

# “SAGEBRUSH” BREWER’S SPARROW

*Spizella breweri breweri*

Original<sup>1</sup> prepared by Martin Gebauer

## Species Information

### Taxonomy

The Brewer’s Sparrow is in the genus *Spizella*, although its relationship within the genus remains uncertain (Rotenberry et al. 1999). Five other sparrow species in North America are included in the genus: American Tree Sparrow (*S. arborea*), Field Sparrow (*S. pusilla*), Chipping Sparrow (*S. passerina*), Clay-colored Sparrow (*S. pallida*), and Black-chinned Sparrow (*S. atrogularis*) (NGS 1999).

Two subspecies of Brewer’s Sparrow are currently recognized, *S. breweri breweri* (Sagebrush Brewer’s Sparrow) and *S. breweri taverneri* (Timberline Brewer’s Sparrow). *Spizella breweri breweri* breeds in lowland and upland sagebrush habitats of British Columbia primarily within the Great Basin region in the south Okanagan and Similkameen valleys, but may occur as far north as the Chilcotin River. In British Columbia, *S. breweri taverneri* is reported to breed in subalpine shrubs, and does not apparently breed south of the Canada–U.S. border (Godfrey 1986; Cannings 1998; Rotenberry et al. 1999). Some authors consider these two subspecies to be separate species (Sibley and Monroe 1990; Klicka et al. 1999). Unless otherwise noted, this account refers to the *breweri* subspecies.

### Description

The Brewer’s Sparrow is one of the most plainly marked sparrows. It bears a strong resemblance to the Clay-colored Sparrow, although the facial markings are much less distinct. The Brewer’s Sparrow can be further distinguished by a brown crown with fine black streaks and the absence of the clear pale central strip of the Clay-colored Sparrow. The Brewer’s Sparrow also features a whitish eye ring and greyish-white eyebrow. The ear patch is pale

brown with darker borders and the bill is dusky above and slightly paler below. Upperparts are buffy brown and streaked with black, and the rump is buffy brown and may be lightly streaked. The tail is dark brown and narrowly edged with grey and lacks the whiter outer tail coverts of the Vesper Sparrow (*Pooecetes gramineus*). Underparts are dull white with the breast and sides lightly washed with greyish buff (Godfrey 1986; NGS 1999).

### Distribution

#### Global

The Brewer’s Sparrow is restricted to North America, breeding from the southern Interior of British Columbia, southeastern Alberta and southwestern Saskatchewan, south through Washington, Oregon, and California, east of the Cascades, throughout most of Montana, Nevada, Utah, Wyoming, and northern Arizona and east to include portions of Colorado, North Dakota, South Dakota, and Nebraska. Sporadic breeding has been reported in Kansas, Oklahoma, and the Texas Panhandle (Rotenberry et al. 1999).

The Sagebrush Brewer’s Sparrow winters from southeastern California to western Texas south throughout Baja California and Sonora, the Pacific Lowlands of northern and central Mexico, and the highlands of west-central Mexico to Guanajuato (Howell and Webb 1995; Rotenberry et al. 1999; Campbell et al. 2001). There is currently no information on how the two subspecies are distributed on wintering grounds (Rotenberry et al. 1999).

#### British Columbia

The Sagebrush Brewer’s Sparrow breeds in the extreme southern portions of the southern Interior west of the Okanagan River, from the Marron Valley

<sup>1</sup> Volume 1 account prepared by L. Hartman.

## Brewer's Sparrow - subspecies *breweri* (*Spizella breweri breweri*)



Note: This map represents a broad view of the distribution of potential habitat used by this species. The map is based on several ecosystem classifications (Ecoregion, Biogeoclimatic and Broad Ecosystem Inventory) as well as current knowledge of the species' habitat preferences. This species may or may not occur in all areas indicated. More detailed maps are available for this species from the Ministry of Sustainable Resource Management.

south to Kilpoola Lake near the International Boundary (Campbell et al. 2001). Brewer's Sparrows have also been reported and may occasionally breed in several other interior locations including Vernon, Kamloops, Ashcroft, the Chilcotin River, and Riske Creek (Campbell et al. 2001).

### **Forest region and districts**

Southern Interior: 100 Mile House (possible),  
Central Cariboo, Kamloops, Okanagan Shuswap

### **Ecoprovinces and ecoregions**

CEI: FRB (possibly)  
SIM: EKT  
SOI: OKR, SOB, NOB suspected in THB and NTU

### **Biogeoclimatic units**

BG: xh1, suspected in xh2, possible in xh3, xw,  
xw1,  
IDF: dk1, dk1a, dm1, dm2, xh1, xh1a, xh2, xh2a  
PP: dh2, xh1, xh1a, xh2, xh2a

### **Broad ecosystem units**

DP, PP, SS

### **Elevation**

In British Columbia, the Brewer's Sparrow has been observed nesting at elevations ranging primarily from 340 to 750 m (Campbell et al. 2001). Breeding behaviour has been observed at 1000 m (Mahony 2003; Paczek 2001), and Cannings et al. (1987) have reported sightings up to 1860 m on Mount Kobau, where sagebrush extends to join stands of subalpine fir (*Abies lasiocarpa*). Mahony (pers. comm.) found two upper elevation sites of the Sagebrush Brewer's Sparrow on a high elevation plateau near Blind Creek, on the north side of Mount Kobau.

## **Life History**

### **Diet and foraging behaviour**

Diet consists of seeds, spiders, and insects, especially caterpillars (see Rotenberry et al. 1999 and Stephens 1985 for details on taxa in adult diet), which are gleaned from open ground between and beneath sagebrush plants (MELP 1998) and from shrub foliage (Dobkin 1992). Brewer's Sparrow nestlings in

Idaho had a diet consisting of a wide range of arthropod orders including Lepidoptera, Araneae, Hemiptera, and Homoptera (Petersen and Best 1986). During the breeding season, Brewer's Sparrow are primarily insectivorous.

During the breeding season, Brewer's Sparrows forage throughout the day, although mornings and late evening before sunset tend to be more active times. Seeds are picked up from the ground and only occasionally are birds observed gleaning seeds directly from plants (Rotenberry et al. 1999). Birds will occasionally fly up and catch insects on the wing (Rotenberry et al. 1999).

### **Reproduction**

Dates for 251 clutches in British Columbia ranged from 12 May to 18 July, with 52% recorded between 4 June and 30 June (Campbell et al. 2001). Dates of clutch initiation in a 4-year study in the south Okanagan ranged from 30 April to 21 July (Mahony 2003). Average size of 119 clutches ranged from one to five eggs with 79% having three or four eggs (Campbell et al. 2001). Average clutches of three to four eggs have also been reported by Paine (1968), Reynolds (1981), and Rotenberry and Weins (1989). Incubation period ranges from 10 to 13 days but is typically 11 days (Ehrlich et al. 1988; Rotenberry et al. 1999). Dates for 157 broods in British Columbia ranged from 26 May to 01 August (Campbell et al. 2001). Broods observed by Mahony (2003) in the south Okanagan ranged between 13 May and 2 August. Sizes of 88 broods ranged from one to four young with 80% having three or four young (Campbell et al. 2001). Young fledge from 6 to 9 days (Ehrlich et al. 1988; Rotenberry et al. 1999; Mahony et al. 2002). Pairs will frequently double-brood (Rotenberry et al. 1999). In British Columbia, females regularly made multiple nesting attempts with 17% ( $n=132$ ) females successfully fledging two broods in a season, and two females fledging three broods (Mahony et al. 2002). In Washington, 5% of females fledged two broods per season (Mahony et al. 2002).

Low levels of Brown-headed Cowbird (*Molothrus ater*) parasitism has been observed in Brewer's

Sparrows nesting in British Columbia (i.e., 6 of 154 nests) (Campbell et al. 2001), and in other areas throughout their range (Rich 1978; Friedmann and Kiff 1985; Rotenberry and Weins 1989; Vander Haegen and Walker 1999, cited by Campbell et al. 2001). In a recent study in the south Okanagan, Mahony (2003) found that only 3% of 664 nests (~20) were parasitized by cowbirds. In Alberta, a relatively high level of cowbird parasitism (i.e., 13 of 25 nests) was reported (Biermann et al. 1987).

Most parasitized Brewer's Sparrow nests are abandoned by adults (Friedmann and Kiff 1985; Biermann et al. 1987). Of 20 parasitized nests found between 1997 and 2000 in the south Okanagan, most were abandoned or the cowbird eggs failed to hatch, and only one cowbird chick hatched and fledged (Mahony 2003).

### Site fidelity

In southeastern Idaho, about 25% of colour-banded adult birds returned to nesting habitat used the previous year (Petersen and Best 1987). Adult annual survival rates in the south Okanagan varied with year but averaged 47% over 3 years (Mahony 2003). Only 4.2% of 495 nestlings banded in the south Okanagan, were resighted in the region. Of these, only 19% moved from natal sites to other areas within the Okanagan to breed (Mahony 2003). Of about 400 nestlings banded in the Great Basin area of the United States during a 7-year period, none returned to breed near their natal site (Rotenberry et al. 1999).

### Home range

In the south Okanagan, territories are approximately 0.4–0.5 ha (Cannings et al. 1987). Mean breeding territory size of Sagebrush Brewer's Sparrows in Oregon ranged from 0.55 to 1.25 ha (Weins et al. 1985) and in Idaho, mean territory size was 0.52 ha. Brewer's Sparrows are often semi-colonial breeding in loose aggregations of 2–21 pairs and occupying areas of 6–225 ha (Harvey 1992).

Densities of Sagebrush Brewer's Sparrows in the south Okanagan reported by Harvey (1992) ranged from 1.83 males/100 ha along Nighthawk Road, to

5.86 males/100 ha at White Lake, to 9.05 males/100 ha at Kilpoola Lake West area. Breeding densities in Nevada ranged from 1.50 to 1.68 individuals/ha between 1981 and 1983 (Medin 1992), whereas breeding densities in Washington ranged from means of 0.51 to 0.85 individuals/ha between 1988 and 1990 (Dobler et al. 1996).

Recent data by Mahony and Paczek (unpubl. data) from the south Okanagan suggest that at least 2.6 times as many pairs may be present in an area than the number of singing males recorded on bird surveys indicates.

### Movements and dispersal

The Sagebrush Brewer's Sparrow arrives in the south Okanagan as early as the third week of April (19 April) with numbers increasing to the last week of May (Cannings et al. 1987; Campbell et al. 2001). No discernible autumn movement has been noted in the south Okanagan, but reports of birds drops sharply by mid-July as birds stop singing, and few birds remain after the end of August, most likely young of the year (latest record on 22 September) (Campbell et al. 2001). A recent study of post-fledging survival and dispersal showed that once young Sagebrush Brewer's Sparrows and adults had finished breeding, they moved from sagebrush-dominated breeding areas to aspen gullies and areas with large non-sage shrubs in the post-breeding but pre-departure stage in July and August (Yu 2001). A survey by Hobbs (2001) indicated a strong relationship between the occurrence of breeding sites in proximity to aspen stands. All six sites at which breeding behaviour was confirmed were located within 500 m of deciduous stands.

### Habitat

#### Structural stage

##### *Nesting*

2: herb

3a: low shrub

##### *Post-fledgling*

4: pole/sapling (aspen stands)



## Important habitats and habitat features

### Nesting

The Sagebrush Brewer's Sparrow nests in sagebrush dominated shrub-steppe habitats (Castrale 1982; Cannings et al. 1987; Knick and Rotenberry 1995; Dobler et al. 1996; Sarell and McGuinness 1996; Paige and Ritter 1999). Despite the close relationship with sagebrush, high densities of shrubs (i.e., >50% foliar cover) may reduce suitability as breeding habitat (Dobler 1994; Harvey 1992; Sarell and McGuinness 1996). Dobler (1994) reported that sagebrush cover density was positively correlated to occurrence of Brewer's Sparrows up to approximately 20% cover. Although his data did not include results for >20%, he suggested that numbers would decline with increasing shrub density.

Harvey (1992) notes that Brewer's Sparrow prefer areas with no more than 10% bare ground. Dobler (1994) who found that Brewer's Sparrow numbers were negatively correlated with annual grass cover reported similar results. An interesting result by Paczek (2001) and Hobbs (2001) was that Sagebrush Brewer's Sparrows were more likely to be found in areas with large well-developed perennials such as parsnip-flowered buckwheat (*Eriogonum heracleoides*) and lupine (*Lupinus sericeus*) and at sites higher in elevation and moisture, and with more lush vegetation. Rotenberry and Weins (1989) found a direct correlation between winter precipitation and clutch size of Brewer's Sparrow, suggesting that birds are able to respond favourably to increased primary and secondary productivity.

Nests are compact cups of grasses, plant stems, and rootlets, lined with mammalian hair (e.g., horse and cow) and fine grasses (Godfrey 1986; Campbell et al. 2001). In the Okanagan, nests of Sagebrush Brewer's Sparrow are almost always built in sagebrush (92%), usually near the ground (mean height of 30 cm) (Cannings et al. 1987; Campbell et al. 2001). Mean nest heights of 25 nests measured by Sarell and McGuinness (1996) was 49 cm (range 12–104 cm). Nests have also been reported in common snowberry (*Symphoricarpos albus*), snowbrush (*Ceanothus velutinus*), and Douglas-fir (*Pseudotsuga menziesii*) (Sarell and McGuinness 1996).

Interestingly, at a site where a wildfire removed most of the sagebrush cover in 1994, Brewer's Sparrows nested in a variety of plants including giant wildrye (*Elymus cinereus*), common snowberry, lemonweed (*Lithospermum ruderales*), lupine, bluebunch wheatgrass (*Pseudoroegneria spicata*), common rabbitbrush (*Ericameria nauseosus*), mustard species, diffuse knapweed (*Centaurea diffusa*), and rose species from 1997 to 2000 (Mahony 2003). However, by 2000, they had shifted back to nesting more in sagebrush as shrubs that germinated after the fire became large enough, demonstrating the plasticity of this species that is adapted to a fire-dependent ecosystem.

Petersen and Best (1985) determined that Brewer's Sparrows preferred to nest in sagebrush shrubs that were entirely or mostly alive and were significantly taller and denser than surrounding shrubs. Knopf et al. (1990) observed that Brewer's Sparrows were positively correlated with shrub vigour presumably because healthy shrubs provide better protective cover and nest concealment. In British Columbia, mean nest shrub height ( $n = 25$ ) was 110 cm and ranged between 64 and 170 cm (Sarell and McGuinness 1996). Mean height of nest shrubs in one Idaho study was 69 cm (range of 42–104 cm) (Petersen and Best 1985), and 66.9 cm in another Idaho Study (Rich 1980). In Oregon, average nest shrub height was 71 cm (range 50–107 cm) (Rotenberry et al. 1999). Rich (1978) found that Brewer's Sparrows built nests above the densest portion of a shrub whereas Sage Thrasher (*Oreoscoptes montanus*) and Sage Sparrow (*Amphispiza belli*) chose nest sites within the densest portions. In the Okanagan, Sagebrush Brewer's Sparrows placed nests in shrubs that were surrounded by a greater density of shrub cover than was randomly available at sites, presumably to hide their movements to and from nests from nest predators (Mahony 2003).

Brewer's Sparrows may avoid nesting close to trees to avoid predation by avian predators that perch in trees (e.g., corvids) (Welstead 2002). They may also select areas with low densities of avian predators (Welstead 2002).

### Post-fledgling habitat

Yu (2001) found that adults and juveniles used aspen-dominated or shrub-dominated ravines more often than sagebrush habitats during the post-fledgling period even though these habitats represented only 15% of the available habitat.

### Foraging

Sagebrush Brewer's Sparrows forage within sagebrush breeding habitat, although wetlands, mesic ravines, and aspen-dominated ravines may also be important insect foraging areas during the nesting season and especially in the post-breeding phase for both adults and independent young (Yu 2001). Weins et al. (1987) found that Brewer's Sparrows foraged primarily within shrubs (>75% of over 600 observations). Shrubs selected for foraging differ significantly from those randomly available. Larger, and more vigorous sagebrush are selected over smaller sagebrush and other shrubs such as rabbitbrush (*Chrysothamnus* spp.) (Rotenberry and Weins 1998). In the south Okanagan, sites with breeding Sagebrush Brewer's Sparrows had four times as many arthropods and two times as many species than sites not supporting breeding populations (P. Krannitz, unpubl. data). This was largely because of the predominance of herbaceous perennials at the sites of importance for Brewer's Sparrow, which tended to support more arthropods. Of particular note were larvae of the moth *Sparganothis tunicana* which were found on lupine plants (*Lupinus sericeus*) and were a favoured food for Brewer's Sparrow chicks (Mahony, pers. comm.)

## Conservation and Management

### Status

The Sagebrush Brewer's Sparrow is on the provincial *Red List* in British Columbia. Its status in Canada has not been evaluated (COSEWIC 2002).

Summary of ABI status in BC and adjacent jurisdictions (NatureServe Explorer 2002)

BC	AB	WA	ID	MT	Canada	Global
S2B	S4B	S4B, S2N	S4B, S2N	S4B, S2N	N?	G5T4

### Trends

#### Population trends

Breeding Bird Survey results for the period 1966 to 1998 indicate a significant decline (-3.5%/yr) in Brewer's Sparrows across North America (Sauer et al. 1999). Significant trends in Canada were not noted, likely due to small sample sizes. Declines were noted in Wyoming (-2.25%), Idaho (-5.17%), and Montana (-2.85%) (Dobkin 1992; Sauer et al. 1999). Declines of -2.25%/yr were observed in western North America (i.e., British Columbia, Washington, Oregon, and California) but were not significant. Declines in the Columbia River Basin were 1.3% for the period 1968–1994 and 4.3% for the period 1984–1994 (Saab and Rich 1997). Declines are largely suspected to be due to loss of suitable sagebrush habitats resulting from range improvements (i.e., burning and clearing) and other land development activities (Rotenberry et al. 1999).

In British Columbia, Fraser et al. (1999) suggest that populations are probably declining slowly because of sagebrush habitat loss, but that populations appear to be stable where habitat is being maintained. An analysis of Breeding Bird Surveys in British Columbia for the period 1966 to 1998 did not reveal a significant trend (Sauer et al. 1999). However, sample sizes are likely too small to obtain significant results. Population size of Sagebrush Brewer's Sparrow in the south Okanagan was determined to be 826 birds (Harvey 1992) or an estimated 800–1000 adults (Sarell and McGuinness 1996). Using the 2.6 multiplication factor determined by Mahony and Paczek (unpubl. data), it is possible that as many as 2000 adults make up the south Okanagan population. Aggregations of up to half a dozen pairs are possible at some of the larger sites in the Thompson region but it remains to be determined if they are nesting successfully there.

The only site where comparisons of population trends over time can be inferred are at White Lake. Willing (1970) estimated between 20 and 30 pairs in 1968 and 1969, Cannings et al. (1987) found 20 males in 1978 and 22 in 1980, and Harvey (1992) reported 41 males in 1992. Although these data may suggest a stable population at White Lake, the survey methods differed so differences may be a result of survey methods. Data from 1998 to 2000 from a plot at White Lake indicate large yearly fluctuations in the breeding population from 51 breeding pairs in 1998 to 42 pairs in 1999 down to 27 pairs in 2000 (Mahony 2003).

### **Habitat trends**

Approximately 3% of potentially suitable Sagebrush Brewer's Sparrow habitats in the south Okanagan is within conservation lands. About 38% is within provincial land (MELP 1998) but much of this is managed under grazing leases, which are not required to implement the recommendations of the *Forest and Range Practices Act*. Indian Reserves include 23% and private lands make up an additional 36% of suitable habitats in the south Okanagan (MELP 1998). The impacts of grazing, fire suppression, and other human activities on the availability of suitable Sagebrush Brewer's Sparrow habitats have not been thoroughly investigated.

In the south Okanagan, an unprecedented rate of urbanization and changes in agricultural practices have resulted in a decline in sagebrush habitats (Sarell and McGuinness 1996). In Washington, more than half of the native shrub-steppe ecosystem has been converted to agricultural lands (Dobler et al. 1996; Vander Haegen et al. 2000).

## **Threats**

### **Population threats**

Nest depredation is thought to be the most important cause of breeding failure. Rates of nest depredation in the Okanagan ranged from 14 to 65% of nests at four sites (Mahony 2003), within the range reported in many migratory songbird species (Martin 1992). Documented predators of eggs and nestlings include Gopher Snake (*Pituophis catenifer*)

and Townsend's Ground Squirrel (*Spermophilus townsendii*) (Rotenberry et al. 1999) and Western Terrestrial Garter Snake (*Thamnophis elegans*) (N. Mahony, pers comm.). Other potential nest predators include Loggerhead Shrike (*Lanius ludovicianus*), Western Rattlesnake (*Crotalus oreganus*), Common Raven (*Corvus corax*), American Crow (*Corvus brachyrhynchos*), Black-billed Magpie (*Pica pica*), Long-tailed Weasel (*Mustela frenata*), and Least Chipmunk (*Tamias minimus*) (Petersen and Best 1987, Rotenberry and Weins 1989). In Idaho, presence of shrikes significantly affected density and nesting success of Brewer's Sparrow (Woods 1994, cited by Rotenberry et al. 1999). American Kestrel (*Falco sparverius*), Prairie Falcon (*Falco mexicanus*), and Loggerhead Shrike have been reported as preying on adults (Rotenberry et al. 1999).

### **Habitat threats**

Continued loss of sagebrush-steppe habitats is the primary threat to Sagebrush Brewer's Sparrow populations (Sarell and McGuinness 1996). Heavy grazing and clearing of sagebrush for urban and agricultural development are the greatest threats to sagebrush habitats (MELP 1998).

In Washington, more than half of the native shrub-steppe ecosystem has been converted to agricultural lands resulting in fragmentation and detrimental effects on numerous shrub-steppe species (Vander Haegen et al. 2000). The majority of habitat loss in the south Okanagan is due to an unprecedented rise in immigration to the area, and subsequent increase of human encroachment (Sarell and McGuinness 1996).

Fires may reduce sagebrush habitat for some time since sagebrush is slow to regenerate from fires (Castrale 1982). Sagebrush Brewer's Sparrow is immediately affected by the loss of shrubs and the effects on Brewer's Sparrow use of a burned area are particularly pronounced within the first few years (up to 4 years) following burning. N. Mahony (pers. comm.) suggests that fire may be an important component in creating high suitability habitat in areas that have not been grazed. Fire cycles of 7–20 years may make some areas temporarily

unsuitable, but result in highly suitable habitat within 5–6 years in the absence of cattle grazing. In a recent burn in the south Okanagan, N. Mahony (pers. comm.) found that Sagebrush Brewer's Sparrow nested in other vegetation 3–5 years after burning, but were nesting again in small sagebrush shrubs that had germinated after the fire, 6 years later. Fire also burns off dead sagebrush and built-up organic material, resulting in more vigorous growth of grasses and herbs, with resulting increased insect prey of high importance to breeding Brewer's Sparrows.

Tree encroachment into grasslands due to fire suppression may also be negatively impacting Brewer's Sparrow by providing perches for nest predators and reducing amount of suitable habitat (Welstead 2002).

Heavy grazing pressure appears to negatively affect Sagebrush Brewer's Sparrow populations whereas light to moderate grazing does not appear to have a significant impact (Harvey 1992; Saab et al. 1995). Although some studies from other areas (Nevada, Idaho) have not reported differences in densities between grazed and ungrazed habitats (Reynolds and Trost 1980; Medin and Clary 1991), level of grazing is thought to be of concern in British Columbia. The impacts of livestock grazing include trampling/disturbance of nests, altering foraging habitat (understorey forbs), reducing aspen regrowth in post-fledgling habitats, as well as altering sagebrush stand density which may influence the establishment and defence of territories.

Intensive range management programs, such as burning, mowing, herbicide applications, and planting with crested wheatgrass (*Agropyron cristatum*), are thought to negatively impact sagebrush habitats and the birds using these areas (Reynolds and Trost 1981; Wiens and Rotenberry 1985; MELP 1988; Knick and Rotenberry 2000).

The spread of cheatgrass (*Bromus tectorum*) has had a negative impact on sagebrush habitats (Rotenberry et al. 1999). Cheatgrass, an annual species, tends to occur in large monocultures that are highly flammable, increasing the spread of fire and loss of sagebrush and other shrubs, and accelerates the

spread of annuals such as cheatgrass (Paige and Ritter 1999, Knick and Rotenberry 2000).

Data concerning the effects of pesticides on Sagebrush Brewer's Sparrow are limited. Herbicides can destroy sagebrush habitat (Best 1972). Castrale (1982) found that 5 years after herbicide spraying, Brewer's Sparrows were virtually absent from a site where shrubs were completely killed. Best (1972) found that herbicide treatment of sagebrush resulted in a diet shift to greater proportion of seeds and a significant reduction in numbers of nesting birds in the season of spraying. Schroeder and Sturges (1975) found that Brewer's Sparrow use of a herbicided sagebrush stand 1–2 years after spraying was 67% and 99% lower, respectively, than use on an unsprayed stand, and no nests were observed in the sprayed area.

Insecticides may have an impact on food availability. In the United States, local declines of grassland birds have been potentially linked to grasshopper control programs using pesticides (Paige and Ritter 1999), although George et al. (1995) noted that pesticide treatments for grasshopper control had little effect on breeding bird communities in western rangelands. In shrub-steppe habitats in southern Idaho, Howe et al. (1996) found that malathion application had no observable direct effects, and only marginal indirect effects, through food-base reduction, on Brewer's Sparrow and Sage Thrasher nestling growth and survival.

## Legal Protection and Habitat Conservation

The Brewer's Sparrow, its nests, and its eggs are protected in Canada and the United States by the *Migratory Birds Convention Act*. In British Columbia, the same are protected from direct persecution by the provincial *Wildlife Act*.

Protected areas in the south Okanagan include Nature Trust of British Columbia lands at White Lake and Kilpoola Lake. According to MELP (1998), only 3% (1496 ha) of potentially suitable Sagebrush Brewer's Sparrow habitat was designated as conservation lands. However, under the Okanagan–Shuswap Land and Resource Management Plan



(LRMP) process, 49 new protected areas were established in the south Okanagan. The Okanagan–Shuswap LRMP, approved in January 2001, covers approximately 2.5 million ha of which 122 963 ha of new protected areas were established in addition to the 71 643 ha of existing parks and ecological reserves (total of 194 606 ha or 7.9%). Some of the more important proposed protected areas for Brewer’s Sparrows include White Lake Grasslands (3627 ha) and South Okanagan Grasslands (9700 ha).

Under the results based code, recommendations for managing riparian and grassland habitats may provide some protection of habitat for Sagebrush Brewer’s Sparrow. Range use plans that consider the requirements of this species may address the needs of the species; however, for a species to be specifically addressed within these plans, they must be designated as Identified Wildlife. In some cases, current grazing practices may be adequate to maintain habitats for this species and therefore it may not be necessary to establish a WHA. This assessment must be made case by case.

## Identified Wildlife Provisions

### Sustainable resource management and planning recommendations

- ❖ Maintain remaining late-seral sagebrush habitats and suitable dry shrub-steppe habitats.
- ❖ Maximize connectivity of suitable Sagebrush Brewer’s Sparrow habitats (sagebrush habitats, aspen-dominated ravines).
- ❖ Encourage growth or restoration of a healthy native grassland and sagebrush communities.
- ❖ Within important Sagebrush Brewer’s Sparrow breeding areas, as recommended by MWLAP:
  - Avoid thinning of dense stands of sagebrush (>50% foliar cover) except where recommend to improve nesting habitat.
  - Plan livestock grazing to avoid damage to sagebrush and sensitive herb and grass communities, and to maintain the desired sagebrush density (10–30% foliar cover).
  - Prevent forest encroachment.

## Wildlife habitat area

### Goal

Maintain suitable nesting for multiple pairs and post-fledgling habitat.

### Feature

Establish WHAs over breeding aggregations of five or more pairs and high suitability shrub-steppe habitats (i.e., sagebrush sites ranging from structural stages 2–3a; age class 1).

### Size

Typically between 5 to 50 ha of contiguous shrub-steppe habitats, or up to 225 ha of discontinuous habitat. Ultimately, size will depend on the area of suitable breeding habitat and post-fledgling habitat.

### Design

The WHA should include sagebrush shrub-steppe habitats with a mosaic of habitat attributes including a low percentage of bare ground (i.e., 10–20%), moderate densities of shrubs (i.e., 10–30%), and high cover of flowering perennials. Aspen-dominated ravines and higher elevation aspen/saskatoon (*Amelanchier alnifolia*) shrubby areas within the vicinity (i.e., within 600 m) of breeding habitat should be included within WHAs.

## General wildlife measures

### Goals

1. Minimize disturbance and trampling by livestock.
2. Retain density and structure of sagebrush habitat.
3. Encourage forb-component in grasslands.
4. Promote development of native perennial herbs, grasses.
5. Maintain integrity of sagebrush and riparian communities.
6. Maintain aspen-dominated stands in a properly functioning condition.
7. Prevent tree encroachment.

## Measures

### Access

- Avoid road development.

### Pesticides

- Do not use pesticides.

### Range

- Limited thinning of dense (>30–50% foliar cover) stands of sagebrush may be appropriate as long as the primary objective is the improvement of nesting habitat.
- Plan livestock grazing to maintain desired structure of plant community, desired stubble height, and browse utilization.
- Do not concentrate livestock during the breeding season.
- Maintain large (>2 ha) patches of sagebrush where the sagebrush is 64–170 cm and sage density is between 10 and 50%.
- Maintain clumps of large (>1m), living sagebrush.
- Do not place livestock attractants within WHA.

## Additional Management Recommendations

Protect sagebrush during weed control programs.

Implement protective measures to reduce the risk of fire that eliminates 100% of shrubs over a wide area.

Do not conduct widespread range burning or shrub clearing, unless a suitable number of productive, dense, and medium-sized shrubs, preferred by Sagebrush Brewer's Sparrow for nesting, are retained. Prescribed burning in patches will likely result in a mosaic of habitats of high value to Sagebrush Brewer's Sparrow.

Remove trees or perches where necessary.

## Information Needs

1. More information on the specific habitat attributes preferred by breeding birds, particularly foraging habitat selection as well as basic information on habitat-related differences in reproduction and survivorship, and dispersal and migration (Fraser et al. 1999).

2. More surveys in suitable habitats to determine distribution, relative densities, and range boundaries. Particular attention should be paid to determining the extent of breeding activity in the lower Thompson River Valley to determine if singing males noted in this area are actually breeding.

## Cross References

“Great Basin” Gopher Snake, Racer, Sage Thrasher Requirements of the Long-billed Curlew and Grasshopper Sparrow may conflict with management prescriptions for the Sagebrush Brewer's Sparrow. The Long-billed Curlew requires more open grassland, and the Grasshopper Sparrow requires grassland with few or no shrubs.

## References Cited

- Best, L.B. 1972. First-year effects of sagebrush control on two sparrows. *J. Wildl. Manage.* 36(2):534–544.
- Biermann, G.C., W.B. McGillivray, and K.E. Nordin. 1987. The effect of cowbird parasitism on Brewer's Sparrow productivity in Alberta. *J. Field Ornith.* 58(3):350–354.
- B.C. Ministry of Environment, Lands and Parks (MELP). 1998. *Habitat atlas for wildlife at risk: South Okanagan and Lower Similkameen*. Penticton, B.C.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, A.C. Stewart, and M.C.E. McNall. 2001. *The birds of British Columbia. Vol. IV: Passerines. Wood-warblers through Old World Sparrows*. Royal B.C. Mus., Victoria, B.C., and Can. Wildl. Serv., Delta, B.C.
- Cannings, R.A., R.J. Cannings, and S.G. Cannings. 1987. *Birds of the Okanagan Valley, British Columbia*. Royal B.C. Mus., Victoria, B.C.
- Cannings, R.J. 1998. *The birds of British Columbia: a taxonomic catalogue*. B.C. Min. Environ., Lands and Parks, Wildl. Br. and Resour. Inventory Br., Victoria, B.C. Wildl. Bull. WB-86. 243 p.
- Castrale, J.S. 1982. Effects of two sagebrush control methods on nongame birds. *J. Wildl. Manage.* 46:945–952.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2002. *Canadian Species at Risk*. [www.speciesatrisk.gc.ca](http://www.speciesatrisk.gc.ca)

- Dobkin, D.S. 1992. Neotropical migrant landbirds in the Northern Rockies and the Great Plains. U.S. Dep. Agric. For. Serv., Northern Reg. Publ. No. R1-93-34.
- Dobler, F.C. 1994. Washington State shrubsteppe ecosystem studies with emphasis on the relationships between nongame birds and shrub and grass cover densities. *In Proc. Ecology and management of annual rangelands*. S.B. Monsen and S.G. Kitchen (compilers). U.S. Dep. Agric. For. Serv., Gen. Tech. Rep. INT-GTR-313, pp. 149–161.
- Dobler, F.C., J. Eby, C. Perry, S. Richardson, and M. Vander Haegen. 1996. Status of Washington's shrub-steppe ecosystem: extent, ownership, and wildlife/vegetation relationships. Phase one completion rep. Wash. Dep. Fish Wildl., Olympia, Wash.
- Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The birder's handbook: a field guide to the natural history of North American birds*. Simon & Schuster Inc., Toronto, Ont.
- Fraser, D.F., W.L. Harper, S.G. Cannings, and J.M. Cooper. 1999. Rare birds of British Columbia. B.C. Min. Environ., Lands and Parks, Wildl. Br. and Resour. Inventory Br., Victoria, B.C. 244 p.
- Friedmann, H. and L.F. Kiff. 1985. The parasitic cowbirds and their hosts. *Proc. West. Found. Vertebr. Zool.* 2 226–303.
- George, L.T., L.C. McEwen, and B.E. Petersen. 1995. Effects of grasshopper control programs on rangeland breeding bird populations. *J. Range Manage.* 48:336–342.
- Godfrey, W.E. 1986. *The birds of Canada*. Natl. Mus. Nat. Sci., Ottawa, Ont. 595 p.
- Harvey, D.H. 1992. The distribution, density and habitat of Brewer's Sparrows *Spizella breweri* in the south Okanagan Valley of British Columbia. BC Environ., Penticton, B.C. Unpubl. draft rep.
- Hobbs, J. 2001. An inventory of Brewer's Sparrow in the grasslands of southern and central British Columbia. Report prepared for B.C. Min. Water, Land and Air Protection, Habitat Br., Victoria, B.C. Unpubl.
- Howe, F.P., R.L. Knight, L.C. McEwen, and T.L. George. 1996. Direct and indirect effects of insecticide applications on growth and survival of nestling passerines. *Ecol. Appl.* 6(4):1314–1324.
- Howell, S.N.G. and S. Webb. 1995. *A guide to the birds of Mexico and northern Central America*. Oxford Univ. Press, New York, N.Y.
- Klicka, J., R.M. Zink, J.C. Barlow, W.B. McGillivray, and T.J. Doyle. 1999. Evidence supporting the recent origin and species status of the Timberline Sparrow. *Condor* 101:577–588.
- Knick, S.T. and J.T. Rotenberry. 1995. Landscape characteristics of fragmented shrubsteppe habitats and breeding passerine birds. *Conserv. Biol.* 9:1059–1071.
- \_\_\_\_\_. 2000. Ghosts of habitats past: contribution of landscape change to current habitats used by shrubland birds. *Ecology* 81:220–227.
- Knopf, F.L., J.A. Sedgwick, and D.B. Inkley. 1990. Regional correspondence among shrub-steppe bird habitats. *Condor* 92: 45–53.
- Krannitz, P.G. and C. Rohner. 2000. Habitat use and distribution of listed neotropical migrant songbirds in northeastern British Columbia. *In Proc. Conf. on the biology and management of species and habitats at risk*. L.M. Darling (editor). Kamloops, B.C., Feb. 15–19, 1999. B.C. Min. Environ., Lands and Parks, Victoria, B.C., and Univ. Coll. Cariboo, Kamloops, B.C., pp. 823–829.
- Mahony, N.A. 2003. Reproductive ecology and population viability of Brewer's Sparrows at the northern edge of their range. Ph.D. thesis. Univ. B.C., Vancouver, B.C.
- Mahony, N.A., W.M. Vander Haegen, B.L. Walker, and P.G. Krannitz. 2002. Male incubation and multiple brooding in Brewer's Sparrows. *Wilson Bull.* 103:441–444.
- Martin, T.E. 1992. Breeding productivity considerations: What are the appropriate habitat features for management? *In Ecology and conservation of neotropical migrant landbirds*. J.M. Hagan III and W.D. Johnston (editors). Smithsonian Inst. Press, Washington, D.C., pp. 435–473.
- Medin, D.E. 1992. Birds of a Great Basin sagebrush habitat in west-central Nevada. U.S. Dep. Agric. For. Serv., Res. Pap. INT-452.
- Medin, D.E. and W.P. Clary. 1991. Breeding bird populations in a grazed and ungrazed riparian habitat in Nevada. U.S. Dep. Agric. For. Serv., Res. Pap. INT-441.
- National Geographic Society (NGS). 1999. *Field guide to birds of North America*. Washington, D.C.
- NatureServe Explorer. 2002. An online encyclopaedia of life. Version 1.6. NatureServe. Arlington, VA. Available at <http://www.natureserve.org/explorer/>

- Paczek, S. 2001. Effects of fine scale and landscape level habitat features on sagebrush breeding birds of the south Okanagan and Similkameen valleys, British Columbia. M.Sc. thesis. Univ. B.C., Vancouver, B.C. Unpubl.
- Paige, C. and S.A. Ritter. 1999. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Partners in Flight, Western Working Group, Boise, Idaho.
- Paine, R.T. 1968. Brewer's Sparrow. *In* Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. O.L. Austin, Jr. (editor). U.S. Natl. Mus. Bull. 237, Part 2, pp. 1208–1217.
- Petersen, K.L. and L.B. Best. 1985. Brewer's Sparrow nest-site characteristics in a sagebrush community. *J. Field Ornith.* 56(1):23–27.
- \_\_\_\_\_. 1986. Diets of nestling Sage Sparrows and Brewer's Sparrows in an Idaho sagebrush community. *J. Field Ornith.* 57(4):283–294.
- \_\_\_\_\_. 1987. Effects of prescribed burning on nongame birds in a sagebrush community. *Wildl. Soc. Bull.* 15:317–329.
- Reynolds, T.D. 1981. Nesting of the Sage Thrasher, Sage Sparrow, and Brewer's Sparrow in southeastern Idaho. *Condor* 83:61–64.
- Reynolds, T.D. and C.H. Trost. 1980. The responses of native vertebrate populations to crested wheatgrass planting and grazing by sheep. *J. Range Manage.* 33(2):122–125.
- \_\_\_\_\_. 1981. Grazing, crested wheatgrass and bird populations in southeastern Idaho. *Northwest Sci.* 55(3):225–234.
- Rich, T. 1980. Nest placement in Sage Thrashers, Sage Sparrows, and Brewer's Sparrows. *Wilson Bull.* 92(3):362–368.
- Rich, T.D. 1978. Cowbird parasitism of Sage and Brewer's Sparrows. *Condor* 80:348.
- Rotenberry, J.T., M.A. Patten, and K.L. Preston. 1999. Brewer's Sparrow (*Spizella breweri*). *In* The birds of North America, No. 390. A. Poole and F. Gill (editors). The Birds of North America, Inc., Philadelphia, Penn.
- Rotenberry, J.T. and J.A. Weins. 1989. Reproductive biology of shrubsteppe passerine birds: geographical and temporal variation in clutch size, brood size, and fledgling success. *Condor* 91:1–14.
- \_\_\_\_\_. 1998. Foraging patch selection by shrubsteppe sparrows. *Ecology* 79(4):1160–1173.
- Saab, V.A., C.E. Bock, T.D. Rich, and D.S. Dobkin. 1995. Livestock grazing effects in western North America. *In* Ecology and management of neotropical migratory birds. T.E. Merten and D.M. Finch (editors). Oxford Univ. Press, New York, N.Y., pp. 311–353.
- Saab, V.A. and T.D. Rich. 1997. Large-scale conservation assessment for neotropical migratory land birds in the interior Columbia River Basin. U.S. Dep. Agric. For. Serv., Gen. Tech. Rep. PNW-GTR-399.
- Sarell, M.J. and K.P. McGuinness. 1996. Status of the Brewer's Sparrow in British Columbia. B.C. Min. Environ., Lands and Parks, Wildl. Br., Victoria, B.C. Wildl. Work. Rep. WR-77.
- Sauer, J.R., J.E. Hines, I. Thomas, J. Fallon, and G. Gough. 1999. The North American Breeding Bird Survey, results and analysis 1966–1998. Version 98.1. U.S. Geol. Surv., Patuxent Wildl. Res. Cent., Laurel, Md.
- Schroeder, M.H. and D.L. Sturges. 1975. The effect on the Brewer's Sparrow of spraying big sagebrush. *J. Range Manage.* 28(4):294–297.
- Sibley, C.G. and B.L. Monroe, Jr. 1990. Distribution and taxonomy of birds of the world. Yale Univ. Press, New Haven, Conn.
- Stephens, D.A. 1985. Foraging ecology of shrubsteppe birds in central Washington. M.Sc. thesis. Central Washington Univ., Ellensburg, Wash.
- Vander Haegan, W.M., F.C. Dobler, and D.J. Pierce. 2000. Shrubsteppe bird response to habitat and landscape variables in eastern Washington, USA. *Conserv. Biol.* 14(4):1145–1160.
- Vander Haegan, M. and B. Walker. 1999. Parasitism by Brown-headed Cowbirds in shrub-steppe of eastern Washington. *In* Research and management of the Brown-headed Cowbird in western landscapes. M.L. Morrison, L.S. Hall, S.K. Robinson, S.I. Rothstein, D.C. Hahn, and T.D. Rich (editors). *Stud. Avian Biol.* 18, pp. 34–40.
- Weins, J.A., J.T. Rotenberry, and V. Van Horne. 1985. Territory size variations in shrubsteppe birds. *Auk* 102:500–505.
- Weins, J.A., B. Van Horne, and J.T. Rotenberry. 1987. Temporal and spatial variations in the behavior of shrubsteppe birds. *Oecologia* 73:60–70.
- Welstead, K. 2002. Factors affecting nest predation of artificial and real Sagebrush Brewer's Sparrow (*Spizella breweri breweri*) nests in the South Okanagan and Similkameen Valleys in British Columbia. M.Sc. thesis. Univ. B.C., Vancouver, B.C.



- Willing, R.M. 1970. The role of song in the behaviour and evolution of three species of spizellid sparrow: sonagraph and field playback studies. M.Sc. thesis. Simon Fraser Univ., Burnaby, B.C. Unpubl. 115 p.
- Woods, C.P. 1994. The Loggerhead Shrike in southwest Idaho. M.Sc. thesis. Boise State Univ., Boise, Idaho.
- Yu, J.H.Y. 2001. Post-fledging habitat use and movements of Brewer's Sparrows (*Spizella breweri breweri*) in the South Okanagan. M.Sc. thesis. Univ. B.C., Vancouver, B.C. Unpubl.

## **Personal Communications**

- Krannitz, P. 2001. Canadian Wildlife Service, Delta, B.C.
- Mahony, N. 2001. Univ. of British Columbia, Graduate Student, Vancouver, B.C.