Transect number	Total number of birds	Transect number	Total number of birds
Long-billed curlew	<i>Numenius americanus</i>	15	3		
Mountain bluebird	<i>Sialia currucoides</i>			12	3
Mourning dove	<i>Zenaida macroura</i>			20	1
				2	6
				4	1
				6	6
				8	2
				10	8
				16	2
				21	2
				22	3
				24	1
26	3				
Ring-necked pheasant	<i>Phasianus colchicus</i>			6	3
				16	3
Sage sparrow	<i>Amphispiza belli</i>			2	17
				4	11
				6	9
				10	16
				12	26
				14	2
				16	22
				18	30
				20	10
				22	6
26	11				
Sage thrasher	<i>Oreoscoptes montanus</i>			4	2
				6	2
				10	6
				12	6
				14	1
				16	3
26	3				
Swainson's hawk	<i>Buteo swainsoni</i>			6	1
Vesper sparrow	<i>Poocetes gramineus</i>			2	3
				3	1
				5	2
					6
					12
				13	1
				19	4
	20				
	5				
	22				
	3				
	24				
	2				
	26				
	3				
Western meadowlark	<i>Sturnella neglecta</i>			2	5
				4	3
				5	1
				6	8
				7	1
				8	5
				9	3
				10	6
				11	2
				12	6
				13	3
				14	5
				15	4
16	11				
17	2				
18	5				
19	2				
	20				
	5				
	22				
	4				
	24				
	5				
	6				
	24				
	5				
	25				
	5				

1. What do the animals that coevolved with big sagebrush suggest to us concerning canopy cover?
2. What are the big sagebrush canopy cover values found in undisturbed relicts and kipukas (older land surrounded by younger lava flows)?
3. What is the quality of the science that is used to support these assertions?

It is obvious that burning big sagebrush stands reduces the biodiversity of the site in terms of bird species and total number of birds. It is held by many in the range management community that killing, thinning, or controlling big sagebrush would result in an increase in biodiversity (Olsen and others 1994). (I have never liked the term “controlling big sagebrush” because it infers that big sagebrush is out of control. Who has the ecological insight to determine when big sagebrush is out of control?) This study does not support that assertion. In fact, it has been shown that big sagebrush is a “nursing mother” to a host of organisms ranging from microscopic to large mammals, and as this study shows, birds (Welch 2002).

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