

BIRDS OF THE GARRY OAK HABITAT IN BRITISH COLUMBIA

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Abstract — In this paper, I characterize the common spring to summer avifauna associated with Garry oak (*Quercus garryana*) in British Columbia, compare it to other habitats, and discuss variation between two study years.

Key words: avifauna, Garry oak habitat, Gulf Islands, inter-year variation, Vancouver Island.

In 1993 and 1994, I conducted a field survey of the birds of Garry oak (*Quercus garryana*) habitat as an addition to the main topic of my M. Sc. thesis, which was on Garry oak ecology (Erickson 1996, 1997). Garry oak habitat is both interesting and unique within Canada. It is related biogeographically to habitats in California, occurring on the Gulf Islands and southeastern Vancouver Island, an area with a distinctive mediterranean climate (Edwards 1993). This range of Garry oak experiences a strong rain-shadow in the lee of the Olympic and Vancouver Island mountains. The result is low precipitation, high sunshine hours and summer drought. These factors combine to set the scene for a mosaic landscape: parklands with spring forb meadows and oak clumps, mossy bluffs often with shrub oaks, open grassy savannahs, and woodlands, sometimes mixed with Douglas-fir (*Pseudotsuga menziesii*). As well as being diverse and productive for plant growth, the area is attractive for human habitation and agricultural development, resulting in ongoing habitat loss and consequent endangerment of the Garry oak ecosystem (Erickson 1993). These pressures compel scientists and environmentalists to expand and share knowledge of the elements of the Garry oak ecosystem, including its birds.

STUDY AREA AND METHODS

My study area extended from East Sooke and Gonzales Hill to Courtenay on Vancouver Island and from East Point, Saturna Island, north to Helliwell Point, Hornby Island on the Gulf Islands (Figure 1). While sampling 286 ecological plots over 120 Garry oak locations, I recorded the presence of bird species, identified primarily by ear. Most sites were near sea level, but a number of hillsides were as high as 550 m. Plots were mostly square, ranging in size from about 100 m.² to about 400 m.², with a mean size of approximately 225 m.² (Erickson 1996). I visited each plot once over the two year period and was on each plot for approximately 1½ hours. Each species was listed as occurring on each plot in which it was identified. Sampling was between mid-April and early July, a period spanning spring migratory influx, spring vegetation growth, territory establishment, nesting, summer plant growth cessation and the beginning of post-nesting bird dispersal. Since the primary focus of the plot visits was vegetative sampling, bird counts

were done throughout the day, generally excluding the more early morning and late evening periods in which such counts are usually conducted. Sampling was centred on the Saanich Peninsula in the southern part of the area, with sampling trips east, west and north each year as the season progressed (Erickson 1996: Appendix 3). Plot effort was generally equivalent between the years and across the geographical areas within the years, with the exception of the northern Gulf Islands, where little Garry oak habitat was available.

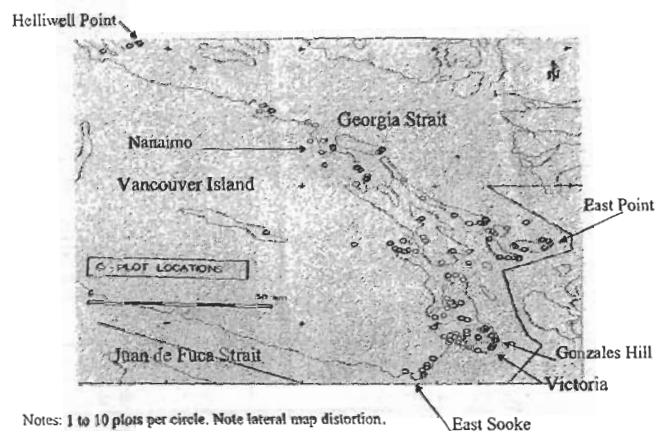


Figure 1: Garry oak study area and plot locations.

The statistical analysis consisted of calculations of frequency of each species for each year and the total for both years. Percent frequency is the number of plots in which a species was detected divided by the total number of plots and multiplied by 100. I also tested the adequacy of the data with species/accumulation curves. This analysis subsamples to develop curves which can be used to determine an appropriate number of plots.

Species and group trends were compared for wintering grounds and food sources (Ehrlich *et al.* 1988; Peterson 1990) for species with a greater value than 10% in either year.

TABLE 1
SUMMARY OF GARRY OAK BIRDS IN ORDER OF DESCENDING FREQUENCY

RANK	SPECIES	BOTH YEARS COMBINED (286 PLOTS)		1993 (151 PLOTS)		1994 (135 PLOTS)	
		CODE	% FREQ ¹	CODE	% FREQ ¹	CODE	% FREQ ¹
1	Orange-crowned Warbler	OCWa	36	AmRo	38	OCWa	38
2	American Robin	AmRo	36	OCWa	34	SpTo	34
3	Spotted Towhee	SpTo	30	SpTo	27	AmRo	33
4	Chestnut-backed Chickadee	CBCh	22	DEJu	20	CBCh	27
5	White-crowned Sparrow	WCSp	21	PSFl	20	AmGo	27
6	American Goldfinch	AmGo	20	CBCh	17	WCSp	25
7	Pacific-slope Flycatcher	PSFl	19	NoFl	17	PiSi	21
8	Northern Flicker	NoFl	16	WCSp	17	HoWr	20
9	Dark-eyed Junco	DEJu	16	AmGo	13	PSFl	18
10	House Wren	HoWr	16	BeWr	13	RuHu	18
11	Chipping Sparrow	ChSp	13	HoWr	13	NoFl	16
12	Pine Siskin	PiSi	13	YRWa	12	ChSp	16
13	Olive-sided Flycatcher	OSFl	12	ChSp	11	NoCr	15
14	Bewick's Wren	BeWr	12	CeWa	10	OSFl	14
15	Northwestern Crow	NoCr	11	OSFl	10	DEJu	13
16	Rufous Hummingbird	RuHu	11	CaVi	9	PuFi	13
17	Cedar Waxwing	CeWa	11	NoCr	8	SoSp	12
18	Yellow-rumped Warbler	YRWa	10	PuFi	6	ToWa	12
19	Purple Finch	PuFi	9	WeTa	6	BeWr	11
20	Song Sparrow (<i>Melospiza melodia</i>)	SoSp	8	CaQu	5	CeWa	10
21	Cassin's Vireo (<i>Vireo cassinii</i>)	CaVi	7	PiSi	5	VGSw	10
22	California Quail (<i>Callipepla californica</i>)	CaQu	7	RuHu	5	EuSt	10
23	Townsend's Warbler	ToWa	7	SoSp	5	BrCr	9
24	Western Tanager (<i>Piranga ludoviciana</i>)	WeTa	6	Bush	4	CaQu	8
25	Violet-green Swallow (<i>Tachycineta thalassina</i>)	VGSw	6	WaVi ²	4	YRWa	7
26	European Starling	EuSt	5	YeWa ³	3	RBNu	7
27	Brown-headed Cowbird	BHCo	5	BHCo	3	BHCo	7
28	Brown Creeper (<i>Certhia americana</i>)	BrCr	5	GCKi ⁴	3	SwTh ⁵	7
29	Red-breasted Nuthatch (<i>Sitta canadensis</i>)	RBNu	5	ToWa	3	CaVi	6
30	Bushtit (<i>Psaltriparus minimus</i>)	Bush	4	EuSt	2	WeTa	6

¹ % freq = percent frequency: the number of plots in which a species was detected divided by the total number of plots, times 100.

² WaVi = Warbling Vireo (*Vireo gilvus*).

³ YeWa = Yellow Warbler (*Dendroica petechia*).

⁴ GCKi = Golden-crowned Kinglet (*Regulus satrapa*).

⁵ SwTh = Swainson's Thrush (*Catharus ustulatus*).

RESULTS

I documented a total of 1243 occurrences of 66 bird species on the plots over the two years. An additional 12 species were recorded as out of plot, out of habitat or overhead. With 151 plots sampled in 1993 and 135 plots in 1994, sampling appears to have been adequate, as judged by the species/accumulation curve tests. A level characterizing about half of the species was obtained with about 15 plots in both years. After 15 plots there was a gradual increase in numbers of species. About 75% of the species were covered by the 45-plot level, leaving only very low-frequency species to be covered by additional samples.

The bird species attaining the 30 top frequency scores are listed in Table 1. An average of about four species (4.3) were detected per plot. Three species led in frequency: Orange-crowned Warbler (*Vermivora celata*) (36.0%), American Robin (*Turdus migratorius*) (35.7%) and Spotted Towhee (*Pipilo maculatus*) (30.4%) (Table 1; Figures 2, 3). The common birds of the Garry oak habitat total 17 species with a frequency greater than 10%. Collectively they include birds of canopy, of sun-loving shrubs and of openings. The habitat relations of the three leading species suggest the composite nature of the Garry oak habitat.

Variation in Bird Frequency

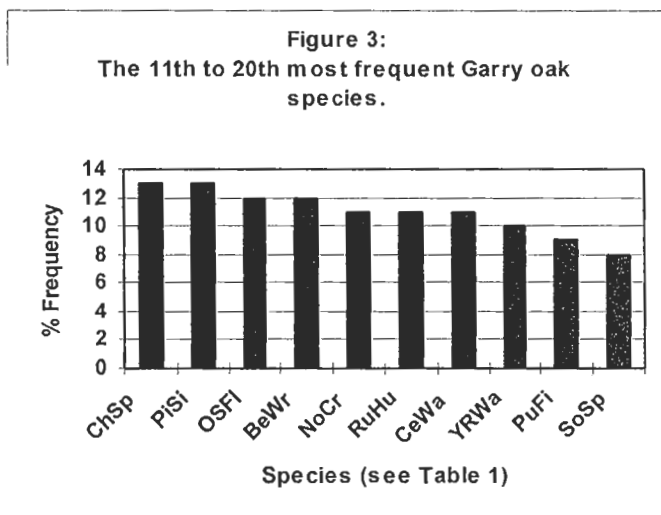
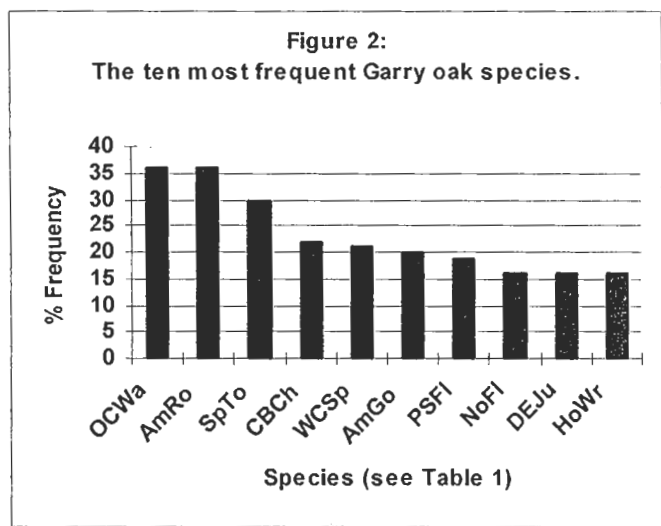
Birds were detected more frequently in 1994 than in 1993. The average number of species detected per plot was considerably higher in 1994 (5.0) than in 1993 (3.7). A linear trendline across the sequential data shows an increase from about 3.6 bird species per plot at the start of the 1993 sampling to about 5.8 per plot at the end of the 1994 season. However, there is wide variation in the numbers, so the trendline has a weak correlation ($r^2 = 0.05$) with the data.

The most frequent species changed their order between the two years (Table 1). Orange-crowned Warbler moved from #2 in 1993 up to #1 in 1994. Similarly, the #4, #5 and #6 ranked species, Chestnut-backed Chickadee (*Poecile rufescens*) (22%), White-crowned Sparrow (*Zonotrichia leucophrys*) (21%) and American Goldfinch (*Carduelis tristis*) (20%) increased substantially in 1994. In 1994, 19 species had a frequency greater than 20%, compared with 11 in 1993; and 19 species had a frequency $\geq 10\%$ compared to 12 in 1993.

TABLE 2
CHANGES IN GARRY OAK BIRD FREQUENCY IN 1994
OVER 1993

SPECIES	% CHANGE*	TYPE OF FOOD
Pine Siskin	319	seeds, insects
American Goldfinch	291	seeds, insects
Rufous Hummingbird	236	nectar, sap, insects
Chestnut-backed Chickadee	124	insects, seeds
White-crowned Sparrow	111	insects, seeds, berries
Townsend's Warbler	101	insects
House Wren	86	insects, other invertebrates
Spotted Towhee	66	insects, seeds, fruit
Northwestern Crow	59	omnivore
Purple Finch	52	seeds, insects, fruit
Song Sparrow	47	insects, seeds
Chipping Sparrow	42	insects, seeds
Olive-sided Flycatcher	25	insects
Orange-crowned Warbler	10	insects, fruit, nectar
Northern Flicker	-2	insects
Pacific-slope Flycatcher	-11	insects
American Robin	-12	insects, fruit
Dark-eyed Junco	-37	seeds, insects
Yellow-rumped Warbler	-42	insects, berries

* % change is an increase unless designated with a minus (-) sign.



Of those with $\geq 10\%$ in 1994, 12 species were recorded substantially more often than in 1993; six were recorded as frequently or slightly less often, and two species substantially less often (Table 2). Species with the greatest increase in detections include Pine Siskin (*Carduelis pinus*) ($>300\%$), American Goldfinch and Rufous Hummingbird (*Selasphorus rufus*) ($>200\%$) and White-crowned Sparrow and Townsend's Warbler (*Dendroica townsendi*) ($>100\%$). Declines in detections were more modest with Dark-eyed Junco (*Junco hyemalis*) (-36%) and Yellow-rumped Warbler (*Dendroica coronata*) (-42%) the only two of a magnitude judged to be reliable.

A comparison of these trends shows the largest increase for 1994 over 1993 in seed eaters with insects as a secondary food ($+157\%$) (Table 3). Three of four species were recorded in larger numbers. Species wintering south to Mexico exhibited the next greatest positive change between the two years ($+147\%$), with seven of eight species showing this trend. All species of insect eaters that secondarily use seeds were observed more frequently in the second year, averaging 77.7% . Winter residents exhibited an overall positive change ($+37\%$), but three of these species were observed less often. Smaller increases, totalling 20% , were recorded for insect eaters without seeds as supplementary food. Included here were eight species which were split evenly between increased and decreased counts. Species wintering south to Central and South America decreased very slightly in counted birds (-2%) between the two years. The largest combined increase in birds counted is for seed-eaters wintering south to Mexico.

DISCUSSION

The habitat relations of the three leading species suggest the composite nature of the Garry oak habitat. Orange-crowned Warblers glean in tree and shrub foliage, American Robins feed on the ground in openings, and Spotted Towhees skulk in thickets. All these elements are important in Garry oak habitat, which is best characterized as a parkland physiognomic type, but varies to full-canopy woodlands and shrub thickets (Erickson 1996).

Comparison with the Birds of Other Habitats

Most of the top ranking species in my study use Garry oak woodlands in Oregon and black oak (*Quercus velutina*) habitat in northern California as primary habitat (Anderson 1980; Dedon *et al.* 1984; Gumtow-Farrier and Gumtow-Farrier 1994). In Oregon, Chestnut-backed Chickadee was associated with Douglas-fir, but Black-capped Chickadee (*Poecile atricapillus*) (not found regularly on Vancouver Island) used the oak woodland (Anderson 1980). American Robin (#2 ranking in the B.C. oak woodlands) was among the most abundant breeding birds in blue oak (*Quercus douglasii*) woodland in northern California (Wilson *et al.* 1991). Species frequent or abundant in California oak woodlands (blue oak, coast live oak (*Q. agrifolia*)) include Bewick's Wren (*Thryomanes bewickii*) (#14 in my study),

Yellow-rumped Warbler (#18), Spotted Towhee, Dark-eyed Junco (#9), House Wren (*Troglodytes aedon*) (#10), Northern Flicker (*Colaptes auratus*) (#8) and Orange-crowned Warbler (#1) (Verner 1980; Block and Morrison 1991; Tietje *et al.* 1997). Olive-sided Flycatcher (*Contopus cooperi*) (#13) is thought to prefer coniferous forests (Verner 1980) and is not mentioned in these California oak studies. However, it is primarily a bird of "edge" habitats and recently burned areas (Bent 1942; Campbell *et al.* 1997; Altman and Sallabanks 2000). These are two characteristics of Garry oak habitat, which has much edge associated with the parkland physiognomic type, and several recent hilltop burns.

Spotted Towhee was the most frequent bird species in Gambel oak (*Quercus gambeli*) habitat of northern California; American Robin and Yellow-rumped Warbler were among the most frequent in southern Arizona. Also listed for Gambel oak are Dark-eyed Junco, Pine Siskin (#12 in my study), American Goldfinch (#6), White-crowned Sparrow (#5), Orange-crowned Warbler, Northern Flicker, Chipping Sparrow (*Spizella passerina*) (#11) and Cedar Waxwing (*Bombycilla cedrorum*) (#17) (Leidolf *et al.* 2000).

Within B.C., Garry oak can be compared to Douglas-fir, physiognomically similar aspen (*Populus tremuloides*) parkland and urban habitats. In a local survey of Douglas-fir/oak woodlands at Rocky Point, west of Victoria, nine frequent species ($> 80\%$ frequency level in those data) were shared with the present study, nine were different, and ten important species (including the #1 and #3 ranking in my study) were lacking (MacLeod undated).

The importance of Chestnut-backed Chickadee was also apparent in Douglas-fir habitat in Washington and Oregon. Along with Pacific-slope Flycatcher (*Empidonax difficilis*), this species was the most widespread and abundant bird (Anderson 1980; Huff and Raley 1991). Other species in these studies include Northern Flicker, Olive-sided Flycatcher, House Wren (*Troglodytes aedon*), American Robin, Orange-crowned Warbler, Yellow-rumped Warbler, Chipping Sparrow, Song Sparrow (*Melospiza melodia*), Purple Finch (*Carpodacus purpureus*) and Pine Siskin. However, the importance of these species in Douglas-fir habitat is less than in oak habitat.

American Robin and Northwestern Crow (*Corvus caurinus*) (#15 in my study) are characteristic suburban species and also Garry oak birds. However, the remaining Garry oak species are more typical of wild habitats. Noticeably lacking from the top 20 are the suburban/agricultural species - Anna's Hummingbird (*Calypte anna*), European Starling (*Sturnus vulgaris*), Brown-headed Cowbird (*Molothrus ater*), House Finch (*Carpodacus mexicanus*) and House Sparrow (*Passer domesticus*).

In aspen stands of northwest central B.C., American Robin, Cedar Waxwing, Orange-crowned Warbler, Yellow-rumped Warbler and

TABLE 3
COMPARISON OF FACTORS POTENTIALLY INFLUENCING CHANGES IN GARRY OAK
BIRD FREQUENCY BETWEEN 1993 AND 1994

SPECIES	% CHANGE*	WINTERING AREA	TYPE OF FOOD
Wintering residents:			
Chestnut-backed Chickadee	124	resident	insects, seeds
Spotted Towhee	66	resident	insects, seeds, fruit
Northwestern Crow	59	resident	omnivore
Purple Finch	52	resident	seeds, insects, fruit
Song Sparrow	47	resident	insects, seeds
Northern Flicker	-2	resident	insects
American Robin	-12	resident	insects, fruits
Dark-eyed Junco	-37	resident	seeds, insects
<i>Total % change</i>	37		
Wintering south to Mexico:			
Pine Siskin	319	to n. Mexico	seeds, insects
American Goldfinch	291	to n. Mexico	seeds, insects
White-crowned Sparrow	111	to central Mexico	insects, seeds, berries
House Wren	86	s. through Mexico	insects, other invertebrates
Chipping Sparrow	42	s. through Mexico	insects, seeds
Rufous Hummingbird	236	n. Mexico	nectar, sap, insects
Townsend's Warbler	101	Mexican high-lands to Costa Rica	insects
Pacific-slope Flycatcher	-11	Mexico	insects
<i>Total % change</i>	147		
Wintering to central and South America:			
Orange-crowned Warbler	10	s. to Guatemala	insects, fruit, nectar
Olive-sided Flycatcher	25	montane South	insects
Yellow-rumped Warbler	-42	s. to Central America	insects, berries
<i>Total % change</i>	-2		
Type of food: seeds primary:			
Purple Finch	52	resident	seeds, insects, fruit
Pine Siskin	319	n. to Mexico	seeds, insects
American Godfinch	291	n. to Mexico	seeds, insects
Dark-eyed Junco	-37	resident	seeds, insects
<i>Total % change</i>	157		
Type of food: miscellaneous foods:			
Northwestern Crow	59	resident	omnivore
Rufous Hummingbird	236	n. Mexico to Costa Rica	nectar, sap, insects
Type of food: insects primary, seeds secondary:			
Spotted Towhee	66	resident	insects, seeds, fruit
White-crowned Sparrow	111	to Central Mexico	insects, seeds, berries
Chestnut-backed Chickadee	124	resident	insects, seeds
Song Sparrow	47	resident	insects, seeds
Chipping Sparrow	42	s. through Mexico	insects, seeds
<i>Total % change</i>	78		
Type of food: insects primary, without seeds as secondary:			
House Wren	86	s. through Mexico	insects, other invertebrates
Orange-crowned Warbler	10	s. to Guatemala	insects, fruit, nectar
American Robin	-12	resident	insects, fruit
Yellow-rumped Warbler	-42	s. to South America	insects, berries
Townsend's Warbler	101	Mexican high-lands to Costa Rica	insects
Olive-sided Flycatcher	25	montane South America	insects
Northern Flicker	-2	resident	insects
Pacific-slope Flycatcher	-11	Mexico	insects
<i>Total % change</i>	20	* % change is an increase unless designated with a minus (-) sign.	

Dark-eyed Junco were found regularly in mature and old aspen, while Purple Finch (#19 in my study) was less frequent (Pojar 1995). Pine Siskin was found in mixed aspen-conifer (spruce, Lodgepole pine (*Pinus contorta*)). White-crowned Sparrow, Chipping Sparrow (#11) and Rufous Hummingbird (#16) were on clearcuts.

Weather

Weather in the study years may have influenced the numbers of birds observed. There had been low precipitation and warm temperatures leading up to, and continuing for the duration of these years. The exception was growing season precipitation, which was high in 1993 and normal in 1994. The study years were also affected by the El Niño climatic phenomenon (NOAA 2001). Two prior years had El Niño events in both winter and summer. Summer El Niño events were experienced in 1993 and 1994. El Niño effects vary along the Pacific Coast. Winter conditions are slightly warmer (+0.75° C.) in southwestern B.C. than usual; California is about normal; and the Mexican highlands are colder (0.25° C.). Breeding conditions are slightly warmer here in B.C. Neither winter nor summer precipitation are affected much by the El Niño cycle here, but winter increases as high as 0.8 mm./day are recorded from California south into Mexico.

Recent research has linked lower survival of Neotropically-wintering songbirds with the effects of reduced rainfall during El Niño years (Silllett *et al.* 2000). Possible mechanisms include scarcer seed and insect foods, consequent production of fewer young, and elevational dislocation due to warm, dry conditions (Pounds *et al.* 1999; Silllett *et al.* 2000).

Several of the species recorded more frequently in 1994 both migrate and remain in B.C. in winter. Their population trends could relate to winter weather or residual seed crops here, to conditions on southern wintering grounds, or to several other factors. Warmer temperatures may have created favourable winter survival conditions for resident species during the El Niño years of the study time period. During the 1991 and 1992 winter El Niño events, species wintering in the Mexican highlands may have experienced increased mortality due to cooler conditions. Populations may have been recovering subsequently during the favourable conditions in the summer 1993 El Niño. A continuation of this trend could have led to the apparent higher frequencies recorded during the 1994 El Niño summer.

The same set of conditions and population trends may be mirrored for southwestern B.C.: apparent initial low populations in 1993 followed low precipitation and high growing season temperatures; favourable growing season rainfall in 1993 combined with a subsequent mild winter; and both warm temperatures and adequate moisture continued into the 1994 nesting season. Given these conditions, populations of both residents and migrants may have increased during the study years.

Other Factors

Of the species with the greatest increases in detections, seed-eaters, such as Pine Siskin and American Goldfinch, are known for the irruptive nature of their occurrence (Newton 1985). Increases in their numbers in any given area may signify shifts in their distribution. Feeder augmentation or higher rates of flowering may allow more pairs of Rufous Hummingbirds to breed within a specific area (Bowles *vide* Bent 1940; Calder 1993), resulting in production of more young within those areas.

Other factors, including sampling effects, could influence the outcome by year. The influence and timing of local weather events on the nesting success of each species, predator/prey dynamics in different seasons, the adaptability of different species to changing conditions, Neotropical habitat degradation and epizootics may warrant further investigation.

SUMMARY

The characteristic, common avifauna of Garry oak habitat in B.C. included 17 species with a frequency of greater than 10 percent, led by Orange-crowned Warbler, American Robin and Spotted Towhee, each on approximately one-third of the study sites. Bird frequency and ranking shifted between the two years of the study. The two-year results stress the need to survey the birds of a given habitat for several years.

This community has affinities with related habitats, particularly with other western oak woodlands. There is less similarity to Douglas-fir, urban and aspen woodland habitats in B.C.

An understanding of local population trends should be underscored by continent-wide population dynamics and weather patterns. Many factors influence individual species, groups of species or the entire avifauna. The comparisons I made suggest that the El Niño cycle may provide a useful framework for interpreting some annual changes in bird frequencies. Its relative importance compared to other influences warrants further study.

Knowledge of the Garry oak avifauna may stimulate further interest, and promote its inclusion as a component of the conservation efforts so important for this endangered ecosystem.

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BIRDS OF THE GARRY OAK HABITAT IN BRITISH COLUMBIA Enlarged view of Figure 1.

