

Historical and Current Distribution and Populations of Bird Species in Prairie-Oak Habitats in the Pacific Northwest

Author: Altman, Bob

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Historical and Current Distribution and Populations of Bird Species in Prairie-Oak Habitats in the Pacific Northwest

Abstract

The loss and degradation of prairie-oak habitats has resulted in significant changes in bird species breeding distributions and populations. Among the 49 species highly associated with prairie-oak habitats, 21 have experienced extirpations, range contractions, and/or regional population declines. Three species have been regionally extirpated as breeding species since the 1940s, including Lewis's woodpecker, which historically occurred throughout the region. Eleven species have experienced local or ecoregional extirpations and/or range contractions. The predominant pattern of range contraction starts at the northern edge of a species range and moves southward. Nine species have relatively small regional populations, six with limited distribution in the Klamath Mountains ecoregion, and three with small and patchily distributed breeding populations throughout the region. There are nine species with significantly declining regional population trends with a high degree of confidence based on Breeding Bird Survey data, and five with similar declines using Christmas Bird Count data. Several other species may be declining based on a lower degree of confidence in the data or anecdotal observations. These include both endemic subspecies, streaked horned lark and Oregon vesper sparrow, which have regional population estimates of <2,000 and <3,000 birds, respectively. Six species have expanded their range in prairie-oak habitats in the last 50 years. The predominant pattern of range expansion starts at the northern edge of a species range and moves northward. Recommended actions to support prairie-oak bird conservation include range-wide and local inventories and monitoring to determine status, and evaluations and implementation of reintroductions or federal listings as appropriate.

Introduction

The prairie-oak ecosystems of the Pacific Northwest support a unique avifauna associated with relatively dry, open habitats amid a landscape dominated by dense coniferous rainforests (Franklin and Dyrness 1973). Thus, prairie-oak ecosystems are major repositories of regional biodiversity, including many obligate or near-obligate species that are now considered rare or endangered (Ewing 1997, Hanna and Dunn 1997).

The avifaunal composition of prairie-oak ecosystems in the Pacific Northwest is in part a northern extension of the bird communities of the dry lowlands and foothills of central and northern California, with some species similarities to the arid steppe habitats of eastern Washington and Oregon (Ewing 1997). The prairie-oak bird community is characterized by relatively low species diversity and richness in prairies and savannas, and a high degree of habitat specialization among species (Altman et al. 2001).

Most prairie-oak habitat in the Pacific Northwest occurs in valley floors and foothills, which coincide with the initially settled, most heavily populated, and most rapidly developing portions of southwestern

British Columbia and western Washington and Oregon (Franklin and Dyrness 1973). Development and land use pressures have been and continue to be extensive, and loss and degradation of prairie-oak habitats has been the consequence. The numbers are staggering; >90% loss of native prairie in the Puget Lowlands (Hall et al. 1995, Crawford and Hall 1997), >99% loss of native prairie and savanna in the Willamette Valley (Alverson 2005), 95% loss of the Garry oak ecosystem on southeast Vancouver Island (Lea 2002), and >50% loss of oak habitat since Euro-American settlement in the South Puget Sound (Hanna and Dunn 1997). Remaining prairie-oak habitats often occur as isolated patches amid a sea of agricultural lands and human development with highly altered natural ecosystem processes and functions (Hanna and Dunn 1997). As a consequence of these losses and degradations, prairies and oak savannas of the Willamette Valley, Oregon were designated as a critically endangered ecosystem in the United States (Noss et al. 1995), and oak savannas in Washington, Oregon, and California were designated as one of the 20 most threatened bird habitats in the United States (American Bird Conservancy 2006).

In the Klamath Mountains ecoregion of southwestern Oregon and northwestern California, prairie-oak

¹Author email: baltman@abcbirds.org

habitats also occur in montane forests where there is extensive forest management including timber harvest and efforts to reduce wildfire potential by reducing fuel loads. In addition to those factors unique to the Klamath Mountains, the primary factors contributing to the loss and degradation of prairie-oak habitats throughout the Pacific Northwest include: permanent loss to urban, residential, and rural development; conversion of prairies and oak savanna to agriculture (cropland and livestock grazing); increasing loss of native species composition to nonnative and invasive annuals and perennials; fire suppression and subsequent conifer tree encroachment, exotic plant spread and proliferation, and higher oak densities; conversion of oak woodland and forest to conifer stands for timber production; lack of recruitment of oak trees; and oak harvesting (Reed and Sugihara 1987, Crawford and Hall 1997, Hanna and Dunn 1997, Altman et al. 2001, Chappell and Kagan 2001, Hosten et al. 2006). As a result of these issues and impacts, there has been a decline in quality and quantity of prairie-oak habitats (Detling 1968, Taylor and Boss 1975, Towle 1982, Larson and Morgan 1998), and concomitant adverse effects on bird species distribution and populations (Altman et al. 2001). Consequently, prairie-oak habitats are recognized as a high priority by every conservation assessment and natural resource agency in the Pacific Northwest.

Purpose and Scope of the Assessment

The purpose of this assessment is to document historical and current population status and distribution of prairie-oak bird species in the Pacific Northwest. It is hoped the assessment will provide a regional context for evaluating the conservation status of species, and stimulate additional regional and local assessments to support sound conservation decisions regarding the avifauna of prairie-oak ecosystems in the Pacific Northwest.

The temporal scope of this assessment includes information back to the time of Euro-American settlement to provide a context of the historical breeding avifauna of the prairie-oak landscape relative to the current situation. Information on species historical status is qualitative and anecdotal, but presented chronologically from all available sources to assess changes in species distribution and populations.

The spatial scope of this assessment is prairie-oak habitats west of the Cascade Mountains in Oregon, Washington, and British Columbia. This area includes four United States Level III ecoregions – Puget Lowlands of western Washington, Willamette Valley of western

Oregon and southwestern Washington, Klamath Mountains of western Oregon and northwestern California, and Coast Range of western Washington, Oregon, and northwestern California (U.S. Environmental Protection Agency 1996) (Figure 1). The assessment also includes the Georgia Depression ecoregion in southwestern British

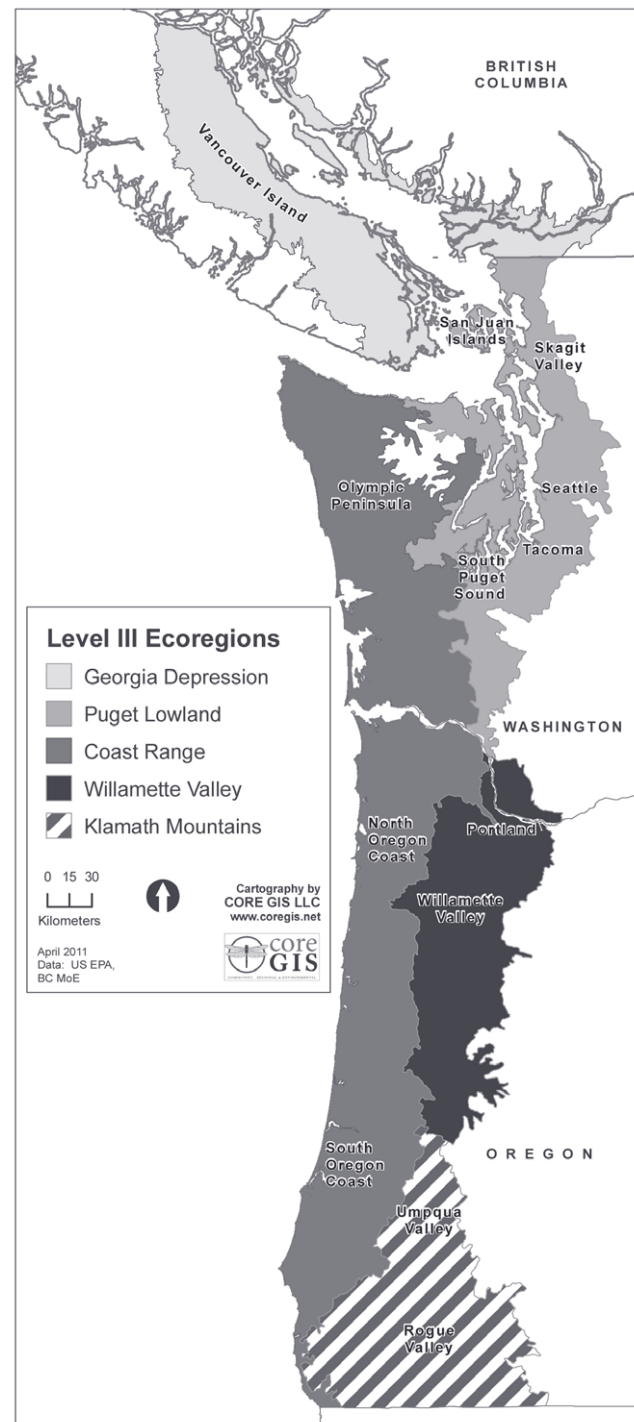


Figure 1. U. S. Environmental Protection Agency (1996) Level III ecoregions and B. C. Ministry of Environment (De-marchi 1995) ecoprovinces.

Columbia (Demarchi 1995) (Figure 1). Prairie-oak habitats in the Coast Range and Klamath Mountains ecoregion of northwestern California, and on the east-slope of the Cascade Mountains in Washington and Oregon are not included in this assessment, although many of the same issues related to bird species distribution and populations are likely similar. Further, there is limited reference to the Coast Range ecoregion because prairie-oak habitats are relatively small and patchily distributed, and include mostly prairies in the form of coastal headland meadows and flat coastal plain prairies.

Within these ecoregions, there is a continuum of avian habitats in the prairie-oak ecosystems. This includes wet prairie (e.g., seasonally flooded, vernal pools), upland prairie (e.g., native and agricultural grasslands, Coast Range headlands and balds), oak savanna (i.e., scattered oak trees or small oak groves with < 25% canopy cover and an herbaceous-dominated understory), oak woodland (i.e., moderate oak canopy cover of 25-75%), oak forest (i.e., > 75% canopy cover of oak), and oak chaparral habitats (i.e., open oak canopy with dense shrub patches in the understory) of the Klamath Mountains ecoregion (Altman et al. 2001).

Methods

I began this assessment by reviewing relevant literature to develop a list of prairie-oak species, and to document species distributions and populations during the breeding season. The species list was based on previous reviews I have done in the region (e.g., Altman 2000, Altman et al. 2001), and revised using the criteria described below. Species distribution and population status were determined by using literature compilations (e.g., state/provincial bird books) to identify original sources to review, and then identifying other sources to review through their cited literature. I only used references that indicated a species distribution and/or population status during the breeding season.

This assessment recognizes 49 native bird species (includes three subspecies) highly associated with prairie-oak habitats during the breeding season (Appendix A). I defined highly associated species as obligates or near-obligates to prairie-oak habitats, or species that either historically or currently reach some of their highest breeding densities in prairie-oak habitats. The latter group of species also may be abundant in one or more other habitat types; thus, often are of less conservation concern than the obligate or near obligate species, which are the focus of this assessment. Obligate or near obligate species are those for which I considered >75% of their historical or current abundance in the

region to be in prairie-oak habitats. I considered 24 of the 49 species as meeting these criteria (Appendix A). Twenty-two of the 24 species are addressed in this report. This includes three species extirpated as breeding birds throughout the region.

Status assessments for the 22 species are presented in taxonomic order within the most appropriate category of the type, degree, or extent of its population changes. This includes regional extirpations, local extirpations and/or regional distribution or population changes, historically small populations, and relatively recent range expansions. A presentation of data-based population changes for all prairie-oak species is followed by a section on population estimates of the two endemic subspecies.

Endemic Subspecies

Two subspecies, streaked horned lark (*Eremophila alpestris strigata*) and Oregon vesper sparrow (*Pooecetes gramineus affinis*) are endemic to prairie-oak habitats west of the Cascade Mountains in the Pacific Northwest (i.e., their range is entirely within this area) (Altman et al. 2001). One other subspecies, slender-billed white-breasted nuthatch (*Sitta carolinensis aculeate*) is a near-endemic, with some of its range extending through California into northern Baja California (Pravosudov and Grubb 1993).

Streaked Horned Lark

The historical breeding range of streaked horned lark included wet and dry prairie habitats and open coastal plains from the Georgia Depression ecoregion south through the Puget Lowlands and Willamette Valley ecoregions, and into the Rogue Valley, Oregon in the Klamath Mountains ecoregion (Beason 1995, Pearson and Altman 2005).

Oregon Vesper Sparrow

The historical breeding range of Oregon vesper sparrow included dry prairie and oak savanna habitats from the Georgia Depression ecoregion south through the Puget Lowlands and Willamette Valley ecoregions, and into the Klamath Mountains ecoregion south to Del Norte County, California (Jones and Cornely 2002).

Regional Extirpations

Three prairie-oak species have been extirpated as breeding species from the region since the 1940s (Table 1). Burrowing owl (*Speotyto cunicularia*) had a breeding

TABLE 1. Approximate dates and locations of extirpations of prairie-oak associated breeding bird species in the Pacific Northwest.

Species (Subspecies)	Ecoregion				
	Georgia Depression	Puget Lowlands	Coast Range	Willamette Valley	Klamath Mountains
Sandhill crane	<i>na</i> ¹	South Puget Sound around 1900	<i>na</i>	<i>na</i>	<i>na</i>
Northern harrier	²	San Juan Islands since at least early 1990s			
Burrowing owl	small population at Boundary bay till mid 1980s	<i>na</i>	First half of 1900s on WA coast	near Corvallis mid 1950s	Umpqua Valley mid 1950s; Rogue Valley early 1980s
Short-eared owl				northern Willamette valley by early 2000s	
Lewis woodpecker	Vancouver Island 1963; Fraser River Delta by 1970s	San Juan Islands 1950s-1960s; western Washington 1960s	<i>na</i>	Finley National Wildlife Refuge early 1970s	Rogue Valley late 1980s
Say's phoebe	<i>na</i>	<i>na</i>	<i>na</i>	central Willamette Valley near Corvallis in 1941-1942	Between 1920s- 1970s in Rogue Valley
Horned lark (Streaked)	Vancouver Airport 1987	San Juan Islands 1960s-1970s	north Oregon coast mid 1980s		Rogue Valley 1976
White-breasted nuthatch (Slender-billed)	<i>na</i>	Tacoma 1995	<i>na</i>	between Woodland and Kalama, WA 1995-2000	
Western bluebird	mainland by the 1970s; Vancouver Island 1995	San Juan Islands 1964; north Puget Lowlands 1975	Long Beach Peninsula 1963		
Vesper sparrow (Oregon)	mainland 1968; 5-10 pairs remain Vancouver Island	Dungeness/Port Angeles early 1990s			
Lark sparrow	<i>na</i>	<i>na</i>	<i>na</i>	central and southern Willamette Valley after 1940s	Umpqua Valley mid 1990s
Western meadowlark	mainland 1968; Vancouver Island 1977	San Juan Island since the 1980s; Dungeness/Sequim late 1990s			

¹ *na* = not applicable; i.e., the species or subspecies did not breed in this ecoregion, thus extirpations were not possible.

² blank cells indicate that the species or subspecies still occurs in this ecoregion.

population in the Rogue Valley and scattered breeding pairs elsewhere. Lewis's woodpecker (*Melanerpes lewis*) formerly bred throughout the region. Say's phoebe (*Sayornis saya*) had local breeding populations in the Willamette Valley and the Klamath Mountains ecoregions.

Burrowing Owl

In the Georgia Depression, there were summer records of burrowing owl in 1931 around Vancouver (Cumming 1932) and into the early 1940s on the southern mainland (Munro and Cowan 1947). One or two pairs nested from

1939 to at least 1984 near the Boundary Bay airport (Campbell et al. 1990). There is a summer record on San Juan Island in 1962 (Retfalvi 1963), and it was an “apparently former rare resident in these islands [i.e., San Juan Islands] and those of the Straits of Georgia” (Larrison 1952:66). There also are a few summer records in the Coast Range ecoregion of Washington (Bowles 1926, Alcorn 1941), which suggests that a few pairs may have bred in western Washington in the first half of the 1900s (Jewett et al. 1953).

In the Willamette Valley from the late 1800s to the early 1950s, burrowing owl likely nested, based on breeding season records. In the late 1800s it was a “resident, not common” near Corvallis (Woodcock 1902:40), and a “constant resident and breeding in Linn County” (A. G. Prill in Woodcock 1902:40). In the southern Willamette Valley in the early 1900s, it was “found sparingly...probably resident” (Shelton 1917:28). In the central Willamette Valley there were summer observations in the 1930s near Lebanon (Graf 1939) and early 1950s near Corvallis (Eddy 1953).

In the Umpqua Valley in the mid 1950s, burrowing owl nested for a few years, but the site was destroyed by construction of Interstate 5, and there are no other references of nesting before or after that (Hunter et al. 1998). In the Rogue Valley in the 1920s, it was a “permanent resident...most abundant in the rocky area between Medford and Eagle Point” (Gabrielson 1931:113), and in the 1930s “a familiar sight...in pasture lands” (Gabrielson and Jewett 1940:347). By the 1970s it was a “rare visitor” (Browning 1975:38), and the last suspected nesting in the Rogue Valley was in the early 1980s (Otis Swisher, citizen, Medford, OR, personal communication). An experimental reintroduction program in the Rogue Valley in the mid 1980s was unsuccessful (Green 2003).

Lewis's Woodpecker

In the Georgia Depression in the 1860s, Lewis's woodpecker was not reported in western British Columbia (Lord 1866). In 1892 it was not reported on southeastern Vancouver Island or the mainland (Rhoads 1893). However, in the late 1800s and early 1900s, it was breeding at scattered locations on the mainland (Fannin 1898), was a “tolerably common summer resident” near Chilliwack (Brooks 1917:41), but was “undoubtedly rare” on Vancouver Island (Brooks and Swarth 1925:69). From 1909-1931 it was a “common summer visitant” around Vancouver (Cumming 1932:10). From 1920-1940 it was an “abundant nesting species in the Garry oaks of southeastern Vancouver Island” (Cowan 1940).

In the early 1920s at Comox on Vancouver Island, it was “seen often” during the breeding season, but by the early 1940s it was no longer breeding (Pearse 1946:7). After 1940 there was a decline in populations on Vancouver Island, probably due to the “loss of Garry oak stands,” and it was last reported nesting at Victoria in 1963 (Campbell et al. 1990). By the early 1980s it was not reported as a breeding species in the Fraser River Delta of the mainland (Butler and Campbell 1987).

On the San Juan Islands in the early 1930s, Lewis's woodpecker was an “occasional summer resident” (Miller et al. 1935:60). By the early 1960s it was not reported as a breeding species (Bakus 1965). It has been extirpated as a breeding species since at least the 1950s or 1960s (Lewis and Sharpe 1987).

In the North Puget Lowlands in the early 1900s, Lewis's woodpecker was a “summer resident, frequent in certain localities” in the Bellingham area (Edson 1908:434). The unpublished notes of Edson indicated breeding near Fort Bellingham from approximately 1910-1934 (Wahl 1995).

In the South Puget Lowlands in the 1850s, Lewis's woodpecker was “very abundant...preferring oak openings and groves” (J. G. Cooper in Suckley and Cooper 1860:162). In the late 1800s it was a “moderately common summer resident...breeds” in burned-over forests around Seattle (Rathburn 1902:135), and a “common summer resident of the Puyallup Valley” (Bowles 1906:144). In the early 1900s it was “locally distributed, chiefly in burns” west of the Cascades (Dawson and Bowles 1909:442), and in 1917 breeding was reported from the Olympic peninsula on the Hoh River (Jewett et al. 1953). In 1920 it was a “fairly plentiful summer resident” in the Seattle area (Burleigh 1929:513), and in the early 1930s “common” in the Seattle area (Hal Opperman, citizen, Seattle, WA, personal communication; from notes of Walter Hagenstein, Seattle Audubon Society). Around 1930 it was a “summer resident (status undescribed)” throughout western Washington (Kitchen 1934:14), including “occasional” sightings on the University of Washington campus in Seattle (Miller and Curtis 1940:43). In the 1940s it was a “summer resident...commonly found in logged-off forest” on the Olympic Peninsula (Kitchin 1949:156), and an “uncommon summer resident” in the Puget Sound (Larrison 1952:108). Up to 1950, Jewett et al. (1953) noted their continued occurrence as a breeding species throughout western Washington in burned forest and prairie habitat, although by the late 1950s it was “not found commonly or abundantly in western Washington” (Alcorn 1959:10). By the mid 1960s it was an “uncom-

mon irregular...local summer resident" (Larrison and Sonnenberg 1968:162). The last nesting in the Puget Lowlands is unknown, but there have been no breeding season records since 1980 (Husak 2005).

In the northern Willamette Valley in the 1870s, a few Lewis's woodpeckers "breed along the Columbia River" (Johnson 1880:637). In the late 1800s it was a "common resident...particularly in oak timber" west of Portland (Anthony 1886:165), a "common summer resident" around Portland (Anthony 1902:95), a "resident, common in summer" around Corvallis (Woodcock 1902:47), and a "not uncommon resident" near Dayton in the northern Willamette Valley (E. F. Hadley in Woodcock 1902:47). In the early 1900s it was a "common summer resident" in the Portland area (Jewett and Gabrielson 1929:25). However, Shelton (1917) did not indicate it was a breeding species in the southern Willamette Valley. In the 1930s it was a "summer resident" throughout western Oregon (Gabrielson and Jewett 1940:375). In the 1940s it was not recorded as a breeding species in the southern Willamette Valley around Eugene (Gullion 1951), but Evenden (1949) reported regular sightings during the breeding season in the central Willamette Valley, and it was recorded in summer in 1952 near Corvallis (Eddy 1953). Prior to 1965 it still nested in a few oak savanna locations in the Willamette Valley, but in the late 1960s and early 1970s a reduction in the population "was obvious" (Gilligan et al. 1994:185). The last suspected breeding in oak habitats in the Willamette Valley was in the mid 1970s at Finley National Wildlife Refuge (Alan Contreras, University of Oregon, personal communication). The last known nesting in the Willamette Valley was in 1977 in riparian forest habitat near Scapoose along the Columbia River (Gilligan et al. 1994).

In the Rogue Valley in the 1920s, Lewis's woodpecker was a "common permanent resident" (Gabrielson 1931:114), and a "summer resident" through the 1930s (Gabrielson and Jewett 1940). In the early 1970s it was a "fairly common summer resident" (Browning 1975:42), and in the early 1990s a "locally fairly common summer resident" in both the Rogue and Umpqua Valleys (Gilligan et al. 1994:185). In the 1990s in the Umpqua Valley, it was not reported as a breeding species (Hunter et al. 1998). Since the early 1990s, summer sightings in the Klamath Mountains are rare to non-existent, and it is likely they are extirpated as a breeding species.

Say's Phoebe

In the 1930s, Say's phoebe was a "regular resident of the Rogue, Umpqua, and Willamette Valleys" (Gabrielson

and Jewett 1940:394), although no authors prior to this list it as a breeding species in the Willamette Valley (e.g., Johnson [1880] for the northern Willamette Valley, Anthony [1886] for the area west of Portland, Anthony [1902] for the Portland area, Woodcock [1902] for the Corvallis area, or Shelton [1917] for the southern Willamette Valley). In the 1940s it was not listed as a breeding bird in the southern Willamette Valley (Gullion 1951). However, in the early 1940s it was a "very uncommon summer bird" in the central Willamette Valley that nested on the Oregon State University campus in Corvallis in 1941 and 1942 (Evenden 1949:153). These were the last reported breeding season records in the Willamette Valley.

In the Rogue Valley in the 1920s, Say's phoebe was a "regular, but not abundant" breeding species (Gabrielson 1931:115). In the early 1970s (Browning 1975) and the early 1990s (Gilligan et al. 1994) it was not reported as a breeding species. In the 1990s it was not reported as a breeding species in the Umpqua Valley (Hunter et al. 1998).

Distribution and Population Changes

Nine prairie-oak species have experienced local or ecoregional extirpations and/or range contractions (Table 1). These species include sandhill crane (*Grus canadensis*), which was extirpated from the Puget Lowlands shortly after Euro-American settlement, and streaked horned lark, which has been extirpated from two ecoregions, Georgia Depression and Klamath Mountains.

Sandhill Crane

In the Georgia Depression in the early 1900s, sandhill crane "bred regularly" on the mainland at Sumas Prairie up to 1902 (Brooks 1917:36). In the early 1940s it was restricted to Lulu Island on the mainland and a few locations on the northern part of Vancouver Island (Munro and Cowan 1947). In the early 1990s it "breeds locally in the Fraser Lowlands" (Campbell et al. 1990).

In the South Puget Lowlands in the 1850s, sandhill crane was a "common summer resident" (Suckley and Cooper 1860). However, it was not mentioned as a breeding species in the Seattle/Tacoma area in the late 1800s (Rathburn 1902), early 1900s (Bowles 1906), or 1920 (Burleigh 1929). Around 1900 it was a "not common summer resident" west of the Cascade Mountains (Dawson and Bowles 1909:620), likely referring to the population south of Seattle/Tacoma in the south Puget Sound prairies. By the 1930s it was "formerly a summer resident" in the Puget Lowlands (Kitchin 1934:8). It is likely that these large birds declined and

were extirpated fairly quickly after Euro-American settlement, for they were a known food source for early settlers (Suckley and Cooper 1860, Dawson and Bowles 1909). It was not historically known to be a breeding species elsewhere in the Puget Lowlands, although a specimen was collected in June, 1858 on Orcas Island in the San Juan Islands (Miller et al. 1935).

Common Nighthawk

In the Georgia Depression in the early 1900s, common nighthawk (*Chordeiles minor*) was a “common summer visitant” (Brooks and Swarth 1925:70, Cumming 1932:10, Munro and Cowan 1947:134), although in the early 1940s a decline in the population was noted at Comox on Vancouver Island (Pearse 1946). In the early 1980s it was “uncommon...breeds” in the Fraser River Delta on the mainland (Butler and Campbell 1987:47). In the 1990s it was an “uncommon to common summer visitant” (Campbell et al. 1990:390).

On the San Juan Islands, common nighthawk was a “common summer resident” in the 1930s (Miller et al. 1935:60), early 1960s (Bakus 1965:19), and in the early 1980s (Lewis and Sharpe 1987:133). Currently, it still occurs during the breeding season on the San Juan Islands, but is only infrequently encountered (Barb Jensen, San Juan Audubon Society, personal communication; Kathleen Foley, San Juan Preservation Trust, personal communication).

In the North Puget Lowlands in the early 1900s, common nighthawk was a “common summer resident” in the Bellingham area (Edson 1908:434). In the 1940s it was a “summer resident (status undescribed)” on Eliza Island in Bellingham Bay and Protection Island near Port Townsend (Wick 1958:6). In the early 1990s it was reported “infrequently” during the breeding season (Wahl 1995:104).

In the South Puget Lowlands in the 1850s, common nighthawk was “abundant” on the prairies near Puget Sound (G. Suckley in Suckley and Cooper 1860:167). In the late 1800s it was “an abundant summer resident...breeds” around Seattle (Rathburn 1902:135), and in the early 1900s a “common summer resident” near Tacoma with nesting on roofs first noted (Bowles 1906:144). In 1920 it was “fairly plentiful both in the city and in the open country” in the Seattle/Tacoma area (Burleigh 1929:513). In the 1940s it was a “common summer resident” in the Puget Sound (Larrison 1952:88), including at the University of Washington campus in Seattle (Miller and Curtis 1940:43). Through the 1940s, it nested in prairies in western Washington and in urban areas in the Puget Lowlands (Jewett et al. 1953). By the

mid 1960s it was still a “common...summer resident” (Larrison and Sonnenberg 1968:155). The last reported roof-top nesting was in 1975, and by the 1990s, declines were noted for western Washington (Smith et al. 1997). In the early 2000s it was “uncommon in much of the Puget Lowlands” in summer (Buchanan 2005a:224).

Throughout the Willamette Valley, common night-hawk was “common or abundant” by all observers from the late 1800s (Johnson 1880:637, Anthony 1886:165, Anthony 1902:95, Woodcock 1902[multiple observers]:49), early 1900s (Shelton 1917:30, Jewett and Gabrielson 1929:26, Gabrielson and Jewett 1940:355), and into the 1950s (Gullion 1951:140; Eddy 1953:30). Nesting on gravel roofs was reported in the 1930s (Gabrielson and Jewett 1940), in the early 1950s near Corvallis (Eddy 1953), and through the 1970s in several cities (Alan Contreras, University of Oregon, personal communication), but none have been reported nesting on gravel roofs in at least 20 years (Altman 2003a). Anecdotal reports of declines were noted in the latter half of the 1900s (Dave Marshall, citizen, Portland, OR, personal communication, Gilligan et al. 1994). It is likely extirpated as a breeding species in prairie habitats, although it may be nesting in gravel bars in the Willamette River, and it does nest in clearcuts in the foothills adjacent to the Willamette Valley (Altman 2003a).

In the Rogue Valley in the 1920s, common night-hawk was a “common summer resident...one of the characteristic birds of the valley floor...especially abundant on the rocky flats between Medford and Eagle Point” (Gabrielson 1931:115). In the 1970s it was still a “common summer resident” in chaparral-oak habitats (Browning 1975:39). In 1980 it nested in the Medford area (Otis Swisher, citizen, Medford, OR, personal communication), but it may no longer nest on the Rogue Valley floor, although nesting does occur in grasslands on the Table Rocks plateau near Medford (Dennis Vroman, citizen, Grants Pass, OR, personal communication).

Streaked Horned Lark

In the Georgia Depression, streaked horned lark breeding season records go back to the late 1800s on southeastern Vancouver Island and the Fraser Lowlands of the mainland (Brooks 1917, Campbell et al. 1997). From 1909-1932 it was a “scarce resident” in the Vancouver area (Cumming 1932:11). By the early 1930s breeding had been documented in the Fraser Lowlands (Behle 1942). In the early 1940s it was “casual on southern Vancouver Island” (Munro and Cowan 1947:154).

By the mid 1960s it was only known to occur at the Vancouver International Airport where the last breeding season observations were in 1987 (Campbell et al. 1997). In the early 1980s it was a “local breeder” in the Fraser River Delta (Butler and Campbell 1987).

On San Juan Island in the early 1930s (Miller et al. 1935) and early 1940s (Miller 1944), streaked horned lark was not reported as a breeding species. However, in 1948 it was “seen at Cattle Point” on San Juan Island (Goodge 1950:28), and in 1949 it was “frequently seen and heard singing in the marshy pastures near Davis Bay” on Lopez Island (McMannama 1950:29). In the early 1960s it was a “common summer resident” on San Juan Island (Bakus 1965:22), and several were present in 1962 (Retfalvi 1963). It was apparently extirpated from the San Juan Islands sometime in the 1960s or 1970s (Lewis and Sharpe 1987).

In the North Puget Lowlands in the early 1900s, streaked horned lark was not reported as a breeding species near Bellingham (Edson 1908). The unpublished notes of Edson indicated breeding season specimen records from Skagit and Whatcom counties in 1929, 1933, and 1937 (Wahl 1995). From 1951-1953, both adults and young were reported from Blaine, at the U.S.-Canada border (Flahaut 1952, 1953; Flahaut and Schulz 1954). The last breeding season record was a territorial male at Bellingham Airport in June 1962 (Wahl 1995). There have been no confirmed sightings since then, including during species-specific surveys in 2000 (MacLaren and Cummins 2000).

In the South Puget Lowlands in the 1850s, streaked horned lark was a “very abundant summer resident on gravelly prairies” (G. Suckley in Suckley and Cooper 1860:196). In the late 1800s it was a “common summer resident” on the prairie near Tacoma (Bowles 1898:53, Rathburn 1902:136). In the early 1900s it was a “common summer resident of the driest prairies...breeds” near Tacoma (Bowles 1906:145), and “breeding only on prairies west of the Cascades” (Dawson and Bowles 1909:218). In 1920 it was “rarely seen about Seattle” but “plentiful...in the open prairie country south of Tacoma” (Burleigh 1929:515). In the early 1930s it was a “rare summer visitant” in the Seattle area (Hal Opperman, citizen, Seattle, WA, personal communication; from notes of Walter Hagenstein, Seattle Audubon Society), and a “summer resident on the prairies of western Washington” (Kitchin 1934:15). In the 1940s it was an “uncommon visitor” in the Puget Sound (Larrison 1952:83), and “occurs commonly in the prairie country south of Tacoma” (Jewett et al. 1953:438). In the mid 1960s its populations were still not recognized

as being of any concern in western Washington (Larrison and Sonnenberg 1968). Anecdotal reports indicated a decline in populations in the early 1980s (Wahl 2005a), and by the mid 1990s only a few scattered breeding populations existed in the South Puget Sound (Smith et al. 1997), the largest on prairies at Joint Base Lewis-McChord (Rogers 1999). Currently, small breeding populations occur at 5-6 sites in prairies and at airports (Hannah Anderson, The Nature Conservancy, personal communication).

On the Olympic Peninsula in the late 1800s, there may have been a breeding population of streaked horned larks near the Quinault River in the Grays Harbor area (Lawrence 1892), but this population has long ago vanished (Sharpe 1993). In the 1940s it was a “summer resident (status undescribed)...only on the open prairie land between Shelton and Olympia” (Kitchin 1949:167). There were a couple breeding season records of multiple birds in the 1960s and 1970s at Leadbetter Point and Graveyard Spit (Stinson 2005). Currently, small breeding populations occur at a few sites in coastal dune habitats on the southern Washington coast and at the Shelton airport (Scott Pearson, Washington Department of Fish and Wildlife, personal communication).

Along the Columbia River in the late 1800s, streaked horned lark was reported to have been breeding up to Dallesport, Washington (across the river from The Dalles, Oregon) (Oberholser 1902). No subsequent authors mention nesting up the Columbia River beyond Portland (e.g., Gabrielson and Jewett 1940, Jewett et al. 1953). Further, Behle (1942) describes the breeding range as limited to west of the Cascades, with specimens from Klickitat County (the aforementioned Dallesport birds) of another subspecies, as might be expected based on the arid nature of the habitat there (Stinson 2005). Currently, small breeding populations occur on 8-9 islands in the lower Columbia River (Hannah Anderson, The Nature Conservancy, personal communication).

On the north Oregon Coast in the early 1990s, streaked horned lark was “formerly an uncommon and local summer resident on sand spits” especially the south jetty of the Columbia River (Gilligan et al. 1994:205). That population was apparently extirpated in the mid 1980s (Gilligan et al. 1994). It has never been reported as a breeding species on the central or southern Oregon Coast.

In the northern Willamette Valley in the 1870s, streaked horned lark was “an abundant summer visitor, nesting very commonly” (Johnson 1880:636). In the late 1800s it was a “rather common summer resident” west of Portland (Anthony 1886:166), “not uncommon in

suitable localities” around Portland (Anthony 1902:96), “resident...very common” around Corvallis (Woodcock 1902:57), and a “common resident” near Dayton in the northern Willamette Valley (E. F. Hadley in Woodcock 1902:57). In the early 1900s it “breeds in some abundance” in the southern Willamette Valley (Shelton 1917:31), and was “abundant in the cultivated sections ...of Gresham (near Portland)” (Jewett and Gabrielson 1929:28). In the 1930s it was a “common breeding bird of the open fields” (Gabrielson and Jewett 1940:403). In the 1940s it was “regularly found in agricultural areas between Portland and Gresham (Dave Marshall, citizen, Portland, OR, personal communication), and a “common permanent resident” in the southern Willamette Valley (Gullion 1951:141). In the early 1990s it “nests locally in small numbers...has probably declined somewhat in recent decades” (Gilligan et al. 1994:205). In the mid 1990s based on roadside surveys throughout the Willamette Valley it was “rare to locally uncommon with scattered small populations.... the largest breeding population occurring on and north of Baskett Slough National Wildlife Refuge” (Altman 1999). In the early 2000s, a relatively large breeding population (approximately 75 pairs) was discovered at the Corvallis airport (Randy Moore, Oregon State University, personal communication).

In the Rogue Valley in the 1920s, streaked horned lark was a “very common permanent resident” (Gabrielson 1931:115), and through the 1930s “abundant in the rocky grasslands east of Medford” (Gabrielson and Jewett 1940:403). In the early 1970s it was still a “fairly common permanent resident in the White City area” (Browning 1975:45). The last confirmed breeding was in 1976 (Altman et al. 2001). It was not reported as a breeding species in the early 1990s (Gilligan et al. 1994).

Slender-billed White-breasted Nuthatch

There are no historical breeding season records of slender-billed white-breasted nuthatch in the Georgia Depression (Brooks and Swarth 1925, Cumming 1932, Munro and Cowan 1947, Butler and Campbell 1987). In the 1990s it was “very rare....accidental” in southwestern British Columbia, and breeding has never been confirmed (Campbell et al. 1997:280). There are no historical breeding season records on the San Juan Islands (Miller et al. 1935, Bakus 1965, Lewis and Sharpe 1987), or elsewhere in northwestern Washington north of Seattle (Edson 1908, Wahl 1995).

In the South Puget Lowlands in the 1850s, slender-billed white-breasted nuthatch was “quite abundant”

(G. Suckley in Suckley and Cooper 1860:193). In the late 1800s it was “not very common” around Seattle (Rathburn 1902:139). In 1896 it was a “common resident being especially numerous among the large oaks of the prairie country” around Tacoma (Bowles 1929:53), but in the early 1900s it was “not common...breeds” in the same area (Bowles 1906:148). By 1907 it was “practically unknown” in the same location, perhaps due to the “dying of large oaks” (Bowles 1929:53). In the early 1900s it was “rare and local in the Puget Sound region” (Dawson and Bowles 1909:288), and it was not mentioned as occurring in Seattle in 1920 (Burleigh 1930). In the early 1930s it was “rare at all times....almost accidentally in western Washington; formerly a common resident” (Kitchin 1934:16). In the 1940s it was an “uncommon resident” in the Puget Sound (Larrison 1952:88), although it was “common in the oak region of the prairies of western Washington” (Jewett et al. 1953:484). By the mid 1960s it was an “irregular...breeder west of the Cascades” (Larrison and Sonnenberg 1968:188), although it was a “common bird in south Tacoma” and still found regularly at Joint Base Lewis-McChord in both oak and ponderosa pine habitats (Ken Brunner, citizen, Tacoma, WA, personal communication to Gary Slater, Ecostudies Institute). By the late 1970s there were only nine known breeding sites in the South Puget Sound, all with small populations (Chappell and Williamson 1984). These populations vanished over the next 25 years until the last known breeding in the Puget Lowlands occurred in nest boxes at Flett Dairy in Lakewood south of Tacoma in 1995 (Chappell 2005). The last breeding season sighting in the Puget Lowlands was in 1998 (Chappell 2005). There was a small population breeding around Woodland and Kalama, Washington (confluence of Puget Lowlands and Willamette Valley ecoregions) between 1985 and 1995 (Chris Chappell, Washington Natural Heritage Program, personal communication), but breeding season reports of birds in that area since then are rare, with no reports of breeding activity or a breeding population.

In the northern Willamette Valley in the 1870s, slender-billed white-breasted nuthatch was “quite common during the summer” (Johnson 1880:488). In the late 1800s it was a “not uncommon resident” west of Portland (Anthony 1886:171), “common” in the Portland area (Anthony 1902:98), and a “resident, not uncommon” near Corvallis (Woodcock 1902:92) and Dayton (E. F. Hadley in Woodcock 1902:92). In the early 1900s it was “rare...a few scattered records” in the southern Willamette Valley (Shelton 1917:40). In the 1920s it was a “permanent resident (status undescribed)”

near Portland (Jewett and Gabrielson 1929:42), and in the 1930s it was “not a common bird” in western Oregon (Gabrielson and Jewett 1940:444). In the 1940s it was “quite common” in the central Willamette Valley (Evenden 1949:177), and it was a “common permanent resident” in the southern Willamette Valley (Gullion 1951:142). In 1952 it was a “common inhabitant” near Corvallis (Eddy 1953:40). In the early 1990s (Gilligan et al. 1994:221) and early 2000s (Hagar 2003:450) it was “common to uncommon” in the Willamette Valley.

In the Rogue Valley in the 1920s, slender-billed white-breasted nuthatch was a “regular and well-distributed permanent resident” (Gabrielson 1931:120). In the 1940s it was “most abundant in eastern Jackson County” (Gabrielson and Jewett 1940:444). In the 1970s it was a “common to fairly common permanent resident” (Browning 1975:48). In the early 1990s it was a “common to uncommon permanent resident” in the Rogue Valley (Gilligan et al. 1994:221), and “fairly common” in the Umpqua Valley (Hunter et al. 1998:104). In the early 2000s it was a “common to uncommon resident...most abundant” in the Umpqua and Rogue Valleys (Hagar 2003:450).

Western Bluebird

In the Georgia Depression in the 1860s, western bluebird (*Sialia mexicana*) was “common on Vancouver Island and throughout British Columbia” (Lord 1866:294). In the late 1880s it was “not common anywhere” on Vancouver Island and the Vancouver area on the mainland (Rhoads 1893:59). During the first half of the 1900s, it was “fairly common” on the east side of Vancouver Island (Swarth 1912:83), a “fairly common breeder in the valley” near Chilliwack on the mainland (Brooks 1917:49), and a “resident (status undescribed) in the lowlands of extreme southwestern British Columbia” (Brooks and Swarth 1925:124). From 1909-1931 it was a “common visitant” around Vancouver (Cumming 1932:12), and through the early 1940s a “common summer visitant” in southwestern British Columbia (Munro and Cowan 1947:179). It began declining on the mainland in the 1950s, and was extirpated in the Fraser River Delta by 1971 (Weber 1980). Population declines were first noted on southeastern Vancouver Island near Comox in the early 1940s (Pearse 1946). A small but stable population remained from 1960 to 1990, but by 1995 that population was gone (Campbell et al. 1997).

On San Juan Island in the 1930s, western bluebird was a “summer resident...common on the south slope of Mt Dallas” (Miller et al. 1935:61), and a “somewhat

common summer resident” in the early 1960s (Bakus 1965:25). The last known nesting occurred on Lopez Island in 1964 (Lewis and Sharpe 1987), prior to a reintroduction project on San Juan Island initiated in 2007 (Slater and Altman 2011).

In the North Puget Lowlands in the early 1900s, western bluebird was a “frequent summer resident” in the Bellingham area (Edson 1908:438). The unpublished notes of Edson indicated it bred regularly from the early 1900s to 1942 (Wahl 1995). The last known nesting was in 1961, and the last breeding season record on the mainland of northwestern Washington was in 1975 (Wahl 1995).

In the South Puget Lowlands in the 1850s, western bluebird was “found abundantly...during the breeding season and summer” (G. Suckley in Suckley and Cooper 1860:174). In the late 1800s it was a “common species...and breeds abundantly” around Seattle (Rathburn 1902:140). In the early 1900s it was a “common summer resident” near Tacoma (Bowles 1906:148), and a “summer resident of general distribution west of the Cascades” (Dawson and Bowles 1909:225). In 1920 it was a “fairly plentiful summer resident” at Seattle (Burleigh 1930:63), and continued to be “fairly common” in the Seattle area in the early 1940s (Larrison 1942:20, 1947:43) and late 1940s (Jewett et al. 1953:523). By the early 1950s it was an “uncommon irregular summer resident” in the Puget Sound (Larrison 1952:74), and population declines were noted over the next 50 years (Herlugson 1978, Smith et al. 1997). By the mid 1960s it was a “rare, irregular summer resident...numbers have sharply decreased in recent years” (Larrison and Sonnenberg 1968:201). Nestbox programs initiated in the 1970s and 1980s resulted in substantial local population increases (Buchanan 2005b). For example, after the 1960s the only place western bluebird nested in western Washington was on Fort Lewis (Smith et al. 1997). This population was nearly extirpated by 1981 when only one pair nested (Smith et al. 1997). An intensive nest box program increased the population substantially and by the 1990s it was “locally common...in the Fort Lewis area, and locally uncommon at other locations in western Washington” (Smith et al. 1997:374). The current population in the South Puget Sound is approximately 250-300 pairs (Jim Lynch, U.S. Army, personal communication).

On the Olympic Peninsula in 1889, western bluebird was “common at Aberdeen” (Palmer 1892:310), and nesting at La Push in the early 1900s (Reagan 1911). In the mid 1920s it was “not very common on the peninsula except in the more open country along the

strait" (Palmer 1927:69). By the 1940s there were no nesting records in any of these places (although nesting was suspected near Sequim) (Kitchin 1949), and the last nesting in coastal grassland habitats was on Long Beach Peninsula in 1963 (Sharpe 1993).

On the Oregon coast in the early 1900s, western bluebird was a "common summer resident" (Jewett 1916:80). By the early 1990s it was a "locally uncommon permanent resident" on the southern Oregon Coast, and "rare and local elsewhere on the outer coast and in the Coast range" (Gilligan et al. 1994:231).

In the northern Willamette Valley in the 1870s, western bluebird was a "common summer resident" (Johnson 1880:487), a "very common resident" west of Portland (Anthony 1886:172), "common" in the Portland area (Anthony 1902:98), and a "common resident" near Corvallis (Woodcock 1902:99) and near Dayton and Sheridan in the northern Willamette Valley (E. F. Hadley and A. L. Pope respectively in Woodcock 1902:98). In the early 1900s it was a "fairly abundant resident" in the southern Willamette Valley (Shelton 1917:42), and a "common summer resident" in the Portland area (Jewett and Gabrielson 1929:45). In the 1930s it was a "permanent resident and breeder...common" throughout the Willamette Valley (Gabrielson and Jewett 1940:477). In the 1940s it was an "uncommon permanent resident" in the southern Willamette Valley (Gullion 1951:143). In 1952 it was "seen commonly" near Corvallis in burned over coniferous forest, but not in oak forest (Eddy 1953:44). From the 1940s through the 1970s significant population declines occurred, but the initiation of several bluebird nest box trails brought some populations back (Elzroth 2003). In the early 1990s it was a "locally uncommon summer resident" in the Willamette Valley (Gilligan et al. 1994:231). In the early 2000s it was "fairly common on open eastern slopes of Coast Range foothills" (Elzroth 2003:474).

In the Rogue Valley in the 1920s, western bluebird was a "common permanent resident" (Gabrielson 1931:121). In the 1930s it was a "permanent resident and breeder" (Gabrielson and Jewett 1940:477). In the 1970s it was a "common to fairly common permanent resident" (Browning 1975:51). In the early 1990s it was a "fairly common summer resident" in the Rogue and Umpqua Valleys (Gilligan et al. 1994:231). In the early 2000s it was "uncommon to common" in the Umpqua and Rogue Valleys (Elzroth 2003:474).

Chipping Sparrow

In the Georgia Depression in the early 1900s, chipping sparrow (*Spizella passerina*) was a "common summer

resident" near Chilliwack on the mainland (Brooks 1917:45), and a "summer visitant" on Vancouver Island and the southern mainland (Brooks and Swarth 1925:95). From 1909-1931 it was "not plentiful in summer" around Vancouver (Cumming 1932:13). In the early 1940s it was an "abundant summer resident" on Vancouver Island and the mainland (Munro and Cowan 1947:225). In the early 1980s it was not reported as a breeding species in the Fraser River Delta (Butler and Campbell 1987). In the 1990s it was an "uncommon to fairly common...summer visitant" in southwestern British Columbia, although "very rare" on western Vancouver Island with no nesting records (Campbell et al. 2001:190).

On the San Juan Islands, chipping sparrow was an "abundant summer resident" in the early 1930s (Miller et al. 1935:62) and into the early 1960s (Bakus 1965:30). In the 1980s it was a "common breeder" but declines had been noted (Lewis and Sharpe 1987:180). In the mid 2000s it was still regularly detected in some oak habitats on San Juan Island (Kathleen Foley, San Juan Preservation Trust, personal communication).

In the North Puget Lowlands in the early 1900s, chipping sparrow was a "frequent summer resident" in the Bellingham area (Edson 1908:435). In the 1940s it was a "summer resident (status undescribed)" on Eliza Island in Bellingham Bay and Protection Island near Port Townsend (Wick 1958:7). In the early 1980s it still "nested widely in Bellingham neighborhoods," but by the early 1990s summer breeders were "infrequently reported" (Wahl 1995:145).

Throughout the South Puget Lowlands, chipping sparrow was "common, abundant, plentiful, or frequent" by all observers from Euro-American settlement (G. Suckley in Suckley and Cooper 1860:203), through the late 1800s (Rathburn 1902:137), the early 1900s (Bowles 1906:146, Dawson and Bowles 1909:127, Burleigh 1930:49, Kitchin 1934:20, Miller and Curtis 1940:46), and up to 1950 (Larrison 1952:91). Through the 1940s it was an "uncommon summer resident.... most common on the prairies and clearings....of the west side" (Jewett et al. 1953:644). By the 1970s it was rare in King County (Hunn 1982). In the 1990s it was still "common in the Fort Lewis area" and a few other locations (Smith et al. 1997:446). In the early 2000s it was a "locally fairly common to common breeder" with substantial declines since the early 1900s in parts of western Washington (Mlodinow 2005a:324).

Throughout the Willamette Valley, chipping sparrow was a "common or abundant" summer resident by all observers from the late 1800s (Johnson 1880:635,

Anthony 1886:169, Anthony 1902:96, Woodcock 1902[multiple observers]:74) through the early- to mid-1900s (Shelton 1917:35, Jewett and Gabrielson 1929:34, Gabrielson and Jewett 1940:574, Evenden 1949, Gullion 1951:146, Eddy 1953:54). In the early 1990s it was a “common to uncommon summer resident” in the Willamette Valley except in the northern valley where it was a “local summer resident” (Gilligan et al. 1994:281). Similarly, in the early 2000s it was “locally uncommon in the northern Willamette Valley...and an uncommon to common summer resident” in the rest of the Willamette Valley (Scheuring 2003a:538).

In the Rogue Valley in the 1920s, chipping sparrow was a “very common summer resident” (Gabrielson 1931:117). In the 1930s it was an “abundant summer resident” (Gabrielson and Jewett 1940:574). In the 1970s it was a “common...breeding species” (Brown-ing 1975:62). In the early 1990s it was a “common to uncommon summer resident” (Gilligan et al. 1994:281). In the early 2000s it was “common in southwest Oregon” (Scheuring 2003a:538).

Oregon Vesper Sparrow

In the Georgia Depression, Oregon vesper sparrow breeding season records go back to the late 1800s, but it was never numerous or annually detected (Campbell et al. 2001). In the early 1900s it was not reported as a breeding species near Chilliwack on the mainland (Brooks 1917), and a “rare summer visitant” in southwestern British Columbia (Brooks and Swarth 1925:90). From 1909-1931 it was not reported around Vancouver (Cumming 1932). In the 1940s it was “occasional” in southwestern British Columbia (Munro and Cowan 1947:220). The last breeding record on the mainland was in 1968 in the Fraser Lowlands (Campbell et al. 2001), and the only current breeding population is 7-10 pairs at the Nanaimo Airport on Vancouver Island (Lucy Reiss, Environment Canada, personal communication).

On San Juan Island in the early 1930s, Oregon vesper sparrow was “not a common summer resident” (Miller et al. 1935:62), although it was a “common summer resident” in the early 1960s (Bakus 1965:30). In the 1980s small nesting “colonies” were still present on San Juan Island (Lewis and Sharpe 1987), and a few of these have continued through the early 2000s (B. Altman, personal observations).

In the North Puget Lowlands in the late 1880s, Oregon vesper sparrow was not reported as a breeding species in the Bellingham area (Edson 1908). By the 1950s there were a few records from farm lands along the Skagit River (Jewett et al. 1953). In the early 1990s

it was “accidental” with no breeding season records in Whatcom County (Wahl 1995:145).

In the South Puget Lowlands in the 1850s, Oregon vesper sparrow was “rather abundant on the Nisqually plains” and “common in summer on the prairies” (Suckley and Cooper 1860:200). In the late 1800s it was “observed...on several occasions” around Seattle (Rathburn 1902:137). In the early 1900s it was a “common summer resident, of local distribution” near Tacoma (Bowles 1906:145), and “not common...on prairies and in cultivated valleys” in western Washington (Dawson and Bowles 1909:109). In 1920 it was “fairly plentiful...in the open prairie country south of Tacoma” (Burleigh 1930:48). In the early 1930s it was a “summer resident (status undescribed) in the prairie country of western Washington” (Kitchin 1934:20). In the 1940s it was an “uncommon summer resident...but commonly found...on Vashon Island and Tacoma prairies” in the Puget Sound (Larrison 1952:94). Through the 1940s it was still “quite numerous about pastures and prairies... more common in the vicinity of Yelm than elsewhere in the Puget Sound region” (Jewett et al. 1953:632). By the mid 1960s it was “found in limited numbers and areas...chiefly south of Tacoma on the prairies and in open fields and meadows on Vashon Island” (Larrison and Sonnenberg 1968:246). Extensive surveys in the Yelm area in the late 1990s did not record any birds with little prairie habitat remaining (Rogers 2000). In the 1990s it was “rare and local...in remnant prairie areas” in western Washington (Smith et al. 1997:452). By the early 2000s the Puget Lowlands population was “in danger of extirpation” (Mlodinow 2005b:326), with birds on a few remnant prairies in the South Puget Sound especially at Joint Base Lewis-McChord (Rogers 1999).

On the Olympic Peninsula in the early 1900s, Oregon vesper sparrow was found “in numbers” at Dungeness (Dawson and Bowles 1909:109). During the 1940s it was still “rather common” at Dungeness and also “on the open prairie country east and west of Shelton” (Kitchin 1949:242). From 1975 into the early 1980s the population at Dungeness declined (Sharpe 1993), but breeding was still reported in the Dungeness/Port Angeles area in the late 1970s (Scott Atkinson, citizen, Lake Stevens, personal communication), and into the 1980s and early 1990s (Sharpe 1993). The last breeding season record was a single bird in 1999 (Bob Boekelheide, Dungeness River Audubon Center, personal communication). A few birds still nested at the Shelton airport through 2010 (Scott Pearson, Washington Department of Fish and Wildlife, personal communication). Currently, there also are small populations on

several islands in the Columbia River (Scott Pearson, Washington Department of Fish and Wildlife, personal communication).

On the northern Oregon Coast in 1913 “a few (Oregon vesper sparrow) were seen along the roadsides near Tillamook” during the breeding season (Jewett 1916:77). In the 1930s it was “less common in the coastal valleys (than interior valleys, e.g., Willamette)” (Gabrielson and Jewett 1940:562). In the early 1990s it was a “locally uncommon summer resident” on the southern coast. Currently, on the southern coast it is a rare and local breeder (Tim Rodenkirk, Bureau of Land Management, personal communication).

In the northern Willamette Valley in the 1870s, Oregon vesper sparrow was “common during the summer, breeding extensively” (Johnson 1880:635). In the late 1800s it was an “abundant summer resident, found everywhere in open country” west of Portland (Anthony 1886:168), “common” in open fields around Portland (Anthony 1902:96), and a “common summer resident” near Corvallis and at several other locations in the central and northern Willamette Valley (multiple observers in Woodcock 1902:71). In the early 1900s it was “fairly common” in the southern Willamette Valley (Shelton 1917:34), and a “very common summer resident” around Portland (Jewett and Gabrielson 1929:33). In the 1930s it was an “abundant summer resident of the Willamette Valley” (Gabrielson and Jewett 1940:562). In the 1940s it was a “common summer resident” in the southern Willamette Valley (Gullion 1951:146), and in the early 1950s “common inhabitants” near Corvallis (Eddy 1953:54). By the early 1990s it was a “local, uncommon to rare summer resident” (Gilligan et al. 1994:284). In the early 2000s it was “rare to locally uncommon” in widely scattered areas of the Willamette Valley (Altman 2003b:543).

In the Rogue Valley in the 1920s, Oregon vesper sparrow was a “summer resident (status undescribed)” (Gabrielson 1931:117). In the 1930s it was a “somewhat less common resident” in the Rogue and Umpqua Valleys than the Willamette Valley (Gabrielson and Jewett 1940:562). In the early 1970s, it was a “fairly common summer resident... in the mountains” in the Rogue Basin (Browning 1975:61), suggesting a reduced presence in the valley prairie-oak habitats from earlier sources. In the early 1990s it was a “local, uncommon to rare summer resident” in the Umpqua Valley and a “fairly common summer resident in the mountains surrounding the Rogue Valley” (Gilligan et al. 1994:284). In late 1990s and early 2000s, it was an “uncommon to locally common breeding species”

in the dry, grassy foothills of the Umpqua and Rogue Valleys (Altman 2003b:543).

Lark Sparrow

In the northern Willamette Valley in the 1870s, lark sparrow (*Chondestes grammacus*) was “sparingly common during the summer, and breeding” (Johnson 1880:635). However, in the late 1800s it was not mentioned by Anthony (1886) for the Portland area or Anthony (1902) for the area west of Portland. By the early 1900s it was a “not common summer resident” near Corvallis in the central Willamette Valley (Woodcock 1902:73) and Dayton in the north-central Willamette Valley (E. F. Hadley in Woodcock 1902:72). During the early 1900s, Shelton (1917) did not report it as a breeding species in the southern Willamette Valley, and Gabrielson and Jewett (1940) had no breeding season records from the Willamette Valley after 1927. However, in the 1940s it was recorded “irregularly” during the breeding season in the central Willamette Valley (Evenden 1949:265), and Gullion (1951) reported a few summer records in the late 1940s in the southern Willamette Valley near Eugene. By the early 1990s it had not been reported as a breeding species in the Willamette Valley for approximately 50 years (Gilligan et al. 1994).

In the Umpqua Valley in the 1930s, lark sparrow was “noted frequently, but not commonly” (Gabrielson and Jewett 1940:563). Breeding was confirmed in 1976 near Oakland, and a few birds were reported annually during the breeding season into the mid 1990s (Hunter et al. 1998). In the early 1990s it was a “very rare and local summer resident” (Gilligan et al. 1994:285), but there have been no detections reported since then (Ron Maertz, U.S. Forest Service, personal communication).

In the Rogue Valley in 1901, lark sparrow was reported near Jacksonville (A.W. Anthony in Woodcock 1902:73). In the 1920s it was a “common summer resident” (Gabrielson 1931:117). In the 1930s it was an “abundant roadside bird” (Gabrielson and Jewett 1940:563). In the 1970s it was a “fairly common permanent resident” (Browning 1975:61). In the early 1990s and early 2000s it was a “fairly common summer resident” in the Rogue Valley (Gilligan et al. 1994:285, Shelmerdine 2003:545).

Western Meadowlark

In the Georgia Depression in the 1860s, western meadowlark (*Sturnella neglecta*) was “plentiful on Vancouver Island” (Lord 1866:147). In 1892 it was “abundant” on southeastern Vancouver Island and the mainland (Rhoads 1893:47). In the early 1900s it was a “fairly

common species” on southeastern Vancouver Island (Swarth 1912:51), and a “common resident” near Chilliwack on the mainland (Brooks 1917:43). In the early 1920s it was “common in summer” on the southern mainland and southern Vancouver Island (Brooks and Swarth 1925:82). From 1909-1931 it was a “common resident” around Vancouver (Cumming 1932:13). In the early 1940s it was a “resident (status undescribed)” on southeastern Vancouver Island and the mainland (Munro and Cowan 1947:199), but “becoming less common and more restricted” (Campbell et al. 2001:406). It has not been reported as a breeding species on Vancouver Island since 1977 (Campbell et al. 2001), and on the Fraser River Delta since 1968 (Butler and Campbell 1987). In the early 1980s it was “rare” in summer in the Fraser River Delta (Butler and Campbell 1987:57).

On San Juan Island in the mid 1930s, western meadowlark was one of the most common grassland nesting species (Miller 1944), although it was not listed by Miller et al. (1935) (probably an oversight). In the late 1940s (Goodge 1950:28) and into the early 1960s (Bakus 1965:27) it was “common.” In the early 1980s breeding season sightings were “rare” (Lewis and Sharpe 1987:185), and they still occasionally occur, although there has been no evidence of breeding or a breeding population since then (Barb Jensen, San Juan Islands Audubon Society, personal communication).

In the North Puget Lowlands in the early 1900s, western meadowlark was “common” in the Bellingham area (Edson 1908:435). The unpublished notes of Edson from the early 1900s to 1942 indicate it was “widespread and common” (Wahl 1995:151). In the 1940s it was a “permanent resident, more abundant in summer” on Eliza Island in Bellingham Bay and Protection Island near Port Townsend (Wick 1958:7). In the early 1990s, birds were reported from only a few locations during the breeding season (Wahl 1995).

In the South Puget Lowlands, western meadowlark was “common, abundant, or plentiful” by all observers from Euro-American settlement (Suckley and Cooper 1860:208), through the late 1800s (Rathburn 1902:136), and into the early 1900s (Bowles 1906:145, Dawson and Bowles 1909:63, Burleigh 1929:517, Kitchin 1934:19). In the 1940s it was a “fairly common resident” in the Puget Sound (Larrison 1952:87), and “probably always common on the prairies of western Washington.... but far more abundant than ever before” (Jewett et al. 1953:583). By the 1990s “their numbers have dropped substantially in recent years” and it was “uncommon and local” in the Puget Trough, the Vancouver area, and in the Sequim area (Smith et al. 1997:478). In the early

2000s it was a “locally uncommon summer resident... restricted to a few remnant quality grasslands in the Puget Trough” (Mlodinow 2005c:346).

On the Olympic Peninsula in the 1940s, western meadowlark nested “on the open prairie country... north and south of the city of Shelton”, in the “open cultivated fields of the Sequim Valley”, and in “open fields... south and west of Port Angeles” (Kitchin 1949:223). In the late 1970s it was a “common permanent resident” at Ocean Shores on the coast, but was uncommon just 10 years later (Hoge and Hoge 1991). In the early 1990s it nested in several places in the Dungeness/Sequim area, but the last breeding season record in this area was in the late 1990s (Bob Boekelheide, Dungeness River Audubon Center, personal communication).

In the Willamette Valley, western meadowlark was “common or abundant” by all observers from the late 1800s (Johnson 1880:636, Anthony 1886:167, Anthony 1902:96, Woodcock 1902:64[multiple observers]), early 1900s (Shelton 1917:33, Jewett and Gabrielson 1929:30, Gabrielson and Jewett 1940:520), and into the 1950s (Eddy 1953:49, Gullion 1951:145). In the early 1990s it was a “local and rare to uncommon summer resident” (Gilligan et al. 1994). By the early 2000s it was “uncommon” in the central and southern Willamette Valley, but “rare” in the northern Willamette Valley (Altman 2003c:580).

In the Rogue Valley in the 1920s (Gabrielson 1931:116) and early 1970s (Browning 1975:56), western meadowlark was a “common resident.” In the early 1990s it was an “uncommon summer resident” in the Umpqua Valley, and a “fairly common resident” in the Rogue Valley (Gilligan et al. 1994:302). By the early 2000s it was a “common” breeding species in the Rogue Valley and “common to uncommon” in the Umpqua Valley (Altman 2003c:580).

Small Populations

There are three prairie-oak species that breed throughout the region, but have likely always maintained a relatively small breeding presence. These include northern harrier (*Circus cyaneus*), short-eared owl (*Asio flammeus*), and western kingbird (*Tyrannus verticalis*). Various authors over time have consistently used similar terminology such as rare, casual, occasional, irregular, and uncommon to describe their status. Additionally, six prairie-oak species have relatively small regional breeding populations because they only occur in the Klamath Mountains ecoregion of southwest Oregon. These include common poorwill (*Phalaenoptilus nuttallii*), ash-throated flycatcher (*Myiarchus cinerascens*),

oak titmouse (*Baeolophus inornatus*), blue-gray gnatcatcher (*Poliophtila caerulea*), California towhee (*Pipilo crissalis*), and lark sparrow.

Northern Harrier

In the Georgia Depression in the early 1900s, northern harrier was a “common resident” on the mainland near Chilliwack (Brooks 1917:37), and “breeds in the valley of the mainland, commonly in the south... not known to breed on Vancouver Island” (Brooks and Swarth 1925:54). From 1909-1931 it was a “common visitor” around Vancouver (Cumming 1932:6). In the 1940s it was a “summer visitant” to the mainland, but not Vancouver Island (Munro and Cowan 1947:83). In the early 1980s it was “uncommon...breeds” in the Fraser River Delta (Butler and Campbell 1987:34). In the 1990s it was “rare to uncommon” in the summer in central Vancouver Island and the Fraser River Delta (Campbell et al. 1990:22).

On San Juan Island in the early 1930s, northern harrier was not reported as a breeding species (Miller et al. 1935). In the early 1960s it was an “uncommon summer resident” (Bakus 1965:12), and there was a pair during the summer on San Juan Island in 1962 (Retfalvi 1963). In the early 1980s it was an “uncommon and local breeder” (Lewis and Sharpe 1987:86). Currently, rare sightings are reported during the breeding season, but there has been no evidence of breeding or a breeding population on the San Juan Islands since at least the early 1990s (Barb Jensen, San Juan Islands Audubon Society, personal communication).

In the North Puget Lowlands in the early 1900s, northern harrier was “of frequent occurrence (did not indicate season)” in the Bellingham area (Edson 1908:432). By the early 1990s it was an “uncommon local summer resident” (Wahl 1995:53).

In the South Puget Lowlands in 1856 “many specimens” of northern harrier were observed (G. Suckley in Suckley and Cooper 1860:150). In the late 1800s it was “moderately common...breeds” in the Seattle area (Rathburn 1902:133), although in 1920 it was not reported as a breeding species (Burleigh 1929). In the early 1900s it was not reported as a breeding species for the Tacoma area (Bowles 1906), although it was “not an uncommon summer resident” throughout western Washington (Dawson and Bowles 1909:493). In the early 1930s it was not reported as a breeding species in western Washington (Kitchin 1934). In the 1940s it was an “uncommon resident” in the Puget Sound (Larrison 1952:62), and a “summer resident...though far more common east of the Cascade Mountains

than in western Washington” (Jewett et al. 1953:178). However, Kitchin (1949) did not indicate breeding in western Washington. Ten documented nests in western Washington between 1978-1984 included locations in the north, central, and south Puget Lowlands, and along the coast (Thompson and McDermond 1985). In the 1990s it was “local and uncommon” in western Washington (Smith et al. 1997:106). By the early 2000s it was a “localized” breeder in western Washington, especially on Whidbey Island (Thompson 2005:112), with a recent (early 2000s) reduction in nesting attempts noted in the Kent Valley (Thompson 2005:113).

In the northern Willamette Valley in the late 1800s, northern harrier was “moderately common, breeding” (Johnson 1880:638), although it was not reported as a breeder west of Portland (Anthony 1886), and “rare” in the Portland area (Anthony 1902:95). In the central Willamette Valley it was a “resident, uncommon” (Woodcock 1902:31). In the early 1900s in the southern Willamette Valley it was of “irregular occurrence” (Shelton 1917:26), and not reported in the Portland area (Jewett and Gabrielson 1929). In the 1930s it was “uncommon but occasionally seen in all parts of the Willamette Valley” (Gabrielson and Jewett 1940:198). In the 1940s it was not reported by Evenden (1949) for the central Willamette Valley, but in 1952 it was an “uncommon summer bird” near Corvallis (Eddy 1953:22). In the 1940s it was a “very common permanent resident” in the southern Willamette Valley (Gullion 1951:136). In the early 1990s it was a “local summer resident” in the Willamette Valley and along the north coast (Gilligan et al. 1994:72). In the early 2000s it was a “locally uncommon summer resident” in western Oregon (Scheuring 2003b:145).

In the Rogue Valley in the 1920s and 1930s, northern harrier was not reported as a breeding species (Gabrielson 1931, Gabrielson and Jewett 1940). In the early 1970s it was an “uncommon permanent resident” (Browning 1975:30). In the early 1990s and early 2000s it was not reported as a breeding species (Gilligan et al. 1994, Scheuring 2003b). In the Umpqua Valley in the 1990s, there were a couple breeding season records, but breeding had not been documented (Hunter et al. 1998).

Short-eared Owl

In the Georgia Depression from the early to mid 1900s, there were a few breeding season records for short-eared owl for Vancouver Island and the mainland (Brooks 1917, Munro and Cowan 1947). From 1909-1931 it was “abundant throughout the year” in the Vancouver area and nesting was documented (Cumming 1932:10).

In the early 1980s it was “uncommon...breeds” in the Fraser River Delta with a noted decrease in population numbers (Butler and Campbell 1987:46). In the 1990s it was an “uncommon resident” on Vancouver Island and the mainland (Campbell et al. 1990:382).

On the San Juan Islands, short-eared owl was not reported as a breeding species in the 1930s (Miller et al. 1935), the early 1960s (Bakus 1965), or the early 1990s (Smith et al. 1997). However, breeding likely occurred at American Camp on San Juan Island in the mid 1980s (Lewis and Sharpe 1987). It has not been reported as a breeding species during the 1990s and 2000s (Barb Jensen, San Juan Audubon Society, personal communication).

In the North Puget Lowlands in the early 1900s, short-eared owl was not reported as a breeding species in the Bellingham area (Edson 1908). In the 1940s it was a “summer resident (status undescribed)” on Eliza Island in Bellingham Bay and Protection Island near Port Townsend (Wick 1958:6). In the early 1990s it was a “locally, rare summer resident” in Whatcom County (Wahl 1995:103).

In the South Puget Lowlands in the 1850s, short-eared owl was not reported as a breeding species (Suckley and Cooper 1860), although in the late 1800s it “possibly breeds” around Seattle (Rathburn 1902:134). In the early 1900s it was not reported as a breeding species for the Tacoma area (Bowles 1906) or for western Washington (Dawson and Bowles 1909). In 1920 it was “rather uncommon during the summer months” in the Seattle/Tacoma area (Burleigh 1929:511), with likely nesting in the Tacoma tideflats in 1922 (Kitchin 1922). In the early 1930s in western Washington it “breeds... more common on the eastside” (Kitchin 1934:13). In the late 1930s it was a “fairly common resident” in the Seattle area (Larrison 1942:18), and in the 1940s an “uncommon resident” in Puget Sound (Larrison 1952:67). In the 1940s it was a “permanent resident... more common in winter” and nested on the Tacoma tideflats (Jewett et al. 1953:368) and on the Olympic Peninsula (Kitchin 1949). In the 1990s it was a “very local” breeder in the Puget Lowlands “that has declined considerably” since the 1950s (Smith et al. 1997:236). In the early 2000s it was a “local...summer resident” in western Washington (Wahl 2005b:103).

In the Willamette Valley in the late 1800s, short-eared owl was not reported as a breeding species in the northern Willamette Valley (Johnson 1880), the Portland area (Anthony 1902), or west of Portland (Anthony 1886). However, in the central Willamette Valley it was a “common resident” (Woodcock 1902:37). In the early

1900s it was a “summer visitant...probably breeds” in the southern Willamette Valley (Shelton 1917:28), but was not reported as a breeding species in the Portland area (Jewett and Gabrielson 1929). In the 1930s it was “much less common (than eastern Oregon)...and most often noted in the southern Willamette Valley and along the Columbia in the vicinity of Portland” (Gabrielson and Jewett 1940:352). In the 1940s it was a “rare breeding bird” in the central Willamette Valley (Evenden 1949:136), but in the southern Willamette Valley it was an “uncommon permanent resident” (Gullion 1951:140). In the early 1950s it was recorded during the breeding season near Corvallis (Eddy 1953). In the early 1990s it was a “very uncommon summer resident in the Willamette Valley” (Gilligan et al. 1994:172). By the early 2000s it was “very uncommon...year-round in the Willamette Valley, becoming more rare in the northern portion” with some speculation that it may be extirpated as a breeding species in the northern Willamette Valley (Scheuring 2003c:326).

Short-eared owl has never been reported as a breeding species in the Rogue Valley from the 1920s (Gabrielson 1931) through the 1970s (Browning 1975) or into the 2000s (Scheuring 2003c). In the 1990s it also was not reported as a breeding species in the Umpqua Valley (Hunter et al. 1998).

Western Kingbird

In the Georgia Depression in 1892, western kingbird was not reported as a breeding species on Vancouver Island or the mainland (Rhoads 1893). In the early 1900s it was a “scarce summer resident” on the mainland near Chilliwack (Brooks 1917:42) with no definitive records for Vancouver Island (Brooks and Swarth 1925). From 1909-1932 it was not reported as a breeding species in the Vancouver area (Cumming 1932). In the 1940s it was “casual” in southwestern British Columbia (Munro and Cowan 1947:148). In the early 1980s it was not reported as a breeding species in the Fraser River Delta (Butler and Campbell 1987). In the early 1990s it was a “rare...summer visitant” to the Fraser River Delta, but not Vancouver Island (Campbell et al. 1997:96), although an increase in status was noted since the 1970s from “irregular occurrence” to “annual occurrence, but still in small numbers” (Campbell et al. 1997:98).

On the San Juan Islands, western kingbird was not reported as a breeding species in the early 1930s (Miller et al. 1935), early 1960s (Bakus 1965), or early 1980s (Lewis and Sharpe 1987). Currently, it is not known to breed on the San Juan Islands, although there are

occasional summer sightings (Barb Jensen, San Juan Islands Audubon Society, personal communication).

In the North Puget Lowlands in the early 1900s, western kingbird was an “occasional summer resident” in the Bellingham area (Edson 1908:434). In the 1940s it was not reported on Eliza Island in Bellingham Bay (Wick 1958) or on the Olympic Peninsula (Kitchin 1949). In the early 1990s it was a “very rare nesting species” in Whatcom County (Wahl 1995:114).

In the South Puget Lowlands in the 1850s, western kingbird was reported as a breeding species (status undescribed) (Suckley and Cooper 1860). In the late 1800s it was a “rare summer resident...breeds” around Seattle (Rathburn 1902:135). In the early 1900s it was a “rare summer visitor” in the Tacoma area (Bowles 1906:144), and “rare or casual” on the westside (Dawson and Bowles 1909:373). In 1920 it was “rather scarce as a breeding bird” in the Seattle/Tacoma area (Burleigh 1929:514). In the early 1930s it was “casual” in western Washington (Kitchin 1934:14). In the 1940s it was a “somewhat rare...summer resident” in the Puget Sound (Larrison 1952:86), and through the 1940s it was a “rare or casual summer resident...west of the Cascade Mountains” (Jewett et al. 1953:419). By the mid 1960s it was an “uncommon to rare...former summer resident” (Larrison and Sonnenberg 1968:167). In the 1990s it was “locally uncommon in prairie and agricultural habitats” where it was “formerly more common” (Smith et al. 1997:304). In the early 2000s “breeders are quite scarce and local...in remnant prairies in Pierce County and agricultural areas along the Skagit River” in western Washington (Mlodinow 2005d:252).

In the northern Willamette Valley in the late 1800s, western kingbird was “common in summer” (Johnson 1880:637), but “rare” west of Portland (Anthony 1886:166), and in the Portland area (Anthony 1902:96). In the central Willamette Valley it was a “rare summer resident” near Corvallis (Woodcock 1902:53) and at Dayton in the northern Willamette Valley (E. F. Hadley in Woodcock 1902:53). In the early 1900s it was an “irregular summer migrant” in the southern Willamette Valley (Shelton 1917:30), and not reported as a breeding species in the Portland area (Jewett and Gabrielson 1929). In the 1930s it was “less common (than Rogue River Valley)...becomes more of a rarity to the northward in western Oregon” (Gabrielson and Jewett 1940:390). In the 1940s it was a “rare” breeding species in the central Willamette Valley (Evenden 1949:50), and it was not reported as a breeding species in the southern Willamette Valley (Gullion 1951). In the early 1990s it was still a “rare summer resident in

the Willamette Valley north of southern Lane County” (Gilligan et al. 1994:203). By the early 2000s it was “uncommon to rare in summer in the Willamette Valley... with more birds and nesting reports from southern locales” (Scheuring 2003d:396).

In the Rogue Valley, western kingbird has always been “common or abundant” since the initial reports of the 1920s (Gabrielson 1931:115), 1930s (Gabrielson and Jewett 1940:390), 1970s (Browning 1975:43), and into the early 1990s in both the Rogue and Umpqua Valleys (Gilligan et al. 1994:203, Hunter et al. 1998:104). In the early 2000s it was a “fairly common summer resident” in the Rogue and Umpqua Valleys (Scheuring 2003d:396).

Range Expansions

Six prairie-oak species have expanded their breeding range in the last 50 years. Two of the six species, white-tailed kite (*Elanus leucurus*) and western scrub-jay (*Aphelocoma californica*), appear to be continuing to expand their range; one species, acorn woodpecker (*Melanerpes formicivorus*), seems to have stabilized; and three species, Anna’s hummingbird (*Calypte anna*), blue-gray gnatcatcher, and grasshopper sparrow (*Ammodramus savannarum*), have only appeared in the region as breeding species in the last 50 years.

White-tailed Kite

Prior to the 1970s only a few incidental nonbreeding season records of white-tailed kite existed in Oregon (Gilligan et al 1994). California population increases (Eisenmann 1971) likely precipitated expansion into Oregon with nesting first reported in 1976 at Finley National Wildlife Refuge (Henny and Annear 1978). It is still a rare and local breeder in western Oregon with nesting reported at several locations in the Klamath Mountain, Willamette Valley, and Coast Range grasslands (Gilligan et al. 1994, Combs 2003).

In the Puget Lowlands, the first sighting was in 1975 (Harrington-Tweit 1980), and the first breeding was on the coast at the Raymond airport in 1988 (Anderson and Batchelder 1990). Currently, scattered breeding season pairs are reported annually in southwestern Washington (Tweit and Orness 2005).

Anna’s Hummingbird

In the 1950s and 1960s, Anna’s hummingbird appeared and established itself as a breeding species throughout the region in a very short time (Zimmerman 1973). It was first reported in the Rogue Valley of the Klamath Mountains in 1958 (Browning 1975), and the first

documented nesting was reported in Victoria and Vancouver of the Georgia Depression in the late 1950s (Campbell et al. 1990), and the South Puget Sound in 1976 in Tacoma (Smith et al. 1997). In the early 1970s it was a “regular uncommon summer visitor” in the lower Rogue River valley (Browning 1975:40). By the 1990s it was a “rare to locally uncommon summer resident” in western Oregon (Gilligan et al. 1994:342), and in the early 2000s “rare to locally fairly common” in western Washington (Wahl 2005c:229).

Acorn Woodpecker

Acorn woodpecker has always been a fairly common species in oak savanna and open woodland of the Rogue and Umpqua Valleys in the Klamath Mountains (Gabrielson 1931, Gabrielson and Jewett 1940, Browning 1975, Gilligan et al. 1994), but has expanded its range in the Willamette Valley in the last 50 years (Gilligan et al. 1994). Prior to 1950, there were only a few records near Eugene (Gabrielson and Jewett 1940, Evenden 1949). In the early 1950s it was reported in Corvallis (Walker 1952) and Salem (Jewett 1954). By the early 1990s it occurred north to Portland, although its distribution in the Willamette Valley was spotty, and it was less abundant further north including being “uncommon and local” south and west of Portland (Gilligan et al. 1994:86).

Western Scrub-jay

In the early 1900s, western scrub-jay was “not at all abundant” north of Salem in the Willamette Valley (Jewett and Gabrielson 1929:28), where it reached the northern extent of its breeding distribution (Gabrielson and Jewett 1940). In the 1940s, it was a “rare permanent resident in extreme southwest Washington” (Jewett et al. 1953:462). It has increased markedly in abundance in the northern Willamette Valley of Oregon since the 1960s (Gilligan et al. 1994), but the rare status in Washington persisted into the mid 1970s (Tweit 2005). In the last 30 years its range expanded rapidly into the Puget Lowlands, and by the 1990s it was “fairly common in southwest Washington” (Smith et al. 1997:328). In the early 2000s it was a “common resident” in the South Puget Sound with the first confirmed breeding in the 1990s (Tweit 2005:262). It also has expanded its range east and west along the Columbia River (Scheuring 2003e).

Blue-gray Gnatcatcher

Blue-gray gnatcatcher was first observed in the Rogue Valley around 1960, with nesting being documented in

1963 (Richardson and Sturges 1964). In the early 1970s there were small breeding populations at a couple locations (Browning 1975). By the early 2000s it “breeds in numerous disjunct localities...may be expanding its range in Oregon” (Vroman 2003:472).

Grasshopper Sparrow

Grasshopper sparrow was first reported in the Rogue Valley in 1963 (Richardson and Sturges 1964). Browning (1975) did not report its occurrence beyond that year, but a small colony (up to 6 males) has persisted since 1987 (Herlyn and Contreras 2009). In the Umpqua Valley, infrequent detections (25% of the time) were reported on the Umpqua Valley BBS route in the 1990s (Hunter et al. 1998), but a population was not located. It was not recorded as a breeding species in the Willamette Valley until the early 1970s (McQueen 1979). Generally, a few birds are reported annually at a couple regular locations, although an extensive survey throughout the Willamette Valley in 1996-97 detected 20-25 singing males, mostly on private pasture lands (Altman 1999).

Population Trends

The Breeding Bird Survey (BBS), in continuous operation since the late 1960s (Robbins et al. 1986), is our best source of regional population trend information for breeding landbirds in North America. Among our 49 highly associated species, there are 10 species with either long-term (1966-2007) or short-term (1980-2007) significant trends ($p < 0.10$) with a high degree of confidence in the Southern Pacific Rainforest BBS Region which encompasses prairie-oak habitats in the Pacific Northwest (Table 2). Of these, nine species have significantly declining trends, and only one species has a significantly increasing trend.

The BBS only provides population trend data for species that occur with sufficient frequency to have sample sizes large enough for analyses. Thus, species with small or disjunct populations, either naturally or as a result of significant declines prior to 1970, would not register as declining with any degree of confidence by the BBS. However, there are several sources of breeding season data other than the BBS that indicate local or regional declining populations of prairie-oak bird species. Based on data from 544 roadside point counts in grassland habitats in the Willamette Valley in 1996 (Altman 1999) and repeated in 2008 (Myers and Kreager 2010), the number of western meadowlark and Oregon vesper sparrow detections declined by 59% and 79% respectively. Streaked horned lark detections

TABLE 2. Bird species highly associated with prairie-oak habitats with significant population trends based on analyses of Breeding Bird Survey (BBS) data (1966-2007) within the Southern Pacific Rainforest BBS Region. ¹

Species	Significant Trends with a High Degree of Confidence ^{2,3}		Significant Trends with a Low Degree of Confidence ^{2,3}	
	Decreasing	Increasing	Decreasing	Increasing
White-tailed kite			R	
Cooper's hawk				R
American kestrel			L	
Mourning dove	L			
Western screech-owl				R
Common nighthawk			L	
Downy woodpecker			R	
Ash-throated flycatcher	L R			
Oak titmouse			L	
Bushtit	L R			
White-breasted nuthatch (Slender-billed)				R
House wren			R	
Wrentit	R			
Black-throated gray warbler	R			
Nashville warbler	R			
Chipping sparrow	L R			
Western meadowlark	L			
Purple finch	L R			
Lesser goldfinch		R		

¹ Considered only the 49 species listed in Appendix A that are highly associated with prairie-oak habitats. Southern Pacific Rainforest BBS Region = a BBS physiographic province which includes northwestern California and coastal western Oregon and Washington (excludes Cascades Mountains).

² Species with significantly declining or increasing trends ($p \leq 0.10$) and a high degree of confidence (Sauer et al. 2008).

L = significant ($p \leq 0.10$) long-term (1966-2007) population trend; R = significant ($p \leq 0.10$) recent (1980-2007) population trend.

remained relatively stable during the same time period. In a comparison of bird surveys conducted in 1967-1968 in oak woodlands in the Willamette Valley (Anderson 1970) with repeat surveys in 1994-1996, two of the three relatively common oak species in 1967-68 not detected in 1994-96 were chipping sparrow and bushtit (Hagar and Stern 2001). Estimates of lambda that include vital rates from all streaked horned lark nesting areas in Washington (i.e., south Puget Lowlands, coast, islands in the Columbia River) indicate that the population is declining by 40 percent per year ($\lambda = 0.61 \pm 0.10$ SD) between 2002-2005, apparently due to a combination of low survival and fecundity rates (Camfield et al. 2010).

Another source of population trend information for year-round resident prairie-oak species is Christmas Bird Counts (CBC). Among our 24 obligate or near-obligate

species, eight species can be evaluated using CBC data based on the criteria of resident status with > 90% of the wintering population likely comprised of individuals that also are breeders. The species include acorn woodpecker, streaked horned lark, western scrub-jay, oak titmouse, slender-billed white-breasted nuthatch, western bluebird, California towhee, and western meadowlark. Five of these have a moderate or high degree of confidence in the CBC trends from 1966-2006 (Dan Niven, National Audubon Society, personal communication). Two species are increasing—western bluebird (3.6% year⁻¹) and western scrub-jay (2.1% year⁻¹); two species are declining—slender-billed white-breasted nuthatch (2.2% year⁻¹) and western meadowlark (2.4% year⁻¹); and one has a stable population trend—acorn woodpecker.

Population Estimates

The two endemic subspecies, streaked horned lark and Oregon vesper sparrow, likely had relatively large regional breeding populations at the time of Euro-American settlement based on the anecdotal accounts described above. Although rigorous range-wide surveys have not been undertaken for these subspecies, estimates of current population size can be determined from multiple sources (Table 3). These include site and ecoregion-specific surveys, occurrence reports on birding list-serves, personal communications with ornithologists and birders familiar with the species, and my experience and assimilation of data from working in prairie-oak habitats throughout the Pacific Northwest for the last 20 years.

The most accurate population estimate for these subspecies, and hence the tightest population range in Table 3, is for streaked horned lark because of the extensive species-specific survey effort. In particular, there is a high degree of confidence in the Puget Lowlands and

Coast Range estimates, and moderate confidence in the Willamette Valley estimates when multiple sources are combined. There is less confidence (moderate to low depending on the ecoregion) in the population estimates for Oregon vesper sparrow due to a lack of species-specific targeted surveys for this subspecies (Table 3). However, there are data from multiple sources, and anecdotal observations from the birding community almost always get reported because of the species' rarity. Estimates of regional population size for these two subspecies is <2,000 birds for streaked horned lark and <3,000 birds for Oregon vesper sparrow.

Discussion

Extirpations, range contractions, and/or population declines have been documented for at least 21 of the 49 species I considered highly associated with prairie-oak habitats. This includes three species with regional extirpations since the 1940s. Two of these species, burrowing owl and Say's phoebe, primarily occurred

TABLE 3. Estimated breeding populations of prairie-oak endemic subspecies, streaked horned lark and Oregon vesper sparrow. ¹

Species (Subspecies)	Ecoregion					Total Population
	Georgia Depression	Puget Lowlands	Coast Ranges ²	Willamette Valley	Klamath Mountains	
Horned lark (Streaked)	<i>Extirpated</i>	150-170	120-140 (<i>Extirpated OR</i>)	900-1300	<i>Extirpated</i>	1170-1610
Vesper sparrow (Oregon)	15-20	250-300	50-100 (WA); 25-50 (OR)	200-400	200-400 (Rogue) 800-1,500 (Umpqua)	1540-2770

¹Population estimates include data from surveys or anecdotal observations plus projected population based on professional judgment of the degree of survey effort or observational coverage relative to potential suitable habitat not covered (e.g., private lands off-road). The wider the range, the greater the uncertainty of the estimate.

²Coast Ranges includes islands in the Columbia River.

Streaked Horned Lark

Puget Lowlands: 2010 survey data of 75 known pairs at 6 sites (Hannah Anderson, The Nature Conservancy, personal communication)

Coast Ranges: Washington Coast, 2010 survey data of 24-25 known pairs at 3 sites (Scott Pearson, Washington Department of Fish and Wildlife, personal communication); Islands in the Columbia River, 2010 survey data of 35 known pairs at 9 sites (Hannah Anderson, The Nature Conservancy, personal communication)

Willamette Valley: 2009 and 2010 survey data of approximately 250 pairs at 7 sites (Randy Moore, Oregon State University, personal communication); 2008 roadside surveys of 168 detections at 544 point count stations (Myers and Kreager 2010); and 2009 and 2010 anecdotal roadside and off-road observations of B. Altman.

Oregon Vesper Sparrow

Georgia Depression: 2009 and 2010 population at Nanaimo airport of 7-10 pairs (Lucy Reiss, Environment Canada, personal communication)

Puget Lowlands: late 1990s estimated 200 birds (100 pairs) on 91st Division prairie (Rogers 2000); informal surveys (Scott Pearson, Washington Department of Fish and Wildlife, personal communication).

Coast Ranges: Islands in the Columbia River informal surveys (Scott Pearson, Washington Department of Fish and Wildlife, personal communication); southern Oregon Coast 25-50 pairs (Tim Rodenkirk, Bureau of Land Management, personal communication)

Willamette Valley: 2008 roadside surveys of 14 detections at 544 point count stations (Myers and Kreager 2010); and 2009 and 2010 anecdotal roadside and off-road observations of B. Altman

Klamath Mountains: Umpqua Valley: 800-1,500 birds based on extrapolation of anecdotal roadside observations to inaccessible habitat on private lands (Matt Hunter, citizen, Umpqua, OR, personal communication); Rogue Basin: 200-400 birds based on detections during extensive bird surveys (Jaime Stephens, Klamath Bird Observatory, personal communication) and subjective extrapolations (B. Altman)

in the Klamath Mountains ecoregion with small local populations elsewhere. However, Lewis's woodpecker has been extirpated as a breeding species in prairie-oak habitats across the entire region. An additional nine species have experienced local or ecoregional extirpations and/or range contractions. This includes sandhill crane with a local South Puget Sound population extirpated shortly after Euro-American settlement, and streaked horned lark which has been extirpated from two ecoregions in the 1970s and 1980s. Since the late 1960s, another nine species have significantly declining regional population trends based on BBS data, and five species have significantly declining regional population trends based on CBC data. Several other species are showing declining population trends, but lack the amount of data to meet statistical levels of confidence. This includes the two endemic subspecies streaked horned lark and Oregon vesper sparrow, and one oak obligate species, oak titmouse.

Globally, prairie and savanna habitats have the highest ratio of conversion to human uses versus protection for conservation among the world's major biomes (Hoekstra et al. 2005). In the Pacific Northwest, the declines and extirpations of prairie-oak birds over the last 150 years should not be surprising considering the increasing human presence and loss and degradation of prairie-oak habitats. It is axiomatic that reductions in habitat will lead to reductions in populations (Bennett et al. 2005). However, the breadth and magnitude of prairie-oak habitat loss and degradation are exacerbated for most of our obligate or near-obligate bird species because they occur in a relatively narrow north-south linear strip at the northern and western edge of their habitat type with a major ecological barrier, the Cascade Mountains, to the east. Edge populations often are more susceptible to several factors relative to the core of their range including less connectivity and higher isolation of populations, which results in lower immigration rates, less genetic variability, and reduced adaptability options (Bahn et al. 2006). Population density also tends to decline and distribution may be patchier towards the edge of species ranges (Maurer and Villard 1994, Brown et al. 1995). Thus the magnitude of change in species abundance is often greatest at range edges, which tends to result in local extirpations (Clark et al. 1990) and contraction of species ranges to their core (Mehlman 1997).

Edge of range contractions, where populations tend to be smaller and more variable, are one of the most reported extirpation patterns (Brown 1984, Gaston 1994), especially for birds (Curnutt et al. 1996, Nathan

et al. 1996, Donald and Greenwood 2001). In the Pacific Northwest, two of the most high profile species, northern spotted owl (*Strix occidentalis caurina*) and greater sage grouse (*Centrocercus urophasianus*), provide examples of this pattern. The one most similar to the patterns observed for prairie-oak species is the northern edge of range extirpation of spotted owl from coniferous forests in southwestern British Columbia (Er et al. 2005). An additional similarity is that many other spotted owl populations continue to decline, especially in the northern parts of its current range (U.S. Fish and Wildlife Service 2011). The greater sage grouse within the interior of western North America exhibits an example of range contraction from the edge in all directions that has resulted in current occupation of only half its historical range (Aldridge et al. 2008). Analyses indicate that core populations in the interior of the species range were more likely to persist, and peripheral populations have experienced greater rates of extirpation than core populations. This was quantified as a 1.9% increase in the persistence of greater sage grouse for every one kilometer increase in distance from the peripheral edge of their historic range (Aldridge et al. 2008).

Patterns of Changes in Species Abundance and Distribution

Qualitative and anecdotal descriptions of a species status are subject to individual biases that cannot be evaluated for accuracy or consistency. However, in the absence of quantitative historical assessments of a species status, I used qualitative descriptions to look for temporal, spatial, and/or ecological patterns over time that might indicate likely trajectories or thresholds of changes in a species abundance and/or distribution. These patterns can be used to predict future changes in species distributions and populations, and direct management strategies for species conservation (Reed 1999).

There are several patterns that are revealed from this assessment. The predominant spatial pattern of range contractions or extirpations starts at the northern edge of a species range and moves southward. Most of the extirpations and range contractions for these species have occurred in the two northernmost ecoregions, Georgia Depression and Puget Lowlands. Examples include slender-billed white-breasted nuthatch, western bluebird, and western meadowlark. The north to south pattern of extirpations or range contractions also has been apparent in the two southernmost ecoregions, the Willamette Valley and Klamath Mountains when the northern extent of the species range is in these

ecoregions. Examples include burrowing owl, Say's phoebe, and lark sparrow.

The chronology for range contraction or extirpation also is typically north to south. For example, Lewis's woodpecker extirpations in the Georgia Depression and northern Puget Lowlands were in the 1950s and 1960s, in the southern Puget Lowlands and Willamette Valley in the 1970s, and in the Klamath Mountains in the 1990s. The exception of the north to south pattern is streaked horned lark which contracted its range in both directions at about the same time between the 1960s and 1980s.

The north to south pattern for extirpations and range contractions is not surprising considering the edge of range scenario described above, and the fact that the core population for many of these species is to the south in California. Further, oak-associated species have a greater extent and diversity of habitat as you move south into the Klamath Mountains, and this ecoregion often remains a population stronghold for a species that is declining or retracting its range elsewhere to the north. Examples include slender-billed white-breasted nuthatch, western bluebird, chipping sparrow, lark sparrow, and western meadowlark. Even the regionally extirpated Lewis's woodpecker maintained its last breeding presence in the Klamath Mountains.

Although these north to south patterns of extirpation are the predominant pattern, there are examples of local extirpations in all the ecoregions that are independent of latitude. Examples include the near extirpation of western bluebird from the South Puget Lowlands while it still maintained a population on Vancouver Island, and Oregon vesper sparrow being extirpated from the Dungeness area in the Puget Lowlands ecoregion while still maintaining a population in the San Juan Islands and in the Georgia Depression. This suggests that there can be factors negatively impacting local populations that are independent of vulnerabilities at the edge of their range.

Conversely to the north to south pattern of extirpations and range contractions, five of the six species with range expansions have expanded northward from the two southernmost ecoregions, Klamath Mountains and Willamette Valley. The exception is grasshopper sparrow, which is difficult to interpret because the population is small and patchily distributed. This northward pattern of range expansion coincidentally parallels the prediction of prairie-oak habitats moving northward with climate change (Schaefer et al. 2001).

The projected northward expansion of prairie-oak habitat with climate change could result in further species range expansions, in particular for migratory species occurring in the Klamath Mountains such as ash-throated flycatcher and blue-gray gnatcatcher. The northward expansion of habitat also may support the continued spread of species with expanding ranges such as white-tailed kite and western scrub jay. Further, it may enhance opportunities for species such as slender-billed white-breasted nuthatch, lark sparrow, and western meadowlark to repopulate areas to the north and beyond where their range has retracted from. Conceptually, this habitat expansion northward may provide a unique conservation opportunity to take advantage of climate change induced habitat expansion to counter the effects of northern edge of range population extirpations described herein. However, most of these species are experiencing declining populations throughout the region, and range expansion is problematic independent of expanding habitat until other issues can be addressed outside of habitat. The rescue of declining or extirpated edge of range populations requires a healthy regional population to function as a source population (Holmes and Sherry 1988, Telleria and Santos 1999). This is not true for most of our prairie-oak species, although there are some exceptions such as western bluebird (Slater and Altman 2011).

Ecological patterns of extirpations or population declines are less evident, as the species represent a wide variety of taxonomic families, trophic levels, migratory status, and ecological niches. However, some insights are noteworthy from habitat type. Along the gradient of prairie-oak habitats (e.g., prairie into savanna into oak), the three regionally extirpated species were associated with the prairie end of the gradient. Burrowing owl was exclusively a prairie species, and Say's phoebe and Lewis's woodpecker were savanna species. Conversely, among the nine species with recent (i.e., since the late 1960s) regionally declining population trends, most are associated with the oak end of the gradient. None of these nine species are exclusively prairie species, and five are exclusively oak species. These differences may reflect the timing of changes in the habitat with prairies and savannas receiving the most extensive impacts from early settlement due to conversion to agriculture (cropland and livestock grazing) and succession and degradation from fire suppression (Altman et al. 2001). More recently, since the 1950s, rapid human population growth and concomitant development has likely had a greater impact on loss of oak habitat.

Data Issues

Anecdotal accounts of the population status and distribution of prairie-oak birds in the Pacific Northwest are limited prior to 1900, as would be expected. They are relatively robust from the early 1900s to about 1950, but surprisingly sparse from the 1950s into the 1990s. After the comprehensive state and provincial bird books of the mid 1900s (e.g., Gabrielson and Jewett 1940 for Oregon, Jewett et al. 1953 for Washington, and Munro and Cowan 1947 for British Columbia), there are limited or no significant works until the 1990s (e.g., Gilligan et al. 1994 and Marshall et al. 2003 for Oregon, Smith et al. 1997 and Wahl et al. 2005 for Washington, and Campbell et al. 1990, Campbell et al. 1997, and Campbell et al. 2001 for British Columbia). There were some noteworthy local publications on the status of bird species during this time period (e.g., Butler and Campbell 1987 for the Fraser River Delta in the Georgia Depression ecoregion, and Browning 1975 for the Rogue Valley in the Klamath Mountains ecoregion).

The limited information on species status from the 1950s to the 1990s is particularly problematic for two reasons. First, many species that were relatively common or abundant throughout the region into the 1940s or 1950s, were uncommon to rare in most areas, with some local extirpations, by the time their status was described again in the 1990s. Some examples include common nighthawk and Oregon vesper sparrow throughout the region, and western bluebird, chipping sparrow, and western meadowlark in all ecoregions except the Klamath Mountains. Secondly, the period from the 1950s to the 1990s also is the time of a great human population increase in the Pacific Northwest. For example, from 1950–2000 in the Willamette Valley–Puget Lowlands–Georgia Basin ecoregions, there was a 62% increase in human population growth (Floberg et al. 2004). Thus, identifying the timing and patterns of declines and extirpations for many bird species is impossible because of the lack of species status assessments when most of the population declines and extirpations apparently occurred (i.e., 1950s – 1990s). Future species status assessments may benefit from continuously updated electronic databases such as eBird (<http://www.eBird.org>, viewed on 2 May 2011), which encourage the submission and archiving of bird detections.

Conservation Directions and Recommendations

Conservation concern for prairie-oak bird species is often based on local or ecoregional population status.

However, there are three prairie-oak species that warrant the greatest regional conservation concern based on the magnitude of their population declines, extirpations, and/or range contractions, and their high degree of association with prairie-oak habitats. They include two extant and endemic subspecies, streaked horned lark and Oregon vesper sparrow, and one regionally extirpated species, Lewis's woodpecker. Conservation concern for Lewis's woodpecker is recognized throughout its range (e.g., Rich et al. 2004, U.S. Fish and Wildlife Service 2008).

Two other prairie-oak obligate species with a high degree of conservation concern at less than the regional level include slender-billed white-breasted nuthatch in the Puget Lowlands ecoregion, and western meadowlark in all ecoregions except the Klamath Mountains. Slender-billed white-breasted nuthatch is listed as a State Candidate species by the State of Washington (<http://wdfw.wa.gov/conservation/endangered/lists>, viewed on 2 May 2011), and a priority species in the Willamette Valley of Oregon (Oregon Department of Fish and Wildlife 2005), but has not been recognized as of conservation concern elsewhere in its regional range (i.e., Klamath Mountains ecoregion of Oregon and all of California). Western meadowlark populations throughout its range are significantly declining (Sauer et al. 2011), although it has not been recognized as being of regional conservation concern. It also was the only species in this regional analysis with corroborative significantly declining trends in BBS and CBC data. This concurrence of data along with extensive anecdotal information on declines and extirpations indicates a pressing need for conservation action for this species.

The degree of conservation concern for several other prairie-oak species is somewhat lessened from a regional perspective because they also breed in other habitats (e.g., common nighthawk, chipping sparrow, and western bluebird in conifer forests) or their historical distributions and/or populations were limited (e.g., northern harrier, sandhill crane, short-eared owl, western kingbird, and lark sparrow).

The following recommendations are suggested to support conservation activities relative to the population status and distribution of prairie-oak species with declining populations, range contractions, and/or extirpations.

- Conduct range-wide and local inventories to determine population status and distribution of priority prairie-oak species.

Rationale: Outside of the extensive work for streaked horned lark which has federal status, there

have been very few species-specific ecoregional surveys (see Rogers 1999, Altman 1999, MacLaren and Cummins 2000, and Myers and Kreager 2010).

- Conduct demographic studies to determine population viability of priority species in altered prairie-oak habitats such as pasture, hayfields, airports, and urban and residential park-like oak woodlands and forests.

Rationale: Although some species have been able to persist to varying degrees in altered prairie-oak habitats, there is uncertainty about their population viability due to issues such as fragmentation and area requirements (e.g., northern harrier and western meadowlark), dispersal ability among patches and across non-suitable habitats (e.g., slender-billed white-breasted nuthatch), increased predators on ground-nesting birds from adjacent residential and rural landscapes (e.g., cats), and increased cowbird parasitism from an agricultural landscape (e.g., chipping sparrow).

- Evaluate the appropriateness of reintroductions and other population management methods for slender-billed white-breasted nuthatch, Lewis's woodpecker, and streaked horned lark (Altman 2006), implement appropriate actions based on these assessments, and expand western bluebird reintroduction to include Vancouver and the Gulf Islands of southwestern British Columbia.

Rationale: Initial successes of the reintroduction of western bluebirds to San Juan Island (Slater and Altman 2011) provide experience and rationale for the expansion of not only that project, but also for the initiation of similar projects with other species.

- Conduct a status assessment for Oregon vesper sparrow to determine its potential for listing under the U.S. Endangered Species Act.

Rationale: The population estimate for Oregon vesper sparrow is similar to that of streaked horned lark which already is listed as a Federal Candidate species.

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Appendix A. Regularly breeding native bird species highly associated with prairie-oak habitats west of the Cascade Mountains with a population (historical or current) in at least one ecoregion. Bold indicates obligate or near-obligate status (i.e., >75% of their abundance in the region is in prairie-oak habitats).

Common Name	Scientific Name
Northern harrier	<i>Circus cyaneus</i>
White-tailed kite	<i>Elanus leucurus</i>
Cooper's hawk	<i>Accipiter cooperii</i>
American kestrel	<i>Falco sparverius</i>
Mountain quail	<i>Oreortyx pictus</i>
California quail	<i>Callipepla californica</i>
Sandhill crane	<i>Grus canadensis</i>
Killdeer	<i>Charadrius vociferus</i>
Mourning dove	<i>Zenaida asiatica</i>
Short-eared owl	<i>Asio flammeus</i>
Burrowing owl (extirpated)	<i>Athene cunicularia</i>
Western screech-owl	<i>Otus kennicottii</i>
Common nighthawk	<i>Chordeiles minor</i>
Common poorwill	<i>Phalaenoptilus nuttallii</i>
Anna's hummingbird	<i>Calypte anna</i>
Acorn woodpecker	<i>Melanerpes formicivorus</i>
Lewis's woodpecker (extirpated)	<i>Melanerpes lewis</i>
Downy woodpecker	<i>Picoides pubescens</i>
Western wood-pewee	<i>Contopus sordidulus</i>
Say's phoebe (extirpated)	<i>Sayornis saya</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>
Western kingbird	<i>Tyrannus verticalis</i>
Hutton's vireo	<i>Vireo huttoni</i>
Cassin's vireo	<i>Vireo cassinii</i>
Western scrub-jay	<i>Aphelocoma californica</i>
Horned lark (Streaked)	<i>Eremophila alpestris strigata</i>
Oak titmouse	<i>Baeolophus onornatus</i>
Black-capped chickadee	<i>Poecile atricapilla</i>
Bushtit	<i>Psaltiriparus minimus</i>
White-breasted nuthatch (Slender-billed)	<i>Sitta carolinensis aculeate</i>
Bewick's wren	<i>Thryomanes bewickii</i>
House wren	<i>Troglodytes aedon</i>
Wrentit	<i>Chamaea fasciata</i>
Blue-gray gnatcatcher	<i>Poliophtila caerulea</i>
Western bluebird	<i>Sialia mexicana</i>
Nashville warbler	<i>Vermivora ruficapilla</i>
Black-throated gray warbler	<i>Dendroica nigrescens</i>
Lazuli bunting	<i>Passerina amoena</i>
Spotted towhee	<i>Pipilo maculatus</i>
California towhee	<i>Pipilo crissalis</i>
Chipping sparrow	<i>Spizella passerina</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Savannah sparrow	<i>Passerculus sandwichensis</i>
Vesper sparrow (Oregon)	<i>Poocetes gramineus affinis</i>
Lark sparrow	<i>Chondestes grammacus</i>
Western meadowlark	<i>Sturnella neglecta</i>
Purple finch	<i>Carpodacus purpureus</i>
Lesser goldfinch	<i>Carduelis psaltria</i>
American goldfinch	<i>Carduelis tristis</i>

Literature Cited

- Alcorn, G. D. 1941. The western burrowing owl in Grays Harbor County, Washington. *Murrelet* 22:57-58.
- Alcorn, G. D. 1959. Another record of Lewis's woodpecker in western Washington. *Murrelet* 40:10.
- Aldridge, C. L., S. E. Nielsen, H. L. Beyer, M. S. Boyce, J. W. Connelly, S. T. Knick, and M. A. Schroeder. 2008. Range-wide patterns of greater sage grouse persistence. *Diversity and Distributions* 14:983-994.
- Altman, B. 1999. Status and conservation of grassland birds in the Willamette Valley. Unpublished report submitted to Oregon Department of Fish and Wildlife, Corvallis.
- Altman, B. 2000. Conservation strategy for landbirds in lowland valleys of western Oregon and Washington. Version 1.0. American Bird Conservancy and Oregon-Washington Partners in Flight.
- Altman, B. 2003a. Common Nighthawk. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 330-333.
- Altman, B. 2003b. Vesper Sparrow. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 542-545.
- Altman, B. 2003c. Western Meadowlark. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 580-582.
- Altman, B. 2006. Restoring populations of cavity-nesting oak-associated bird species. In D. Apostol and M. Sinclair (editors), *Restoring the Pacific Northwest: The Art and Science of Ecological Restoration in Cascadia*. Island Press, Washington, D. C. Pp. 358-359.
- Altman, B., M. Hayes, S. Janes, and R. Forbes. 2001. Wildlife communities of westside grassland and chaparral habitats. In D. Johnson and T. O'Neil (editors), *Wildlife-habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis. Pp. 261-291.
- Alverson, E. R. 2005. Recovering prairies and savannas in a sea of forest: a conservation challenge in the Pacific Northwest. *Plant Talk* 40:23-27.
- American Bird Conservancy. 2006. Top 20 most threatened bird habitats in the United States: oak savannah. *Bird Conservation*, Summer 2006:12-13.
- Anderson, S. H. 1970. The avifauna composition of Oregon white oak stands. *Condor* 72:417-423.
- Anderson, C. M., and D. M. Batchelder. 1990. First confirmed nesting of the black-shouldered kite in Washington. *Western Birds* 21:37-38.
- Anthony, A. W. 1886. Field notes on the birds of Washington, County, Oregon. *Auk* 3:161-172.
- Anthony, A. W. 1902. List of the birds in the vicinity of Portland, Oregon. In F.M. Bailey, *Handbook of Birds of the Western United States*. Houghton, Mifflin and Company, Boston. Pp. 93-98.
- Bahn, V., R. J. O'Conner, and W. B. Krohn. 2006. Effect of dispersal at range edges on the structure of a species ranges. *Oikos* 115:89-96.
- Bakus, G. J. 1965. Avifauna of San Juan Island and Archipelago, Washington. Allan Hancock Foundation, University of California, Los Angeles.
- Beason, R. C. 1995. Horned Lark (*Eremophila alpestris*). In A. Poole and F. Gill (editors), *The Birds of North America*, No. 195. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D. C.
- Behle, W. H. 1942. Distribution and variation of the horned larks of western North America. *University of California Publications in Zoology* 3:205-316.
- Bennett, P. M., I. P. F. Owens, D. Nussey, S. T. Garnett, and G. M. Crowley. 2005. Mechanisms of extinction in birds: phylogeny, ecology, and threats. In A. Purvis, J. L. Gittleman, and T. Brooks (editors), *Phylogeny and Conservation*. Cambridge University Press, Cambridge. Pp. 317-336.
- Bowles, J. H. 1898. Notes on the streaked horned lark. *Osprey* 3:53-54.
- Bowles, J. H. 1906. A list of the birds of Tacoma, Washington, and vicinity. *Auk* 23:138-148.
- Bowles, J. H. 1926. Summer record of the burrowing owl in Clallam County, Washington. *Murrelet* 7:39.
- Bowles, J. H. 1929. Changes in bird populations. *The Murrelet* 10:52-55.
- Brooks, A. 1917. Birds of the Chilliwack district, British Columbia. *Auk* 34:28-50.
- Brooks, A. C. and H. S. Swarth. 1925. A distributional list of the birds of British Columbia. *Cooper Ornithological Club, Pacific Coast Avifauna* 17:1-158.
- Brown, J. H. 1984. On the relationship between abundance and distributions of species. *American Naturalist* 124:255-279.
- Brown, J. H., D. W. Mehlman, and G. C. Stevens. 1995. Spatial variation in abundance. *Ecology* 76:2028-2043.
- Browning, M. R. 1975. The distribution and occurrence of the birds of Jackson County, Oregon and surrounding areas. *North American Fauna* No. 70.
- Buchanan, J. B. 2005a. Common Nighthawk. In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 224-225.
- Buchanan, J. B. 2005b. Western Bluebird. In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 290-291.
- Burleigh, T. D. 1929. Notes on the bird life of northwestern Washington. *Auk* 46:502-519.
- Burleigh, T. D. 1930. Notes on the bird life of northwestern Washington. *Auk* 47:48-63.
- Butler, R. W., and R. W. Campbell. 1987. The birds of the Fraser River delta: populations, ecology, and international significance. *Canadian Wildlife Service Occasional Paper* No. 65, Ottawa, Ontario.
- Camfield, A. F., S. F. Pearson, and K. Martin. 2010. Life history variation between high and low elevation subspecies of horned larks *Eremophila* spp. *Journal of Avian Biology* 41:1-9.
- Campbell, R. W., N. K. Dawe, I. McTaggart-Cowan, J. M. Cooper, G. W. Kaiser, and M. C. E. McNall. 1990. *The Birds of British Columbia. Volume 2: Non-passerines. Diurnal birds of prey through woodpeckers*. University of British Columbia Press, Vancouver.
- Campbell, R. W., N. K. Dawe, I. McTaggart-Cowan, J. M. Cooper, G. W. Kaiser, M. C. E. McNall, and G. E. J. Smith. 1997. *The Birds of British Columbia. Volume 3: Passerines. Flycatchers through vireos*. University of British Columbia Press, Vancouver.
- 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. Volume 4: Passerines. Wood Warblers through Old World Sparrows*. University of British Columbia Press, Vancouver.

- Chappell, C. B. 2005. White-breasted Nuthatch (*Sitta carolinensis*). In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. University of Washington Press, Seattle. Pp. 280-281.
- Chappell, C. B., and J. Kagan. 2001. Westside grasslands. In D. Johnson and T. O'Neil (editors), *Wildlife-habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis. Pp. 41-43.
- Chappell, C. B., and T. A. Williamson. 1984. First documented breeding of the white-breasted nuthatch in western Washington. *Murrelet* 65:51-52.
- Clark, T. W., R. M. Warnecke, and G. G. George. 1990. Management and conservation of small populations. In T. W. Clark and J. H. Seebeck (editors), *Management and Conservation of Small Populations*. Chicago Zoological Society, Brookfield, IL.
- Combs, B. 2003. White-tailed Kite. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 138-140.
- Cowan, I. 1940. Bird records from British Columbia. *Murrelet* 21:69-70.
- Crawford, R. C., and H. Hall. 1997. Changes in the South Puget prairie landscape. In P. Dunn and K. Ewing (editors), *Ecology and Conservation of the South Puget Sound Prairie Landscape*. The Nature Conservancy, Seattle. Pp. 11-16.
- Cumming, R. A. 1932. Birds of the Vancouver district, British Columbia. *Murrelet* 13:1-15.
- Curnutt, J. L., S. L. Pimm, and B. A. Maurer. 1996. Population variability of sparrows in space and time. *Oikos* 76:131-144.
- Dawson, W. L., and J. H. Bowles. 1909. *The Birds of Washington*. 2 volumes. Occidental Publishing Company, Seattle.
- Demarchi, D. A. 1995. *Ecoregions of British Columbia*, 4th edition. British Columbia Ministry of Environment, Land, and Parks, Victoria. Map (1:2,000,000).
- Detling, L. E. 1968. The chaparral formation of southwestern Oregon, with considerations of its postglacial history. *Ecology* 42:348-357.
- Donald, P. F., and J. J. D. Greenwood. 2001. Spatial patterns of range contraction in British breeding birds. *Ibis* 143:593-601.
- Eddy, R. H. 1953. Summer bird habitats in the Corvallis area, Willamette Valley, Oregon. M. S. Thesis, Oregon State University, Corvallis.
- Edson, J. M. 1908. Birds of the Bellingham Bay region. *Auk* 25:425-439.
- Eisenmann, E. 1971. Range expansion and population increase in North and Middle America of the white-tailed kite (*Elanus leucurus*). *American Birds* 25:529-536.
- Eltzroth, E. K. 2003. Western Bluebird. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 474-477.
- Er, K. B. H., J. L. Innes, K. Martin, and B. Klinkenberg. 2005. Forest loss with urbanization predicts bird extirpations in Vancouver. *Biological Conservation* 126:410-419.
- Ewing, K. 1997. Management and restoration of south Puget Sound prairies and woodlands. In P. Dunn and K. Ewing (editors), *Ecology and Conservation of the South Puget Sound Prairie Landscape*. The Nature Conservancy of Washington, Seattle. Pp. 3-9.
- Evenden, F. G. 1949. Habitat relations of typical austral and boreal avifauna in the Willamette Valley, Oregon. Ph.D. Dissertation, Oregon State College, Corvallis.
- Fannin, J. 1898. Checklist of British Columbia birds: a preliminary catalogue of the collections of natural history and ethnology of the Provincial Museum, Victoria, British Columbia. British Columbia Provincial Museum, Victoria.
- Flahaut, M. R. 1952. North Pacific coast region, summer report. *Audubon Field Notes* 6:295.
- Flahaut, M. R. 1953. North Pacific coast region, summer report. *Audubon Field Notes* 7:323-324.
- Flahaut, M. R., and Z. M. Schultz. 1954. North Pacific coast region, summer report. *Audubon Field Notes* 8:357-358.
- Floberg, J., M. Goering, G. Wilhere, C. MacDonald, C. Chappell, C. Rumsey, Z. Ferdana, A. Holt, P. Skidmore, T. Horsman, E. Alverson, C. Tanner, M. Bryer, P. Iachetti, A. Harcombe, B. McDonald, T. Cook, M. Summers, D. Rolph. 2004. *Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment, Volume One: Report*. Prepared by The Nature Conservancy with support from the Nature Conservancy of Canada, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (Natural Heritage and Nearshore Habitat programs), Oregon State Natural Heritage Information Center and the British Columbia Conservation Data Centre.
- Franklin, J. F., and C. T. Dyrness. 1973. *Natural Vegetation of Oregon and Washington*. U. S. Department of Agriculture, Forest Service General Technical Report PNW-008, Portland, OR.
- Gabrielson, I. N. 1931. The birds of the Rogue River Valley, Oregon. *Condor* 33:110-121.
- Gabrielson, I. N., and S. G. Jewett. 1940. *Birds of Oregon*. Oregon State Monograph No. 2. Oregon State College, Corvallis.
- Gaston, K. J. 1994. Geographic range sizes and trajectories to extinction. *Biodiversity Letters* 2:163-170.
- Gilligan, J., M. Smith, D. Rogers, and A. Contreras. 1994. *Birds of Oregon: Status and Distribution*. Cinclus Publications, McMinnville, OR.
- Goodge, W. 1950. Some notes on the birds of the San Juan Island. *Murrelet* 31:27-28.
- Graf, W. 1939. The distribution and habitats of amphibians and reptiles in Lincoln, Benton, and Linn counties. M.S. Thesis, Oregon State College, Corvallis.
- Green, G. A. 2003. Burrowing Owl. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 316-319.
- Gullion, G. W. 1951. Birds of the southern Willamette Valley, Oregon. *The Condor* 53:129-149.
- Hagar, J. 2003. White-breasted Nuthatch. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 449-451.
- Hagar, J. C., and M. A. Stern. 2001. Avifauna in oak woodland habitats of the Willamette Valley, Oregon. *Northwest Naturalist* 82:12-25.
- Hall, H. L., R. C. Crawford, and B. Stephens. 1995. Regional inventory of prairies in the southern Puget Trough: Phase I. File report, Washington Department of Natural Resources, Natural Heritage Program, Olympia.
- Hanna, I., and P. Dunn. 1997. Restoration goals for Oregon white oak habitats in the south Puget Sound region. In P. Dunn and K. Ewing (editors), *Ecology and Conservation of the South Puget Sound Prairie Landscape*. The Nature Conservancy of Washington, Seattle. Pp. 231-245.
- Harrington-Tweit, B. 1980. First records of the white-tailed kite in Washington. *Western Birds* 11:151-153.
- Henny, C. J., and J. T. Annear. 1978. A white-tailed kite breeding record for Oregon. *Western Birds* 9:131-133.

- Herlugson, C. J. 1978. Comments on the status and distribution of western and mountain bluebirds in Washington. *Western Birds* 9:21-32.
- Herlyn, H. G., and A. L. Contreras. 2009. *Handbook of Oregon Birds: A Field Companion to Birds of Oregon*. Oregon State University Press, Corvallis.
- Hoekstra, J. M., T. M. Boucher, T. H. Ricketts, and C. Roberts. 2005. Confronting a biome crisis: global disparities of habitat loss and protection. *Ecological Letters* 8:23-29.
- Hoge, G., and W. Hoge. 1991. *Birds of Ocean Shores*. Black Hills Audubon Society, Olympia, WA.
- Holmes, R. T., and T. W. Sherry. 1988. Assessing population trends of New Hampshire forest birds: local versus regional patterns. *Auk* 105:756-768.
- Hosten, P. E., O. E. Hickman, F. K. Lake, F. A. Lang, and D. Vesely. 2006. Oak woodlands and savannah. In D. Apostol and M. Sinclair (editors), *Restoring the Pacific Northwest: The Art and Science of Ecological Restoration in Cascadia*, Island Press, Washington, D. C. Pp. 63-96.
- Hunn, E. S. 1982. *Birding in Seattle and King County*. Seattle Audubon Society, Seattle, Washington.
- Hunter, M. G., M. M. Sawyer, R. Maertz, B. Kruse, and K. Wilson. 1998. *Birds of Douglas County, Part 3: the hundred valleys of the Umpqua*. *Oregon Birds* 24:103-117.
- Husak, M. S. 2005. Lewis's Woodpecker. In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 233-234.
- Jewett, S. G. 1916. Notes on some land birds of Tillamook County, Oregon. *The Condor* 18:74-80.
- Jewett, S. G. 1954. Northward extension of the range of the California woodpecker. *The Murrelet* 35:14.
- Jewett, S. G., and I. Gabrielson. 1929. *Birds of the Portland area, Oregon*. Pacific Coast Avifauna 19, Cooper Ornithological Club, Berkeley, California.
- Jewett, S. G., W. P. Taylor, W. T. Shaw, and J. W. Aldrich. 1953. *Birds of Washington State*. University of Washington Press, Seattle.
- Johnson, O. B. 1880. List of the birds of the Willamette Valley, Oregon. *American Naturalist* 14:485-491 and 635-641.
- Jones, S. L., and J. E. Cornely. 2002. Vesper Sparrow (*Pooecetes gramineus*). In A. Poole and F. Gill (editors), *The Birds of North America*, No. 624. The Birds of North America, Inc., Philadelphia, Pennsylvania.
- Kitchin, E. A. 1922. Nesting notes at Tacoma in 1922. *The Murrelet* 3:13-18.
- Kitchin, E. A. 1934. Distributional checklist of the birds of the state of Washington. Northwest Fauna Series Number 1. Seattle.
- Kitchin, E. A. 1949. *Birds of the Olympic Peninsula*. Olympic Stationers, Port Angeles, Washington.
- Larrison, E. J. 1942. *A Field Guide to the Birds of the Seattle Area*. Seattle Audubon Society.
- Larrison, E. J. 1947. *Field Guide to the Birds of King County, Washington*. Seattle Audubon Society.
- Larrison, E. J. 1952. *Field Guide to the Birds of Puget Sound*. Seattle Audubon Society.
- Larrison, E. J. and K. G. Sonnenberg. 1968. *Washington Birds: Their Location and Identification*. Seattle Audubon Society.
- Larson, E. M., and J. T. Morgan. 1998. Management recommendations for Washington's priority habitats: Oregon white oak woodlands. Washington Department of Fish and Wildlife, Olympia.
- Lawrence, R. H. 1892. A preliminary list of the birds of the Gray's Harbor region, Washington. *Auk* 9:39-47.
- Lea, T. 2002. Historical Garry oak ecosystems of greater Victoria and Saanich Peninsula – a 1:20,000 Map. In P. J. Burton (editor), *Garry Oak Ecosystem Restoration: Progress and Prognosis*. Proceedings of the third annual meeting of the British Columbia chapter of the Society for Ecological Restoration, April 27-28, 2002. University of Victoria, British Columbia. Pp. 24-27.
- Lewis, M. G., and F. A. Sharpe. 1987. *Birding in the San Juan Islands*. The Mountaineers, Seattle, Washington.
- Lord, J. K. 1866. *The Naturalist in Vancouver Island and British Columbia*. Volume 2. Richard Bentley, London.
- MacLaren, P. A., and E. B. Cummins. 2000. Streaked horned lark surveys in western Washington, year 2000. Unpublished report, Washington Department of Fish and Wildlife, Olympia.
- Marshall, D. B., M. G. Hunter, and A. L. Contreras. 2003. *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis.
- Maurer, B. A. and M. A. Villard. 1994. Population density: geographic variation in abundance of North American birds. *National Geographic Research and Exploration* 10:306-317.
- McQueen, L. 1979. The grasshopper sparrows of the Willamette Valley. *Oregon Birds* 5:32-35.
- McMannama, Z. 1950. Additional notes on the birds of the San Juan Islands. *Murrelet* 31:29-30.
- Mehlman, D. W. 1997. Changes in avian abundance across the geographic range in response to environmental change. *Ecological Applications* 7:614-624.
- Miller, R. C. 1944. A two-year bird census of San Juan Island, Washington. *Auk* 61:395-400.
- Miller, R. C., E. D. Lumley, and F. S. Hall. 1935. *Birds of the San Juan Islands, Washington*. *Murrelet* 16:51-65.
- Miller, R. C., and E. L. Curtis. 1940. *Birds of the University of Washington campus*. *Murrelet* 21:35-46.
- Mlodinow, S. G. 2005a. Chipping Sparrow. In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 324.
- Mlodinow, S. G. 2005b. Vesper Sparrow. In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 326-327.
- Mlodinow, S. G. 2005c. Western Meadowlark. In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 346.
- Mlodinow, S. G. 2005d. Western Kingbird. In T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 252-253.
- Munro, J. A., and I. Cowan. 1947. A review of the bird fauna of British Columbia. Special Publication No. 2, British Columbia Provincial Museum, Victoria, British Columbia.
- Myers, A. M., and D. A. Kreager. 2010. Declining and state sensitive bird species breeding in Willamette valley grasslands: status update. Unpublished report prepared for Oregon Department of Fish and Wildlife, Corvallis, and The Oregon Zoo, Portland.
- Nathan, R., U. N. Safriel, and H. Sirihai. 1996. Extinction and vulnerability to extinction at distribution peripheries: an analysis of the Israeli breeding avifauna. *Israel Journal of Zoology* 42:361-383.
- Noss, R. F., E. T. LaRoe III, and J. M. Scott. 1995. *Endangered ecosystems of the United States: a preliminary assessment of loss and degradation*. U.S. Department of the Interior, National Biological Service Biological Report 28, Washington, D. C.

- Oberholser, H. C. 1902. A review of the larks of the genus *Otocoris*. U.S. National Museum Proceedings 24:801-803.
- Oregon Department of Fish and Wildlife. 2005. Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem.
- Palmer, R. H. 1927. Birds of the Olympic Peninsula. Part 1. Murrelet 8:35-42.
- Palmer, T. S. 1892. Notes on some birds of Grays Harbor, Washington. Auk 9:308-310.
- Pearse, T. 1946. Notes on changes in bird populations in the vicinity of Comox, Vancouver Island – 1917 to 1944. The Murrelet 27:4-9.
- Pearson, S. F., and B. Altman. 2005. Range-wide streaked horned lark (*Eremophila alpestris strigata*) assessment and preliminary conservation strategy. Washington Department of Fish and Wildlife, Olympia.
- Pravosudov, V. V., and T. C. Grubb, Jr. 1993. White-breasted Nuthatch (*Sitta carolinensis*). In A. Poole and F. Gill (editors), The Birds of North America, No. 195. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D. C.
- Rathburn, S. F. 1902. A list of the landbirds of Seattle, Washington, and vicinity. Auk 19:131-141.
- Reagan, A. B. 1911. Birds of the Olympic Peninsula, Washington. Transactions of the Kansas Academic Society 24:242-272.
- Reed, J. M. 1999. The role of behavior in recent avian extinctions and endangerments. Conservation Biology 13:232-241.
- Reed, L. J., and N. G. Sugihara. 1987. Northern oak woodlands: ecosystem in jeopardy, or is it already too late? In T. R. Plumb and N. H. Pillsbury (technical coordinators), Proceedings of the symposium on multiple-use management of California's hardwood resources, 12-14 November 1986, San Luis Obispo, CA. U. S. Department of Agriculture, Forest Service General Technical Report PSW 100, Pacific Southwest Forest and Range Experiment Station, Berkeley, California. Pp. 59-63.
- Retfalvi, L. 1963. Notes on the birds of the San Juan Islands, Washington. Murrelet 44:12-13.
- Rhoads, S. N. 1893. The birds observed in British Columbia and Washington during spring and summer 1892. Proceedings of the Academy of Natural Sciences, Philadelphia, Pennsylvania.
- Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology, Ithaca, New York. http://www.partnersinflight.org/cont_plan/ (viewed on 2 May 2011).
- Richardson, C., and F. W. Sturges. 1964. Bird records from southern Oregon. Condor 66:514-515.
- Robbins, C. S., D. Bystrak, and P. H. Geissler. 1986. The Breeding Bird Survey: its first 15 years, 1965-1979. U. S. Department of the Interior, Fish and Wildlife Service Research Publication 157.
- Rogers, R. 1999. The streaked horned lark in western Washington. Unpublished report to U.S. Fish and Wildlife Service, Western Washington Office, Lacey, WA.
- Rogers, R. 2000. Microhabitat requirements of foraging areas for streaked horned lark, western bluebird, Oregon vesper sparrow, and western meadowlark in the south Puget Sound. M.S. Thesis, Evergreen State College, Olympia, WA.
- Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American breeding bird survey, results and analysis 1966 - 2007. Version 5.15.2008. U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, Maryland. Available online at <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html> (viewed on 2 May 2011).
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Zololkowski, Jr., and W. A. Link. 2011. The North American breeding bird survey, results and analysis 1966 - 2009. Version 3.23.2011. U. S. Geological Survey, Patuxent Wildlife Research Center, Laurel, Maryland.
- Schafer, S. L., P. J. Bartlein, and R. S. Thompson. 2001. Potential changes in the distributions of western North America tree and shrub taxa under future climate scenarios. Ecosystems 4:200-215.
- Scheuring, R. W. 2003a. Chipping Sparrow. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), Birds of Oregon: A General Reference. Oregon State University Press, Corvallis. Pp. 538-540.
- Scheuring, E. J. 2003b. Northern Harrier. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), Birds of Oregon: A General Reference. Oregon State University Press, Corvallis. Pp. 144-146.
- Scheuring, E. J. 2003c. Short-eared Owl. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), Birds of Oregon: A General Reference. Oregon State University Press, Corvallis. Pp. 326-327.
- Scheuring, R. W. 2003d. Western Kingbird. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), Birds of Oregon: a general reference. Oregon State University Press, Corvallis. Pp. 395-397.
- Scheuring, R. W. 2003e. Western Scrub-jay. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), Birds of Oregon: A General Reference. Oregon State University Press, Corvallis. Pp. 414-416.
- Sharpe, F. A. 1993. Olympic Peninsula birds: the songbirds. Unpublished manuscript.
- Shelmerdine, T. 2003. Lark Sparrow. In D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), Birds of Oregon: A General Reference. Oregon State University Press, Corvallis. Pp. 545-547.
- Shelton, A. C. 1917. A distributional list of the landbirds of west-central Oregon. University of Oregon Bulletin 14:1-51.
- Slater, G. L., and B. Altman. 2011. Avian restoration in the prairie-oak ecosystem: a reintroduction case study of western bluebirds to San Juan Island, Washington. Northwest Science 85:223-232.
- Smith, M. R., P. W. Mattocks, Jr., and K. M. Cassidy. 1997. Breeding birds of Washington State, Volume 4. In K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich (editors), Washington State Gap Analysis - Final Report, Seattle Audubon Society Publications in Zoology No 1, Seattle.
- Stinson, D. W. 2005. Washington State status report for the Mazama pocket gopher, streaked horned lark, and Taylor's checkerspot. Washington Department of Fish and Wildlife, Olympia.
- Suckley, G. and J. G. Cooper. 1860. The natural history of Washington Territory and Oregon. Final reports on the survey of the Northern Pacific Railroad route. Bailliere Brothers, New York.
- Swarth, H. S. 1912. Report on a collection of birds and mammals from Vancouver Island. University of California Publications in Zoology 10:1-124.
- Taylor, R. J., and T. R. Boss. 1975. Biosystematics of *Quercus garryana* in relation to its distribution in the state of Washington. Northwest Science 49:49-57.

- Telleria, J. L., and T. Santos. 1999. Distribution of birds in fragments of Mediterranean forests: the role of ecological densities. *Ecography* 22:13-19.
- Thompson, S. P., and D. K. McDermond. 1985. Summary of recent northern harrier nesting in western Washington. *The Murrelet* 66:82-84.
- Thompson, P. A. 2005. Northern Harrier. *In* T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 112-113.
- Towle, J. C. 1982. Changing geography of Willamette valley woodlands. *Oregon Historical Quarterly* 83:66-87.
- Tweit, B. 2005. Western Scrub-jay. *In* T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 262-263.
- Tweit, B., and R. Orness. 2005. White-tailed Kite. *In* T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 110-111.
- U. S. Environmental Protection Agency. 1996. Level III ecoregions of the continental United States (revision of Omernik 1987). U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Map M-1. Corvallis, Oregon.
- U. S. Fish and Wildlife Service. 2008. *Birds of Conservation Concern 2008*. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. <http://www.fws.gov/migratorybirds> (viewed on 2 May 2011).
- U. S. Fish and Wildlife Service. 2010. Draft revised recovery plan for the northern spotted owl, *Strix occidentalis caurina*. U.S. Fish and Wildlife Service, Portland, Oregon.
- Vroman, D. P. 2003. Blue-gray Gnatcatcher. *In* D. B. Marshall, M. G. Hunter, and A. L. Contreras (editors), *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis. Pp. 472-474.
- Wahl, T. R. 1995. *Birds of Whatcom County: status and distribution*. T. R. Wahl, Bellingham, Washington.
- Wahl, T. R. 2005a. Horned Lark. *In* T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 268-269.
- Wahl, T. R. 2005b. Short-eared Owl. *In* T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 221-222.
- Wahl, T. R. 2005c. Anna's Hummingbird. *In* T. R. Wahl, B. Tweit, and S. G. Mlodinow (editors), *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis. Pp. 229-230.
- Wahl, T. R., B. Tweit, and S. G. Mlodinow. 2005. *Birds of Washington: Status and Distribution*. Oregon State University Press, Corvallis.
- Walker, K. M. 1952. Northward extension of the range of the acorn woodpecker. *The Condor* 54:315.
- Weber, W. C. 1980. A proposed list of rare and endangered bird species for British Columbia. *In* R. Stace-Smith, L. Johns, and P. Joslin (editors), *Threatened and Endangered Species and Habitats in British Columbia and the Yukon*. Fish and Wildlife Branch, Ministry of Environment, Victoria. Pp. 160-182.
- Wick, W. Q. 1958. A nine year bird list from Eliza and Protection islands, Washington. *Murrelet* 39:1-9.
- Woodcock, A. R. 1902. Annotated list of the birds of Oregon. *Oregon Agricultural Experimental Station Bulletin* 68:1-118.
- Zimmerman, D. A. 1973. Range expansion of Anna's hummingbird. *American Birds* 27:827-835.

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