

Glacier National Park
Eastside Grassland Bird Assessment
2000-2001 Draft Report

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Introduction

Grassland bird populations have declined precipitously over the last few decades (as cited in Madden et al. 1999). These reductions are thought to be strongly associated with reductions and alterations in the vegetation and disturbance regimes of native grasslands. Different grassland species respond differently to various grassland management practices. For example, some grassland birds favor areas that undergo annual mowing or grazing whereas others are negatively affected by such practices. Bird species that require natural disturbance regimes (fire and periodic grazing) have experienced the worst declines.

Historically, fires were frequent in eastside meadows (as cited in GNP plant id guide-need reference-no name on my copy). Fire suppression efforts in recent decades, however, have allowed for the encroachment of trees and shrubs. Furthermore, although many meadows on the eastside of Glacier National Park are still comprised of native vegetation, exotic forbs and grasses such as timothy (*Phleum pratense*) and Kentucky bluegrass (*Poa pratensis*) do occur. Indeed, some meadows are dominated by timothy to the exclusion of other native grass species. What effect this has had on the eastside grassland bird community is unknown.

Beginning in 2000 Glacier National Park began an assessment of wildlife and vegetation in eastside fescue grasslands. The results will be used to determine ecological condition of grasslands for prioritizing management actions. The main objective of this study, therefore, was to provide baseline data regarding bird diversity and abundance in eastside grasslands.

Methods

Bird Surveys

In 2000, 35 points were established in seven different grassland areas (Table 1) on the eastside of Glacier National Park (GNP). All points were randomly established while maintaining a minimum distance of 300 m apart. Owing to the small size of some meadows, however, some stations were established closer to each other. Subsequently, if a bird was known to be detected on two stations because of their close proximity, the bird was not recorded on the second point.

Table 1. Areas, station numbers, and number of points and visits during 2000 and 2001 bird surveys.

Area	Number of points	Station numbers	Number of visits
Rising Sun	2	1-2	8
Two Dog Flats	8	3-10	8
St. Mary Flats	4	11-14	9
Many Glacier	6	15-20	9
Belly River	7	21-27	8
Dry Fork	3	41-43	7
Two Medicine	5	44-48	6

Bird surveys were conducted during the breeding season using the point count method (Reynolds et al. 1980). I followed standard point count procedures as outlined in the USFS Northern Region Landbird Monitoring Program, recording all species detected by sight or sound. I did deviate slightly from the Landbird Monitoring Program Protocol in one respect; that is, I did not limit my bird-detection radius to 100-m. Rather I recorded all bird detections regardless of how far away they were. This allowed me to detect rarer species such as the Common Snipe that otherwise would have rarely been recorded. This also allowed me to examine bird diversity among points. The sampling period at each station lasted 10 minutes. Upon arrival at each station I would record the air temperature, and assign a numeric code to indicate sky and wind conditions. Wind conditions were based on the Beaufort wind scale. Bird surveys were not conducted when wind speeds exceeded 24 mph or in heavy rain or snow.

For each species detected I recorded its abundance, distance, azimuth and the habitat type in which it was located. I visited each station once every 7-10 days. Wherever possible, I changed the order of my visits so that I did not arrive at the same time of the day at specific station. In the Two Medicine and Belly River areas, however, this was not possible due to logistics.

Habitat Measurements

Station locations were recorded on aerial photographs, and exact locations were recorded using a GPS unit (Appendix I). In the year 2000 I followed standard procedures outlined in the USFS Northern Region Landbird Monitoring Program protocol to describe the habitat characteristics at each station. Because I felt that this approach did not adequately capture the habitat variables influencing bird abundance, however, in 2001 I measured habitat variables using a second approach. This approach included measuring variables that were likely to influence the presence and abundance of grassland bird species. For example, grass cover, forb cover, and depth of litter from previous years grass growth has been shown to be a strong indicator of Savannah Sparrow abundance (Swanson 2001). Therefore, at each point I measured the percent cover of grasses, forbs, litter, rock, and bare ground in five places: plot center and 25 m from plot center in the four cardinal directions. I also measured grass and forb height, and litter depth at each of these five locations. Percent cover of each of these variables was estimated using a Daubenmire frame rather than ocularly as done in 2000. I also recorded the percentage of exotic forbs within each Daubenmire plot, as well as the percentage of the exotic grass timothy (*Phleum pratense*). Bush, shrub, snags, and live deciduous and coniferous tree cover were estimated ocularly on both a 25- and 100-m radius circular plot. Area of each meadow was calculated by tracing the edge of each meadow in ArcView to obtain an estimate of its size in hectares.

Statistical Analyses

Relative abundances of all bird species were calculated for each point by tallying the number of birds of each species and dividing by the number of counts periods or visits to each point. This was done independently for the years 2000 and 2001, and again for both years combined. Bird diversity was simply expressed as the number of individual bird species detected at each station.

All density estimates for Savannah Sparrow were calculated using the Variable Circular Plot program (Garton 1992). The Variable Circular Plot program produces estimates using the ordered statistic method (Patil et al. 1977). This method has been shown to be robust even when certain assumptions of the point count method are violated. The ordered distance method ranks detection distances from lowest to highest and then calculates an effective area. An effective area assumes that detection of birds varies by species, weather and habitat conditions. It then calculates the maximum distance that an observer consistently detects a given species. This distance is used to calculate an effective area. Then the average number of birds detected per count period is divided by the effective area to obtain a density estimate.

To insure consideration of habitat variables that were independent I first built a Pearson correlation matrix to examine the strength of associations of each variable with the others. I used Pearson correlation coefficients to examine how strongly associated habitat variables were with each other. If two variables were highly correlated with each other, one was removed from consideration in model building. I looked at p-values and considered the relevance of each habitat variable before it was removed.

I used forward stepwise-multiple regression analysis to evaluate the relation between the relative abundance of Savannah Sparrow and the habitat variables. This approach was repeated using Savannah Sparrow densities as the dependent variable. The alpha value to enter a variable was set at 0.10. I used paired t-tests to examine differences in wind, cloud cover and temperature between years for each point.

Results and Discussion

All Species

Species Diversity

Eighty-six different species were detected in the year 2000 and 92 different species were detected in 2001. With both years combined, 96 different bird species were detected during point counts in eastside grasslands during bird surveys conducted in the 2000-2001 bird season.

The number of different bird species detected at each point ranged from 16-37 (mean = 27). The species detected at each station in the years 2000-2001, their numbers and their relative abundance, are listed in Appendix II. The juxtaposition of each meadow strongly influenced the number and type of species detected at a point. For example, aspen stands, riparian corridors, mixed deciduous/coniferous forests, cliffs and krumholtz trees were sometimes located near a plot. All bird detections, their distance away from plot center, their azimuth, cover type (habitat type), and habitat measurements using the USFS Northern Region Landbird Monitoring Program definitions are contained within the Excel spreadsheet named Birdcombo.xls. This file contains four sheets: (1) bird detections for 2000, (2) bird detections for 2001, (3) bird detections for 2000-2001 combined, and (4) cover type classifications and estimated grass, tree, shrub, bush cover.

As a complex, the stations (21-27) located in the Belly River drainage had the highest species diversity ($n = 68$). This was closely followed by stations (3-10) within the Two Dog meadow complex ($n=65$). Fifty-nine different bird species were detected in the St. Mary flats (stations 11-14). Forty-nine species were detected in the meadows of Many Glacier (stations 15-20). Thirty-seven birds were detected at the stations in the Dry Fork area (41-43) and 38 were detected in the Two Medicine stations (44-48). The two stations (1-2) in the Rising Sun area supported the lowest bird diversity with 36 species detected.

The two points that had a combination of high species diversity ($n \geq 34$) and relative abundance (≥ 32) both included riparian habitats: St. Mary (11) and Belly River (22). By contrast, stations in the Two Medicine meadows, which were not adjacent to riparian areas, had some of the lowest species diversity and relative abundance. These meadows were unique, however, because they had species present that were absent or rare at other stations: Rock Wren, Brewer's Sparrow, and Blue Grouse, Hermit Thrush, Prairie Falcon and Golden Eagle. Prairie Falcons were also detected in the Two Dog Flat area and Golden Eagles in the Many Glacier area. In the year 2001 Trumpeter Swans were detected flying over during surveys in the Many Glacier ($n=2$) and Belly River ($n=3$) complexes. I also believe that Alder Flycatchers occupy the riparian area along Belly River. Alder Flycatchers were confirmed in the Waterton Lakes National Park (Pearson 2000).

Relative abundance of birds was greater at each point in the year 2001 compared to 2000 for all stations except those in the Two Medicine area. At these stations the trend was reversed (Appendix II).

In the year 2001 I detected European Starlings in the Two Dog meadows. These were not seen in this area in 2000. American Crows were also detected in the St. Mary Flats area in the year 2001. In Belly River I observed a Song Sparrow feeding a fledgling Brown-headed Cowbird suggesting that Song Sparrows may also be susceptible to nest parasitism.

Relative abundance

The relative abundance of birds at each point ranged from 8.1 to 38.7 (mean = 15.8) individual birds per station. As with species diversity, the habitat surrounding the meadow where the point was contained appeared to strongly influence the relative abundance of birds at each station.

The relative abundance of birds at each station was 20% higher in 2001 (17.1) compared to 2000 (13.7). Many factors can influence bird abundance such as weather, food resources, predation, parasitism. Due to the limited scope of this study, however, only weather factors can be discussed. I found no difference ($P > 0.05$) between years at each station for temperature and cloud cover. There was, however, a significant difference in wind conditions between years at each station (paired t-test: $t = 7.06$, $n = 35$, $p < 0.001$). On average at each station wind conditions were calmer (1.2 on Beaufort Wind Scale) in 2001 compared to 2.3 in the year 2000 during survey periods. This may have allowed for detections further from the point center. Indeed, Emlen and DeJong (1981) demonstrated that increases in wind speed similar to what I encountered reduced bird detectability by

20%. Average wind speed was a significant predictor of the relative abundance of birds at each point ($r^2 = 0.94$, $n=7$, $p < 0.001$) (Table 2). Whether wind speed alone affected the difference in relative abundance of birds is unknown. Interestingly however, Waterton Lakes National Park also reported an increasing trend in bird abundance from 1997 to 2000 (Pearson 2000). Subsequently, factors in addition to the wind may have accounted for the differences in bird abundance between the years.

For all species combined, 83% were within 100 m ($n=3,717$). The most common species that were detected beyond 100 m were woodpeckers, raptors, waterfowl, and common snipe. All but one of the detection distances for Savannah Sparrow ($n=357$) were within 100 m of plot center (99.9%). The one detection that occurred beyond 100 m was estimated to be 110m and was detected in a meadow across the Belly River on a day without wind.

Table 2. Number of count periods, number of birds and their relative abundance for six levels of Beaufort Wind Scale encountered during grassland bird surveys in Glacier National Park in 2000 and 2001.

Wind	Number of count periods	Number of birds detected	Relative abundance
0	67	1367	20.4
1	68	1143	16.8
2	28	494	17.6
3	37	485	13.1
4	32	385	12.0
5	30	235	7.8
6	1	3	3

Grassland Birds

Of the grassland birds detected in the 2000-2001 bird surveys in the eastside fescue grasslands in Glacier, Savannah Sparrow were by far the most abundant species. Savannah Sparrows were most abundant in the Belly River meadow complex, followed by St. Mary Flats, Two Medicine, Two Dog, and Many Glacier. Savannah Sparrows were least abundant in the Rising Sun meadows with only two detections. Both detections occurred in the 2000 season (Table 3).

Table 3. Number of Savannah Sparrows detected, their relative abundance, density and bound (90% confidence interval) in eastside meadow complexes in Glacier National Park. Data collected 2000-2001.

	Number of birds	Relative abundance	Density (birds/ha)	Bound
Belly River	160	3.33	6.05	1.76
Dry Fork	0	0	0	0
Many Glacier	38	0.81	0.58	0.28
Rising Sun	2	0.13	N/A	N/A
St. Mary	76	2.11	1.67	0.59
Two Dog	54	0.86	0.47	0.195
Two Medicine	30	0.94	0.77	0.41

Clay-colored and Vesper sparrows were the next most abundant grassland bird species, followed by Western Meadowlark (Table 4). LeConte's Sparrow was also detected on one point in Belly River in the 2000 season.

Table 4. Relative abundance of other grassland birds in eastside grasslands in Glacier National Park. Data collected 2000-2001.

	Relative abundance		
	CCSP	VESP	WEME
Belly River	0.05	0.02	0.0
Dry Fork	0.0	0.0	0.0
Many Glacier	0.07	0.0	0.02
Rising Sun	0.0	0.0	0.0
St. Mary	0.31	0.22	0.03
Two Dog	0.08	0.22	0.02
Two Medicine	0.0	0.0	0.0

Density

Savannah Sparrow was the only grassland bird species for which there were enough detections to obtain density estimates. Density estimates were calculated in two ways: 1) by station (Table 5); and 2) by meadow complex (Table 4). A meadow complex was simply defined as the stations found in a similar area such as St. Mary flats of the Two Medicine stations. Density estimates for Savannah Sparrow at each station using the ordered distance method (Patil et al. 19??) typically had wide bounds indicating lack of precision for each station. Density estimates, however, were highly correlated with the relative abundance of Savannah Sparrow at each station (Bartlett Chi-square statistic: 33.2, $r = 0.8$; $df = 1$; $P < 0.001$). Therefore, the relation of habitat variables to the abundance of Savannah Sparrow were examined in two ways: 1) based on Savannah Sparrow relative abundance; and 2) Savannah Sparrow densities. All density estimates were expressed in birds per hectare.

Estimated densities of Savannah Sparrow territories are small, ranging from 0.05 to 1.25 hectares (as cited in Swanson 2001). The highest density of Savannah Sparrow found in Glacier National Park was estimated to be 14.3 birds per hectare (point 26). This would translate into a territory size of approximately 0.14 hectares for a pair. This estimate fits well within the reported range of territory sizes for Savannah Sparrow.

Table 5. Number of Savannah Sparrows detected, their relative abundance, and estimated densities calculated using variable-radius and fixed-radius plots in eastside grasslands for each station in Glacier National Park. Data collected 2000-2001.

Station	Number of birds	Relative abundance	Density (birds/ha)	
			Ordered-Distance	100-m radius plot
1	0	0.0	0.0	0.0
2	2	0.3	0.1	0.1
3	2	0.5	0.1	0.2
4	3	1.4	0.2	0.4
5	14	2.8	1.4	0.9
6	7	1.6	2.9	0.5
7	4	0.9	0.4	0.3
8	1	0.1	0.0	0.0
9	5	0.8	0.3	0.3
10	0	0.1	0.0	0.0
11	19	2.6	1.6	0.8
12	16	2.4	1.1	0.8
13	3	0.3	0.1	0.1
14	21	3.1	3.9	1.0
15	0	0.0	0.0	0.0
16	0	0.0	0.0	0.0
17	5	0.8	0.4	0.3
18	8	1.6	4.3	0.5
19	0	0.0	0.0	0.0
20	13	2.4	1.5	0.8
21	10	2.3	2.3	0.7
22	10	2.4	4.4	0.8
23	17	4.1	5.1	1.3
24	22	4.9	11.5	1.6
25	13	2.9	7.3	0.9
26	18	3.7	14.3	1.2
27	12	3.0	5.4	1.0
41	0	0.0	0.0	0.0
42	0	0.0	0.0	0.0
43	0	0.0	0.0	0.0
44	2	0.3	0.8	0.1
45	1	0.1	0.0	0.0
46	7	1.7	1.4	0.5
47	6	2.2	1.4	0.7
48	3	0.7	0.2	0.2

Brown-headed Cowbird Brood Parasitism

Grassland birds are commonly parasitized by Brown-headed Cowbirds. In Manitoba, parasitism rates of Savannah Sparrows ranged from 2% to 44% of nests (Swanson 2001). Savannah Sparrows lost 2.2 young per successful nest to cowbird parasitism. Vesper Sparrow, Western Meadowlarks, and Clay-colored Sparrow also are frequently

parasitized by Brown-headed Cowbirds. Providing large blocks of treeless grassland help to reduce brood parasitism for certain species (Dechant et al. 2001). Brown-headed Cowbirds were one of the most abundant bird species detected in the 2000-2001 bird surveys and were detected on 86% of the stations (n=35). Over 35 cowbirds were seen at the Belly River ranger station one evening.

Savannah Sparrow Habitat Relationships

Ten predictor variables were included in the model to predict the relative abundance of Savannah Sparrow: (1) percent cover of grass, (2) percent cover of forbs, (3) percent cover of litter, (4) grass height, (5) forb height, (6) litter depth, (7) percent cover of small bushes, (8) percentage of exotic forbs, (9) percentage of timothy (*Phleum pratense*), and (10) area (size of meadow). Only four variables were statistically significant in predicting the relative abundance of Savannah Sparrow and were included in the final model: (1) percent cover of forbs, (2) litter depth, (3) percent cover of small bushes, and (4) area of meadow. Seventy percent of the variability of the relative abundance of Savannah Sparrow was explained by this model ($r^2=0.70$, $n=35$, $P<0.001$). All relationships were positive except for that of small bushes which was negative. Litter depth was the strongest predictor of Savannah Sparrow abundance (coefficient = 0.27, $p<0.001$), followed by percent cover of forbs (coefficient = 0.044, $p=0.001$), area (coefficient = 0.021, $p=0.01$), and percent cover of bushes (coefficient = -0.041, $p=0.026$).

The same ten predictor variables included in the model to predict the relative abundance of Savannah Sparrow were also used to build a model to predict Savannah Sparrow density. Only three variables, however, were statistically significant and included in the final model to predict Savannah Sparrow density: (1) litter depth, (2) percentage of timothy, and (3) grass height. Eighty-two percent of the variability of Savannah Sparrow density was explained by this model ($r^2=0.82$, $n=35$, $P<0.001$). As in the model to predict relative abundance of Savannah Sparrow, litter depth was the strongest predictor of Savannah Sparrow abundance (coefficient=1.12, $p<0.001$), followed by percentage of timothy (coefficient = 0.04, $p=0.001$). The coefficient for grass height was negative (coefficient = -0.14, $p=0.013$). Because litter depth, grass height, and percentage of timothy were all highly correlated, the two variables with the weakest effect were subsequently removed. This left litter depth as the single best predictor of Savannah Sparrow density ($r^2=0.73$). The slope of the this variable remained similar as in the previous model (coefficient=1.08, $p<0.001$).

During bird surveys at Windy Point in the Many Glacier area (points 17 and 20), it became apparent to me that Savannah Sparrow consistently called from the thick grassy area near the shores of Lake Sherburne. Habitat characteristics contrasted sharply with those surrounding the point. Therefore, I also took habitat measurements in this area which was dominated by a homogeneous cover of *Elymus repens*. Forward step-wise regression analysis with the altered habitat data for these two points resulted in some model changes. Predictions of the relative abundance of Savannah Sparrow slightly improved ($r^2=0.71$, $p<0.001$). The model for predicting Savannah Sparrow density shifted to be more similar to the model predicting Savannah Sparrow relative abundance. That is, four variables were statistically significant in predicting the density of Savannah Sparrow

and were included in the final model: (1) percent cover of forbs, (2) litter depth, (3) percentage of timothy, and (4) area of meadow ($r^2=0.78$, $p<0.001$). Once again, litter depth was by far the strongest predictor of Savannah Sparrow density (coefficient=0.78, $p<0.001$).

Meadow Conditions and Grassland Birds

The presence of exotic grasses such as timothy and quack grass may partially explain why Savannah Sparrows were so abundant relative to other grassland bird species in eastside meadows. The highest depth of litter was often found where these two grasses were present. Savannah Sparrows use litter created by dead vegetative growth in previous years. Savannah Sparrows are a wide-ranging grassland bird species that occupy a variety of habitats. They prefer short to intermediate vegetation height and density, and a well-developed litter layer, which is used in nest construction (Swanson 2001). Their response to fire appears mixed or inconclusive. In some areas Savannah Sparrows responded positively to fire, whereas in other studies they responded negatively (Swanson 2001). Most of these studies, however, were of short duration (1-2 years). In a long-term study (15 years) Madden et al. (1999) concluded that Savannah Sparrow would most likely benefit from moderate (5-7 years) fire return intervals. Savannah Sparrows were absent on shrubby prairie where fire was absent. Therefore, although abundance of Savannah Sparrow may be depressed for the first 1-2 years postfire, in the long-term fire may increase the abundance of Savannah Sparrows.

The abundance Clay-colored Sparrows appears most strongly associated with increasing cover of low growing shrubs such as western snowberry (*Symphoricarpos occidentalis*) and silverberry (*Elaeagnus commutata*) (Dechant et al. 2001b). Therefore, fire-suppression efforts that have resulted in increased shrub cover, may be beneficial for this species. Indeed, Dechant et al. (2001b) observed that Clay-colored Sparrows reached their highest abundance in unburned grasslands where shrub cover increased. Based on my observations of the 2000-2001 seasons, I also began to associate Clay-colored Sparrows with the presence of silverberry shrubs that had attained heights ≥ 1.0 m. However, the presence of Clay-colored Sparrow during these two field seasons was so erratic that any conclusion on their status seems misleading. That is, I would detect their presence at any given point maybe only once in a field season. Whether this meant that they were not nesting in the area, but rather only passing through, is unknown. Further investigation is warranted.

Western Meadowlarks were rarely detected during bird surveys in the years 2000-2001. The literature suggests that they prefer open, treeless areas (Dechant et al. 2001c). They avoid extremely sparse or tall cover, and prefer high forb and grass cover, with low to moderate litter cover. They may be sensitive to fragmentation and negatively associated with high perimeter-area ratio. Burning is recommended to maintain open grasslands. Whether burning would increase Western Meadowlark abundance in eastside meadows, however, is unknown. Most meadows that I surveyed had trees and shrubs present. This may limit their willingness to populate these meadows. Just east of the park, where tree cover is less, Western Meadowlarks are more common. Western Meadowlarks are

positively associated with short-term fire intervals (2-4 years)(Madden et al. 1999). Indeed, this species may be absent on unburned areas where shrub and tree encroachment has occurred. LeConte's Sparrow is the other grassland species that was found to be absent on unburned prairies. It responds favorably to short-term intervals of fire.

Although not widespread, where present Vesper Sparrows were consistently detected. Vesper Sparrows prefer dry, open areas with short, sparse and patchy vegetation (Dechant et al. 2001a). Indeed, this describes the areas where I most consistently detected this species. Where dense grass cover and litter existed, this species was absent. Perch sites also appear important in the form of shrubs 20 to 100 cm tall. Vesper Sparrow response to fire has varied among studies. Nevertheless, management recommendations to increase their numbers suggest burning small blocks every 3-5 years while maintaining shrubby areas within or along boundaries.

Conclusions

Eighty-six different species were detected in the year 2000 and 92 different species were detected in 2001 detected during points counts in eastside grasslands. Combined, 96 different bird species were detected during bird surveys conducted in the 2000-2001 bird season. The relative abundance of birds was greater in 2001 compared to the 2000 season. Differences in wind conditions in Glacier National Park between the two seasons may partially have explained this pattern; however, bird abundance in the Waterton Lakes National Park also showed an increasing trend (Pearson 2000) and other factors.

Of the grassland bird species detected, Savannah Sparrows were most abundant, followed by Clay-colored sparrows and Vesper's Sparrows. Western meadowlarks were only rarely detected in the Many Glacier, St. Mary, and Two Dog meadows. A LeConte's Sparrow was detected on one point in the Belly River meadow complex in 2000. Lack of fire may partially explain the low abundance of Western Meadowlarks and Vesper Sparrows in eastside grasslands, and near absence of LeConte's Sparrow. By contrast, fire-suppression efforts may favor species such as the Clay-colored Sparrow which are strongly associated with increasing cover of low-growing shrubs (Dechant et al. 2001b). Nevertheless, long-term fire intervals of (8-10 years) in small blocks may improve foraging habitat even for this species.

Each of the grassland bird species known to occupy eastside Glacier National Park grasslands has likely evolved with natural disturbance regimes such as fire. To maintain grasslands in their "natural" state, introduction of prescribed fire on both a temporal and spatial scale may be necessary. If burning is to occur, spring or late summer is recommended as the best time to do so (Madden et al. 1999). Burning should take place before breeding territories are established or after birds have left the area. Late fall burns, however, may preclude re-growth of vegetation. Many authors suggest burning portions of small areas on a rotational time schedule to maintain a mosaic to meet the needs of all grassland species.

Habitat models for Savannah Sparrow found that litter depth, percent cover of forbs, and area were all positively associated with the abundance and density of Savannah Sparrow.

In addition, the relative abundance of Savannah Sparrow was also negatively associated with the abundance of small bushes. Savannah Sparrow density was best predicted by litter depth, percent cover of forbs, percentage of timothy, and area. Litter depth was the strongest predictor of both Savannah Sparrow abundance and density. The presence of exotic grasses (*Phleum pratense* and *Elymus repens*) created dense cover of grasses in certain meadows. Where these grasses were present, litter depth increased creating favorable nesting conditions for Savannah Sparrow.

Glacier National Park provides a unique setting to examine the relationship between grassland birds and their habitat. Unmanaged for agricultural or domestic grazing purposes, effects of different fire intervals on wildlife could be simplified. It is critical, however, to conduct long-term studies to fully understand the factors affecting the survival of an individual species throughout its lifetime. Without long-term studies, most of our conclusions regarding habitat quality may be misleading due to multi-annual variability "in the food source, predator populations, or in abiotic environmental factors (Van Horne 1983)." For example, in a five-year study that examined the relation between bird and food resources, Gaud et al. (1986) observed that more than half of their predictive variables for bird abundance related to weather. They stressed the importance of research for birds on both a temporal, and spatial, scale. As Wiens and Rotenberry (1981) suggested, the "year-to-year variability in many ecological systems is so great that many "rules" which we develop from data gathered in one year may only apply to that particular year." Therefore, it is strongly recommended that if management actions are to occur, such as burning, in an effort to improve grassland habitat for birds in Glacier nation Park, that monitoring continue.

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Appendix I. Global Positioning System readings for bird stations in eastside grasslands in Glacier National Park: 2000-2001.

Point	GPS_North	GPS_West
1	53.96.247	3.15.124
2	53.96.547	3.15.177
3	53.98.715	3.17.384
4	53.98.393	3.17.307
5	53.98.467	3.17.726
6	53.98.826	3.17.811
7	53.99.502	3.18.145
8	53.99.906	3.18.583
9	54.00.150	3.18.787
10	54.00.591	3.18.746
11	54.01.918	3.20.495
12	54.01.727	3.20.988
13	54.01.181	3.20.756
14	54.01.436	3.20.309
15	54.08.709	3.05.774
16	54.08.794	3.06.268
17	54.09.436	3.09.017
18	54.09.086	3.08.013
19	54.09.480	3.08.724
20	54.09.754	3.09.315
21	54.23.193	3.01.269
22	54.24.274	3.01.975
23	54.24.606	3.02.164
24	54.25.832	3.02.722
25	54.52.799	3.02.963
26	54.26.221	3.02.800
27	54.27.561	3.03.885
41	53.75.568	3.27.140
42	53.75.705	3.27.232
43	53.76.118	3.27.269
44	53.76.763	3.27.465
45	53.77.053	3.27.319
46	53.77.098	3.27.834
47	53.77.273	3.27.930
48	53.77.674	3.28.037

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Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
2	Rising Sun	BHCO	5	1.25	AMRO	5	1.25	BHCO	9	1.13
		AMRO	3	0.75	WAVI	5	1.25	AMRO	8	1.00
		CHSP	3	0.75	BHCO	4	1	WAVI	7	0.88
		CORA	2	0.5	CORA	4	1	CHSP	6	0.75
		MGWA	2	0.5	WCSP	4	1	CORA	6	0.75
		RCKI	2	0.5	BCCH	3	0.75	WCSP	6	0.75
		SAVS	2	0.5	CHSP	3	0.75	MGWA	5	0.63
		SWTH	2	0.5	MGWA	3	0.75	YRWA	5	0.63
		WAVI	2	0.5	YRWA	3	0.75	SWTH	4	0.50
		WCSP	2	0.5	CAVI	2	0.5	BCCH	3	0.38
		WIFL	2	0.5	DUFL	2	0.5	DUFL	3	0.38
		YEWA	2	0.5	SWTH	2	0.5	BARS	2	0.25
		YRWA	2	0.5	BARS	1	0.25	CAVI	2	0.25
		BARS	1	0.25	FOSP	1	0.25	FOSP	2	0.25
		DUFL	1	0.25	LISP	1	0.25	RCKI	2	0.25
		FOSP	1	0.25	RBNV	1	0.25	SAVS	2	0.25
		NOWA	1	0.25	RECR	1	0.25	WETA	2	0.25
		TRSW	1	0.25	RTHA	1	0.25	WIFL	2	0.25
		VGSW	1	0.25	UNFL	1	0.25	YEWA	2	0.25
		WETA	1	0.25	WETA	1	0.25	LISP	1	0.13
								NOWA	1	0.13
								RBNV	1	0.13
								RECR	1	0.13
								RTHA	1	0.13
								TRSW	1	0.13
								UNFL	1	0.13
								VGSW	1	0.13

Station number	Location	Year		Combined 2000/2001			
		2000		2001		Combined 2000/2001	
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance
3	Two Dog Ill.-West	Species		Species		Species	
		PISI	9	PISI	13	PISI	22
		CHSP	2.25	BHCO	3.25	CHSP	2.75
		AMRO	6	CHSP	5	AMRO	11
		CEWA	1.5	YRWA	1.25	CEWA	8
		WCSP	5	AMRO	1.25	YRWA	7
		TRSW	4	RBNV	1	BHCO	6
		WAVI	3	BCCH	0.75	CEWA	5
		YRWA	3	CAGO	0.75	WAVI	5
		LABU	3	DEJU	0.5	WCSP	5
		RTHA	2	DUFL	0.5	RBNV	4
		VESP	2	NOFL	0.5	BCCH	3
		BCCH	2	RCKI	0.5	RTHA	3
		BHCO	1	SAVS	0.5	SAVS	3
		MGWA	1	SWTH	0.5	TRSW	3
		MOCH	1	WAVI	0.5	VESP	3
		RBNV	1	WETA	0.5	CAGO	2
		SAVS	1	CAHU	0.25	DEJU	2
		SWTH	1	MOCH	0.25	DUFL	2
		TOWA	1	PRFA	0.25	LABU	2
		WEWP	1	RTHA	0.25	MOCH	2
		WIFL	1	VESP	0.25	NOFL	2
		WIWA	1	WCSP	0.25	RCKI	2
						WETA	2
						CAHU	2
						MGWA	1
						PRFA	1
						TOWA	1
						WEWP	1
						WIFL	1
						WIWA	1

Station number	Location	Year			Year					
		2000			2001					
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance			
4	Two Dog III-West	PISI	8	2	CHSP	6	1.5	PISI	10	1.25
		TRSW	8	2	WAVI	5	1.25	TRSW	10	1.25
		CAGO	7	1.75	WCSP	5	1.25	CHSP	9	1.13
		HOWR	5	1.25	BHCO	4	1	WCSP	9	1.13
		MGWA	4	1	MGWA	4	1	MGWA	8	1.00
		SAVS	4	1	CORA	3	0.75	WAVI	8	1.00
		WCSP	4	1	SAVS	3	0.75	CAGO	7	0.88
		AMRO	3	0.75	AMRO	2	0.5	SAVS	7	0.88
		CHSP	3	0.75	BCCH	2	0.5	BHCO	6	0.75
		RCKI	3	0.75	DUFL	2	0.5	AMRO	5	0.63
		WAVI	3	0.75	PISI	2	0.5	HOWR	5	0.63
		BHCO	2	0.5	RCKI	2	0.5	RCKI	5	0.63
		CEWA	2	0.5	TRSW	2	0.5	YRWA	4	0.50
		RNSA	2	0.5	YRWA	2	0.5	CORA	3	0.38
		YEWVA	2	0.5	CAVI	1	0.25	BCCH	2	0.25
		YRWA	2	0.5	DEJU	1	0.25	CEWA	2	0.25
		RTHA	1	0.25	HAWO	1	0.25	DUFL	2	0.25
		SWTH	1	0.25	LABU	1	0.25	RNSA	2	0.25
		UNFL	1	0.25	RBNU	1	0.25	SWTH	2	0.25
VESP	1	0.25	SWTH	1	0.25	WIFL	2	0.25		
WIFL	1	0.25	UNCH	1	0.25	YEWVA	2	0.25		
			WIFL	1	0.25	CAVI	1	0.13		
			WIWA	1	0.25	DEJU	1	0.13		
						HAWO	1	0.13		
						LABU	1	0.13		
						RBNU	1	0.13		
						RTHA	1	0.13		
						UNCH	1	0.13		
						UNFL	1	0.13		
						VESP	1	0.13		
						WIWA	1	0.13		

Station number	Location	2000		2001		Combined 2000/2001	
		Species	Number detected	Species	Number detected	Species	Number detected
		Relative Abundance	Relative Abundance	Relative Abundance	Relative Abundance		
5	Two Dog	PISI	5	SAVS	14	SAVS	18
	III-West	SAVS	4	COGE	7	AMRO	9
		AMRO	3	AMRO	6	PISI	9
		TRSW	3	PISI	4	COGO	7
		VESP	3	BHCO	3	VESP	5
		CORA	2	EUST	3	BHCO	4
		COGO	1	GBHE	2	TRSW	4
		BEKI	1	RECR	2	EUST	3
		BHCO	1	VESP	2	CORA	2
		CONI	1	CCSP	1	GBHE	2
		KILL	1	EAKI	1	KILL	2
		NOWA	1	HOWR	1	RECR	2
		RCKI	1	KILL	1	YEWA	2
		YEWA	1	RNGR	1	BAGO	1
			TRSW	1	BEKI	1	
			WAVI	1	CCSP	1	
			WCSP	1	CONI	1	
			YEWA	1	EAKI	1	
					HOWR	1	
					NOWA	1	
					RCKI	1	
					RNGR	1	
					WAVI	1	
					WCSP	1	

Station number	Location	2000		2001		Combined 2000/2001	
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance
		Species	Species	Species	Species	Species	Species
6	Two Dog III-East	PISI	SAVS	SAVS	SAVS	SAVS	SAVS
		SAVS	AMRO	WAVI	WAVI	WAVI	WAVI
		WAVI	WAVI	WAVI	WAVI	WAVI	WAVI
		AMRO	CORA	CORA	AMRO	AMRO	AMRO
		CHSP	SWTH	SWTH	WCSP	WCSP	WCSP
		HOWR	WCSP	WCSP	CORA	CORA	CORA
		MGWA	CCSP	CCSP	HOWR	HOWR	HOWR
		WCSP	DUFL	DUFL	PISI	PISI	PISI
		CCSP	HOWR	HOWR	CCSP	CCSP	CCSP
		CORA	MOBL	MOBL	CHSP	CHSP	CHSP
		YRWA	BCCH	BCCH	MGWA	MGWA	MGWA
		BHCO	BHCO	BHCO	MOBL	MOBL	MOBL
		LABU	CHSP	CHSP	SWTH	SWTH	SWTH
		MOBL	EUST	EUST	YRWA	YRWA	YRWA
		NOFL	FOSP	FOSP	BHCO	BHCO	BHCO
		RCKI	LABU	LABU	DUFL	DUFL	DUFL
		VESP	MGWA	MGWA	RCKI	RCKI	RCKI
		WIFL	PRFA	PRFA	BCCH	BCCH	BCCH
		YEWA	RBNU	RBNU	EUST	EUST	EUST
			RCKI	RCKI	FOSP	FOSP	FOSP
			WETA	WETA	NOFL	NOFL	NOFL
			YRWA	YRWA	PRFA	PRFA	PRFA
					RBNU	RBNU	RBNU
					VESP	VESP	VESP
					WETA	WETA	WETA
					WIFL	WIFL	WIFL
					YEWA	YEWA	YEWA

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
7	Two Dog II	CHSP	7	1.75	PISI	9	2.25	PISI	12	1.50
		RCKI	4	1	AMRO	7	1.75	CHSP	10	1.25
		WAVI	4	1	BHCO	6	1.50	RCKI	10	1.25
		BCCH	3	0.75	RCKI	6	1.50	AMRO	9	1.13
		CEWA	3	0.75	WCSP	5	1.25	SAVS	7	0.88
		DUFL	3	0.75	SAVS	4	1.00	WCSP	7	0.88
		PISI	3	0.75	CHSP	3	0.75	BHCO	6	0.75
		SAVS	3	0.75	MGWA	3	0.75	WAVI	6	0.75
		TRSW	3	0.75	SWTH	3	0.75	CEWA	5	0.63
		VESP	3	0.75	CEWA	2	0.50	DUFL	5	0.63
		AMRO	2	0.5	DUFL	2	0.50	BCCH	4	0.50
		FOSP	2	0.5	MOBL	2	0.50	MGWA	4	0.50
		HOWR	2	0.5	WAVI	2	0.50	MOBL	4	0.50
		MOBL	2	0.5	BCCH	1	0.25	SWTH	4	0.50
		WCSP	2	0.5	FOSP	1	0.25	FOSP	3	0.38
		GCKI	1	0.25	GBHE	1	0.25	HOWR	3	0.38
		LISP	1	0.25	HOWR	1	0.25	TRSW	3	0.38
		MGWA	1	0.25	NOFL	1	0.25	VESP	3	0.38
		MOCH	1	0.25	RBNV	1	0.25	NOFL	2	0.25
		NOFL	1	0.25	RTHA	1	0.25	YRWA	2	0.25
		RNSA	1	0.25	UNHU	1	0.25	GBHE	1	0.13
		RWBL	1	0.25	WEWP	1	0.25	GCKI	1	0.13
		SWTH	1	0.25	WIFL	1	0.25	LISP	1	0.13
		UNCH	1	0.25	YEWA	1	0.25	MOCH	1	0.13
		WEME	1	0.25	YRWA	1	0.25	RBNV	1	0.13
		WETA	1	0.25				RNSA	1	0.13
		YRWA	1	0.25				RTHA	1	0.13
								RWBL	1	0.13
								UNCH	1	0.13
								UNHU	1	0.13
								WEME	1	0.13
								WETA	1	0.13
								WEWP	1	0.13
								WIFL	1	0.13
								YEWA	1	0.13

Station number	Location	Year					
		2000			2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
8	West of Two Dog I	TRSW	12	3	YEWA	7	1.75
		YEWA	6	1.5	BHCO	6	1.50
		AMRO	5	1.25	FOSP	6	1.50
		WCSP	4	1	AMRO	5	1.25
		BHGR	3	0.75	NOFL	3	0.75
		RCKI	3	0.75	RCKI	3	0.75
		WAVI	3	0.75	WCSP	3	0.75
		YRWA	3	0.75	CHSP	2	0.50
		CEWA	2	0.5	COYE	2	0.50
		LISP	2	0.5	HOWR	2	0.50
		NOWA	2	0.5	LEFL	2	0.50
		RNSA	2	0.5	MGWA	2	0.50
		SWTH	2	0.5	NOWA	2	0.50
		BHCO	1	0.25	RNSA	2	0.50
		CHSP	1	0.25	WAVI	2	0.50
		CORA	1	0.25	WEWP	2	0.50
		DUFL	1	0.25	BCCH	1	0.25
		FOSP	1	0.25	BHGR	1	0.25
		LABU	1	0.25	CEWA	1	0.25
		MGWA	1	0.25	DUFL	1	0.25
RBNU	1	0.25	KILL	1	0.25		
UNFL	1	0.25	LISP	1	0.25		
WEWP	1	0.25	PISI	1	0.25		
WIFL	1	0.25	SAVS	1	0.25		
			SWTH	1	0.25		
			WIWA	1	0.25		
Combined 2000/2001							
		Species	Number detected	Relative Abundance			
		YEWA	13	1.63			
		TRSW	12	1.50			
		AMRO	10	1.25			
		BHCO	7	0.88			
		FOSP	7	0.88			
		WCSP	7	0.88			
		RCKI	6	0.75			
		WAVI	5	0.63			
		BHGR	4	0.50			
		NOWA	4	0.50			
		RNSA	4	0.50			
		CEWA	3	0.38			
		CHSP	3	0.38			
		LISP	3	0.38			
		MGWA	3	0.38			
		NOFL	3	0.38			
		SWTH	3	0.38			
		WEWP	3	0.38			
		YRWA	3	0.38			
		COYE	2	0.25			
		DUFL	2	0.25			
		HOWR	2	0.25			
		LEFL	2	0.25			
		BCCH	1	0.13			
		CORA	1	0.13			
		KILL	1	0.13			
		LABU	1	0.13			
		PISI	1	0.13			
		RBNU	1	0.13			
		SAVS	1	0.13			
		UNFL	1	0.13			
		WIFL	1	0.13			
		WIWA	1	0.13			

Station number	Location	2000		2001		Combined 2000/2001				
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance			
		Species	Species	Species	Species	Species	Species			
9	Two Dog I	BHCO	7	1.25	WCSP	6	1.50	WCSP	11	1.38
		TRSW	5	1.25	SAVS	5	1.25	BHCO	10	1.25
		WCSP	5	1	YEWA	4	1.00	MGWA	6	0.75
		PISI	4	0.75	AMRO	3	0.75	SAVS	6	0.75
		MGWA	3	0.75	BHCO	3	0.75	TRSW	6	0.75
		WAVI	3	0.5	DUFL	3	0.75	AMRO	5	0.63
		AMRO	2	0.5	MGWA	3	0.75	RCKI	5	0.63
		CORA	2	0.5	RCKI	3	0.75	WAVI	5	0.63
		RCKI	2	0.5	CORA	2	0.50	YEWA	5	0.63
		SWTH	2	0.25	HOWR	2	0.50	CORA	4	0.50
		BAEA	1	0.25	RNSA	2	0.50	PISI	4	0.50
		CHSP	1	0.25	WAVI	2	0.50	DUFL	3	0.38
		FOSP	1	0.25	AMRE	1	0.25	SWTH	3	0.38
		LABU	1	0.25	LEFL	1	0.25	HOWR	2	0.25
MOBL	1	0.25	MOBL	1	0.25	MOBL	2	0.25		
NOFL	1	0.25	NOWA	1	0.25	RNSA	2	0.25		
SAVS	1	0.25	SWTH	1	0.25	VEER	2	0.25		
VEER	1	0.25	TRSW	1	0.25	AMRE	1	0.13		
YEWA	1	0.25	VEER	1	0.25	BAEA	1	0.13		
YRWA	1	0.25	WETA	1	0.25	CHSP	1	0.13		
			WEWP	1	0.25	FOSP	1	0.13		
						LABU	1	0.13		
						LEFL	1	0.13		
						NOFL	1	0.13		
						NOWA	1	0.13		
						WETA	1	0.13		
						WEWP	1	0.13		
						YRWA	1	0.13		

Station number	Location	Year		Combined 2000/2001			
		2000		2001		Combined 2000/2001	
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance
10	Two Dog I						
	PISI	8	2				
	RCKI	3	0.75				
	CHSP	2	0.5				
	CORA	2	0.5				
	SWTH	2	0.5				
	YRWA	2	0.5				
	BAEA	1	0.25				
	BHCO	1	0.25				
	DUFL	1	0.25				
	FOSP	1	0.25				
	MGWA	1	0.25				
	MOBL	1	0.25				
	NOFL	1	0.25				
	RBNJ	1	0.25				
	RNSA	1	0.25				
	RTHA	1	0.25				
	SAVS	1	0.25				
	TRSW	1	0.25				
	UNFL	1	0.25				
	WAVI	1	0.25				
	WCSP	1	0.25				
	WIWA	1	0.25				
	BHCO			10	2.50		
	WAVI			6	1.50		
	PISI			4	1.00		
	AMRO			3	0.75		
	CHSP			3	0.75		
	DUFL			3	0.75		
	HOWR			2	0.50		
	MGWA			2	0.50		
	RCKI			2	0.50		
	SWTH			2	0.50		
	WCSP			2	0.50		
	BCCH			1	0.25		
	CAVI			1	0.25		
	CORA			1	0.25		
	DOWO			1	0.25		
	MOBL			1	0.25		
	NOFL			1	0.25		
	RNSA			1	0.25		
	RUGR			1	0.25		
	TRSW			1	0.25		
	VESP			1	0.25		
	WETA			1	0.25		
	YRWA			1	0.25		
	PISI					12	1.50
	BHCO					11	1.38
	WAVI					7	0.88
	CHSP					5	0.63
	RCKI					5	0.63
	DUFL					4	0.50
	SWTH					4	0.50
	AMRO					3	0.38
	CORA					3	0.38
	MGWA					3	0.38
	WCSP					3	0.38
	YRWA					3	0.38
	HOWR					2	0.25
	MOBL					2	0.25
	NOFL					2	0.25
	RNSA					2	0.25
	TRSW					2	0.25
	BAEA					1	0.13
	BCCH					1	0.13
	CAVI					1	0.13
	DOWO					1	0.13
	FOSP					1	0.13
	RBNJ					1	0.13
	RTHA					1	0.13
	RUGR					1	0.13
	SAVS					1	0.13
	UNFL					1	0.13
	VESP					1	0.13
	WETA					1	0.13
	WIWA					1	0.13

Station number	Location	Year			Combined 2000/2001					
		2000		Relative Abundance	2001		Relative Abundance			
		Species	Number detected		Species	Number detected				
11	St. Mary Flats	CLSW	37	12.33	CLSW	177	29.50	CLSW	214	23.78
		CAGO	14	4.67	SAVS	19	3.17	SAVS	23	2.56
		WCSP	6	2.00	COME	7	1.17	CAGO	14	1.56
		NOWA	4	1.33	NOWA	6	1.00	NOWA	10	1.11
		SAVS	4	1.33	YEWA	5	0.83	COME	8	0.89
		AMGO	3	1.00	CORA	4	0.67	WCSP	8	0.89
		PISI	3	1.00	FOSP	4	0.67	WIFL	7	0.78
		WIFL	3	1.00	WIFL	4	0.67	YEWA	7	0.78
		CORA	2	0.67	AMRO	3	0.50	CORA	6	0.67
		COSN	2	0.67	RWBL	3	0.50	FOSP	6	0.67
		FOSP	2	0.67	VEER	3	0.50	RWBL	5	0.56
		RWBL	2	0.67	MALL	2	0.33	VEER	5	0.56
		VEER	2	0.67	WCSP	2	0.33	PISI	4	0.44
		YEWA	2	0.67	AMCR	1	0.17	AMGO	3	0.33
		CCSP	1	0.33	BHCO	1	0.17	AMRO	3	0.33
		COME	1	0.33	COSN	1	0.17	COSN	3	0.33
		COYE	1	0.33	COYE	1	0.17	MALL	3	0.33
		GBHE	1	0.33	GRCA	1	0.17	COYE	2	0.22
		MALL	1	0.33	HOWR	1	0.17	WAVI	2	0.22
		SWTH	1	0.33	LISP	1	0.17	AMCR	1	0.11
		VESP	1	0.33	OSFL	1	0.17	BHCO	1	0.11
		WAVI	1	0.33	PISI	1	0.17	CCSP	1	0.11
		YHBL	1	0.33	RNSA	1	0.17	GBHE	1	0.11
					RTHA	1	0.17	GRCA	1	0.11
			WAVI	1	0.17	HOWR	1	0.11		
			WIWA	1	0.17	LISP	1	0.11		
			YRWA	1	0.17	OSFL	1	0.11		
						RNSA	1	0.11		
						RTHA	1	0.11		
						SWTH	1	0.11		
						VESP	1	0.11		
						WIWA	1	0.11		
						YHBL	1	0.11		
						YRWA	1	0.11		

Station number	Location	Year			Combined 2000/2001					
		2000		Relative Abundance	2001		Relative Abundance			
		Species	Number detected		Species	Number detected				
12	St. Mary Flats	SAVS	6		SAVS	16	2.67	SAVS	22	2.44
		CORA	3		CORA	8	1.33	CORA	11	1.22
		PISI	2		WCSP	8	1.33	WCSP	10	1.11
		VESP	2		AMRO	6	1.00	AMRO	6	0.67
		WCSP	2		CAGO	6	1.00	CAGO	6	0.67
		BBMA	1		PISI	4	0.67	PISI	6	0.67
		KILL	1		TRSW	3	0.50	VESP	4	0.44
		NOHA	1		CCSP	2	0.33	TRSW	3	0.33
		OSFL	1		CLSW	2	0.33	BBMA	2	0.22
					VESP	2	0.33	CCSP	2	0.22
					BBMA	1	0.17	CLSW	2	0.22
					BEKI	1	0.17	BEKI	1	0.11
			EAKI	1	0.17	EAKI	1	0.11		
			FOSP	1	0.17	FOSP	1	0.11		
			MGWA	1	0.17	KILL	1	0.11		
			NOFL	1	0.17	MGWA	1	0.11		
			UNGU	1	0.17	NOFL	1	0.11		
			UNKN*	1	0.17	NOHA	1	0.11		
			VEER	1	0.17	OSFL	1	0.11		
			YEWA	1	0.17	UNGU	1	0.11		
			YRWA	1	0.17	UNKN	1	0.11		
						VEER	1	0.11		
						YEWA	1	0.11		
						YRWA	1	0.11		

* Lark Sparrow?

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
13	St. Mary	WCSP	6	2.00	WCSP	10	1.67	WCSP	16	1.78
		NOFL	4	1.33	CHSP	8	1.33	CHSP	11	1.22
		CHSP	3	1.00	AMRO	6	1.00	AMRO	8	0.89
		AMRO	2	0.67	CORA	6	1.00	CORA	8	0.89
		CORA	2	0.67	MOBL	6	1.00	MOBL	8	0.89
		HOWR	2	0.67	PISI	6	1.00	PISI	8	0.89
		MOBL	2	0.67	RBNV	5	0.83	WAVI	7	0.78
		PISI	2	0.67	WAVI	5	0.83	RBNV	6	0.67
		WAVI	2	0.67	AMCR	3	0.50	HOWR	4	0.44
		BHCO	1	0.33	RNSA	3	0.50	NOFL	4	0.44
		CCSP	1	0.33	SAVS	3	0.50	SWTH	4	0.44
		MGWA	1	0.33	SWTH	3	0.50	AMCR	3	0.33
		RBNV	1	0.33	TRSW	3	0.50	BHCO	3	0.33
RWBL	1	0.33	YRWA	3	0.50	MGWA	3	0.33		
SWTH	1	0.33	BHCO	2	0.33	RNSA	3	0.33		
VESP	1	0.33	FOSP	2	0.33	SAVS	3	0.33		
YEWA	1	0.33	HOWR	2	0.33	TRSW	3	0.33		
				MALL	2	0.33	YRWA	3	0.33	
				MGWA	2	0.33	CCSP	2	0.22	
				ROCK	2	0.33	FOSP	2	0.22	
				BAEA	1	0.17	MALL	2	0.22	
				BBMA	1	0.17	ROCK	2	0.22	
				CCSP	1	0.17	VESP	2	0.22	
				CLNV	1	0.17	YEWA	2	0.22	
				DUFL	1	0.17	BAEA	1	0.11	
				NOWA	1	0.17	BBMA	1	0.11	
				PIWO	1	0.17	CLNV	1	0.11	
				VESP	1	0.17	DUFL	1	0.11	
				WETA	1	0.17	NOWA	1	0.11	
				WEWP	1	0.17	PIWO	1	0.11	
				YEWA	1	0.17	RWBL	1	0.11	
							WETA	1	0.11	
							WEWP	1	0.11	

Station number	Location	2000		2001		Combined 2000/2001	
		Species	Number detected	Species	Number detected	Species	Number detected
		Relative Abundance	Relative Abundance	Relative Abundance	Relative Abundance	Relative Abundance	Relative Abundance
14	St. Mary	SAVS	7	SAVS	21	SAVS	28
		WCSP	6	CAGO	18	CAGO	18
		CCSP	3	YEWA	8	WCSP	12
		CORA	3	WCSP	6	YEWA	10
		WIFL	3	AMRO	5	FOSP	7
		CEWA	2	FOSP	5	CCSP	6
		CLSW	2	MGWA	4	WIFL	6
		FOSP	2	RWBL	4	AMRO	5
		NOWA	2	CCSP	3	NOWA	5
		YEWA	2	NOWA	3	MGWA	4
		BEKI	1	WIFL	3	RWBL	4
		CHSP	1	COME	2	CORA	3
		LISP	1	HOWR	2	PISI	3
		PISI	1	PISI	2	WAVI	3
		UNWO	1	TRSW	2	BEKI	2
		VESP	1	WAVI	2	CEWA	2
		WAVI	1	AMCR	1	CLSW	2
		WEME	1	BBMA	1	COME	2
		YHBL	1	BEKI	1	HOWR	2
				BHGR	1	TRSW	2
				CLNU	1	AMCR	1
				COSN	1	BBMA	1
				HAWO	1	BHGR	1
				NOFL	1	CHSP	1
				VEER	1	CLNU	1
				WIWA	1	COSN	1
						HAWO	1
						LISP	1
						NOFL	1
						UNWO	1
						VEER	1
						VESP	1
						WEME	1
						WIWA	1
						YHBL	1

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
15	Many Glacier sewage ponds	CORA	6	2.00	CORA	5	1.25	CORA	11	1.57
		PISI	4	1.33	AMRO	4	1.00	PISI	6	0.86
		MGWA	2	0.67	YEW A	4	1.00	MGWA	5	0.71
		WAVI	2	0.67	BHCO	3	0.75	AMRO	4	0.57
		BHCO	1	0.33	COME	3	0.75	BHCO	4	0.57
		CHSP	1	0.33	MGWA	3	0.75	WAVI	4	0.57
		FOSP	1	0.33	RCKI	3	0.75	YEW A	4	0.57
		NOFL	1	0.33	COYE	2	0.50	COME	3	0.43
		TRSW	1	0.33	FOSP	2	0.50	FOSP	3	0.43
		YRWA	1	0.33	NOWA	2	0.50	RCKI	3	0.43
					PISI	2	0.50	YRWA	3	0.43
					SWTH	2	0.50	CHSP	2	0.29
					WAVI	2	0.50	COYE	2	0.29
					YRWA	2	0.50	NOWA	2	0.29
					AMCR	1	0.25	SWTH	2	0.29
			CHSP	1	0.25	AMCR	1	0.14		
			DUFL	1	0.25	DUFL	1	0.14		
			MOCH	1	0.25	MOCH	1	0.14		
			WETA	1	0.25	NOFL	1	0.14		
						TRSW	1	0.14		
						WETA	1	0.14		

Station number	Location	Year			Combined 2000/2001					
		2000		Relative Abundance	2001		Relative Abundance			
		Species	Number detected		Species	Number detected				
16	Many Glacier- West of Poia Trailhead	CHSP	4	1.33	AMGO	12	2.40	CHSP	14	1.75
		BHCO	3	1.00	CORA	11	2.20	CORA	13	1.63
		WAVI	3	1.00	CHSP	10	2.00	AMGO	12	1.50
		WCSP	3	1.00	PISI	7	1.40	WAVI	9	1.13
		CORA	2	0.67	WAVI	6	1.20	PISI	7	0.88
		GOEA	2	0.67	AMRO	4	0.80	WCSP	7	0.88
		MGWA	2	0.67	WCSP	4	0.80	BHCO	6	0.75
		RBNU	2	0.67	YRWA	4	0.80	AMRO	4	0.50
		TRSW	2	0.67	BHCO	3	0.60	MGWA	4	0.50
		DEJU	1	0.33	NOFL	3	0.60	NOFL	4	0.50
		NOFL	1	0.33	RCKI	3	0.60	RCKI	4	0.50
		RCKI	1	0.33	DUFL	2	0.40	YRWA	4	0.50
					HAWO	2	0.40	RBNU	3	0.38
					MGWA	2	0.40	DUFL	2	0.25
					VATH	2	0.40	GOEA	2	0.25
					RBNU	1	0.20	HAWO	2	0.25
			SWTH	1	0.20	TRSW	2	0.25		
			UNCH	1	0.20	VATH	2	0.25		
			VGSW	1	0.20	DEJU	1	0.13		
						SWTH	1	0.13		
						UNCH	1	0.13		
						VGSW	1	0.13		

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
17	Many Glacier- Windy Point	WCSP	6	2.00	WCSP	9	1.80	WCSP	15	1.88
		BHCO	4	1.33	AMGO	7	1.40	CHSP	9	1.13
		MOBL	4	1.33	CHSP	7	1.40	MOBL	8	1.00
		TRSW	4	1.33	SAVS	5	1.00	TRSW	8	1.00
		CCSP	3	1.00	MOBL	4	0.80	AMGO	7	0.88
		DUFL	3	1.00	PISI	4	0.80	SAVS	6	0.75
		AMRO	2	0.67	TRSW	4	0.80	BHCO	5	0.63
		CEWA	2	0.67	CEWA	3	0.60	CEWA	5	0.63
		CHSP	2	0.67	AMRO	2	0.40	PISI	5	0.63
		EAKI	2	0.67	SWTH	2	0.40	AMRO	4	0.50
		WAVI	2	0.67	VATH	2	0.40	CCSP	4	0.50
		CORA	1	0.33	WAVI	2	0.40	DUFL	4	0.50
		PISI	1	0.33	BHCO	1	0.20	WAVI	4	0.50
		RCKI	1	0.33	CCSP	1	0.20	EAKI	3	0.38
		SAVS	1	0.33	DUFL	1	0.20	SWTH	2	0.25
		WIFL	1	0.33	EAKI	1	0.20	VATH	2	0.25
		YRWA	1	0.33	FOSP	1	0.20	YRWA	2	0.25
			KILL	1	0.20	CORA	1	0.13		
			MGWA	1	0.20	FOSP	1	0.13		
			NOFL	1	0.20	KILL	1	0.13		
			SPSA	1	0.20	MGWA	1	0.13		
			WEME	1	0.20	NOFL	1	0.13		
			YRWA	1	0.20	RCKI	1	0.13		
						SPSA	1	0.13		
						WEME	1	0.13		
						WIFL	1	0.13		

Station number	Location	Year		Combined 2000/2001			
		2000		2001		Combined 2000/2001	
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance
18	Many Glacier- Middle	PISI	2.33	AMRO	1.60	PISI	1.63
		SAVS	1.67	SAVS	1.60	SAVS	1.63
		TRSW	1.33	CORA	1.40	AMRO	1.25
		AMRO	0.67	BHCO	1.20	TRSW	1.25
		CHSP	0.67	PISI	1.20	WAVI	1.00
		KILL	0.67	TRSW	1.20	BHCO	0.88
		MGWA	0.67	WAVI	1.20	CORA	0.88
		WAVI	0.67	DEJU	0.80	SPSA	0.63
		BHCO	0.33	SPSA	0.80	YRWA	0.63
		SPSA	0.33	YRWA	0.80	CHSP	0.50
		SWTH	0.33	RCKI	0.60	DEJU	0.50
		UNSA	0.33	SWTH	0.60	SWTH	0.50
		WETA	0.33	BCCH	0.40	MGWA	0.38
		YRWA	0.33	CHSP	0.40	RCKI	0.38
				RBNJ	0.40	BCCH	0.25
				YEWA	0.40	KILL	0.25
				DUFL	0.20	RBNJ	0.25
				HOWR	0.20	YEWA	0.25
				MGWA	0.20	DUFL	0.13
				VATH	0.20	HOWR	0.13
				WCSP	0.20	UNSA	0.13
						VATH	0.13
						WCSP	0.13
						WETA	0.13

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
19	Many Glacier- Windy Creek	WAVI	4	1.33	CHSP	8	1.60	CHSP	10	1.25
		AMRO	3	1.00	BHCO	7	1.40	WAVI	9	1.13
		DUFL	3	1.00	AMRO	5	1.00	AMRO	8	1.00
		WCSP	3	1.00	WAVI	5	1.00	BHCO	8	1.00
		CHSP	2	0.67	MGWA	4	0.80	WCSP	7	0.88
		PISI	2	0.67	WCSP	4	0.80	DUFL	4	0.50
		TRSW	2	0.67	PISI	2	0.40	MGWA	4	0.50
		BHCO	1	0.33	YRWA	2	0.40	PISI	4	0.50
					CORA	1	0.20	TRSW	3	0.38
					DUFL	1	0.20	YRWA	2	0.25
			RCKI	1	0.20	CORA	1	0.13		
			RTHA	1	0.20	RCKI	1	0.13		
			RUGR	1	0.20	RTHA	1	0.13		
			SWTH	1	0.20	RUGR	1	0.13		
			TRSW	1	0.20	SWTH	1	0.13		
			YEWA	1	0.20	YEWA	1	0.13		

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
20	Many Glacier-Windy Point	SAVS	6	2.00	CAGO	13	2.60	SAVS	19	2.38
		PISI	4	1.33	SAVS	13	2.60	CAGO	13	1.63
		WCSP	3	1.00	WCSP	8	1.60	WCSP	11	1.38
		AMRO	2	0.67	CHSP	5	1.00	PISI	8	1.00
		CHSP	2	0.67	PISI	4	0.80	CHSP	7	0.88
		CORA	2	0.67	RCKI	4	0.80	RCKI	6	0.75
		NOFL	2	0.67	AMRO	3	0.60	AMRO	5	0.63
		RCKI	2	0.67	CORA	3	0.60	CORA	5	0.63
		TRSW	2	0.67	DUFL	3	0.60	MGWA	4	0.50
		WAVI	2	0.67	MGWA	3	0.60	BHCO	3	0.38
		BHCO	1	0.33	BHCO	2	0.40	DUFL	3	0.38
		KILL	1	0.33	EAGR	2	0.40	SWTH	3	0.38
		MGWA	1	0.33	RECR	2	0.40	WAVI	3	0.38
		SWTH	1	0.33	SWTH	2	0.40	EAGR	2	0.25
VATH	1	0.33	TRUS	2	0.40	NOFL	2	0.25		
			YRWA	2	0.40	RECR	2	0.25		
			DEJU	1	0.20	TRSW	2	0.25		
			EAKI	1	0.20	TRUS	2	0.25		
			NOHA	1	0.20	VATH	2	0.25		
			RBNJ	1	0.20	YRWA	2	0.25		
			UNCH	1	0.20	DEJU	1	0.13		
			VATH	1	0.20	EAKI	1	0.13		
			WAVI	1	0.20	KILL	1	0.13		
			YEWA	1	0.20	NOHA	1	0.13		
					RBNJ	1	0.13			
					UNCH	1	0.13			
					YEWA	1	0.13			

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
21	Belly River Ranger Station	PISI	35	11.67	PISI	56	14.00	PISI	91	13.00
		BHCO	6	2.00	BHCO	22	5.50	BHCO	28	4.00
		SAVS	6	2.00	SAVS	10	2.50	SAVS	16	2.29
		AMRO	5	1.67	AMRO	8	2.00	AMRO	13	1.86
		WAVI	5	1.67	WCSP	5	1.25	WAVI	9	1.29
		YEW A	4	1.33	BCCH	4	1.00	WCSP	8	1.14
		CORA	3	1.00	CORA	4	1.00	CORA	7	1.00
		WCSP	3	1.00	RCKI	4	1.00	RCKI	6	0.86
		CCSP	2	0.67	TRSW	4	1.00	TRSW	6	0.86
		RBNNU	2	0.67	WAVI	4	1.00	RBNNU	5	0.71
		RCKI	2	0.67	MGWA	3	0.75	RNSA	5	0.71
		RNSA	2	0.67	RBNNU	3	0.75	SWTH	5	0.71
		SWTH	2	0.67	RNSA	3	0.75	BCCH	4	0.57
		TRSW	2	0.67	SWTH	3	0.75	MGWA	4	0.57
		DUFL	1	0.33	WETA	3	0.75	YEW A	4	0.57
HAWO	1	0.33	COSN	2	0.50	VATH	3	0.43		
MGWA	1	0.33	NOWA	2	0.50	WETA	3	0.43		
OSFL	1	0.33	VATH	2	0.50	YRWA	3	0.43		
VATH	1	0.33	YRWA	2	0.50	CCSP	2	0.29		
WIFL	1	0.33	BARS	1	0.25	COSN	2	0.29		
YRWA	1	0.33	DOWO	1	0.25	NOWA	2	0.29		
			FOSP	1	0.25	BARS	1	0.14		
			HOWR	1	0.25	DOWO	1	0.14		
			LISP	1	0.25	DUFL	1	0.14		
						FOSP	1	0.14		
						HAWO	1	0.14		
						HOWR	1	0.14		
						LISP	1	0.14		
						OSFL	1	0.14		
						WIFL	1	0.14		

Station number	Location	Year			Combined 2000/2001		
		2000		2001		Combined 2000/2001	
		Species	Number detected	Species	Number detected	Species	Number detected
22	Belly River South	PISI	31	PISI	22	PISI	53
		SAVS	7	BHCO	11	SAVS	17
		RWBL	4	SAVS	10	BHCO	14
		WCSP	4	RWBL	7	RWBL	11
		WIFL	4	YEWVA	7	YEWVA	11
		YEWVA	4	COSN	6	WIFL	10
		BHCO	3	TRSW	6	COSN	9
		COSN	3	WIFL	6	WCSP	9
		FOSP	3	AMRO	5	FOSP	8
		LEFL	3	FOSP	5	AMRO	7
		RBNV	3	WCSP	5	LEFL	7
		SOSP	3	BCCH	4	TRSW	6
		AMRO	2	HOWR	4	BCCH	5
		LABU	2	LEFL	4	HOWR	5
		LISP	2	NOVA	4	LISP	5
		SWTH	2	LISP	3	SWTH	5
		WAVI	2	RCKI	3	NOVA	4
		BCCH	1	RNSA	3	RCKI	4
		HOWR	1	SWTH	3	SOSP	4
		NOFL	1	AMGO	2	RBNV	3
		OSFL	1	WEWP	2	RNSA	3
		RCKI	1	BHGR	1	AMGO	2
		RUGR	1	GRIA	1	LABU	2
				MGWA	1	NOFL	2
				NOFL	1	RUGR	2
				NOHA	1	WAVI	2
				RUGR	1	WEWP	2
				SOSP	1	BHGR	1
				UNFL	1	GRIA	1
				VEER	1	MGWA	1
				WETA	1	NOHA	1
				YRWA	1	OSFL	1
						UNFL	1
						VEER	1
						WETA	1
						YRWA	1

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
23	Belly River South	PISI	13	4.33	SAVS	17	4.25	SAVS	26	3.71
		SAVS	9	3.00	BHCO	8	2.00	PISI	18	2.57
		LISP	6	2.00	COME	5	1.25	BHCO	11	1.57
		GRJA	4	1.33	PISI	5	1.25	WCSP	8	1.14
		WIFL	4	1.33	WCSP	5	1.25	LISP	7	1.00
		AMRO	3	1.00	RCKI	4	1.00	RCKI	7	1.00
		BHCO	3	1.00	DUFL	3	0.75	WIFL	6	0.86
		COSN	3	1.00	HOWR	3	0.75	AMRO	5	0.71
		RCKI	3	1.00	MGWA	3	0.75	COME	5	0.71
		WCSP	3	1.00	SWTH	3	0.75	COSN	5	0.71
		CAGO	2	0.67	YEWA	3	0.75	GRJA	5	0.71
		FOSP	2	0.67	AMRO	2	0.50	CAGO	4	0.57
		LESP	2	0.67	CAGO	2	0.50	FOSP	4	0.57
		RNSA	2	0.67	COSN	2	0.50	RNSA	4	0.57
		WAVI	2	0.67	COYE	2	0.50	SWTH	4	0.57
		BEKI	1	0.33	FOSP	2	0.50	YEWA	4	0.57
		COFL	1	0.33	GBHE	2	0.50	COYE	3	0.43
		COLO	1	0.33	GRCA	2	0.50	DUFL	3	0.43
		COYE	1	0.33	LABU	2	0.50	HOWR	3	0.43
		NOWA	1	0.33	RNSA	2	0.50	MGWA	3	0.43
		SWTH	1	0.33	WIFL	2	0.50	WAVI	3	0.43
		YEWA	1	0.33	BHGR	1	0.25	COFL	2	0.29
					CEWA	1	0.25	GBHE	2	0.29
					CHSP	1	0.25	GRCA	2	0.29
					COFL	1	0.25	LABU	2	0.29
					GRJA	1	0.25	LESP	2	0.29
					HOGR	1	0.25	NOWA	2	0.29
					LISP	1	0.25	BEKI	1	0.14
					NOWA	1	0.25	BHGR	1	0.14
					OSFL	1	0.25	CEWA	1	0.14
					SPSA	1	0.25	CHSP	1	0.14
					UNFL	1	0.25	COLO	1	0.14
					WAVI	1	0.25	HOGR	1	0.14
								OSFL	1	0.14
								SPSA	1	0.14
								UNFL	1	0.14

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
24	Belly River Veldt	SAVS	12	4.00	SAVS	22	5.50	SAVS	34	4.86
		WCSP	4	1.33	PISI	19	4.75	PISI	21	3.00
		AMRO	2	0.67	TRSW	6	1.50	TRSW	8	1.14
		GBHE	2	0.67	AMRO	3	0.75	WCSP	7	1.00
		NOFL	2	0.67	RCKI	3	0.75	AMRO	5	0.71
		PISI	2	0.67	WCSP	3	0.75	RCKI	5	0.71
		RCKI	2	0.67	AMGO	2	0.50	OSFL	3	0.43
		TRSW	2	0.67	GRJA	2	0.50	HOWR	3	0.43
		BHCO	1	0.33	HOWR	2	0.50	AMGO	2	0.29
		CORA	1	0.33	OSFL	2	0.50	CORA	2	0.29
		COSN	1	0.33	CORA	1	0.25	COSN	2	0.29
		FOSP	1	0.33	COSN	1	0.25	GBHE	2	0.29
		HOWR	1	0.33	OCWA	1	0.25	GRJA	2	0.29
		NOWA	1	0.33	SWTH	1	0.25	NOFL	2	0.29
		OSFL	1	0.33	VESP	1	0.25	YEWA	2	0.29
		RNSA	1	0.33	WAVI	1	0.25	BHCO	1	0.14
YEWA	1	0.33	YEWA	1	0.25	FOSP	1	0.14		
				YRWA	1	0.25	NOWA	1	0.14	
							OCWA	1	0.14	
							RNSA	1	0.14	
							SWTH	1	0.14	
							VESP	1	0.14	
							WAVI	1	0.14	
							YRWA	1	0.14	

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
25	Belly River Veldt	WCSP	8	2.67	SAVS	13	3.25	SAVS	20	2.86
		SAVS	7	2.33	AMRO	5	1.25	WCSP	13	1.86
		DUFL	4	1.33	PISI	5	1.25	AMRO	7	1.00
		MGWA	4	1.33	WCSP	5	1.25	DUFL	7	1.00
		BHCO	3	1.00	HOWR	4	1.00	PISI	7	1.00
		CHSP	3	1.00	OCWA	4	1.00	MGWA	6	0.86
		SWTH	3	1.00	COSN	3	0.75	BHCO	5	0.71
		AMRO	2	0.67	DUFL	3	0.75	COSN	5	0.71
		COSN	2	0.67	MOCH	3	0.75	CHSP	4	0.57
		NOFL	2	0.67	BHCO	2	0.50	HOWR	4	0.57
		PISI	2	0.67	GRJA	2	0.50	OCWA	4	0.57
		RCKI	2	0.67	LISP	2	0.50	SWTH	4	0.57
		CCSP	1	0.33	MGWA	2	0.50	GRJA	3	0.43
		FOSP	1	0.33	RECR	2	0.50	MOCH	3	0.43
		GRJA	1	0.33	BAEA	1	0.25	NOFL	3	0.43
		OSFL	1	0.33	CHSP	1	0.25	FOSP	2	0.29
		RNSA	1	0.33	DEJU	1	0.25	LISP	2	0.29
		WAVI	1	0.33	FOSP	1	0.25	RCKI	2	0.29
					NOFL	1	0.25	RECR	2	0.29
					SWTH	1	0.25	BAEA	1	0.14
								CCSP	1	0.14
								DEJU	1	0.14
								OSFL	1	0.14
								RNSA	1	0.14
								WAVI	1	0.14

Station number	Location	Year					
		2000		2001		Combined 2000/2001	
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance
26	Belly River Veldt	Species		Species		Species	
		SAVS	8	SAVS	18	SAVS	26
		TRSW	8	PISI	16	PISI	19
		RCKI	4	BANS	9	BANS	11
		AMRO	3	WCSP	6	TRSW	8
		PISI	3	NOWA	5	WCSP	8
		BANS	2	CEWA	4	NOWA	7
		BHCO	2	GRJA	4	RCKI	7
		CEWA	2	RBNV	4	AMRO	6
		CORA	2	WAVI	4	CEWA	6
		FOSP	2	AMRO	3	FOSP	5
		LEFL	2	FOSP	3	GRJA	5
		MGWA	2	LEFL	3	LEFL	5
		NOWA	2	OSFL	3	BHCO	4
		WCSP	2	RCKI	3	RBNV	4
		YRWA	2	BHCO	2	WAVI	4
		COME	1	RNSA	2	CORA	3
		DUFL	1	YEWA	2	MGWA	3
		GRJA	1	COME	1	OSFL	3
		NOFL	1	CORA	1	YEWA	3
		SWTH	1	COSN	1	YRWA	3
		UNTR	1	DEJU	1	COME	2
		WIWA	1	DUFL	1	DUFL	2
		YEWA	1	HOWR	1	RNSA	2
				MGWA	1	SWTH	2
				OCWA	1	COSN	1
				SPSA	1	DEJU	1
				SWTH	1	HOWR	1
				VATH	1	NOFL	1
				WETA	1	OCWA	1
				WEWP	1	SPSA	1
				YRWA	1	UNTR	1
						VATH	1
						WETA	1
						WEWP	1
						WIWA	1

Station number	Location	Year		Year		Year				
		2000		2001		Combined 2000/2001				
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance			
27	Belly River North	PISI	19	6.33	PISI	54	18.00	PISI	73	12.17
		SAVS	6	2.00	SAVS	12	4.00	SAVS	18	3.00
		WCSP	5	1.67	AMRO	5	1.67	WCSP	9	1.50
		RCKI	4	1.33	BHCO	4	1.33	AMRO	7	1.17
		YEWA	4	1.33	FOSP	4	1.33	YEWA	7	1.17
		NOWA	3	1.00	SWTH	4	1.33	BHCO	6	1.00
		AMRO	2	0.67	WCSP	4	1.33	SWTH	6	1.00
		BHCO	2	0.67	CEWA	4	1.33	FOSP	5	0.83
		DUFL	2	0.67	GRJA	3	1.00	NOWA	5	0.83
		LISP	2	0.67	MGWA	3	1.00	RCKI	5	0.83
		RNSA	2	0.67	YEWA	3	1.00	LISP	4	0.67
		SWTH	2	0.67	LISP	2	0.67	MGWA	4	0.67
		WAVI	2	0.67	MOCH	2	0.67	CEWA	3	0.50
		WIWA	2	0.67	NOWA	2	0.67	DUFL	3	0.50
COSN	1	0.33	TRSW	2	0.67	GRJA	3	0.50		
FOSP	1	0.33	CORA	1	0.33	RNSA	3	0.50		
HAWO	1	0.33	DUFL	1	0.33	LEFL	2	0.33		
LEFL	1	0.33	OSFL	1	0.33	MOCH	2	0.33		
MGWA	1	0.33	RCKI	1	0.33	WAVI	2	0.33		
SOSP	1	0.33	RNSA	1	0.33	WIWA	2	0.33		
UNWO	1	0.33	UNHU	1	0.33	CORA	1	0.17		
			WIFL	1	0.33	COSN	1	0.17		
			YRWA	1	0.33	HAWO	1	0.17		
						OSFL	1	0.17		
						SOSP	1	0.17		
						UNHU	1	0.17		
						UNWO	1	0.17		
						WIFL	1	0.17		
						YRWA	1	0.17		

Station number	Location	Year					
		2000		2001		Combined 2000/2001	
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance
41	Lower Dry Fork	Species		Species		Species	
		CHSP	4	CHSP	7	CHSP	16
		MGWA	1.33	PISI	1.75	PISI	2.29
		OCWA	4	RBNV	1.75	SWTH	15
		RBNV	2	RBNV	1.25	SWTH	10
		RCKI	2	RCKI	1.25	AMRO	6
		WAVI	2	SWTH	1.25	RCKI	6
		WCSP	2	AMRO	0.50	RBNV	5
		AMRO	2	BCCH	0.50	WAVI	4
		BHCO	1	CEWA	0.50	DEJU	3
		DEJU	1	WAVI	0.50	MGWA	3
		DUFL	1	WCSP	0.50	MOCH	3
		FOSP	1	YRWA	0.50	WCSP	3
		HAWO	1	CAVI	0.25	YRWA	3
		MOCH	1	CLNV	0.25	BCCH	2
		PISI	1	DEJU	0.25	CEWA	2
		RNSA	1	GOEA	0.25	OCWA	2
		SWTH	1	GRJA	0.25	RUGR	2
		UNCH	1	MGWA	0.25	CAVI	1
		WIWA	1	MOCH	0.25	CLNV	1
		YRWA	1	OCWA	0.25	GOEA	1
			0.33	RUGR	0.25	GRJA	1
							0.14

		Year								
Station number	Location	2000		2001		Combined 2000/2001				
		Species	Number detected	Species	Number detected	Species	Number detected			
42	Lower Dry Fork	MGWA	4	1.33	PISI	8	2.00	PISI	9	1.29
		CHSP	3	1.00	BCCH	4	1.00	CHSP	7	1.00
		DEJU	2	0.67	CHSP	4	1.00	MGWA	7	1.00
		OCWA	2	0.67	DEJU	4	1.00	DEJU	6	0.86
		RBNV	2	0.67	RBNV	4	1.00	RBNV	6	0.86
		RCKI	2	0.67	WAVI	4	1.00	WAVI	6	0.86
		WAVI	2	0.67	MGWA	3	0.75	OCWA	5	0.71
		WCSP	2	0.67	OCWA	3	0.75	BCCH	4	0.57
		AMRO	1	0.33	AMRO	2	0.50	WCSP	4	0.57
		BHCO	1	0.33	CEWA	2	0.50	AMRO	3	0.43
		DUFL	1	0.33	SWTH	2	0.50	SWTH	3	0.43
		FOSP	1	0.33	WCSP	2	0.50	WIWA	3	0.43
		HAWO	1	0.33	WIWA	2	0.50	CEWA	2	0.29
		MOCH	1	0.33	FOSP	1	0.25	FOSP	2	0.29
PISI	1	0.33	GCKI	1	0.25	RCKI	2	0.29		
RNSA	1	0.33	GRJA	1	0.25	BHCO	1	0.14		
SWTH	1	0.33	LABU	1	0.25	DUFL	1	0.14		
UNCH	1	0.33	RUGR	1	0.25	GCKI	1	0.14		
WIWA	1	0.33				GRJA	1	0.14		
YRWA	1	0.33				HAWO	1	0.14		
						LABU	1	0.14		
						MOCH	1	0.14		
						RNSA	1	0.14		
						RUGR	1	0.14		
						UNCH	1	0.14		
						YRWA	1	0.14		

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
		OCWA			PISI			PISI		
43	Upper Dry Fork	PISI	5	1.67	CORA	7	1.75	PISI	12	1.71
		CHSP	5	1.67	OCWA	5	1.25	OCWA	10	1.43
		WCSP	4	1.33	CHSP	5	1.25	CHSP	8	1.14
		AMRO	4	1.33	CHSP	4	1.00	WCSP	7	1.00
		DEJU	3	1.00	DUFL	4	1.00	DEJU	6	0.86
		RCKI	3	1.00	RCKI	4	1.00	RCKI	6	0.86
		RECR	2	0.67	YRWA	4	1.00	CORA	5	0.71
		WAVI	2	0.67	DEJU	3	0.75	RECR	5	0.71
		BCCH	1	0.33	MGWA	3	0.75	WAVI	5	0.71
		CLNU	1	0.33	RECR	3	0.75	YRWA	5	0.71
		NOFL	1	0.33	WAVI	3	0.75	AMRO	4	0.57
		SWTH	1	0.33	WCSP	3	0.75	DUFL	4	0.57
		VATH	1	0.33	CLNU	2	0.50	CLNU	3	0.43
		YRWA	1	0.33	SWTH	2	0.50	MGWA	3	0.43
					AMRO	1	0.25	SWTH	3	0.43
					FOSP	1	0.25	NOFL	2	0.29
					NOFL	1	0.25	VATH	2	0.29
					OSFL	1	0.25	BCCH	1	0.14
					RBNU	1	0.25	FOSP	1	0.14
					TOSO	1	0.25	OSFL	1	0.14
					VATH	1	0.25	RBNU	1	0.14
					WETA	1	0.25	TOSO	1	0.14
					YRWA	1	0.25	WETA	1	0.14
					YRWA	1	0.25	YRWA	1	0.14

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
44	Two Medicine south	PISI	13	4.33	CLNU	7	1.75	PISI	14	2.00
		WCSP	7	2.33	WCSP	6	1.50	WCSP	13	1.86
		CLNU	5	1.67	CHSP	4	1.00	CLNU	12	1.71
		AMRO	3	1.00	AMRO	3	0.75	AMRO	6	0.86
		PRFA	3	1.00	BLGR	3	0.75	CHSP	6	0.86
		CHSP	2	0.67	DEJU	3	0.75	RCKI	5	0.71
		LABU	2	0.67	DUFL	3	0.75	LABU	4	0.57
		MGWA	2	0.67	RCKI	3	0.75	MGWA	4	0.57
		RCKI	2	0.67	LABU	2	0.50	BLGR	3	0.43
		AMEKE	1	0.33	MGWA	2	0.50	DEJU	3	0.43
		FOSP	1	0.33	SAVS	2	0.50	DUFL	3	0.43
		NOFL	1	0.33	SWTH	2	0.50	PRFA	3	0.43
		OSFL	1	0.33	TOSO	2	0.50	SWTH	3	0.43
		SWTH	1	0.33	CEWA	1	0.25	TOSO	3	0.43
TOSO	1	0.33	GCKI	1	0.25	SAVS	2	0.29		
UNCH	1	0.33	MOCH	1	0.25	AMEKE	1	0.14		
			OCWA	1	0.25	CEWA	1	0.14		
			PISI	1	0.25	FOSP	1	0.14		
			RBNV	1	0.25	GCKI	1	0.14		
			WAVI	1	0.25	MOCH	1	0.14		
			WETA	1	0.25	NOFL	1	0.14		
						OCWA	1	0.14		
						OSFL	1	0.14		
						RBNV	1	0.14		
						UNCH	1	0.14		
						WAVI	1	0.14		
						WETA	1	0.14		

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
45	Two Medicine Bowl	NOFL	4	1.33	WCSP	8	2.00	WCSP	11	1.57
		BRSP	3	1.00	CLNU	4	1.00	NOFL	6	0.86
		PISI	3	1.00	TOSO	3	0.75	PISI	5	0.71
		WCSP	3	1.00	AMRO	2	0.50	BRSP	4	0.57
		GOEA	2	0.67	CHSP	2	0.50	CLNU	4	0.57
		LABU	2	0.67	FOSP	2	0.50	CHSP	3	0.43
		CHSP	1	0.33	MGWA	2	0.50	FOSP	3	0.43
		DUFL	1	0.33	NOFL	2	0.50	GOEA	3	0.43
		FOSP	1	0.33	PISI	2	0.50	LABU	3	0.43
		RNSA	1	0.33	BRSP	1	0.25	TOSO	3	0.43
		ROWR	1	0.33	DUFL	1	0.25	AMRO	2	0.29
					GOEA	1	0.25	DUFL	2	0.29
					LABU	1	0.25	MGWA	2	0.29
					MOBL	1	0.25	ROWR	2	0.29
					RBNU	1	0.25	MOBL	1	0.14
					RCKI	1	0.25	RBNU	1	0.14
					ROWR	1	0.25	RCKI	1	0.14
					SAVS	1	0.25	RNSA	1	0.14
					WWCR	1	0.25	SAVS	1	0.14
								WWCR	1	0.14

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
46	Two Medicine Middle	WCSP	8	2.67	PISI	12	4.00	PISI	17	2.83
		CHSP	5	1.67	CLNU	8	2.67	WCSP	13	2.17
		PISI	5	1.67	SAVS	7	2.33	CLNU	12	2.00
		CLNU	4	1.33	WCSP	5	1.67	SAVS	10	1.67
		SAVS	3	1.00	AMRO	4	1.33	CHSP	8	1.33
		AMKE	2	0.67	CHSP	3	1.00	AMRO	6	1.00
		AMRO	2	0.67	MGWA	3	1.00	MGWA	5	0.83
		MGWA	2	0.67	NOFL	3	1.00	RCKI	4	0.67
		RCKI	2	0.67	BLGR	2	0.67	AMKE	3	0.50
		ROWR	2	0.67	RCKI	2	0.67	BLGR	3	0.50
		BLGR	1	0.33	AMKE	1	0.33	NOFL	3	0.50
		DEJU	1	0.33	DUFL	1	0.33	DUFL	2	0.33
		DUFL	1	0.33	RBNJ	1	0.33	ROWR	2	0.33
		FOSP	1	0.33	SWTH	1	0.33	DEJU	1	0.17
MOBL	1	0.33	WAVI	1	0.33	FOSP	1	0.17		
			YRWA	1	0.33	MOBL	1	0.17		
						RBNJ	1	0.17		
						SWTH	1	0.17		
						WAVI	1	0.17		
						YRWA	1	0.17		

Station number	Location	Year		Combined 2000/2001			
		2000		2001		Combined 2000/2001	
		Number detected	Relative Abundance	Number detected	Relative Abundance	Number detected	Relative Abundance
47	Two Medicine Middle	SAVS	2.33	PISI	2.00	SAVS	2.17
		WCSP	1.67	SAVS	2.00	WCSP	1.50
		LABU	1.33	CLNU	1.67	CLNU	1.17
		ROWR	1.33	AMRO	1.33	PISI	1.17
		CHSP	0.67	WCSP	1.33	AMRO	0.83
		CLNU	0.67	CHSP	0.67	LABU	0.83
		RECR	0.67	LABU	0.33	CHSP	0.67
		AMRO	0.33	MGWA	0.33	ROWR	0.67
		BLGR	0.33	DUFL	0.33	NOFL	0.33
		DEJU	0.33	NOFL	0.33	RECR	0.33
		FOSP	0.33			BLGR	0.17
		NOFL	0.33			DEJU	0.17
		PISI	0.33			DUFL	0.17
		PRFA	0.33			FOSP	0.17
		RCKI	0.33			MGWA	0.17
		SWTH	0.33			PRFA	0.17
		TOSO	0.33			RCKI	0.17
						SWTH	0.17
						TOSO	0.17

Station number	Location	2000			2001			Combined 2000/2001		
		Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance	Species	Number detected	Relative Abundance
		PISI	15	2.50	PISI	5	1.67	PISI	15	2.50
48	Two Medicine north	WCSP	11	1.83	WCSP	5	1.67	WCSP	11	1.83
		CHSP	7	1.17	AMRO	3	1.00	CHSP	7	1.17
		ROWR	7	1.17	CHSP	3	1.00	ROWR	7	1.17
		AMRO	5	0.83	CLNU	3	1.00	AMRO	5	0.83
		FOSP	5	0.83	FOSP	3	1.00	FOSP	5	0.83
		CLNU	4	0.67	ROWR	3	1.00	CLNU	4	0.67
		DUFL	4	0.67	SAVS	3	1.00	DUFL	4	0.67
		SAVS	4	0.67	DUFL	2	0.67	SAVS	4	0.67
		LABU	3	0.50	NOFL	2	0.67	LABU	3	0.50
		OSFL	3	0.50	OSFL	2	0.67	OSFL	3	0.50
		RCKI	3	0.50	TOSO	2	0.67	RCKI	3	0.50
		TOSO	3	0.50	HETH	1	0.33	TOSO	3	0.50
		WIWA	3	0.50	LABU	1	0.33	WIWA	3	0.50
		BHCO	2	0.33	MOBL	1	0.33	BHCO	2	0.33
		HETH	2	0.33	RBNU	1	0.33	HETH	2	0.33
		NOFL	2	0.33	RCKI	1	0.33	NOFL	2	0.33
		RBNU	2	0.33	RECR	1	0.33	RBNU	2	0.33
		MOBL	1	0.17	SWTH	1	0.33	MOBL	1	0.17
		RECR	1	0.17	WIWA	1	0.33	RECR	1	0.17
		SWTH	1	0.17				SWTH	1	0.17