



Bird Counts in Stands of Big Sagebrush and Greasewood

Bruce L. Welch

Abstract—Total numbers of birds and numbers of bird species were significantly ($p=0.05$ percent) higher in stands of big sagebrush than in stands of greasewood. This was especially true for Brewer's sparrow, lark sparrow, and mourning dove. The big sagebrush ecosystem appears to support greater number of birds and more species of birds than does the greasewood ecosystem.

Introduction

While walking through a stand of greasewood (*Sarcobatus* spp.), I noticed some Brewer's sparrow (*Spizella breweri*), which are considered by some to be a sagebrush-obligate (Belthoff and others 1998; Reynolds 1981; Welch 2005). Johnsgard and Rickard (1957), however, found some use of other shrub species by Brewer's sparrow other than big sagebrush (*Artemisia tridentata*) or silver sagebrush (*A. cana*). These were snowberry (*Symphoricarpos* spp.), hawthorn (*Crataegus* spp.), plum (*Prunus* spp.), and serviceberry (*Amelanchier* spp.).

Short (1984) reported for Brewer's sparrow a habitat suitability index of 1.0 for shrub communities dominated by big sagebrush, 0.5 for shrub communities dominated by hawthorn or serviceberry, and 0.1 for shrub communities dominated by greasewood. Interestingly, shrub communities, dominated by big sagebrush, with an index of 1.0 also, had a canopy cover of 30 percent or more (Short 1984)—far higher than that considered normal by some in the range management community (Miller and others 1994; Winward 1991). Thus, shrub communities dominated by big sagebrush could support higher numbers of Brewer's sparrow than shrub communities dominated by greasewood. This may extend to additional species of birds such as sage sparrow (*Amphispiza belli*), lark sparrow (*Chondestes grammacus*), sage thrasher (*Oreoscoptes montanus*), and others (Belthoff and others 1998; Reynolds 1981; Welch 2002; Welch 2004).

Bruce L. Welch is a research plant physiologist with the U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Shrub Sciences Laboratory, Provo, UT 84606.

I designed a study to test the hypothesis that total number of birds, number of bird species, and total number of specific species of birds are higher in stands of big sagebrush than in stands of greasewood.

Materials and Methods

I selected 10 stands of big sagebrush and greasewood to conduct bird counts. The stands were paired according to date of count. Table 1 lists the location of each pair. Stands of big sagebrush and greasewood were selected that had less than 20 percent decadent shrubs in the stands and that were typical of the ecosystem for height and canopy cover. While the shrub component was healthy for all stands selected, the understory species were suffering from the combined effects of overgrazing by livestock and prolonged drought. Percent shrub canopy cover of selected big sagebrush stands were in the low 30's which was considered by Short (1984) to be optimal for Brewer's sparrow but excessive by others (Miller and other 1994; Winward 1991). Standards have not been determined for greasewood stands, and even the thickest greasewood stands appeared not to match the canopy of big sagebrush.

Stands were selected that would provide enough continuous cover to accommodate a mile-long transect. A Global Positioning System (GPS) unit was used to lay out the 1 mile transects. In three cases—one greasewood and two big sagebrush stands—a 1 mile straight line transect was not possible, so a short side branch was added to complete the mile (25 May 2004 greasewood; 4 June 2004 big sagebrush; 7 June 2004 big sagebrush).

Bird counts were conducted between 24 May 2004 and 14 June 2004 and between the hours of 7:30 and 11:30 a.m. Birds that were flushed from stands and birds that flew into stands were counted. Fly-overs were counted only if the birds appeared to be hunting over the stands; this would apply to swallows, eagles, ravens, hawks, and other hunters.

Statistical tests were performed on the various data sets. Tests included paired t-tests (Hintze 1992), a nonparametric test, Wilcoxon match pairs tests (Hintze 1992), and

multiresponse permutation procedure for one-way layouts (Mielke and Berry 2001), for total number of birds, total number of bird species, and for specific individual species of birds that appeared to be in greater number in one of the two ecosystems. Probability levels were set at 5 percent.

Results

Results of bird counts, on an individual bird species basis, are given in table 2. Number of bird species per stand per date are shown in table 3. Table 4 presents the data used to conduct statistical tests for differences between the two ecosystems: total number of birds, total number of bird species, number of Brewer's sparrows, number of horned larks—*Eremophila alpestris*, number of lark sparrow, number of mourning doves—*Zenaida macroura*, and number of western meadow larks—*Sturnella neglecta*.

There were significantly more birds counted in big sagebrush stands than in stands of greasewood— 46.0 ± 16.8 versus 17.9 ± 10.0 (tables 3, 4). Also, significantly more bird species were encountered in stands of big sagebrush than in greasewood— 9.0 ± 1.5 versus 4.4 ± 1.1 (tables 3, 4). Brewer's sparrow counts were significantly greater in big sagebrush than in greasewood— 14.7 ± 10.8 versus 4.1 ± 2.3 (tables 3, 4). Other bird species that were significantly more numerous in big sagebrush than in greasewood included: lark sparrows— 5.0 ± 6.4 versus 0.6 ± 1.3 , and mourning doves— 4.8 ± 4.8 versus 1.5 ± 2.2 (tables 3, 4). Western meadow larks were not significantly higher in big sagebrush than in greasewood— 5.4 ± 3.7 versus 4.1 ± 3.7 (tables 3, 4). Horned larks were not significantly higher in greasewood than in big sagebrush— 4.3 ± 5.4 versus 1.1 ± 1.1 (tables 3, 4).

Species of birds found in big sagebrush, but not in greasewood, include: blue-winged teal—*Anas discors*, California gulls—*Larus californicus*, Chipping sparrow—*Spizella passerina*, chukars—*Alectoris chukar*, Cliff swallows—*Petrochelidon pyrrhonota*, Cooper's hawks—*Accipiter cooperii*, golden eagles—*Aquila chrysaetos*, mallards—*Anas platyrhynchos*, pinyon jays—*Gymnorhinus cyanocephalus*, sage sparrows, sage thrashers, spotted towhees—*Pipilo maculatus*, turkey vulture—*Cathartes aura*, vesper sparrow—*Pooecetes gramineus*, and western kingbird—*Tyrannus verticalis* (table 2). The loggerhead shrike—*Lanius ludovicianus*—was the only bird species sighted in greasewood but not in big sagebrush (table 2).

Bird species common to both shrub communities were: barn swallow—*Riparia riparia*, Brewer's blackbird—*Euphagus cyanocephalus*, Brewer's sparrow, common Nighthawk—*Chordeiles minor*, common raven—*Corvus corax*, horned lark, lark sparrow, long-billed curlew—*Numenius americanus*, mourning dove—*Zenaidamacroura*, northern Harrier—*Circus cyaneus*, western meadowlark—*Sturnella neglecta*, and willet—*Catoptrophorus semipalmatus* (table 2).

Observations and Discussion

Based on the of number of bird species and total number of birds, it appears from this study that big sagebrush stands provide a more productive habitat for birds than stands of greasewood. Some bird species seem to occupy big sagebrush stands exclusively: sage sparrow, sage thrasher, pinyon jay, and western kingbird. However, I have sighted sage sparrows, pinyon jays, and western kingbirds in other ecosystems (Welch 2002 and personal observations; Woodyard and others 2003).

This study is in general agreement with an earlier study (Welch 2002), which compared bird counts of unburned big sagebrush sites with burned-over big sagebrush dominated by perennial grasses. I found that intact big sagebrush sites supported more species of birds (7.5 versus 2.2 per mile), than burned-over big sagebrush sites dominated by perennial grasses. Also, unburned big sagebrush sites supported greater numbers of total birds, 37.4 versus 7.6 per mile, compared to burned-over sites dominated by perennial grasses.

It appears from this study that greasewood stands may support more species of birds, 4.4 per mile, than burned-over big sagebrush sites dominated by perennial grasses at 2.2 per mile (Welch 2002). This also appears to be true for total numbers of birds, 17.9 versus 7.6 per mile (Welch 2002).

This study, those of Reynolds and Trost (1980a,b,1981), and Welch (2002) offer strong evidence of the importance of intact big sagebrush stands in providing habitat for a number of Western bird species. In my opinion, killing or thinning big sagebrush, even in stands where canopy cover exceeds 20 percent (Miller and others 1994; Winward 1991), does not result in wildlife habitat improvement for the majority of bird or animal species that occur in big sagebrush ecosystems (Welch 2005).

Some Special Observations

I made some unusual sightings of bird species during the course of this study. They are explained below by date.

While walking the 01 June 2004 transect in a stand of big sagebrush, I flushed a pair of blue-winged teals (table 3). Later, a pair of blue-winged teal landed near the same location. I searched the big sagebrush in the immediate vicinity but was unable to determine why they were there. Sevier Bridge Reservoir was within three quarters of a mile from where the teals were sighted (table 1).

Blue-winged teal were again sighted 03 June 2004 while conducting a bird count in a big sagebrush stand (tables 1, 3). Also, two mallard were flushed in this same stand. Again, I searched the big sagebrush in the immediate vicinity in an attempt to determine why the birds were there and found no obvious reason. Rush Lake was within 1.5 miles of the sighting.

On 08 June 2004 while conducting a bird count in a greasewood stand (tables 1, 3), I watched numerous flocks of California gull flying overhead on a southwest course, disappearing over some foothills. It was not until I had arrived at the big sagebrush stand (table 1), later that morning, that I was able to tell where these flocks of California gull were headed. They were landing among big sagebrush plants for a few seconds, then they would fly on for a few feet (around 50) and land again for a few seconds. This was repeated several times on an individual bird basis until a few individuals would fly off toward the Great Salt Lake. While I was conducting the bird count in the big sagebrush stand, small flocks of California gulls were coming in waves from the Great Salt Lake replacing those that were leaving. I walked over where these gulls were practicing “touch and go take offs and landings” and found a high concentration of Mormon crickets. Presumably, the California gulls were feeding on Mormon crickets living among big sagebrush plants.

Acknowledgments

The author expresses his appreciation to Dr. Jordan C. Pederson, Dr. Carl L. Wambolt, and Mrs. Jackee L. Alston for providing peer reviews of this manuscript. Dr. David L. Turner provided a statistical review for this study.

References

Alsop, Fred J. III. 2001. *Birds of North America; western region*. New York DK. 752 p.

- Belthoff, James R.; Powers, Leon R.; Reynolds, Timothy D. 1998. Breeding birds at the Idaho National Engineering and Environmental Laboratory, 1985—1991. *Great Basin Naturalist*. 58:167-183.
- Hintze, Jerry L. 1992. Number cruncher statistical system. 329 N 1000 E, Kaysville, UT 84037. 442 p.
- Johnsgard, P. A.; Rickard, W. H. 1957. The relation of spring birds distribution to a vegetation mosaic in southeastern Washington. *Ecology*. 38:171-174.
- Mielke, Paul W. Jr.; Berry, Kenneth J. 2001. *Permutation methods: A distance function approach*. New York: Springer-Verlag. 352 p.
- Miller, Richard F.; Svejcar, Tony J.; West, Neil E. 1994. Implications of livestock grazing in the Intermountain sagebrush region: plant composition. In: Vavra, Martin; Laycock, William A.; Pieper, Rex D., eds. *Ecological implications of livestock herbivory in the West*. Denver, CO: Society for Range Management: 101-146.
- Reynolds, Timothy D. 1981. Nesting of the sage thrasher, sage sparrow, and Brewer’s sparrow in southeastern Idaho. *Condor*. 83:61-64.
- Reynolds, Timothy D.; Trost, Charles H. 1980a. The effect of crested wheatgrass planting on wildlife on the Idaho National Engineering Laboratory site. In: Swanson, Gustav A., tech. coord. *Proceedings—the mitigation symposium*. 1997 July 16-20; Fort Collins, CO. Gen. Tech. Rep. RM-65. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 665-666.
- Reynolds, Timothy D.; Trost, Charles H. 1980b. The response of native vertebrate populations to crested wheatgrass planting and grazing by sheep. *Journal of Range Management*. 33:122- 125.
- Reynolds, Timothy D.; Trost, Charles H. 1981. Grazing, crested wheatgrass, and bird populations in southeastern Idaho. *Northwest Science*. 55:225-234.
- Short, H. L. 1984. Habitat suitability index models: Brewer’ sparrow. U.S. Fish Wildlife Service. FWS/OBS-82/10.83. 16 p.
- Welch, Bruce L. 2002. Bird counts of burned versus unburned big sagebrush sites. Res. Note RMRS-RN-16. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 6 p.
- Welch, Bruce L. 2005. Big sagebrush: a sea fragmented into lakes, ponds, and puddles. Gen. Tech. Rep. RMRS-GTR-144. Fort Collins, CO: U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station. 210 p.
- Winward, Al H. 1991. A renewed commitment to the management of sagebrush grasslands. Special Report 880. Corvallis, OR: Oregon State University, Agriculture Experiment Station. 7 p.
- Woodyard, John; Renfro, Melissa; Welch, Bruce L.; Heister, Kristina. 2003. A 20 year recount of bird populations along a great Basin elevational gradient. Res. Pap. RMRS-RP-43. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 11 p.

You may order additional copies of this publication by sending your mailing information in label form through one of the following media. Please specify the publication title and number.

Telephone (970) 498-1392
FAX (970) 498-1396
E-mail rschneider@fs.fed.us
Web site http://www.fs.fed.us/rm
Mailing Address Publications Distribution
 Rocky Mountain Research Station
 240 West Prospect Road
 Fort Collins, CO 80526

Table 1—Date of bird counts, starting points, and direction of travel for bird count surveys in big sagebrush and greasewood stands.

24 May 2004

Big sagebrush (east of Faust, UT) traveling south:

N 40° 13.771'

W 112° 10.95'

Greasewood (east of Faust, UT) traveling south by southwest:

N 40° 11.216'

W 112° 21.911'

25 May 2004

Big sagebrush (north of Yuba State Park, UT) traveling south:

N 39° 24.010'

W 112° 01.894'

Greasewood (west of Yuba State Park, UT) traveling NE for 0.71 mile and then WSW for 0.29 mile:

N 39° 22.607'

W 112° 04.123'

1 June 2004

Big sagebrush (south of Painted Rock Campground-Yuba State Park, UT) traveling northwest:

N 39° 20.715'

W 111° 57.268'

Greasewood (north of Painted Rock Campground-Yuba State Park, UT) traveling north:

N 39° 21.525'

W 111° 56.743'

2 June 2004

Big sagebrush (Little Sahara Recreation Area, UT south of turn off) traveling north:

N 39° 43.641'

W 112° 17.143'

Greasewood (east of Intermountain Power Project-North of Delta, UT) traveling northeast:

N 39° 28.808'

W 112° 25.179'

3 June 2004

Big sagebrush (south of Stockton, UT) traveling north:

N 40° 24.418'

W 112° 22.913'

Greasewood (south of Stockton, UT) traveling north:

N 40° 22.910'

W 112° 23.089'

4 June 2004

Big sagebrush (north of Iosepa, UT) traveling north for 0.83 mile and then east for 0.17 mile:

N 40° 36.716'

W 112° 41.439'

Greasewood (north of Iosepa, UT) traveling north by northwest:

N 40° 39.314'

W 112° 41.143'

7 June 2004

Big sagebrush (northwest of Grantsville, UT) traveling west by southwest for 0.54 mile, then 0.46 mile south:

N 40° 41.971'

W 112° 35.455'

Greasewood (northwest of Grantsville, UT) traveling west by northwest:

N 40° 42.716'

W 112° 35.440'

(con.)

Table 1 (Con.)

8 June 2004

Big sagebrush (northwest of Grantsville, UT) traveling north by northwest:
N 40° 35.952'
W 112° 32.223'

Greasewood (northwest of Grantsville, UT) traveling southeast:
N 40° 40.878'
W 112° 32.828'

9 June 2004

Big sagebrush (south of Fairfield, UT) traveling southwest:
N 40° 13.064'
W 112° 04.422'

Greasewood (south of Fairfield, UT) traveling south:
N 40° 15.201'
W 112° 05.732'

14 June 2004

Big sagebrush (west of Faust, UT) traveling northwest:
N 40° 08.549'
W 112° 28.333'

Greasewood (east of Faust, UT) traveling northeast:
N 40° 11.084'
W 112° 22.724'

Table 2—Results of bird counts in 10 paired stands of big sagebrush and greasewood on an individual bird species basis. Common and scientific names after Alsop (2001). Each line of data is based on the date collected for a specific time; for instance, the first line represents data collected on 24 May 2004, second line 25 May 2004, and so forth.

Species	Big sagebrush	Greasewood
Barn Swallow	-	-
(<i>Hirundo rustica</i>)	2	-
	-	-
	4	1
	-	-
	-	-
	-	-
	-	-
Totals	6	1
Black-billed Magpie	-	-
(<i>Pica nuttallii</i>)	-	-
	-	1
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
Totals	0	1
Blue-winged Teal	-	-
(<i>Anas discors</i>)	-	-
	2	-
	-	-
	3	-
	-	-
	-	-
	-	-
	-	-
Totals	5	0
Brewer's Blackbird	-	-
(<i>Euphagus cyanocephalus</i>)	6	-
	-	-
	8	4
	-	-
	2	-
	-	-
	1	13
	-	-
Totals	17	17

(con.)

Table 2 (Con.)

Species	Big sagebrush	Greasewood
Brewer's Sparrow	6	2
(<i>Spizella breweri</i>)	7	8
	6	4
	15	2
	21	5
	6	3
	6	3
	18	8
	24	13
	38	2
Totals	147	41
California Gull	-	-
(<i>Larus californicus</i>)	-	-
	-	-
	-	-
	-	-
	-	-
	3 (large flock)	-
	-	-
	-	-
Totals	3	0
Chipping Sparrow	-	-
(<i>Spizella passerina</i>)	2	-
	-	-
	-	-
	-	-
	-	-
	-	-
	4	-
	-	-
Totals	6	0
Chukar	-	-
(<i>Alectoris chukar</i>)	-	-
6	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
Totals	6	0
Cliff Swallow	-	-
(<i>Hirundo pyrrhonota</i>)	4	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
Totals	4	0

(con.)

Table 2 (Con.)

Species	Big sagebrush	Greasewood
Common Nighthawk (<i>Chordeiles minor</i>)	-	-
	-	-
	-	2
	-	-
	1	-
	-	-
	-	2
	-	-
	2	-
Totals	3	4
Common Raven (<i>Corvus corax</i>)	1	-
	1	1
	-	-
	-	2
	3	-
	1	1
	1	-
	1	-
	-	-
	-	-
Totals	8	4
Copper Hawk (<i>Accipiter cooperii</i>)	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
	1	-
	-	-
Totals	1	0
Golden Eagle (<i>Aquila chrysaetos</i>)	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
	1	-
	-	-
Totals	1	0
Horned Lark (<i>Eremophila alpestris</i>)	3	3
	-	11
	-	-
	2	-
	-	2
	1	9
	1	-
	2	15
	-	3
	2	-
Totals	11	43

(con.)

Table 2 (Con.)

Species	Big sagebrush	Greasewood
Lark Sparrow	2	-
(<i>Chondestes grammacus</i>)	3	-
	7	3
	-	-
	2	-
	3	-
	16	3
	17	-
	-	-
	-	-
Totals	50	6
Loggerhead Shrike	-	-
(<i>Lanius ludovicianus</i>)	-	-
	-	-
	-	-
	-	-
	-	1
	-	-
	-	-
	-	-
Totals	0	1
Long-billed Curlew	-	-
(<i>Numenius americanus</i>)	-	-
	-	-
	-	-
	-	-
	-	2
	-	-
	3	-
	-	-
	-	-
Totals	3	2
Mallard	-	-
(<i>Anas platyrhynchos</i>)	-	-
	-	-
	2	-
	-	-
	-	-
	-	-
	-	-
Totals	2	0
Mourning Dove	-	-
(<i>Zenaida macroura</i>)	6	-
	4	3
	8	4
	-	-
	3	-
	2	-
	4	-
	17	6
	2	2
Totals	48	15

(con.)

Table 2 (Con.)

Species	Big sagebrush	Greasewood
Northern Harrier	-	1
(<i>Circus cyaneus</i>)	-	-
	-	-
	-	-
	1	-
	1	-
	-	-
	-	1
	1	-
Totals	3	2
Pinyon Jay	-	-
(<i>Gymnorhinus cyanocephalus</i>)	-	-
	5	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
Totals	5	0
Sage Sparrow	2	-
(<i>Amphispiza belli</i>)	-	-
	-	-
	7	-
	-	-
	4	-
	-	-
	-	-
	9	-
	8	-
Totals	28	0
Sage Thrasher	1	-
(<i>Oreoscoptes montanus</i>)	2	-
	-	-
	3	-
	12	-
	-	-
	-	-
	4	-
	-	-
	8	-
Totals	30	0
Spotted Towhee	-	-
(<i>Pipilo maculatus</i>)	-	-
	-	-
	-	-
	-	-
	-	-
	2	-
	-	-
	-	-
	-	-
Totals	2	0

(con.)

Table 2 (Con.)

Species	Big sagebrush	Greasewood
Turkey Vulture	-	-
(<i>Cathartes aura</i>)	-	-
	-	-
	-	-
	-	-
	-	-
	1	-
	-	-
	-	-
Totals	1	0
Vesper Sparrow	1	-
(<i>Pooecetes gramineus</i>)	-	-
	2	-
	-	-
	-	-
	-	-
	-	-
	-	-
	3	-
Totals	6	0
Western Kingbird	1	-
(<i>Tyrannus verticalis</i>)	6	-
	1	-
	-	-
	-	-
	-	-
	-	-
	-	-
	-	-
Totals	8	0
Western Meadowlark	1	-
(<i>Sturnella neglecta</i>)	3	3
	6	1
	3	3
	7	4
	8	-
	9	9
	12	11
	5	6
	-	4
Totals	54	41
Willet	-	-
(<i>Catoptrophorus semipalmatus</i>)	-	-
	-	-
	2	1
	-	-
	-	-
	-	-
	-	-
Totals	2	1
Grand totals	460	179

Table 3—Bird counts within big sagebrush and greasewood stands on a per date basis. Common and scientific names of birds after Alsop (2001).

24 May 2004

Big Sagebrush	
Brewer's Sparrow -----	6
Common Raven -----	1
Horned Lark -----	3
Lark Sparrow -----	2
Sage Sparrow -----	2
Sage Thrasher -----	1
Vesper Sparrow -----	1
Western Kingbird -----	1
Western Meadow Lark -----	1

Species-9; total birds-18

Greasewood	
Brewer's Sparrow2	
Horned Lark -----	3
Northern Harrier -----	1

Species-3; total birds-6

25 May 2004

Big Sagebrush	
Barn Swallow -----	2
Brewer's Blackbird -----	6
Brewer's Sparrow -----	7
Chipping Sparrow -----	2
Cliff Swallow -----	4
Common Raven -----	1
Lark Sparrow -----	3
Mourning Dove -----	6
Sage Thrasher -----	2
Western Kingbird -----	6
Western Meadow Lark -----	3

Species-11; total birds-42

Greasewood	
Brewer's Sparrow -----	8
Common Raven -----	1
Horned Lark -----	11
Western Meadow Lark -----	3

Species-4; total birds-23

1 June 2004

Big Sagebrush	
Blue-winged Teal -----	2
Brewer's Sparrow -----	6
Chukar -----	6
Lark Sparrow -----	7
Mourning Dove -----	4
Pinyon Jay -----	5
Vesper Sparrow -----	2
Western Kingbird -----	1
Western Meadow Lark -----	6

Species-9; total birds-39

Greasewood	
Black-billed Magpie -----	1
Brewer's Sparrow -----	4
Lark Sparrow -----	3
Mourning Dove -----	3
Western Meadow Lark -----	1

Species-5; total birds-12

2 June 2004

Big sagebrush	
Brewer's Sparrow -----	15
Horned Lark -----	2
Mourning Dove -----	8
Sage Sparrow -----	7
Sage Thrasher -----	3
Western Meadow Lark -----	3

Species-6, total birds-38

Greasewood	
Brewer's Sparrow -----	2
Common nighthawk -----	2
Common Raven -----	2
Mourning Dove -----	4
Western Meadow Lark -----	3

Species-5; total birds-13

3 June 2004

Big sagebrush	
Barn Swallow -----	4
Blue-winged Teal -----	3
Brewer's Blackbird -----	8
Brewer's Sparrow -----	21
Common Raven -----	3
Lark Sparrow -----	2
Mallard -----	2
Mourning Dove -----	2
Sage Thrasher -----	12
Western Meadow Lark -----	7
Willet -----	2

Species-11; total birds-66

Greasewood	
Barn Swallow -----	1
Brewer's Blackbird -----	4
Brewer's Sparrow -----	5
Horned Lark -----	2
Western Meadow Lark -----	4
Willet -----	1

Species-6; total birds-17

(con.)

Table 3 (Con.)

4 June 2004

Big sagebrush	
Brewer's Sparrow -----	6
Common Nighthawk -----	1
Common Raven -----	1
Horned Lark -----	1
Lark Sparrow -----	3
Mourning Dove -----	3
Northern Harrier -----	1
Sage Sparrow -----	4
Western Meadow Lark -----	8

Species-9; total birds-28

Greasewood	
Brewer's Sparrow -----	3
Common Raven -----	1
Horned Lark -----	9
Long-billed Curlew -----	2

Species-4; total birds-15

7 June 2004

Big sagebrush	
Brewer's Blackbird -----	2
Brewer's Sparrow -----	6
Common Raven -----	1
Horned Lark -----	1
Lark Sparrow -----	16
Mourning Dove -----	2
Northern Harrier -----	1
Spotted Towhee -----	2
Western Meadow Lark -----	9

Species-9; total birds-40

Greasewood	
Brewer's Sparrow -----	3
Lark Sparrow -----	3
Loggerhead Shrike -----	1
Western Meadow Lark -----	9

Species-4; total birds-16

8 June 2004

Big sagebrush	
Brewer's Sparrow -----	18
California Gull ----- 3 (large flock)	
Common Raven -----	1
Horned Lark -----	2
Lark Sparrow -----	17
Long-billed Curlew -----	3
Mourning Dove -----	4
Sage Thrasher -----	4
Turkey Vulture -----	1
Western Meadow Lark -----	12

Species-10; total birds-65

Greasewood	
Brewer's Sparrow -----	8
Common nighthawk -----	2
Horned Lark -----	15
Western Meadow Lark -----	11

Species-4; total birds-36

09 June 2004

Big sagebrush	
Brewer's Blackbird -----	1
Brewer's Sparrow -----	24
Chipping Sparrow -----	4
Golden Eagle -----	1
Copper Hawk -----	1
Mourning Dove -----	17
Sage Sparrow -----	9
Western Meadow Lark -----	5

Species-8; total birds-62

Greasewood	
Brewer's Blackbird -----	13
Brewer's Sparrow -----	4
Horned Lark -----	3
Mourning Dove -----	6
Northern Harrier -----	1
Western Meadow Lark -----	6

Species-6; total birds-33

14 June 2004

Big sagebrush	
Brewer's Sparrow -----	38
Common Nighthawk -----	2
Horned Lark -----	2
Mourning Dove -----	2
Northern Harrier -----	1
Sage Sparrow -----	6
Sage Thrasher -----	8
Vesper Sparrow -----	3

Species-8; total birds-62

Greasewood	
Brewer's Sparrow -----	2
Mourning Dove -----	2
Western Meadow Lark -----	4

Species-3; total birds-8

Table 4—Data sets used to conduct comparative statistical analyses between bird counts for big sagebrush and greasewood stands. Comparisons were for total number of birds, number of bird species, and for specific species—Brewer’s sparrows, horned larks, lark sparrows, mourning doves, and western meadow larks. Data sets are paired per date. n = 10. Each date pair consists of one big sagebrush and one greasewood stand. Common and scientific names of birds after Alsop (2001).

Date	Big sagebrush	Greasewood
Total number of birds		
24 May 04	18	6
25 May 04	42	23
01 June 04	39	12
02 June 04	38	13
03 June 04	66	17
04 June 04	28	15
07 June 04	40	16
08 June 04	65	36
09 June 04	62	33
14 June 04	62	8
Means	46.0 ^a	17.9
Number of bird species		
24 May 04	9	3
25 May 04	11	4
01 June 04	9	5
02 June 04	6	5
03 June 04	11	6
04 June 04	9	4
07 June 04	9	4
08 June 04	10	4
09 June 04	8	6
14 June 04	8	3
Means	9.0 ^a	4.4
Number of Brewer’s Sparrow		
24 May 04	6	2
25 May 04	7	8
01 June 04	6	4
02 June 04	15	2
03 June 04	21	5
04 June 04	6	3
07 June 04	6	3
08 June 04	18	8
09 June 04	24	4
14 June 04	38	2
Means	14.7 ^a	4.1
Number of horned larks		
24 May 04	3	3
25 May 04	0	11
01 June 04	0	0
02 June 04	2	0

(con.)

Table 4 (Con.)

Date	Big sagebrush	Greasewood
03 June 04	0	2
04 June 04	1	9
07 June 04	1	0
08 June 04	2	15
09 June 04	0	3
14 June 04	2	0
Means	1.1	4.3
Number of lark sparrows		
24 May 04	2	0
25 May 04	3	0
01 June 04	7	3
02 June 04	0	0
03 June 04	2	0
04 June 04	3	0
07 June 04	16	3
08 June 04	17	0
09 June 04	0	0
14 June 04	0	0
Means	5.0 ^a	0.6
Number of mourning doves		
24 May 04	0	0
25 May 04	6	0
01 June 04	4	3
02 June 04	8	4
03 June 04	2	0
04 June 04	3	0
07 June 04	2	0
08 June 04	4	0
09 June 04	17	6
14 June 04	2	2
Means	4.8 ^a	1.5
Number of western meadow larks		
24 May 04	1	0
25 May 04	3	3
01 June 04	6	1
02 June 04	3	3
03 June 04	7	4
04 June 04	8	0
07 June 04	9	9
08 June 04	12	11
09 June 04	5	6
14 June 04	0	4
Means	5.4	4.1

^a Significantly greater at the 5 percent level; determined by paired t-tests, Wilcoxon matched pairs test (Hintze 1992), and multiresponse permutation procedure for one-way layouts (Mielke and Berry 2001).



The Rocky Mountain Research Station develops scientific information and technology to improve management, protection, and use of the forests and rangelands. Research is designed to meet the needs of National Forest managers, Federal and State agencies, public and private organizations, academic institutions, industry, and individuals.

Studies accelerate solutions to problems involving ecosystems, range, forests, water, recreation, fire, resource inventory, land reclamation, community sustainability, forest engineering technology, multiple use economics, wildlife and fish habitat, and forest insects and diseases. Studies are conducted cooperatively, and applications may be found worldwide.

Research Locations

Flagstaff, Arizona	Reno, Nevada
Fort Collins, Colorado*	Albuquerque, New Mexico
Boise, Idaho	Rapid City, South Dakota
Moscow, Idaho	Logan, Utah
Bozeman, Montana	Ogden, Utah
Missoula, Montana	Provo, Utah

*Station Headquarters, Natural Resources Research Center,
2150 Centre Avenue, Building A, Fort Collins, CO 80526

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.